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Introduction

What is Technical English: Vocabulary and Grammar and who is it for?
Technical English: Vocabulary and Grammar will help you increase your knowledge of technical English and develop your vocabulary and grammar. By working through the materials you will become more accurate and more appropriate in a range of key technical contexts. You can use it on your own (self-access) or in class (as part of a course).

What is in Technical English: Vocabulary and Grammar?
There are 50 topic areas divided into vocabulary (30) and grammar (20):
- 1–9 Vocabulary: Professional activities
- 10–30 Vocabulary: Company profiles
- 31–50 Grammar uses

In addition to the topic areas there is:
- an answer key
- a grammar glossary explaining key grammatical terms
- a vocabulary glossary of 1500 vocabulary items, based around the technical themes covered in the topics 1–30. A multilingual glossary is available on our website at www.summertown.co.uk

Each topic consists of input on the left-hand page, and exercises and tasks on the right-hand page. The left-hand page presents language through:
A sample sentences to show the language forms in use
B an explanation and extension of the language forms
C examples and descriptions of the uses of these forms

The right-hand page presents exercises and tasks to:
1 familiarize you with the language forms
2 provide a controlled task to check that you can apply the language
3 help you practise using the language in a practical context

Using the material
The book may be used either in class or for self-study. For classroom use, teachers should choose topic areas to supplement the language areas covered by the English course book being followed, either to consolidate the presentation of language forms or to provide additional exercises. For self-study use, students should choose topics according to their own interests or to problems they or their teachers have identified. For both teachers and students, the contents at the front of the book and the detailed index at the end will help to locate appropriate units.

Having chosen a topic area, we recommend you work through the language presentation on the left-hand page:
A read through the sample sentences and note the use of the language forms
B study the language forms presented
C study the use of these forms
The glossary will help you to understand any words and phrases that you don’t know.
Next you can move on to the practice exercises and tasks on the right-hand page. Before you start an exercise:

- make sure you clearly understand the task
- look at any examples that have been given
- refer back to the language forms and uses on the left-hand page, if necessary

After you have finished an exercise:

- check your answer with the key at the back of the book
- if your answers to an exercise are wrong, look again at the left-hand page. If you are not sure, then ask your teacher.

An introduction to the topic, with examples of the vocabulary or grammar in context

The words in **bold** are defined in the glossary

The first exercise aims to familiarize you with the language forms

The second exercise provides a controlled task to check that you can apply the language

An extension of the unit topic with further vocabulary forms and grammar patterns

Examples of the language presented in a range of practical contexts

Further key words from each topic are presented and defined in the glossary

The third exercise asks you to use the language around a practical context

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книг выложена группой vk.com/create_your_english
Production 1

Production management is concerned with planning and controlling industrial processes which produce and distribute products and services. Techniques of production management are also used in service industries; here they are called operations management. During production processes, inputs are converted into outputs. These processes take many forms: from basic agriculture to large-scale manufacturing. Much manufacturing takes place in factories, where assembly lines allow a steady flow of raw materials (inputs) and finished products (outputs).

People in production focus on efficiency and effectiveness of processes in order to maximize productivity. To achieve overall success, it is important to measure, analyse and evaluate these processes. However, other activities also contribute to success: purchasing, inventory control, quality control, storage, logistics.

Production varies according to the inputs, processes and outputs. Other important factors are the place of production and the resources. In addition, stock, a major cost, needs to be carefully controlled, and the equipment must be regularly maintained to remain productive and prevent breakdowns.

Production place
- factory
- layout
- plant
- site
- unit
- workshop

Process
- assemble
- batch
- component
- convert
- effectiveness
- efficiency
- line
- lot
- maximize
- optimize

Resources
- equipment
- fixtures
- machinery
- materials handling
- raw materials

Stock
- inventory
- stock
- store

Maintenance
- breakdown
- failure
- fault
- maintain
- repair

Study the Productivity Conceptual Model below:

A simple way of looking at productivity in a business organization is to think of it in terms of the productivity model. The Productivity Conceptual Model below takes the form of a 'productivity tree'. The roots denote the inputs to the system, the trunk the conversion process and the leaves and fruit the system outputs.
1. Match the words that go together and then complete the sentences below.

Quality material
finished manager
industrial lines
production process
large-scale levels
assembly control
raw products
productivity manufacturing

1. Improved __________________ has led to higher efficiency in production.
2. The manufacture of paper is an ___________ _____________.
3. Crude oil is the basic ___________ ____________ for the plastics industry.
4. Increased ___________ ____________ have reduced the number of manufacturing workers.
5. The large warehouse is used to store ___________ __________, waiting for delivery.
6. Large car manufacturers use ___________ ____________ in production.
7. The company began in a single room but has now developed into ___________ _____________.
8. The manufacturing process is the responsibility of the __________ _____________.

2. Complete the sentences below. The first letter of the missing word has been given.

1. A quantity of __________ goods prepared at the same time is known as a b_________.
2. To put parts together to produce the final product is to a ___________ _____________.
3. Production processes convert inputs to o _____________.
4. The process of buying inputs is known as p _____________.
5. A part which is used in the final product is called a c _____________.
6. To get the best possible level of production is to o _____________.

3. Here is part of a memo from a company director to the production manager. Complete it with words from the box.

faulty • equipment • repair • site • workshops • factory • stock breakdowns • layout • maintain • fixtures • machinery

MEMO
From Robert George To Sarah Bridge Re Premises

We are making good progress with the new (a) ___________ development. A new (b) __________ close to the river has been acquired. Designers are currently working on the (c) __________ of the area and exact location of the factory building. All (d) __________ and fittings will be carried out by Alan Shores Ltd. The new manufacturing (e) __________ has been ordered and we hope to be able to install it ahead of schedule. New (f) __________ will be purchased for the engineering (g) ___________ once they have been completed.

The present machinery is old and several (h) __________ recently have caused production backlogs. We will continue to (i) __________ and (j) __________ these machines until the new ones are up and running. I would ask you to carry out a full (k) __________ inventory as soon as possible. Any (l) __________ goods should be removed from store and disposed of.
A production planning system is essential to ensure that a company's processes, machinery, equipment, labour skills and material are organized efficiently for better profitability. There are many factors that need to be considered in the planning system. For example, a firm may require a large number of different components. Also demand can vary daily in this ever-changing world. New sales orders come in. Some get cancelled; there may be breakdowns in the workshop. backlogs build up; there may be late or early delivery from suppliers. It is difficult to keep track of all these changes manually. To handle these situations, many companies keep safety stock. However, if a company has an effective production planning system there is no need to keep high safety stock. The money blocked in the excessive safety stock can be released. At the same time, opportunity costs due to stock-outs can be minimized.

All areas of management require careful planning and organizing. Planning and organizing production is essential for efficient operations.

Planning

aggregate · backlog · back order · bottleneck · capacity · cycle · downtime
flow · forecast · idle · lead time · make-to-order · make-to-stock
optimization · output · productivity · prototype · requirement · run · satisfy
schedule · sequence · set up · set-up time · slack · throughput · uncertainty
update · work in progress

Work organization

lot · overtime · shift · workforce · workload

Study the Market Needs Analysis Model below:

There are two principal aims of the Market Needs Analysis Model below:

- to identify market needs for your product
- to analyse the market potential for new products or services

The product performance specifications detail the operational features of the product.

At the product design stage, designers and product managers will redefine how the product is to work and how it is to be made.

At the production system specifications stage, we focus on the manufacturing requirements.

Investment decision methods focus on the alternative methods for financing the investment needed.

The objective of production system design is to standardize both the methods of production system design and the machine units for production system construction.

A production cost model calculates production costs and capacity factors.
Choose the correct answer in the following.

1. Recent faults with machines have cost the company a great deal of _____.
   a) maintenance  b) slack time  c) downtime

2. Once the mock-up of the new design has been tested, we can build the _____.
   a) prototype  b) update  c) set up

3. It's unprofitable to manufacture small quantities because of the machine _____.
   a) lead time  b) set-up time  c) sequence

4. The production manager has to produce a production ____ for the next four weeks.
   a) set up  b) schedule  c) output

5. Once the order has been agreed and production begun, the designer is still responsible
   for the _____.
   a) work in progress  b) workload  c) back order

6. These items are produced together as one _____.
   a) cycle  b) delivery  c) lot

Match the correct word with each definition.

workload: The movement of materials through a production system
workforce: An order from an earlier time which hasn't been produced yet
back order: The volume of goods which are produced
material flow: Something that is needed for a particular process
throughput: The series of activities following one another to produce a product
output: The amount of work that has to be done
cycle: The volume of goods that can be dealt with in a certain period of time
requirement: All the people who work in a particular company

The works manager is showing a group around the factory. The letters of the missing words are mixed up. Complete the dialogue with the missing words.

We're not particularly busy at the moment. Believe it or not, the (a) _______ (manedd) for furniture is seasonal.

So, do you (b) _________ (kaem-osct)?

Well, all our units are made- (c) _________ (ot-reord). However, we make components-to-stock.

When are your busy times?

Normally from September to May but there is always a great deal of (d) _________ (cerunintya) and it's difficult to (e) _________ (recatos) sales trends.

So does the (f) _________ (adel mite) vary?

No, not really. Our (g) _________ (adel mite) is usually 8 to 10 weeks. When we are very busy, the workforce usually do (h) _________ (mitevero) to try to avoid a (i) _________ (lockbag) of orders. If necessary we introduce a (j) _________ (fisht) system when we're working at full capacity to avoid (k) _________ (beckslotten) at key machines.

During a busy period do you have (l) _________ (tosko-tous)?

Seldom. We use the time when work is (m) _________ (lacks) to build up stock of components. We don't like machines or workers to be (n) _________ (lide)!
Research and development (R and D) is the search for new and improved products and industrial processes. Both industrial firms and governments carry out R and D. Innovations in products or processes normally follow a path from laboratory (lab) idea, through pilot or prototype production and manufacturing start-up, to full-scale production and market introduction. There are two main types of research. Pure or basic research aims to clarify scientific principles without a specific end product in view; applied research uses the findings of pure research in order to achieve a particular commercial objective. Development describes the improvement of a product or process by scientists in conjunction with engineers. Industry spends vast sums to develop new products and the means to produce them cheaply, efficiently, and safely.

Research is important in many disciplines and there are different types of research with different research professionals. The type of research reflects the environment and the objectives. In addition, many research words have entered the general language.

Types of research

- academic research
- applied research
- clinical research
- development and evaluation research
- experimental development
- experimentation
- innovation
- practical application
- product development
- pure basic research
- pure research
- strategic basic research

Research professionals

- analyst
- engineer
- lab technician
- research assistant
- scientist
- technician

General terms

- breakthrough
- carry out
- feasible
- feasibility
- me-too product
- patent
- file* a patent
- pipeline
- pilot
- prototype
- register* a patent
- technical know-how (TKH)

* file/ register a patent

Notice the stress in the word families below often changes:

<table>
<thead>
<tr>
<th>Verb</th>
<th>Noun (process)</th>
<th>Noun (person)</th>
<th>Adjective</th>
</tr>
</thead>
<tbody>
<tr>
<td>'analyse'</td>
<td>an'alysis</td>
<td>'analyst</td>
<td>ana'lytical</td>
</tr>
<tr>
<td>'innovate'</td>
<td>inno'vation</td>
<td>'innovator</td>
<td>innov'ative</td>
</tr>
<tr>
<td>de'velop</td>
<td>de'veloment</td>
<td>de'veloper</td>
<td>develop'mental</td>
</tr>
<tr>
<td>ex'periment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>in'vent</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

You Are Here Ladder

- 'What a breakthrough - we've bred the first germ we can attack with everyday household objects!'
1. Match the term with the correct definition.

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>applied research</td>
<td>the study of pure scientific principles</td>
</tr>
<tr>
<td>clinical research</td>
<td>the study of the parts and their relationship to one another</td>
</tr>
<tr>
<td>pilot study</td>
<td>changing and improving a product to achieve the best possible result</td>
</tr>
<tr>
<td>experimentation</td>
<td>looking at how scientific theory can be used in practice</td>
</tr>
<tr>
<td>pure basic research</td>
<td>looking at the effects of drugs or treatment on patients</td>
</tr>
<tr>
<td>product development</td>
<td>a new technique or idea</td>
</tr>
<tr>
<td>innovation</td>
<td>the process of tests and trials to see what happens under different conditions</td>
</tr>
<tr>
<td>analysis</td>
<td>small-scale experiment</td>
</tr>
</tbody>
</table>

2. Use the word in brackets to form a word which fits in the sentence.

1. The scientists have presented a detailed _________ of the results. (analyse)
2. They have brought in a food _________ to help in the research. (analyse)
3. All process materials are tested using highly developed _________ techniques. (analyse)
4. The researchers have come up with an _________ idea for the use of recycled plastics. (innovate)
5. Charles Dyson is the _________ of a vacuum cleaner which works on a new principle. (invent)
6. The advent of the ballpoint pen was a wonderful _________ . (invent)
7. They employ a large team of software _______. (develop)
8. A report has been prepared on the _________ tests that have been carried out. (develop)
9. Increasing numbers of people can now work from home thanks to _________ in telecommunications. (develop)
10. These methods of production are still at an _________ stage. (experiment)
11. The _________ is continuing work on the new drug. (experiment)
12. Many people are against animal _________. (experiment)

3. The following email has been received by the R and D department. Complete it using words from the list.

breakthrough • prototype • developmental • engineers

design • patent • innovative • experiment

Dear Frank

I had a preliminary meeting with Maria Altefors regarding her (a) _________ for a new children’s pushchair. It’s a simple but (b) _________ invention which will allow two children of different ages to be transported in a single unit. She has already registered a (c) _________ and I’d like us to develop a (d) _________ . Could you arrange a meeting with the (e) _________ to discuss this? We will have to carry out (f) _________ tests to assess safety features and (g) _________ with different weight loads.

This could be a real (h) _________ in pushchair design!

Regards

Ruth
Research and development 2

A

If you want to get feedback on a product or service, you can use qualitative research. Qualitative research uses open-ended interviewing to explore and understand the attitudes, opinions, feelings and behaviour of individuals or a group of individuals. Qualitative research has many common uses, including:

- investigating current product/service/brand positioning
- identifying strengths and weaknesses
- exploring alternative communication messages
- understanding why customers buy and use a product or service
- evaluating the impact of advertising or public relations campaigns

B

Research is based around a wide range of activities – from detailed analysis to product improvement. Results from research activities need to be scientifically measured and then reported.

Research activities

- analyse
- assess
- compile
- determine
- develop
- discover
- evaluate
- experiment
- explore
- find
- identify
- improve
- innovate
- investigate
- modify
- record
- search for
- study
- survey
- test
- trial

Measuring the results

- constant
- correlation
- deviation
- distribution
- frequency
- mean
- measurement scale
- median
- mode
- norm
- random
- reliability
- sampling
- standard
- statistics
- validity
- variable
- variance

Reporting the results

- feedback
- report
- response

C

The following words can be used as both nouns and verbs:

- study
- test
- trial
- experiment

We plan to conduct a study of consumer attitudes.
We are going to study consumer attitudes.
We intend to test the reactions to our new advertising campaign.
We will carry out the tests in order to get feedback on our advertising campaigns.
The trials produced some very interesting results.
We aim to trial our new products over the coming months.
We have evaluated the reliability of the experiments.
It is important to experiment with new processes.

Notice the following verb and noun patterns

<table>
<thead>
<tr>
<th>Form</th>
<th>Noun ending</th>
<th>Noun</th>
</tr>
</thead>
<tbody>
<tr>
<td>compile</td>
<td>-ation</td>
<td>compilation</td>
</tr>
<tr>
<td>standardize</td>
<td></td>
<td>standardization</td>
</tr>
<tr>
<td>evaluate</td>
<td></td>
<td>evaluation</td>
</tr>
<tr>
<td>identify</td>
<td>-ication</td>
<td>identification</td>
</tr>
<tr>
<td>modify</td>
<td></td>
<td>modification</td>
</tr>
<tr>
<td>assess</td>
<td>-ment</td>
<td>assessment</td>
</tr>
<tr>
<td>develop</td>
<td></td>
<td>development</td>
</tr>
<tr>
<td>improve</td>
<td></td>
<td>improvement</td>
</tr>
</tbody>
</table>
1

Choose the correct word from the box to complete the following.

distribution  •  random  •  scale  •  sampling  •  statistics
mean  •  frequency  •  median  •  mode

The collecting, classifying and analysing of information shown in numbers is known as
(a) ___________.
The middle value of a set of numbers is known as the (b) ___________.
The average value is also known as the (c) ___________.
The value which occurs most often is the (d) ___________.

1,480 ball bearings were measured as part of quality control. The results are shown in a
histogram. The histogram shows frequency (e) ___________. The figures are based on a
(f) _______ of 2,000 ball bearings. They were chosen at (g) _______; in no particular order,
time or pattern. The measurement (h) _______ is in millimetres. The (i) _______ of 14.96mm
is two.

Answer the following questions from the graph below.
The median is (j) ___________. The mode of distribution is (k) ___________. The mean is (l) ___________.

2

Complete the following sentences with an appropriate verb from Research Activities on the page
opposite. You will have to put the verb in the correct form.

1 They __________ a report on future energy requirements.
2 The temperature was measured every hour and carefully ___________.
3 Following the accident, fire experts have to __________ the cause of the fire.
4 These clothes have not worn well so we will have to try and __________ the quality.
5 Scientists continue to __________ for a cure for cancer.
6 They are trying to __________ a solution to the problem of friction.

3

Put the following sentences in the correct order to describe the steps in the process of developing
a new drug.

a After hospital specialists have evaluated the drug, information gathered from clinical trials is
analysed.
b Data is subsequently sent to the Committee on Safety of Medicines.
c Then an application is made to the government for a clinical licence.
d Tests are then carried out on volunteers.
e They are monitored closely for any other unwanted effects which were not identified earlier.
f A decision is made by the committee and a licence issued before the new product is
introduced.
g Any side effects or toxicity are identified at this early stage.
h First of all, a new substance is tested in the laboratories.
5 Information technology 1

Information systems **collect, organize, store, process, retrieve** and **display** information in different formats (text, video, and voice). Information technology allows very fast, automated manipulation of **digital** data and their transformation from and to **analogue**.

Two basic technologies have been responsible for the development of the necessary **hardware**: **integrated circuits** and **digital communications**. Parallel advances have been made in **software**, particularly easy-to-use software products to **create**, **maintain**, **manipulate**, and **query** files and **records**. Many of these **software programs** are designed for use both by computer professionals and enthusiastic amateurs. Another important factor is the development of **computer networks** (p. 5).

As technology develops, new **models** and **types** of computer appear. At the heart of all computers is the **hardware**. However, without **software**, computers are just dumb boxes, unable to perform any calculations or operations.

**Models and types of computer**
- desktop
- laptop
- mainframe
- notebook
- server
- terminal
- workstation

**Computer hardware**
- CPU (central processing unit)
- dot matrix printer
- expansion card
- Inkjet printer
- keyboard
- laser printer
- monitor
- mouse
- RAM (random access memory)
- scanner
- screen
- storage devices

**Software**
- applet
- application software
- browser
- database software
- email software
- graphics software
- operating system
- search engine
- spreadsheet
- word processing

Many words in the field of IT come from American English. So you may see the following spellings:

<table>
<thead>
<tr>
<th>British English</th>
<th>American English</th>
</tr>
</thead>
<tbody>
<tr>
<td>programme</td>
<td>program</td>
</tr>
<tr>
<td>analogue</td>
<td>analog</td>
</tr>
</tbody>
</table>

The area of IT is developing very quickly; and the language to describe hardware, software and applications is also evolving at a high speed. As a result new **noun + noun** combinations often change to **single nouns**

<table>
<thead>
<tr>
<th>noun + noun</th>
<th>single noun</th>
</tr>
</thead>
<tbody>
<tr>
<td>lap top</td>
<td>laptop</td>
</tr>
<tr>
<td>note book</td>
<td>notebook</td>
</tr>
<tr>
<td>work station</td>
<td>workstation</td>
</tr>
<tr>
<td>desk top</td>
<td>desktop</td>
</tr>
</tbody>
</table>
Label the diagram.

Combine one word from A and one word from B and match it with the appropriate definition in C.

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>create</td>
<td>products</td>
<td>a monitor will do this on a computer screen</td>
</tr>
<tr>
<td>central</td>
<td>information</td>
<td>this describes the format of 0 and 1 in which information is stored</td>
</tr>
<tr>
<td>software</td>
<td>processing unit</td>
<td>these enable a computer to perform word processing, to create databases, and to manipulate numerical data</td>
</tr>
<tr>
<td>display</td>
<td>card</td>
<td>when two or more components are combined and then incorporated into a single package</td>
</tr>
<tr>
<td>digital</td>
<td>files</td>
<td>to make new programs, utilities or documents</td>
</tr>
<tr>
<td>expansion</td>
<td>network</td>
<td>a group of electronic machines connected by cables or other means which can exchange information and share equipment (such as printers and disk drives)</td>
</tr>
<tr>
<td>integrated</td>
<td>data</td>
<td>the principal microchip that the computer is built around</td>
</tr>
<tr>
<td>computer</td>
<td>circuits</td>
<td>you plug this into a slot to add features such as video, sound, modem and networking</td>
</tr>
</tbody>
</table>

Complete each gap in the following text with a phrase from the table above.

1. The computer monitor will ________ ________ so you can see it on screen.
2. Information is stored on a computer as ________ ________.
3. Spreadsheet and graphic software are examples of ________ ________.
4. Digital communications and ________ ________ have allowed developments in hardware to be made.
5. In order to organise data you should ________ ________ where you can store data.
6. When several computers are linked together you have a ________ ________.
7. The part of the computer which interprets and carries out instructions is the ________ ________.
8. An ________ ________ can be inserted in your computer to give your computer extra capabilities.
A network includes:
- techniques
- physical connections
- computer programs

used to link two or more computers.

Network users can:
- share files, printers and other resources
- send electronic messages
- run programs on other computers

Each network operates according to a set of computer programs called network protocols for computers to talk to one another. Computer networks can now be interconnected efficiently through gateways. The biggest network is the World Wide Web. It consists of a large number of smaller interconnected networks called internets. These internets may connect tens, hundreds, or thousands of computers. They can share information with each other, such as databases of information. The internet allows people all over the world to communicate with each other effectively and inexpensively.

Before a network can operate, it needs physical connections so that signals can be transmitted. After the network has been connected, it is ready for operation.

Network connections
- bandwidth
- baud
- bits per second (bps)
- optical fibre
- packet
- receive
- signal
- transmit
- transmission speed
- twisted pair

Network operation
- configure
- download
- hack
- hub
- install
- internet service provider (ISP)
- local area network (LAN)
- switch
- transmit
- upload
- web page
- website
- wide area network (WAN)
- wireless

A prefix comes at the beginning of a word and usually has a specific meaning, for example inter = between.

Look at the following prefixes and their use in the above IT words/phrases:

<table>
<thead>
<tr>
<th>prefix</th>
<th>meaning of prefix</th>
<th>example of use</th>
</tr>
</thead>
<tbody>
<tr>
<td>inter-</td>
<td>between</td>
<td>internet, interconnect, interactive, international</td>
</tr>
<tr>
<td>intra-</td>
<td>within</td>
<td>intranet, e.g. company intranet</td>
</tr>
<tr>
<td>trans-</td>
<td>across</td>
<td>transmit, transfer, transaction</td>
</tr>
<tr>
<td>co-/com-/con-</td>
<td>with</td>
<td>combine, compatible, connect, configure</td>
</tr>
<tr>
<td>up-</td>
<td>up (to internet)</td>
<td>upload</td>
</tr>
<tr>
<td>down-</td>
<td>down (from internet)</td>
<td>download, downtime, i.e. when the network is down (not working)</td>
</tr>
</tbody>
</table>
Choose the correct word in each of the following.

1. The speed with which a modem can process data is measured in _____.
   a) bandwidth   b) bits per second (bps)   c) signal
2. Cables consisting of several copper wires each with a shield are known as _____.
   a) twisted pair   b) optical fibre   c) power cables
3. Computers that are connected together within one building form a _____.
   a) WAN   b) ISP   c) LAN
4. If you transfer a file from a remote computer to your computer, you _____.
   a) download   b) upload   c) run
5. To send out information is to _____.
   a) signal   b) packet   c) transmit
6. A document containing information and graphics that can be accessed on the internet is _____.
   a) a website   b) a web page   c) the World Wide Web

Complete the words in the following sentences by adding the prefix inter-, intra-, trans-, com-, con-, up- or down-.

1. Last month computer ____ time cost the company over €10,000 in lost production.
2. The computers in the production department have now been successfully ____ connected with those in the planning department.
3. Once you have completed payment details the data will be ____ mitted via a secure link.
4. We cannot network these computers because the systems are not ____ patible.
5. Many companies distribute internal documents on their own ____ net.
6. Once the home page has been completed, we’ll be ready to ____ load the site.
7. Cables are being laid throughout the building as the network requires physical ____ nections.
8. Using the network he was able to ____ bine the data from different reports.

Here is a list of instructions for someone wanting to set up a small network. Put the instructions in the correct order.

a) Make wiring and layout plans for your network.
b) Hook up the network cables by connecting everything to the hub.
c) Check that each computer has an IP address and give it a name.
d) If you’re installing a small network, twisted pair will be adequate. However, in order to span greater distances and to minimize magnetic and electrical interference use fibre optic cable.
e) Decide on the type of network you want to install. To enable you to transfer large amounts of data, choose Fast Ethernet (100BaseT).
f) Install network adapters in the computers.
g) Add an internet gateway to your network to set up a shared internet connection.
h) Install driver software for the adapter driver and install client software to share printers and files.
i) Check which protocols are installed and add any other protocols you require.
j) Get the hardware you need: an Ethernet adapter card for each computer that doesn’t have an Ethernet port, a hub if you’ve got more than two computers, cables and wall jacks.
Logistics

Logistics describes the organized movement of physical materials in a factory. It is usually subdivided into materials management, which is control of the efficient and effective flow of materials in the factory, from the arrival of raw materials to the packaging of the product; and distribution management, which includes the storage of goods and their transportation to distributors and consumers.

At the same time, efficient logistics needs efficient documentation flow for the goods from storage to destination. The process of distribution involves different means of transportation and requires secure packaging.

Documentation
- bill of lading
- delivery note
- envelope
- packing list
- picking list

Goods
- cargo
- consignment
- freight
- shipment

Storage
- depot
- distribution centre
- forklift truck
- pallet
- warehouse

Packaging
- carton
- crate
- pack
- package

Distribution
- carriage
- carrier
- channel
- deliver
- delivery
- dispatch
- export
- forward
- haul
- import
- in transit
- lading
- load
- shipper
- unload

Means of transportation
- air freight
- lorry
- ship
- tanker
- truck
- van

Read the following extract from a delivery note:

**Delivery Note**

774 Booth Street South, YORK Y01 6PL

Ref: 80000402

**Delivery address:** 67 Toshoro Avenue, Rotaronga City, Republic of Rotaronga

**Customer no.:** 45673457

**Purchase order date:** 12/12/02

**Purchase order no.:** 346696

**Order date:** 02/12/02

**Order no.:** 705555

**TRANSPORTATION DETAILS**

**Terms of delivery:** CIF

**Volume Gross wt.:** 340 kgs

**Net wt.:** 300 kgs

**ITEM DETAILS**

<table>
<thead>
<tr>
<th>Item</th>
<th>Material</th>
<th>Weight</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>000010</td>
<td>600002453</td>
<td>340 kgs</td>
<td>7,500</td>
</tr>
</tbody>
</table>

**Material description:** RP-335, BG, 50

**Customer article number:** R-2082

**Batch number:** D0395
1 Match the sentences with the pictures.

1. Heavy goods are sent by truck.
2. Milk is transported in a tanker.
3. Goods for export are being sent by ship.
4. Local deliveries are made in the van.
5. Put the documents in an envelope and send them by post.
6. The goods are packed in cartons.
7. Fresh fruit and vegetables are sent by air freight.
8. The goods are packed on a pallet.
9. These are moved using a forklift truck.

2 Find a word or phrase on the opposite page which means:

1. A contract with a shipper to transport goods.
2. The control of flow of materials and goods within the factory.
3. To bring goods in from another country.
4. A place where large quantities of materials, equipment or goods are stored until they are needed.
5. Goods packed together and wrapped up ready for transportation.
6. Goods carried on a plane, ship or truck.
7. The system of distribution of goods from producer to customer.
8. In the process of being transported.
9. To put goods onto a ship, lorry or plane.
10. The act of moving goods from one place to another.

3 Here is an email from Woodman Ltd., a manufacturing company, to a customer. Fill in the blanks with words from the box.

dispatched • warehouse • shipped • delivery • carrier
packing list • crate • delivery note • consignment

Ref: MS423

Dear Clive,

We have just (a) _________ the (b) _________ of goods, order no. MS423, to you. We have used our usual (c) _________, MJ Irving. The chairs have been packed in a wooden (d) _________ and marked WD MS Belfast. I am attaching the (e) _________; the (f) _________ is enclosed with the goods.

The crate should be (g) _________ to Ireland on Thursday and Irving has promised (h) _________ to your (i) _________ in Belfast on Friday morning.

Regards

Barry
Quality

Quality means meeting the minimum set of requirements in a product's specification and then being delighted that the customer's expectations have been met and exceeded. Therefore, the goal of a business should be to find out customer needs and then fine tune the process to ensure that they are met.

Quality improvement concepts have developed over several decades. They began simply as a method for detecting defective products by inspection at the end of the production line. In recent years the emphasis has changed from inspection to prevention. Today sampling methods monitor processes and keep them under control. The ultimate aim, of course, is zero defects.

In recent years different approaches to quality improvement have been developed. The overall aim is to prevent defects through:

- continuous process improvement
- customer focus

Defect prevention

- error • failure • inspect • prevent
- process control • repair • rework • scrap

Continuous process improvement

- add value • analysis • cause/effect analysis • check • commitment
- control • define • facilitate • monitor • prioritize
- inventory control • system failure analysis • variability

Customer focus

- accurate • comply with • needs • rectify

Below are three examples of useful quality summary charts:

A Pareto chart is a type of bar chart typically used to improve quality, process capability, or to conserve materials and energy.

A bar graph uses either horizontal or vertical bars to show comparisons among categories.

A pie chart helps you to visualize the relative importance of several categories of a variable.
Choose the correct word in the following sentences.

1. We must check/control the temperature regularly to make sure it doesn’t rise.
2. To compare the number of defects over the last ten years, it would be best to use a Pareto/bar chart.
3. We try to detect/define faulty products before they are sent to our customers.
4. But it’s a better idea to protect/prevent faulty products in the first place.
5. Making sure that materials are stored correctly is part of process/inventory control.
6. We’re sending our engineer who will repair/remake the faulty motor.
7. We have had problems with the electronic equipment due to power errors/failures.
8. This process is very inefficient because of the volume of scrap/error left over.
9. Here is a list of things we could do to improve quality, and now we must define/prioritize them.
10. Improving the design quality of these cars will add value/variability.

Choose the correct ending from B to complete each of the following sentences in A and then produce a short article about Japanese cars.

A

Let us consider what happened when Japanese cars were first imported into the UK and America.
Local manufacturers thought they were cheap and of low quality.
But soon people noticed that they didn’t break down, which exceeded their expectations.
At the same time, Japanese manufacturers started trying to meet customer needs in terms of style and design.
Customers were delighted with the new cars, which provided value for money.
The cars did more than simply satisfy customers’ requirements.

B

as often as British or American cars.
which exceeded their expectations.
they provided value for money.
were first imported into the UK and America.
and of low quality.
meet customer needs in terms of style and design.

Here is a memo from the head of quality control to the managing director. Complete it with words from the box.

MEMO

From Sue Braun
To Alois Vincent
Re Quality control

As you know we recently carried out a (a) ______________ analysis of the bottle manufacturing plant. Our aim was quality (b) ______________ and to reduce the number of (c) ______________ products. As you can see from the attached (d) ______________ chart, raw materials and system failures are the areas we must improve on.

We will introduce new systems to change our (e) ______________ methods and (f) ______________ raw materials more carefully. We carried out a system failure (g) ______________ and we are now repairing the moulding machine. This will (h) ______________ future failures and reduce (i) ______________. With (j) ______________ process improvement, our aim is (k) ______________ defects.
Health and safety

The average person finds it difficult to assess risks. For this reason, work practices need to be regulated. Examples of dangerous activities are:

- welding or grinding without goggles
- working on a construction site work without a hard hat
- working in noisy factories, cabs, on airport tarmacs and with outdoor machinery without ear protection
- working in chemical areas without protective clothing
- smoking near hazardous substances

Without regulation some employees will take risks.

Health and safety is a part of employment (labour) law. It covers general matters such as:

- occupational health
- accident prevention regulations
- special regulations for hazardous occupations such as mining and building
- provisions for risks such as poisons, dangerous machinery, dust, noise, vibration, and radiation
- the full range of dangers arising from modern industrial processes, for example the widespread use of chemicals

The key concerns for health and safety are to assess the risks and hazards by identifying and quantifying the effects so that appropriate protective measures can be taken.

Risks and hazards

<table>
<thead>
<tr>
<th>Combustion</th>
<th>Contamination</th>
<th>Drains</th>
<th>Dust</th>
<th>Explosion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flammable</td>
<td>Friction</td>
<td>Fumes</td>
<td>Fumigation</td>
<td>Gas</td>
</tr>
<tr>
<td>Harmful</td>
<td>Shock</td>
<td>Spraying</td>
<td>Toxic</td>
<td>Vapour</td>
</tr>
</tbody>
</table>

Effects

<table>
<thead>
<tr>
<th>Adverse effects</th>
<th>Birth defect</th>
<th>Burn</th>
<th>Cancer</th>
<th>Dizziness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drowsiness</td>
<td>Genetic damage</td>
<td>Impair fertility</td>
<td>Irreversible effect</td>
<td>Vomiting</td>
</tr>
</tbody>
</table>

Protective measures

<table>
<thead>
<tr>
<th>Avoid contact with</th>
<th>Dispose of</th>
<th>Dry</th>
<th>Handle</th>
<th>Keep precautionary</th>
<th>Protect</th>
<th>Recycle</th>
<th>Rinse</th>
<th>Seal tightly</th>
<th>Wash</th>
<th>Well-ventilated</th>
</tr>
</thead>
</table>

The following health and safety notices show some protective measures that can be taken:
**Tasks**

**1** Choose the correct word in each sentence.

1. Store containers in a **well-ventilated**/good-ventilated place
2. Wipe up any spillages immediately and **wash**/rinse with soapy water.
3. Process cooling water can be **returned**/recycled.
4. This chemical is **toxic**/intoxicating if swallowed.
5. Leftover chemicals should be **disposed**/disposed of safely.
6. Please wear protective gloves when **finger**/handling this material.
7. Remember that asbestos fibres can cause **cancer**/coma.
8. Pregnant women should not take this medicine as it may cause birth **defects**/effects.
9. Increased levels of radiation may lead to **compared**/impaired fertility.
10. Do not empty chemical paint products into the **drains**/grains.
11. Protect/Avoid contact with skin and eyes.
12. Do not use with other products as it may release dangerous fumes/fumigation.

**2** Complete the following sentences with a form of the word in brackets.

1. When working in this area, please wear ____________ clothing (protect).
2. Don’t pour used chemicals into the drains as they will cause ____________ (contaminate).
3. Heating this liquid may cause an ____________ (explode).
4. These chemicals must be kept in a locked cupboard because they are ____________ (harm).
5. While they repair the roof, we will close this department as a ____________ measure (precaution).
6. ____________ health is one part of Health and Safety (occupation).
7. Working in a noisy factory without ear protectors is a ____________ activity (danger).
8. Petrol and oil are ____________ chemicals (flame).
9. Make sure the containers are closed ____________ (tight).
10. Make sure you are wearing breathing equipment before starting ____________ (fume).

**3** The manager in charge of health and safety is explaining things to some new employees. Complete what he says by filling the blanks with the correct word from the box.

noise • protection • drowsiness • dust • accidents • smoke
poisonous • fumes • risks • burns • goggles

**MANAGER:** New government regulations mean that we are all required to be more aware of
(a) ____________ in the workplace. As your employer, we will provide you with the
necessary safety equipment. You must wear (b) ____________ to protect your eyes when
working on this machinery. You should also wear ear (c) ____________ because the
(d) ____________ from the machines is high enough to cause damage to your hearing.
And of course, there is a lot of (e) ____________ in the air, so please wear masks to stop
you breathing it in. But, you too are responsible for your safety and for preventing
(f) ____________ happening.

**EMPLOYEE:** Are we looking at fire risks?

**MANAGER:** Yes, of course. Remember that it is very dangerous to (g) ____________ near the
chemical store. In fact, we have a no smoking policy throughout the company. Chemicals
themselves are, of course, (h) ____________ so they should never enter your mouth.
They could cause (i) ____________ if you get them on your skin. If you leave them
without a lid, (j) ____________ may escape and cause headaches,
(k) ____________ or dizziness.
Engineering

Engineering is based principally on physics, chemistry, and mathematics, and their extensions into materials science, solid and fluid mechanics, thermodynamics, transfer and rate processes, and systems analysis.

Engineering as a profession involves different tasks. It can refer specifically to the manufacture or assembly of engines, machine tools and machine parts. It is also used more generally to describe the creative application of scientific principles to design, develop, construct and forecast the behaviour of structures, apparatus, machines, manufacturing processes and works.

The function of scientists is to know, while that of engineers is to do: they must solve specific problems.

See also: Chemical (12), Civil (20, 21), Electrical (16), Electronic (17, 18), Mining (22), Petroleum (23, 24), Production (1, 2), Construction (15).

Different branches of engineering require different equipment and are based on different processes.

Branches of engineering
The following words/phrases are all followed by ‘engineering’

chemical • civil • electrical • electronic • highway • hydraulic • industrial mechanical • mining • petroleum production • production • structural

Equipment in engineering
boiler • crane • gas engine • machine tool • pump • turbine

Processes in treating metals
anneal • anodize • electroplate • forge • found • galvanize • grind harden • mint • plate • roll • soften • temper • tinplate

Notice the following adjective endings:
al • chemical • mechanical • physical • structural
tial • industrial
tic • electronic • hydraulic

Notice the following verb endings:
en • harden • soften
ize • anodize • galvanize

Notice the following nouns which are a plural form but are normally used with a singular verb
mathematics • mechanics • physics • thermodynamics
1 Match the following verbs with the correct definition.

- anneal: to melt metal and then pour it into a form, e.g. iron components
- anodize: to make thin sheets of metal by passing it between large rollers, e.g. steel
- electroplate: to shape metals by heating and then hammering, e.g. horse shoes
- forge: to make materials tough by cooling them slowly, e.g. glass
- found: to make something softer, e.g. fibres
- galvanize: to heat and then cool metals to obtain the required hardness and elasticity, e.g. steel
- grind: to cover with a thin layer of metal using electrolysis, e.g. car components
- roll: to protect from rusting by coating in zinc, e.g. food cans
- plate: to give a metal a protective coat by using it as an anode in electrolysis, e.g. car components
- soften: to polish or sharpen by rubbing on a rough surface, e.g. stone
- temper: to cover one metal with a thin layer of another, e.g. silver plate

2 Complete the following sentences with a form of the word in brackets.

1 In the __________ industry, engineers develop processes for producing plastics, fibres, medicines, etc. from simple chemicals. (chemistry)
2 Producing steel using the Bessemer process is one of the best-known __________ processes. (industry)
3 Most __________ devices need oil as a lubricant. (mechanics)
4 Following the earthquake, every building had to be inspected to see whether it had suffered any __________ damage. (structure)
5 Certain chemicals are added to glue to __________ it. (hard)
6 Excavators and power shovels are two types of __________ equipment used by __________ when they are removing rocks from the ground. (mine)

3 Here is an extract from a speech made by a careers advisor to a group of students choosing their future courses of study at university. Complete the speech by choosing one of the words from the box.

- machines • highway • mechanical • chemical • civil • physics
- electrical • develop • production • electronic

Engineering students should have an understanding of maths, (a) __________ and chemistry. Working with pharmaceuticals, food, mineral processing and chemical manufacturing, a (b) __________ engineer is trained to understand, design, control, and investigate material flows. If you enjoy problem solving and find projects such as the Channel Tunnel and the Three Gorges Dam interesting, (c) __________ engineering may be for you. You will produce creative designs at an economical price while paying due concern to the environment. If your interest is in road building then you may decide to follow a specialized course in (d) __________ engineering. By studying (e) __________ and (f) __________ engineering you learn about the design of complete systems, such as computers, controllers, power and transport systems. (g) __________ engineers plan, design and (h) __________ a wide range of things: washing machines, cars and spacecraft. (i) __________ engineers work very closely with mechanical engineers, to make new products at the right price, on time and in the correct quantity. As well as designing and selecting (j) __________ and materials, they also organize people and finance.
11 Automotive

Building a car takes a long time—from research, through design to final development. First, researchers need to determine what consumers want, and then suggest what kind of automobile to make. During the design phase, new ideas are converted into tangible parts or products. At the same time engineers modify existing parts and features for the new model and draft new plans for the prototype (a working example of a new design). Then manufacturers begin to construct a few prototypes. These are extensively tested in wind tunnels and dust tunnels, factory tracks, water-proofing bays, desert heat, Arctic cold, and crashes. At the next stage a plant is set up to build the new model and the necessary components. Product planners monitor the process to ensure that the new car programme finishes on time and within budget. Managers must also coordinate different activities, including producing the cars, purchasing materials, and training the workers.

Marketing teams must then sell the car. Every year the major car manufacturers launch their new models, but a single car design can take several years from the drawing board to the showroom floor. A typical company will therefore have several new designs in various stages of development at any given time.

Automobiles have developed over the years, both in terms of mechanics and design. Today’s automobile system is more efficient and safer, and the range of models more varied. A central part of car manufacture is the workshop where car bodies are shaped and painted (the bodyshop).

Models

- bus
- executive
- 4 x 4
- jeep
- lorry
- luxury
- medium
- mini
- multi-purpose vehicle (MPV)
- people carrier
- pickup
- small family sports
- supermini
- truck
- van

Body shaping and painting

- body panel
- cast
- cut
- fibreglass
- forge
- machine operator mould
- paint shop
- press shop
- spray gun
- stamp
- steel

Automobile system

Advertising plays an important role in promoting the features of cars. Read the following:

- advanced braking system (ABS)
- air conditioning
- airbag
- alarm
- alloy wheels
- central locking
- climate control
- electric windows
- immobilizer
- power assisted steering (PAS)
- sunroof
There are several steps in the process of developing a car. Put the following steps in the correct order.

a. A plant is set up to build the new model.
b. Marketing teams work to promote the new model and the new car is launched.
c. Researchers analyse the answers and suggest the type of car to be built.
d. Engineers work to modify existing parts for the new model.
e. Customers are asked questions about the sorts of features they would like in a car.
f. Product planners make sure that the new car is ready on time.
g. Tests are carried out in different conditions.
h. A prototype is built.
i. Designers work to design a new car based on these suggestions.

Match the part of the car with its function.

- steering wheel: holds brake fluid
- exhaust manifold: provides the power
- radiator: stores electricity
- fuel tank: ensures that the rear wheels turn at a different speed to each other when a car corners
- brake line: produces electricity
- silencer/muffler: sends an electric current to the spark plugs
- battery: carries waste gases to the exhaust pipe
- clutch: makes the car go faster when it is pressed
- differential: used by the driver to turn the car
- engine: holds fuel
- brake cylinder: cools water from the engine
- accelerator: connects the brake cylinder to the brakes
- distributor: reduces the exhaust noise
- alternator: disconnects the engine from the gearbox while the gears are changed

Here is a newspaper article reviewing a new small family car. Fill in the blanks with words from the page opposite. The first letter is given to help you.

Launched soon after their competitor’s failure, the new LOTE A1 is the perfect car for Mum, Dad and two kids. Just back from its (a) t_________ in the heat of the (b) d_________ and the cold of the Arctic, the LOTE is the perfect small (c) f_________ car. The interior is classy and comfortable with surprisingly good leg room in the back. The (d) a_________ c_________ is highly efficient for the heat of summer, but if you prefer the carefree image, you can open the (e) s_________. There should be no arguments about how far to open the windows as the driver has full control of the (f) g_________ windows in the back, and of course, (g) c_________ l_________ saves telling the kids to lock their doors.

Driving this little beauty is a real pleasure. (h) P_________ a_________ s_________ makes those corners easy and the (i) a_________ b_________ s_________ will stop you comfortably in those tight moments. Safety is also high on the agenda here with fitted (j) a_________ for the front passenger as well as the driver. A car (k) a_________ is fitted as standard and an (l) j_________ will prevent someone starting the car without your permission.

It’s a great-looking vehicle, bigger than the (m) m_________, less roomy than the (n) p_________ c_________ but faster than a (o) y_________! With aluminium (p) a_________ w_________ and a price that’s less than anything else in this range, it’s one that’s hard to beat.
The chemical industry covers the business that uses chemical reactions to turn raw materials, such as coal, oil, and salt, into different products. Technological advances in the chemical industry have dramatically altered the world's economy. Chemical processes have created pesticides and fertilizers for farmers, pharmaceuticals for the health care industry, synthetic dyes and fibres for the textile industry, soaps and beauty aids for the cosmetics industry, synthetic sweeteners and flavours for the food industry, plastics for the packaging industry, chemicals and celluloid for the motion picture industry, and artificial rubber for the automotive industry. The chemical industry includes makers of more than 70,000 different chemicals, with global sales worth more than €1.1 trillion.

Chemicals can be broken down into:
- basic and intermediate chemicals
- agricultural chemicals
- petrochemicals
- plastics and fibres
- paints and coatings
- specialty chemicals

Some basic and intermediate chemicals:
- acids, alcohols, alkanes, aromatics, benzene, carbonates, chlorides, ethylene, fluorides, industrial gases, methanol, nitrates, olefins, oxides, polyethylene, polypropylene

Agricultural chemicals:
- fungicide, herbicide, insecticide, nutrient management, pest management, pesticide, soil management, sustainable production systems

Features of plastics and fibres:
- easy flow, flame resistant, flame-retardant, heat resistant, stiff, tough, transparent

Use of petrochemicals:
- agriculture, aircraft, automobile, explosives, plastics, synthetic fibres

Paint finishes:
- baked, crack resistant, fast drying, glossy, hard, matt

Notice the following endings and their meanings:

<table>
<thead>
<tr>
<th>ending</th>
<th>meaning</th>
<th>example of use</th>
<th>meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>-cide</td>
<td>something that kills</td>
<td>herbicide</td>
<td>a chemical that kills weeds</td>
</tr>
<tr>
<td>-ide</td>
<td>group of related chemical compounds</td>
<td>oxide</td>
<td>any of various oxides</td>
</tr>
<tr>
<td>-anol</td>
<td>denotes alcohol</td>
<td>methanol</td>
<td>colourless, toxic, flammable liquid used as an antifreeze, a general solvent, and a fuel</td>
</tr>
<tr>
<td>-ate</td>
<td>a derivative of a specified chemical compound or element</td>
<td>carbonate</td>
<td>a derivative of carbon</td>
</tr>
<tr>
<td>-ene</td>
<td>organic compound, especially one containing a double bond between carbon atoms</td>
<td>propylene</td>
<td>a flammable gas derived from petroleum hydrocarbon cracking and used in organic synthesis</td>
</tr>
<tr>
<td>-fin</td>
<td>making</td>
<td>olefin</td>
<td>oil forming gas</td>
</tr>
</tbody>
</table>
1 Match the chemical with the correct description

- benzene: an alcohol with the formula CH₃OH
- aromatics: compound of oxygen and another element
- ethylene: compounds that react with acids to give off carbon dioxide
- olefins: contains six carbon atoms in a ring
- fluorides: made from propene and often used for kitchen tools for example
- carbonates: the simplest olefin, it is a sweet-smelling gas that is used to make plastics
- chlorides: a group of compounds made by cracking alkanes and used to make plastics and antifreeze
- methanol: chemicals that contain the benzene ring
- nitrates: compounds containing chlorine and another element
- oxides: inorganic compounds of fluorine that are added to toothpastes
- polypropylene: contain NO₃ and a metal cation

2 Fill in the blanks with a word from the opposite page.

1 Farmers use this to kill insects: ____________
2 These fibres are made from chemicals: ____________
3 Farmers use these to make plants grow: ____________
4 This describes a paint which dries quickly: ____________
5 This describes a paint that doesn’t have a shiny appearance: ____________
6 This industry makes soaps and beauty aids: ____________
7 These give food a good taste: ____________
8 This describes a plastic that doesn’t bend: ____________

3 Here is the first part of a speech about the chemical industry. The letters of the missing words in brackets are mixed up. Complete the text with the missing words.

Huge quantities of chemicals are used today. Products of the chemical industry include (a) _______ (sposa), fibres and explosives. The starting point in the manufacture of chemical products is (b) _______ (bicsa) chemicals and these include (c) _______ (adics), for example sulphuric acid, and (d) _______ (akillsa), for example sodium hydroxide. Sulphuric acid is one of the best-known acids and is used to make (e) _______ (fizterniles), plastics, (f) _______ (ptaisn), dyes, detergents and many other chemicals. Alkali mixtures containing sodium and potassium are used to manufacture (g) _______ (gslas), soap and textiles and are also used in refining crude (h) _______ (lio). (i) _______ (lmeditterane) chemicals such as synthetic resins are made from these basic chemicals, and then used in further chemical (j) _______ (peecorssss).

The modern chemical industry began towards the end of the 19th century. William Perkin discovered (k) _______ (dsey) from coal. These were soon being used by the (l) _______ (tlextie) industry. Shortly after, Alfred Nobel invented dynamite which was the start of the (m) _______ (epsolxevis) industry. The discovery of celluloid by Hyatt and bakelite by Baekeland led to the creation of the (n) _______ (piitascas) industry. The (o) _______ (pchemiacetori) industry grew rapidly after 1950 when petroleum became very important in the production of organic chemicals.

Plastics have different properties: strong and (p) _______ (tugho), (q) _______ (tpentrasarn) or heat (r) _______ (ritessant).
A pharmaceutical is any substance or mixture of substances for use in the diagnosis, detection, treatment, cure, mitigation, or prevention of disease – abnormal physical states, e.g. chronic depression in man or animals.

The pharmaceutical industry produces medicinal drugs used for the above purposes.

The sale of new drugs is controlled by strict legislation. When a new drug is discovered, a rigorous testing programme is initiated:

- first on small animals, such as mice
- then on larger animals, such as monkeys and dogs
- next on healthy volunteers
- finally on patients suffering from the illness or affliction

After testing drugs in a range of clinical processes, the next stage is to seek approval. The regulatory process is carried out by the relevant local authority, e.g. the Food and Drug Administration (FDA) in the US or the Medicines Control Authority (MCA) in the UK. Finally, the drug is ready for production.

The clinical process
- double-blind technique
- evaluate
- hospital
- investigate
- laboratory
- observe
- placebo
- stringent conditions
- therapeutic practice
- validate

Regulatory process
- approve
- certificate
- exemption
- factory inspection
- harmful
- inspect
- licence
- product labelling
- purity standards
- safety risk
- safety standards
- seize
- test

Producing pharmaceuticals
- aerobic
- biological product
- boiling point
- chemical purity
- concentrate
- crude drug
- cultivate
- density
- distil
- extract
- ferment
- harvest
- inorganic elements and compounds
- melting point
- odour
- organic compound
- particle size
- plant
- preservative
- solubility
- viscosity

The following chart shows the evolution of a Pharmaceutical Benefit (in Australia):
1 Complete the sentences below. Some of the letters of the missing word have been given.

1 Measuring the presence of certain substances in the blood may lead to the early **d e t c** of disease.
2 Clinical trials are often carried out in **h o s** where doctors and nurses can **a b** patients.
3 Any illegal drugs will be **s e d b** by the authorities.
4 There are regular factory **i n s** to check that standards are being met.
5 One important factor in packaging and selling a drug is product **i n g**.
6 Doctors may disagree about good **h i p** practice.
7 X-rays are of great importance in the **d i a** of a medical condition.
8 Laboratories carrying out tests on animals must have **a l c e** to do so.

2 Find a more accurate word under **producing pharmaceuticals** on the opposite page to replace the word or words in bold.

1 Heating the liquid will decrease its **t i c**.
2 Liquids with a low temperature at which they boil are more volatile than those with a high **t e n** at which they boil.
3 Our bodies and the bodies of animals obtain oxygen through using **a i** for respiration.
4 To obtain pure water from sea-water you have to **d v a i a i l t i c**
5 In wine and beer making as well as in the manufacture of bread, yeast is used to **c g d o c a i o c o e t e n**.
6 Water, **H O** and sodium chloride, **NaCl**, are **n c b b o c** compounds.
7 Toiletries are products which have been developed to remove or disguise **s m e t**.
8 The food industry uses **b b b b c e e** in order to keep food fresh for a longer period of time.
9 Saponaria is a plant **s b b b b c e e e e**.

3 Here is the beginning of a talk to a group of volunteers. Fill in the blanks with words from the box.

approved • placebo • stringent • suffering • regulatory • evaluate • patients
safety • laboratories • treatment • harmful • healthy • disease

I'd like to thank you all for coming along today and for agreeing to take part in these drug tests. This drug is to be used in the (a) ________ of a specific illness. The drug was developed in our (b) ________ under (c) ________ conditions, and has already been tested on small and larger animals. We are now at the stage of testing on (d) ________ volunteers which is why you are here. Once we have analysed the results of these tests we will be able to test the drug on (e) ________ who are (f) ________ from the (g) ________.

The drug can only be sold once the local (h) ________ authority has (i) ________ it and a licence has been obtained. The authority is concerned about any (j) ________ effects of the drug as well as (k) ________ standards.

In our tests, half of you will be given the drug while the others will receive a (l) _________. You won't know which you have received. Afterwards we will be able to compare the two groups and (m) ________ the results.
14 Pharmaceutical 2

A

A disease is an **impairment** of the normal condition or functioning of the body or any of its parts. Some diseases are **acute**, causing severe symptoms that last only for a short time, e.g., pneumonia; others are **chronic disorders**, e.g., arthritis, and last a long time; and still others return periodically and are termed **recurrent**, e.g., malaria.

Diseases may result from:
- infectious agents which can be transmitted by humans, animals and insects, and infected objects and substances
- chemical and physical agents such as drugs, poisons, and radiation
- internal causes including hereditary abnormalities, congenital diseases and allergies
- natural **ageing** of the body tissues
- emotional disturbances, such as **psychoses** and **neuroses**

B

There are many **diseases** which can be treated with pharmaceuticals. Appropriate treatment depends on the correct drug and the correct **dosage**. Help with these areas is available from a range of **carers** and **treaters**.

Some diseases

<table>
<thead>
<tr>
<th>Disease</th>
</tr>
</thead>
<tbody>
<tr>
<td>AIDS</td>
</tr>
<tr>
<td>epilepsy</td>
</tr>
<tr>
<td>multiple sclerosis</td>
</tr>
</tbody>
</table>

Some carers and treaters

- anaesthetist
- dentist
- midwife
- nurse
- nutritionist
- obstetrician
- occupational therapist
- orthodontist
- orthopaedist
- osteopath
- paediatrician
- paramedic
- pharmacist
- physiotherapist
- radiographer
- radiologist
- surgeon

Dosage forms

- dispersion
- pill
- radioactive dosage form
- solid dosage form
- solution
- sterile medicament
- tablet

C

The language of pharmaceuticals and medicine is generally based on many Latin and Greek forms. Study the forms and their use in the terms in B above: (US spellings are given in brackets)

<table>
<thead>
<tr>
<th>Form</th>
<th>Meaning</th>
<th>Origin</th>
</tr>
</thead>
<tbody>
<tr>
<td>arthr-</td>
<td>joint</td>
<td>Greek</td>
</tr>
<tr>
<td>haemo- (hemo-)</td>
<td>blood</td>
<td>Greek</td>
</tr>
<tr>
<td>sclero-</td>
<td>hard</td>
<td>Greek</td>
</tr>
<tr>
<td>pneu-</td>
<td>air, wind; breathing</td>
<td>Greek</td>
</tr>
<tr>
<td>dent-/dont-</td>
<td>teeth</td>
<td>Latin</td>
</tr>
<tr>
<td>ortho-</td>
<td>straight, right, upright, regular</td>
<td>Greek</td>
</tr>
<tr>
<td>nutri-</td>
<td>food</td>
<td>Latin</td>
</tr>
<tr>
<td>obstet-</td>
<td>relating to midwifery or the delivery of women in childbirth</td>
<td>Latin</td>
</tr>
<tr>
<td>therap-</td>
<td>heal, cure, treatment; service done to the sick</td>
<td>Greek</td>
</tr>
<tr>
<td>paedia- (pedia-)</td>
<td>children and infants</td>
<td>Greek</td>
</tr>
<tr>
<td>physio-</td>
<td>nature</td>
<td>Greek</td>
</tr>
</tbody>
</table>
One word is wrong in the following sentences. Underline it and correct it.

1. Patients normally recover fairly quickly from an acute condition.
2. A patient suffering from a recurrent disease is unlikely to get it again.
3. Neurosis is an infectious illness.
4. The tropical disease which is transmitted by mosquitoes is known as asthma.
5. Someone suffering from bronchitis will have difficulties walking.
6. Multiple sclerosis is a disease of the digestive system.
7. A person whose body cannot regulate salt in the blood is known as a diabetic.
8. A physiotherapist is someone who is qualified to prepare and dispense medication.

Which medical specialist will be able to help the following people? Choose from Carers and treaters on the opposite page.

1. A woman who is pregnant and expecting her baby in the next few days.
2. Someone who has cancer and requires radiotherapy.
3. Someone who is about to have an operation and must first go into a deep sleep.
4. Someone who has discovered that they are allergic to wheat products and who wants to know what they can eat.
5. Someone who has just been injured in a car crash and must get emergency help.
6. Someone who has been recovering from severe injuries following an accident and who now wants to go home and possibly to work.
7. Someone who has toothache.
8. Someone who had a broken leg and who now needs exercises to help them get mobility back.
9. A baby who is very unwell.
10. Someone who should have an X-ray taken to help make a diagnosis.

Complete the following article about aspirin using the words from the box.

side effect • chronic • doses • stroke • tablet • heart attack • arthritis • cancer

The drug known as aspirin is over one hundred years old. It was patented in 1899 by the German pharmaceutical company, Bayer.

However, it was not until 1971 that Professor Vane discovered exactly how aspirin worked. People who have had a (a) ____________ are advised to take a low dose of 75mg (b) ____________ a day to reduce the risk of another attack. For the majority of people it is known to reduce the risk of a (c) ____________ but for a very small number of people this risk is in fact a dangerous (d) ____________. Scientific tests have also shown that aspirin taken twice a week reduces the risk of bowel (e) ____________. At high (f) ____________, aspirin reduces pain in people suffering from the (g) ____________ disorder, rheumatoid (h) ____________.
Construction means the erection or assembly of large structures, primarily those which provide shelter, such as commercial and residential buildings. It also includes major works such as ships, aircraft, and public works such as roads, dams, and bridges.

The major elements of a building include:
- the foundation, which supports the building and gives it stability
- the structure, which supports all the imposed loads and transmits them to the foundation
- the exterior walls, which may or may not be part of the primary supporting structure
- the interior partitions, which also may or may not be part of the primary structure
- the environmental-control systems, including the heating, ventilating, air conditioning, lighting, and acoustical systems
- the power, water supply, and waste disposal systems

Jobs in construction are many and varied, ranging from architects to painters. However, every building needs a solid foundation on which the structure can be erected, paying special attention to the exterior walls which will need to withstand the elements.

Jobs in construction
- architect
- carpenter
- electrician
- mason
- painter
- plasterer
- plumber
- quantity surveyor
- roofer

The foundations
- caisson
- deep
- mat
- pile
- reinforced concrete
- shallow
- spread footing

The structure
- beam
- bracing connection
- column
- floor
- girder
- rigid connection
- roof
- truss
- wall

The exterior walls
- curtain wall
- exterior skin
- load-bearing wall
- nonload-bearing wall
- roofing felt
- sound-deadening material
- vapour barrier

Constructware is a US company which provides collaboration solutions to construction companies to help them achieve business success by increasing productivity, improving risk management and reducing costs. Look at the diagram opposite which shows their areas of activity:
1 Choose the correct word in the following sentences.

1 A flat roof is usually covered in roofing felt/skin for protection against the weather.
2 Rooms in a building are divided by interior supports/partitions.
3 To prevent water entering the cavity of the wall, moisture barriers are used on the external surface and vapour/insulating barriers are used on the internal face.
4 The assembly/structure of a building transfers all the loads acting on the building to the ground.
5 The ventilating/acoustical system provides fresh air.
6 Sound-deadening/-barrier material is used to reduce sound passing from one room to another.
7 The foundations for a skyscraper building must be deep/shallow.
8 A spread footing/caisson piers is/are used when the soil is weak.

2 Label the following diagrams using words from the opposite page.

1 __________
2 __________
3 steel __________
4 __________
5 roof __________
6 lattice __________
7 _______ foundations

3 Here is part of a text about house building. Complete the text with words from the opposite page.

There are two main methods of building houses. In one, solid walls known as (a) __________ walls are constructed. They support the floors and the roof of the building. In the other, a framework of steel, timber or concrete is constructed. The frame can be covered or filled in with lightweight material.

When building a house, the (b) __________ first of all examines the site and makes a plan of the size and shape of the plot of land. Next, an (c) __________ makes a detailed drawing of the building, and gives information about the materials which are to be used. A (d) __________ calculates exactly how much of these materials will be needed for the building. Then, the ground is dug out and the (e) __________ laid. During building, (f) __________ make the wooden structures, (g) __________ cut and place stone, (h) __________ construct the roof and (i) __________ cover walls and ceilings with plaster. Once the building has been completed, (j) __________ lay meters of electrical cable, and (k) __________ install pipes for heating and water. Finally (l) __________ paint the walls and ceilings of the building.
Electrical engineering deals with the practical application of the theory of electricity to the construction and manufacture of systems, devices and assemblies that use electric power and signals.

Electrical engineering can be divided into four main branches:
- electric power and machinery
- communications and control
- electronics (⇒ 17&18)
- computers (⇒ 5&6)

Electrical applications are used in many industrial areas including:
- electric power and machinery
- electronic circuits
- control systems
- computer design
- superconductors
- solid-state electronics
- medical imaging systems
- robotics
- lasers
- radar
- consumer electronics
- fibre optics

In recent years, the electronic computer has emerged as the largest application of electrical engineering. However, another very large field is concerned with electric light and power and their applications. Specialities within the field include the design, manufacture, and use of turbines, generators, transmission lines, transformers, motors, lighting systems, and appliances.

Electrical problems can be avoided by always using the right devices and taking appropriate measures for electrical protection.

Electrical problems
- ground fault
- overcurrent
- overload
- short circuit

Electrical protection
- dustproof
- explosionproof
- rainproof
- raintight
- watertight
- weatherproof

Electrical devices
- branch circuit
- (circuit) breaker
- cable
- circuit
- feeder
- fixture
- fuse
- ground
- junction (electrical) box
- panelboard
- service panel
- switch
- switchboard

Circuit breaker operation

Compounds are short ways of giving information. They are used to express complex ideas economically:
- noun + noun, e.g. panel board (or panelboard) = a board consisting of a number of panels
- noun + adjective, e.g. explosionproof = material which cannot be damaged by explosions
- adverb + noun, e.g. overload = current which is greater than the load for which the system or mechanism was intended
1 Express each of these ideas as a compound.
   1 a board consisting of a number of panels
   2 material that does not allow water to get into it
   3 material that doesn’t allow rain to get into it
   4 a board consisting of a number of electrical switches
   5 conductors which are perfect, conducting a current without a battery
   6 material that will not be damaged in an explosion
   7 current which is greater than the load for which the system or mechanism was intended
   8 material that does not allow dust to get into it

2 What is being described? Find a word or phrase from the page opposite.
   1 It produces a narrow beam of light and can be used to read barcodes in a supermarket, play compact discs, etc.
   2 A word to describe any piece of equipment made for a specific purpose.
   3 A pulse of light, current or sound that is used to convey information.
   4 A device that uses electromagnetic waves to calculate the distance of an object.
   5 Glass fibres that are used for data transmission.
   6 The study of how robots are made and used.
   7 A circuit where the current has a choice of paths.
   8 A situation where the electrical current takes an easier path than the one intended.
   9 A piece of equipment that stops an electrical current if it becomes dangerous.
   10 A connection point where several cables are connected.

3 Complete the text below with words from the page opposite. The first letter of the missing words has been given.

In power stations, high pressure steam, gas, water or wind is used to drive
   (a) t__________ which turn huge (b) g__________ . Large power stations generate electricity at 25,000 volts. This is then stepped up to 275,000 or 400,000 volts using
   (c) t__________ before being fed into a network of (d) e__________ known as the Grid. Electrical (e) p__________ is then carried across the country by overhead
   (f) t__________ . The Grid voltage is reduced by stepping down (g) t__________ at substations before it is used in homes and factories. Some
   industrial plants take electrical energy from the Grid system at 33,000 or 11,000 volts, but for use in homes and offices it is stepped down to a lower level.

In the home, supply from the mains (h) c__________ passes through a main
   (i) f__________ and then to a fuse box. The fuse box is a distribution point for the electricity supply to the house. Most houses have two or three ring main
   (j) c__________ connecting electric sockets. There are also two or three
   (k) l__________ circuits and separate circuits for (l) a__________ such as cookers and hot water heaters.
Electronics 1

Electronics is a branch of engineering and physics. It deals with the emission, behaviour, and effects of electrons for the generation, transmission, reception, and storage of information. This information can be audio signals in a radio, images (video signals) on a television screen, or numbers and other data in a computer. Electronic systems are important in communication, entertainment, and control systems.

Electronic circuits consist of interconnections of electronic components, at the heart of which are semiconductors. Transistors, which are made of silicon or germanium, are made from semiconductors. Commercial products range from cellular radiotelephone systems and video cassette recorders to high-performance supercomputers and sophisticated weapons systems. In industry, electronic devices have led to dramatic improvements in productivity and quality. For example, computer-aided design tools facilitate the design of complex parts, such as aircraft wings, or intricate structures, such as integrated circuits.

The development of microelectronics has had a major impact on the electronics industry. Electronic components are expected to deliver ever higher performance, while electronic circuits continue to benefit from miniaturization.

Function of electronic circuits
- amplification • demodulation • electronic processing • generation
- information extraction • modulation • radio wave • recovery (of audio signal)

Electronic components
- absorb • active • battery • capacitor • diode • energy • generator • inductor
- passive • resistor • transducer • transistor • vacuum tube (AmE) • valve (BrE)

Impacts
- device size • digitization • fidelity • high speed • increased reliability
- manufacturing cost • storage capacity • storage system • ultrahigh image definition

One way of increasing your vocabulary is to learn the associated words from a key word. Look at the word table below, which shows words related to the key words presented above:

<table>
<thead>
<tr>
<th>Noun</th>
<th>Verb</th>
<th>Adjective</th>
</tr>
</thead>
<tbody>
<tr>
<td>activation</td>
<td>activate</td>
<td>active</td>
</tr>
<tr>
<td>amplification</td>
<td>amplify</td>
<td>amplified</td>
</tr>
<tr>
<td>emission</td>
<td>emit</td>
<td>emitted</td>
</tr>
<tr>
<td>entertainment</td>
<td>entertain</td>
<td>entertaining</td>
</tr>
<tr>
<td>extraction</td>
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<td>extracted</td>
</tr>
<tr>
<td>generation</td>
<td>generate</td>
<td>generative</td>
</tr>
<tr>
<td>integration</td>
<td>integrate</td>
<td>integrated/integrative</td>
</tr>
<tr>
<td>reception</td>
<td>receive</td>
<td>receptive</td>
</tr>
<tr>
<td>recovery</td>
<td>recover</td>
<td>recovered</td>
</tr>
<tr>
<td>reliability</td>
<td>rely</td>
<td>reliable</td>
</tr>
<tr>
<td>storage</td>
<td>store</td>
<td>stored</td>
</tr>
<tr>
<td>transmission</td>
<td>transmit</td>
<td>transmittable/transmissible</td>
</tr>
</tbody>
</table>
1. Choose the correct word in the following sentences.
   1. Transistors/inductors are the key component in electronics.
   2. They consist of three layers of silicon semiconductor/superconductor.
   3. All electronic/electrical systems consist of input, a processor and output, and usually memory.
   4. The input receives/resists and converts information while the output converts and supplies electronically processed information.
   5. The memory may not be present in simple systems, but its function is the storage/transmission of information for the processor.
   6. Continual developments in electronics give us increased reliability/recovery in electronic devices.
   7. Electronic equipment controls microprocessors/microwaves in, for example, weapons systems, cellular radiotelephone systems and domestic appliances.
   8. Electronic devices have improved our lives by providing high quality communication/combination and entertainment.

2. Use the word in brackets to form a word which fits in the sentence.
   1. The weak audio signal entering a radio is ______ by the ______ thus making it audible. (amplify)
   2. Computer games are just one example of electronic systems being used for ______. (entertain)
   3. Due to developments in mobile telecommunications systems, a new ______ of mobile phone is now available. (generate)
   4. IC stands for ______ circuit. (integrate)
   5. Computer software is ______ if it does what the manual says it should. (rely)
   6. One area of electronics is concerned with the ______ of information. (store)
   7. The ______ of signals to satellites is made by microwaves. (transmit)
   8. A computer chip is capable of holding vast amounts of ______ information. (store)
   9. ______ of speech was first carried out through ______ of the amplitude of a radio signal. (transmit, modulate)
   10. In a laser, energy is released in the form of ______ light. (emit)

3. Complete the text about electronics by choosing a word from the box.

diodes • semiconductor • electrons • devices • germanium • transistors
integrated circuits • capacitors • silicon • integrated • resistors

Electronic circuits are built from basic components. (a) ______ are the most important components. They can be used to amplify the strength of a signal by converting a weak signal into a stronger one or to switch other circuits on or off. (b) ______ reduce the flow of (c) ______ through the circuit, adding resistance to that circuit. (d) ______ function as electronic valves allowing current to flow in only one direction. (e) ______ store electricity in order to smooth the flow. They can be charged and discharged. The two most common capacitors are ceramic and electrolytic.

Most electronic devices use (f) ______ ______ (IC) or microchips. Inside an IC is a very small piece of (g) ______ with circuits built in. Today, semiconductors are usually made of (h) ______ which is cheaper and easier to manufacture than (i) ______.

Researchers are constantly trying to reduce the size of transistors in order to reduce the size of (j) ______.
Electronics 2

The electronics industry creates, designs, produces, and sells devices such as radios, televisions, stereos, video games, and computers, and components such as semiconductors, transistors, and integrated circuits. In the second half of the 20th century, this industry had two major influences. Firstly it transformed our lives in factories, offices, and homes; secondly it emerged as a key economic sector. Specific advances include:
- the development of space technology and satellite communications
- the revolution in the computer industry that led to the personal computer
- the introduction of computer-guided robots in factories
- systems for storing and transmitting data electronically
- radio systems to automobiles, ships, and other vehicles
- navigation aids for aircraft, automatic pilots, altimeters, and radar for traffic control

The applications of electronic engineering cover almost every aspect of modern life; the industry involves a wide range of tasks.

Applications of electronic engineering
- aerospace
- automotive
- consumer goods
- chemical
- defence
- energy/power
- environmental
- imaging equipment
- industrial automation
- medical instrumentation
- oil and gas
- pharmaceutical
- pulp and paper
- semiconductor
- telecommunications
- transportation

Tasks in electronic engineering
- design
- develop
- diagnose
- evaluate
- manufacture
- repair
- test

Electronic engineers are highly sought after, well rewarded and can be found in practically every branch of industry and commerce. Here is an extract from a job description for an electronic engineer:

Scope and responsibilities
Senior Electronics Design Engineer

The Senior Electronics Design Engineer will be responsible for enhancing and supporting the entire electronic design process, including, but not limited to:
- electronic product development from design to production release
- electronic design, analysis and testing of new products from product specification, producing electronic prototypes and preparation of all necessary design documentation
- firmware design for electronic devices
- electronic circuit design and board layout for very small devices and instruments
- accurate project and design documentation
- interfacing closely with marketing to create and develop products according to customer needs
- interacting with contract engineers that support product development
- developing and maintaining vendor selection and involvement to ensure the highest quality products
- obtaining necessary product approvals and communicating progress throughout the design process
- providing technical support for new and existing products in manufacturing and in the field
- producing design schedules
- staffing and operating an electronics lab
1. Put these words and phrases into one of the three categories below.

- develop solutions
- transportation systems
- robot
- automotive industry
- transmit data
- diagnose problems
- radio
- pharmaceutical industry
- evaluate results
- television
- provide support
- chemical industry
- altimeter
- defence
- computer

<table>
<thead>
<tr>
<th>devices</th>
<th>functions</th>
<th>applications</th>
</tr>
</thead>
</table>

2. Choose one word from A with one word from B to complete the sentences below.

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>space</td>
<td>computer</td>
</tr>
<tr>
<td>computer-guided</td>
<td>goods</td>
</tr>
<tr>
<td>satellite</td>
<td>robots</td>
</tr>
<tr>
<td>consumer</td>
<td>technology</td>
</tr>
<tr>
<td>navigation</td>
<td>communications</td>
</tr>
<tr>
<td>personal</td>
<td>aids</td>
</tr>
</tbody>
</table>

1. ___________ has enabled people to survive in space.
2. Communications systems for aircraft and ships are dependent on ___________.
3. Many people today have their own ___________ at home.
4. Industrial processes have been made more efficient through the use of ___________.
5. Ships and aircraft require ___________ to find their way.
6. ___________ such as washing machines and dishwashers contain electronic circuits.

3. Here are two extracts from advertisements for jobs in electronics. Complete them with words from the box.

- architecture
- repair
- examined
- technicians
- instrumentation
- medical

**Electronics Technician**

The Biomedical Engineering Department provides electronic and mechanical engineering as well as ITU support to different specialties within the hospital. We are looking for (b) ________ to join our team of engineers. You will be involved in the management, (c) ________ and maintenance of the hospital's highly sophisticated medical electronic (d) ________. You will be required to work unsupervised in maintaining complex systems and equipment.

There have been great changes in crime and in its detection over the past ten years as a result of technological advances. Computers and mobile phones have become more common and, as a result, criminal activity involving them has also risen. Computers and SIM cards are (e) ________ in our department to recover data that is required in criminal investigations.

You will have knowledge of electronic (f) ________ of computers, PDAs or mobile phones and possibly an understanding of computer operating systems.
19 Energy

The UK's energy system has changed dramatically over the last century.

In the first half of the twentieth century:
- coal was the dominant fuel in industry and electricity power plants, and in houses and businesses
- town-gas networks existed in larger towns, with the gas derived from coal

In the second half of the 20th century:
- coal continued to be of central importance for electricity generation, although its importance elsewhere fell substantially
- nuclear power plants began to be commissioned from the mid-1950s
- the electricity industry was combined into state-owned monopolies, during the 1950s
- the high voltage electricity transmission network was created in order to transport electricity over long distances from big power plants
- electricity distribution networks shrank in importance and activity
- during the 1960s and 1970s there was a move to an extensive natural gas network for heating (industry, commerce and domestic)
- demand for transport fuel increased dramatically
- gas-fired central heating largely replaced open coal fires in homes
- the use of electrical appliances in commerce and the domestic sector increased hugely

Today we are seeing increasing interest in those renewable sources of energy which can deliver clean and cheap types of energy, using environmentally-friendly processes and equipment.

Sources of energy

<table>
<thead>
<tr>
<th>renewable</th>
<th>non-renewable</th>
</tr>
</thead>
<tbody>
<tr>
<td>sun</td>
<td>fossil fuels: coal, oil, natural gas, petroleum</td>
</tr>
<tr>
<td>wave</td>
<td>biofuel</td>
</tr>
<tr>
<td>wind</td>
<td>plutonium</td>
</tr>
</tbody>
</table>

Types of energy

- electrical energy
- fire
- fossil fuels
- gas power
- geothermal energy
- greenhouse effect
- hydraulic power
- hydroelectric energy
- kinetic energy
- magnetic energy
- nuclear energy
- solar energy
- steam power
- tidal power
- water power
- wave power
- wind power

Equipment to produce energy

- atomic energy plant
- gas station
- gasworks
- generating station
- generator heat exchanger
- hydroelectric scheme
- motor
- nuclear plant
- power station powerhouse
- solar cell
- solar panel
- tidal barrage
- tide mill
- turbine
- waterfall
- waterworks
- wind farm
- windmill

Study the sentences below.

In 1950, the energy system for both industry and domestic demand was fuelled by coal.

Today domestic natural gas is the UK's largest source of energy.

Developments in technology are gradually lowering the costs of generating electricity from alternative and renewable sources.

The increasing and fluctuating prices of natural gas are contributing to making biomass and wind energy competitive.
1. Rearrange the letters to name six sources of energy.

   1 uns   2 fielu  3 dwni  4 piunutoIn  5 weva  6 peurnoetl

2. Complete the crossword with words from the opposite page.

   Across
   1 When a nuclear plant is put into action it is ________.
   3 The flow of electrons produces this type of energy.
   7 This heat comes from the earth itself.
   9 This is where gas was made from coal in the past.
   10 Almost all the energy we use comes from this.
   12 The reactor in nuclear power stations contains a nuclear fuel such as ________.
   13 These turn the energy in sunlight into electricity.
   14 This kind of energy is in things that are moving, e.g. a moving turbine.
   15 This is a hydroelectric power station together with its dam and reservoir.
   16 This is made from plant or animal matter.

   Down
   2 The main way of heating homes in the UK before central heating.
   4 This energy is associated with electric current.
   5 Exhaust gases from vehicles and power stations, methane from oil and gas
      rigs and CFCs in refrigerators all contribute to this effect.
   6 This type of fuel is used to power all sorts of vehicles.
   8 This power comes from the pressure or movement of a liquid.
   11 Another word for oil.
   15 This type of energy comes from the sun.

3. Complete the following text about power using the words from the box.

   Most large power stations burn (a) __________ which were formed from the remains of plants and
animals that lived on the earth millions of years ago. The first type of fossil fuel to be used in large
quantities was (b) __________. Today, it is increasingly expensive to mine, however, many
(c) __________ still burn it to (d) __________ electricity. Oil and natural (e) __________ have
now largely replaced coal. These fuels are all (f) __________ and will eventually run out. Wood is
used by 2 billion people in the developing world and unlike fossil fuels, it is a (g) __________ energy
source. Alternative energy sources include (h) __________ power technology. In hydro schemes,
water from a reservoir or from a river powers (i) __________ which drive (j) __________.
(k) __________ power systems use the energy from wind and sea or take mechanical energy from
wave movement. The UK offers a good position to exploit wave energy. The movement of the sun,
moon and earth combine to produce (l) __________ power. Electricity can be generated when tidal
water passes through turbines positioned in a (m) __________.
Civil engineering

The term civil engineering describes engineering work performed by civilians for non-military purposes. In general, it describes the profession of designing and executing structural works for the general public and the communal environment. Civil engineering covers different areas of engineering, including the design and construction of large buildings, roads, bridges, canals, railway lines, airports, water-supply systems, dams, irrigation, harbours, docks, aqueducts, and tunnels.

The civil engineer needs a thorough knowledge of surveying, of the properties and mechanics of construction materials, of the mechanics of structures and soils, and of hydraulics and fluid mechanics. Today civil engineering includes the production and distribution of energy, the development of aircraft and airports, the construction of chemical process plants and nuclear power stations, and water desalination.

A range of civil engineering tools and equipment is used in the construction of roads, bridges and waterways.

**Roads**
- camber
- crown
- culvert
- kerb/curb
- macadam
- manhole
- metal
- pavement
- pedestrian crossing
- pothole
- sewer
- soft shoulder
- tarmac
- underdrain

**Bridges**
- arch
- bascule
- cable
- cantilever
- clapper
- crossover
- lift
- footbridge
- span
- suspension
- swing
- viaduct

**Canals, rivers and other waterways**
- aqueduct
- barrage
- dam
- dike
- drainage
- flume
- lock
- paddle
- pier
- sluice
- watercourse
- water main
- weir
- well

**Civil engineering tools and equipment**
- bulldozer
- dredger
- earthmover
- excavator
- plate girder
- pylon
- road roller
- shovel

Here are the vital statistics of the famous *Golden Gate Bridge* in San Francisco:

<table>
<thead>
<tr>
<th>Statistic</th>
<th>Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total length of bridge</td>
<td>2,737 m</td>
</tr>
<tr>
<td>Length of main span</td>
<td>1,280 m</td>
</tr>
<tr>
<td>Width of bridge</td>
<td>27 m</td>
</tr>
<tr>
<td>Width of pavement</td>
<td>3 m</td>
</tr>
<tr>
<td>Clearance above mean higher high water</td>
<td>57 m</td>
</tr>
<tr>
<td>Deepest foundation below mean low water</td>
<td>34 m</td>
</tr>
<tr>
<td>Total weight of bridge, anchorages and north and south approaches (1994)</td>
<td>887,000 tons</td>
</tr>
</tbody>
</table>
1. Name the bridges opposite. Choose from the following:
   - masonry arch
   - cantilever
   - swing
   - suspension
   - clapper
   - bascule

2. What is being described? Choose from the words on the opposite page.
   1. This structure is built across a river to hold back the water to produce power, improve navigation or control flooding.
   2. This structure is built along the banks of a river or along the coast to hold back water and prevent flooding.
   3. This carries a road or railway across water.
   4. This carries water (canal or river) across land, usually over a valley.
   5. The section of a canal where the water level changes to raise boats from one level to the next.
   6. These allow water to flow in or out in order to change the water level in a canal.
   7. A deep hole in the ground where people can get water.
   8. These are dug underground for roads and railways.
   9. This is the process of removing salt from sea water.
   10. This large powerful vehicle uses a large blade to move earth and rocks.
   11. This machine or ship is used for removing sand and mud from the bottom of a river or a harbour.
   12. This machine is used for rolling tarmac or asphalt flat on a road surface.

3. A civil engineer is showing an international visitor around. Complete the text with words from Roads from the opposite page.

   Here we are on one of our town streets. As you can see the road is not flat, it has a (a) _________. This is to allow rain water to run off the surface and into the drains at the side. The highest part of the road is the (b) _________ in the centre. A (c) _________ carrying waste water runs below the surface of the road. At certain points along the road you'll find large (d) ________ which allow engineers to go down and inspect electricity and telephone cables which also run below the road. On either side of the road there is a raised (e) ________ for pedestrians which is edged with (f) ________ stones. The black surface we use nowadays is a variety of (g) ________. It was invented by a man of that name whose company was later called Tarmac. As you can see this road needs to be resurfaced. There are a number of (h) ________ following the heavy rain we had last month.

   Now, here we are on a (i) ________ road out of town. There are no pavements here. Grass is allowed to grow along the edges and provides a (j) _________. Over there you can see a (k) ________ carrying a small stream under the road.
Civil engineering 2

A

The functions of civil engineers fall into three categories:

1. before construction (feasibility studies, site investigations, and design).
2. during construction (dealing with clients, consulting engineers, and contractors).
3. after construction (maintenance).

Any major civil engineering project starts with a feasibility study to assess both financial and engineering aspects. During the feasibility study a preliminary site investigation is carried out. Once a scheme has been approved, a more extensive investigation is usually necessary to evaluate the load-bearing qualities and stability of the ground. This field is called soil mechanics. The design of engineering works may require the application of principles of hydraulics, thermodynamics and nuclear physics. During the construction phase, a consulting engineer is often employed to be responsible for design of the works, supplying specifications, drawings, and legal documents to get competitive tender prices. In a turnkey or package contract the building contractor undertakes to finance, design, specify, construct, and commission the whole project. Maintenance is normally carried out by the contractor as part of the agreement; if there are maintenance problems, it is the responsibility of the contractor to pay for any necessary work.

B

Now look at the following statements about the pre-construction phase.

Preliminary feasibility study:
A series of steps by which all the attributes of each proposal are marked, resulting in two or three being selected.

Secondary feasibility study:
A process to determine the best of the two or three remaining schemes. Rough dimensions are put onto the structure at this stage, in order that a more accurate costing system can be implemented.

Feasibility study factors:
cost • aesthetic appeal • maintenance • ecology • disruption

Preliminary design:
Dimensions and quantities of materials are roughly analysed and calculations are performed to estimate prices and construction needs.

Detailed design:
At this stage of the design other factors are considered, such as the exact geology of the area. To determine this, boreholes and trial pits are sunk.

After all calculations have been worked out exactly and checked, detailed technical drawings are done. The result of these calculations is a finished design which can be built from the drawings produced. Once the detailed design is complete, construction can begin.

C

Read the list of the essential duties and responsibilities of a civil engineer below:

- to provide detailed fact finding, research and analysis
- to provide support for less experienced staff
- to develop computer models, including detailed and potentially complex spreadsheet analyses
- to assist with engagement planning activities including the development of draft work plans and budgets
- to prepare client communications for senior level review
TASKS

1. Match the following words and phrases with their definitions.

- feasibility study: building or installation which is built, supplied, or installed complete and ready to operate
- site investigation: activities carried out after the project to ensure problems are solved
- maintenance: detailed plan of proposed structures
- soil mechanics: dimensions and measurements
- specifications: extensive investigation to evaluate the load-bearing qualities and stability of the ground
- technical drawings: investigation to assess both financial and engineering aspects of a project
- commission a project: offer of a bid for an engineering contract
- costing system: procedure to monitor the costs of a project so that management can get information on development
- tender: study of the proposed location to assess geology of the area
- turnkey project: to order a plan to be carried out

2. Put the following tasks into the appropriate phase of construction.

- consulting engineer: communications with client • extensive site investigation
- consulting engineer: contact with contractors • feasibility study • detailed design
- maintenance • employment of consulting engineer • preliminary site investigation

<table>
<thead>
<tr>
<th>Phase</th>
<th>Tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before construction</td>
<td></td>
</tr>
<tr>
<td>During construction</td>
<td></td>
</tr>
<tr>
<td>After construction</td>
<td></td>
</tr>
</tbody>
</table>

3. The following extract is from a letter written by a qualified civil engineer in response to a job advertisement. Complete the extract by unscrambling the letters in brackets.

I am writing in connection with the job advertisement for a civil (e) ________ (renigeen), which appeared in today’s Civil Engineering.

I have a degree in (b) ________ (ruditasid) engineering. After graduation, I worked for four years at Locke Engineers in the field of (c) ________ (onscorutite) consulting. During my time there, I specialized in (d) ________ (liamsce) preparation and construction (e) ________ (ehdnsgulic). I am particularly interested in the opportunities to further develop my skills, especially in the following areas:

• development of (f) ________ (tdfr) work plans
• (g) ________ (etis) investigations
• preparation of (h) ________ (nictel) communications
Mining

Mining is the process of extracting useful minerals from the earth’s crust – the land and the seas. The process involves the physical removal of rock and earth. Excavations take place in different types of mines. Underground mines are constructed when any ore lies deep below the surface. There are several types of surface mining, but the three most common are open-pit mining, strip mining, and quarrying. These differ from one another in:

- their structure
- the mining techniques employed
- the minerals produced.

There are typically four stages to mining:

- prospecting – looking for mineral deposits
- exploring – assessing the size, shape, location, and economic value of the deposit
- developing – preparing access to the deposit so that the minerals can be mined
- exploiting – extracting the minerals

Mining is an extremely dangerous activity. The health and safety of mine workers and the protection of the public are achieved by regular mine safety audits and mine site inspections.

Various professionals are employed in mining to extract minerals. The output from mines can be divided into metalliferous, nonmetalliferous and building and ornamental stones.

Professionals in mining
- drill supervisor
- environmental engineer
- geochemist
- geologist
- geophysicist
- hydrogeologist
- miner
- mining engineer
- prospector
- safety engineer

Minerals: metalliferous ores
- copper
- gold
- iron
- lead
- manganese
- tin
- zinc

Minerals: nonmetalliferous ores
- asbestos
- bauxite
- borax
- coal
- feldspar
- phosphate rock
- quartz
- talc

Building and ornamental stones
- granite
- limestone
- marble
- slate
- traprock
- travertine

What’s in a mine?
- cage
- chute
- conveyor
- dragline
- drift
- drill
- dump truck
- explosive
- headframe
- mechanical loader
- mine car
- pump
- raise
- shovel
- skip
- stope
- stripping machine
- sump
- ventilation shaft

Here is a comparison of the properties of different grades of coal:

Peat is the lowest grade of coal. It is composed of 90% water, 5% carbon, and 5% volatile materials. Because of its high water content, it is not commonly used for fuel. The second lowest grade of coal is lignite. It is formed in swamps and then covered by large amounts of water, usually an ocean or sea. The second highest grade of coal is called bituminous or “soft coal”. It is formed when the weight of overlying sediment, the depth of burial, and the length of time are slightly increased. The highest and most desirable grade of coal, called anthracite, is formed when previously formed coal deposits are subjected to substantially increased heat and pressure.
1. Match the following words and phrases with their definitions.

- **deposit**: a natural occurrence of a useful mineral in sufficient quantities for exploitation
- **excavate**: a natural resource extracted from the earth for human use, e.g., ores, salts, coal, or petroleum
- **explore**: an open or surface mineral working, usually for the extraction of building stone, such as slate and limestone
- **extract**: examine a territory for its mineral wealth
- **mineral**: remove soil and/or rock materials from one location and transport them to another
- **ore**: search for coal, minerals, or ore
- **prospect**: the naturally occurring material from which a mineral or minerals of economic value can be extracted
- **quarry**: the science, technique, and business of mineral discovery and exploitation

2. Label the following items of mining equipment with words from the box.

   - 1. **shovel**
   - 2. **conveyor**
   - 3. **drift**
   - 4. **headframe**
   - 5. **skip**
   - 6. **dragline**
   - 7. **drill**
   - 8. **cage**
   - 9. **dump truck**

3. Rearrange the letters to complete the short descriptions of the activities of different mining professionals.

   - **There are two main activities in my job. Firstly to make holes in rock so that samples of the rock can be taken and to insert (a)___________(teoisxspe) for blasting.**
   - **I make evaluations of conditions at a (b)___________(ieinn) and check air pollution, waste disposal, and previously mined areas.**
   - **My job is to study the chemistry of (c)___________(hitare) materials. I specialize in the study of the planet and the materials of which it is made. This information helps us to discover (d)___________(nliames) and fuels.**
   - **I study and investigate phenomena which cause movement of the earth’s surface. Through my studies I help others to locate petroleum and mineral (e)___________(tseopids).**
   - **I specialize in various branches of work, including (f)___________(goesropnitip), surveying, and technical underground management.**
   - **My job is to inspect all possible danger spots in the mine. prepare (g)___________(sudail) and cooperate with committees to prevent unnecessary dangers.**
Petroleum is an oily, thick, flammable, usually dark-coloured liquid that is a form of bitumen or a mixture of various hydrocarbons. It occurs naturally in various parts of the world and is usually obtained by drilling. Offshore drilling for oil takes places in oceans, seas or large lakes from platforms standing on the bed; onshore drilling takes place on land. Because petroleum is found underground, it must be extracted by means of wells. To check whether there is any oil at a site, an exploratory well, or wildcat, is dug. Scientific methods and technical equipment, such as gravimeters, magnetometers, and seismographs are used to find subsurface rock formations that might hold crude oil. The petroleum from a new well will usually come to the surface under its own pressure. Later the crude oil must be pumped out or forced to the surface by injecting water, gas, or air into the deposits. The oil and gas industry distinguishes between:

upstream – oil and natural gas exploration and production activities; plus gas gathering, processing and marketing operations
downstream – all activities from the processing of refined crude oil into petroleum products to the distribution, marketing, and shipping of the products. (⇒ 24)

Accurate forecasting and measuring always precedes drilling and pumping.

Forecasting and measuring
- downhole
- flow rate
- layer
- pressure
- reserves
- reservoir
- rock mapping
- wellbore
- wildcat well

Drilling and pumping
- blowout
- casing
- (drill) collar
- cuttings
- derrick
- drill bit
- drill pipe
- drill string
- drilling mud
- inject
- kelly
- licence
- oil field/gas field
- permit
- platform
- pump
- recover
- rig
- trap
- turntable/rotary table
- well

Below are some excerpts from professional journals about exploration and drilling.
1. Match the following words and phrases with their definitions.

- derrick: a hole drilled into the earth to recover oil or gas
- drill: a pyramid of steel erected over a bore hole to drill for oil
- extract: a structure that contains all the necessary equipment for drilling
- flammable: an offshore structure from which wells are drilled
- offshore: burns easily
- platform: exploration and production activities for oil and natural gas
- reservoir: places in oceans, seas or large lakes
- rig: rock formation containing oil and/or natural gas
- upstream: to cut through rock
- well: to take out a solid or liquid

2. The following diagram shows the main parts of an oil rig. Label the parts.

3. The following text describes the eight basic steps to drill a surface hole – a hole above where the exploration company thinks oil is located. The steps are mixed up and some of the letters of the missing words are also mixed up. Number the steps in the correct order and then rearrange the jumbled words.

   __ Add new sections (joints) of drill (a) ________ (isep) as the hole gets deeper.
   __ Allow the (b) ________ (tenemcm) to harden.
   __ As drilling progresses, circulate drilling (c) ________ (und) through the pipe and out of the
     (d) ________ (ibt) to float the rock (e) ________ (quintsci) out of the hole.
   __ Attach the (f) ________ (ylekl) and (g) ________ (lumbretat) and begin drilling.
   __ Place (h) ________ (nagsie) pipe sections into the hole to prevent it from collapsing in on
     itself.
   __ Place the drill bit, (i) ________ (relaol) and drill pipe in the hole.
   __ (j) ________ (pmmu) cement down the casing (k) ________ (iiepp).
   __ (l) ________ (emevor) the drill pipe, collar and bit when the pre-set depth is reached.
Petroleum is used in a natural or refined state as fuel, or separated by distillation into petrochemicals such as petrol (gasoline), benzene, kerosene and paraffin. From the well, the crude is usually transported to a refinery in pipelines or tanker ships. There the hydrocarbons are separated from each other by various refining processes. In a process called fractional distillation, petroleum is heated and sent into a tower. The vapours of the different components condense on collectors at different heights in the tower. The separated fractions are then drawn from the collectors and further processed into various petroleum products, for example gasoline or asphalt.

Cracking processes use heat, pressure, and certain catalysts to break up the large molecules of heavy hydrocarbons into small molecules of light hydrocarbons. Some of the heavier fractions find eventual use as lubricating oils and paraffins.

Today the world is heavily dependent on petroleum for power, lubrication, fuel, dyes, drugs, and many synthetics. The widespread use of petroleum has created serious environmental problems: air pollution from burnt fuels contaminates the atmosphere and oil spillages from tankers and offshore wells pollute oceans and coastlines.

After refining, the petroleum is transported to the refinery. Depending on the end use, the petroleum may be converted into petrochemicals.

### Refined
- Catalytic cracking
- Distillation
- Impurity
- Refinery separation
- Steam cracking
- Thermal cracking

### Transporting
- Barrel
- Pipeline
- Spill
- Store
- Tanker
- Terminal
- Transport

### Uses of petroleum fuel
- Aeroplanes
- Automobiles
- Electrical power supply
- Rockets
- Ships
- Tractors
- Trucks

### Petrochemicals from petroleum (→ 12)
- Cleansing agents
- Explosives
- Fertilizers
- Jellies
- Paints
- Plastics (→ 25)
- Soaps
- Solvents
- Synthetic rubber and fibres
- Waxes

One way of increasing your vocabulary is to learn the associated words from a key word. Look at the word table below, which shows words related to the key words presented above.

<table>
<thead>
<tr>
<th>Noun</th>
<th>Verb</th>
<th>Adjective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refinery</td>
<td>Refine</td>
<td>Refining/refined</td>
</tr>
<tr>
<td>Separation</td>
<td>Separate</td>
<td>Separate</td>
</tr>
<tr>
<td>Distillation</td>
<td>Distil</td>
<td>Distilling/distilled</td>
</tr>
<tr>
<td>Heat</td>
<td>Heat</td>
<td>Hot</td>
</tr>
<tr>
<td>Vapour</td>
<td>Vaporize</td>
<td>Vaporous</td>
</tr>
<tr>
<td>Lubrication/lubricant</td>
<td>Lubricate</td>
<td>Lubricating/lubricated</td>
</tr>
<tr>
<td>Synthetics</td>
<td>Synthesize</td>
<td>Synthetic</td>
</tr>
<tr>
<td>Pollution/pollutant</td>
<td>Pollute</td>
<td>Polluting/polluted</td>
</tr>
<tr>
<td>Spillage</td>
<td>Spill</td>
<td>Spill</td>
</tr>
<tr>
<td>Explosive</td>
<td>Explode</td>
<td>Explosive</td>
</tr>
</tbody>
</table>
1. **Tasks**

Find 15 petroleum-related products in the word square opposite.

```
PWDTKLPEOSINCUB
LUBRICATIONMOJQL
AVIOSRUKLWFUEL
SOAPLWAXGPQOLS
TARGETNFTPETROL
IQUZFCXKHNHTML
CBUPWZITBFKAHY
TTEPAINTACPLPPX
ASDWXTEXPLSIVE
BREEFGIOUWWSTJP
ATDRUGFPZDEJBPO
OYFHPARARRTTHJ
FFERTILIZERUNBV
WGHPBOAKTKLPTY
```

2. **Complete the following sentences by adding a word derived from the word given.**

1. At the first stage in the refining process, crude oil is heated and petroleum products are initially _________.

2. _________ are devices used to remove solids from the gas.

3. _________ converts crude oil into petroleum products by separating the crude oil into its constituent components through evaporation and condensation.

4. In the stack, crude oil is pumped into a boiler and _________.

5. Refining crude involves removing the _________, most of which become valuable products.

6. Synthetic motor oils provide extremely fast _________ of all moving parts compared to conventional mineral oils.

7. Fuels generate most of the air _________ in industrialized countries.

8. In a _________ the various components present in crude oil are separated and converted into usable products.

3. **Petronoc refines and transports oil. In the following extract from the chairman’s end-of-year presentation, some words are missing. Complete the extract using appropriate words from the box below. You should use each word once.**

- refineries • distillation • impurities • pipeline • barrel • processed
- refining • separate • spillage • tankers • terminal • transporting

I am pleased to report that the supply of crude from our wells is expected to flow for some decades. Further good news is that over the last twelve months we have seen a significant rise in the price per (a) _________, therefore we will continue to be active in our two core areas: (b) _________ and (c) _________ oil. For the first area, we plan to invest in technology for new (d) _________ In particular, we need to improve the (e) _________ process in order to (f) _________ the hydrocarbons more efficiently. In addition, we need to research new technologies to remove the (g) _________ so that they can be (h) _________ and converted into marketable products. On to transportation. We will continue to lease the (i) _________ from Seafred Enterprises, since this is the most economical way to transport oil from the fields to the (j) _________ After the major (k) _________ last year, we sold all our (l) _________ This is no longer part of our core business.
25 Plastics

Plastic is a common name for polymers: materials made of long strings of carbon and other elements. Each unit in a string is called a monomer, and is a chemical derived from oil, coal or natural gas. (➔ 24). Monomers are made into polymers by joining the carbon atoms together.

There are many different types of plastic, depending on:
- the starting monomer selected
- the length of the polymer chains
- the type of modifying compounds added

There are two main groups of plastics: thermoplastics soften with heat and harden with cooling, while thermostets are cured or hardened by heat.

The disposal of plastics causes major environmental problems. Efforts to reduce the environmental impact of waste plastics are:
- source reduction – using less material to manufacture a product
- biodegradable plastics – developing plastics that will disintegrate
- incineration – some plastics can be burned though this is strictly regulated because of hazardous air emissions and other pollutants
- recycling plastics – making the plastics into new products
- collecting and sorting used plastics

Life would be different without plastics, as their features make them indispensable.

A selection of plastic products
- audio cassette
- ballpoint pen
- bucket
- electric cables
- milk bottle
- plastic bag
- refrigerator liner
- ruler
- shoe soles
- water pipes

Features of plastics
- attractive
- cheap
- easy to shape and colour
- flexible
- good insulators of heat or electricity
- hard and slippery
- hygienic
- lightweight
- non-rusting
- soft and rubbery
- tough and slippery

Plastics are made into shapes in many ways. Here are some of the processes used.

Extrusion – hot molten plastic is squeezed through a nozzle to make long lengths of special shapes like pipes

Blow extrusion – used for making plastic films and bags

Injection moulding – lots of everyday articles like washers or bowls are made this way

Blow moulding – many bottles and toys are made this way

Reaction injection moulding – used to make car bumpers and the meat trays in supermarkets

Fabrication – used to make acrylic signs and displays, and industrial tanks and equipment.
1. Are the following statements about plastics true or false? If false, correct the information.

1. Polymers are made of long strings of carbon and other elements. ( )
2. Monomers are made into polymers by separating the carbon atoms. ( )
3. Thermoplastics harden with heat and soften with cooling. ( )
4. All plastics can be recycled and made into new products. ( )
5. Incineration is the safest way to dispose of plastics. ( )
6. Biodegradable plastics will disintegrate. ( )

2. Below is a table showing a list of plastic articles and the types of plastic used. The middle column shows how the plastics are made. Choose the correct method from the list in the box.

<table>
<thead>
<tr>
<th>Article</th>
<th>How made</th>
<th>Plastic</th>
</tr>
</thead>
<tbody>
<tr>
<td>bucket</td>
<td>a</td>
<td>polyethylene</td>
</tr>
<tr>
<td>shoe sole</td>
<td>b</td>
<td>polyurethane</td>
</tr>
<tr>
<td>ballpoint pen</td>
<td>c</td>
<td>styrene</td>
</tr>
<tr>
<td>electric cable</td>
<td>d</td>
<td>PVC</td>
</tr>
<tr>
<td>ruler</td>
<td>e</td>
<td>styrene</td>
</tr>
<tr>
<td>plastic bag</td>
<td>f</td>
<td>polyethylene</td>
</tr>
<tr>
<td>water pipe</td>
<td>g</td>
<td>PVC</td>
</tr>
<tr>
<td>milk bottle</td>
<td>h</td>
<td>polyethylene</td>
</tr>
<tr>
<td>audio cassette</td>
<td>i</td>
<td>styrene</td>
</tr>
</tbody>
</table>

3. Below is the contents page from a leading book on plastics. On the left is the title of each chapter; on the right, a short description of the contents of each chapter. Link the chapter title to the correct contents.

1. Introduction to plastics
   - a pushing heated plastic through a nozzle
2. Physical properties
   - b using compressed air to blow bubbles inside the plastic
3. Thermoplastics
   - c combining carbon atoms
4. Thermosets
   - d heat-hardening processes
5. Features of plastics
   - e safe disposal of plastics
6. Plastic products
   - f from audio cassettes (A) to zips (Z)
7. Extrusion process
   - g monomers and polymers
8. Injection moulding process
   - h heat-softening and cool-hardening processes
9. Blow moulding
   - i squeezing heated plastic into a mould
10. Environmental aspects of plastics
    - j attractive, flexible, lightweight ... the ideal material
Agroindustry

**Agroindustry** includes a number of industries connected to the growing, processing and transporting of food and food-related products. In its widest sense, it covers the outputs and inputs of **agriculture** and the food industry, including:

- food production and supply
- animal feed
- dairy farming and produce
- food and drink for consumption

**Agroprocessing** can be divided into:

- upstream industries which are engaged in the initial processing of agricultural commodities such as **rice milling** and **flour milling**, leather **tanning**, oil **pressing**, and fish **canning**
- downstream industries which carry out further manufacturing operations on intermediate products made from agricultural materials. Examples are bread and biscuit **baking**, textile **spinning** and **weaving**, paper production, and clothing and **footwear** manufacturing

**Agribusiness** covers businesses that:

- supply farm inputs, such as **fertilizers**, **pesticides** or equipment
- are involved in the marketing of farm products, such as warehouses, processors, wholesalers, transporters, and retailers

Finally, **agriculture** is the art, science, and industry of managing the **growth** of plants and animals for human use. In a broad sense agriculture includes **cultivation** of the soil, growing and harvesting **crops**, **breeding** and **raising livestock**, dairy farming, and forestry.

**Agricultural engineering** is the application of engineering principles to agricultural production systems, processing systems, and conservation of land and water resources. It covers:

- conservation • drainage • food engineering • post-harvest handling
- power and machinery development • processing of commodities
- resource management and utilization • sanitary engineering
- soil and water management

**Agricultural chemistry** deals with the chemical compositions and changes involved in the production, protection, and use of crops and livestock.

- additive • animal feed supplement • fertilizer • fungicide
- herbicide • insecticide • plant growth regulator • soil makeup

**Food packing and processing** covers the activities needed to distribute the food and prevent it from spoiling

- canning • dehydration • drying • fermentation • food preservation
- freezing • irradiation • pasteurization • quick-freezing • refrigeration
- reverse osmosis • spoilage • spray drying • thermal processing

Below are the course contents of a food hygiene programme – essential training for all food handlers in the catering, food retailing or food processing environments.

- Introduction to food hygiene
- Food poisoning
- Bacteriology
- Prevention of contamination and food poisoning
- Personal hygiene
- Premises, equipment and pest control
- Cleaning and disinfection
- Legislation
**TASKS**

1. Find 10 agroindustrial terms in the word square opposite.

```
LUCKR GROWTH
ISUJAB HDHY
VRBREEDING
EWTIFE ZDBI
SFICIBABFE
TOFEEDTAE
OXLZHTKRE
CRPSPRITI
KBUQUIRNIV
ODRAINAGER
```

2. Combine a word in A with a word in B to form ten agroprocessing and food processing terms. Finally, choose the best definition for the term in C.

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>bread</td>
<td>weaving</td>
<td>to convert animal skin into a material that can be worn</td>
</tr>
<tr>
<td>fish</td>
<td>baking</td>
<td>to make paper</td>
</tr>
<tr>
<td>flour</td>
<td>drying</td>
<td>to extract liquid by squeezing</td>
</tr>
<tr>
<td>footwear</td>
<td>freezing</td>
<td>to cook by dry heat especially in an oven</td>
</tr>
<tr>
<td>leather</td>
<td>grinding</td>
<td>to make chilled with cold</td>
</tr>
<tr>
<td>oil</td>
<td>manufacturing</td>
<td>to make cloth</td>
</tr>
<tr>
<td>pulp</td>
<td>pressing</td>
<td>to make from raw materials by machinery</td>
</tr>
<tr>
<td>quick</td>
<td>producing</td>
<td>to make grains into very small particles for human food or animal feed</td>
</tr>
<tr>
<td>spray</td>
<td>tanning</td>
<td>to preserve by sealing in airtight containers</td>
</tr>
<tr>
<td>textile</td>
<td>canning</td>
<td>to remove liquid</td>
</tr>
</tbody>
</table>

3. Below are the details of a course in food hygiene. Link the correct description on the right to the course component on the left.

**FOOD HYGIENE COURSE DETAILS**

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction to food hygiene</td>
<td>Cross-contamination can easily occur when one food touches (or drips onto) another, or indirectly, for example from hands, equipment, work surfaces, or knives and other utensils.</td>
</tr>
<tr>
<td>Food handling</td>
<td>Floors, walls, ceilings and surfaces (which come into contact with food) must be adequately maintained, easy to clean and, where necessary, disinfected.</td>
</tr>
<tr>
<td>Bacteriology</td>
<td>Food handlers must protect food and ingredients against risks which may make them unfit for human consumption or a health hazard.</td>
</tr>
<tr>
<td>Prevention of contamination</td>
<td>Hygiene is important for anyone working in a food business. Good hygiene prevents food poisoning and protects your reputation with customers.</td>
</tr>
<tr>
<td>Premises</td>
<td>Owners and managers of food businesses must ensure that their businesses comply with the law.</td>
</tr>
<tr>
<td>Cleaning and disinfection</td>
<td>People who work in food areas can spread food poisoning germs very easily.</td>
</tr>
<tr>
<td>Staff</td>
<td>The place where you work has to be kept clean, maintained in good repair and be designed and constructed to permit good hygiene practices.</td>
</tr>
<tr>
<td>Legislation</td>
<td>While you are working, clean up any spills immediately and clean work surfaces, equipment and floors frequently.</td>
</tr>
</tbody>
</table>
Pulp and paper

Paper is used for a wide range of writing, printing, wrapping and packaging products. There are two main raw materials: primary wood pulp from felled trees and recycled waste. For the cheapest grades of paper, such as newsprint, only pulp is used; for better grades, chemical wood, pulp from which undesirable materials have been chemically removed, or a mixture of pulp and rags (from cotton or linen) is used; and for the finest papers, such as the highest grades of writing papers, only rag fibre is used.

Wood pulp is prepared by removing the bark (the outer layer of a log). Then the logs are chopped into chips (very small pieces). There are two types of pulping: chemical and mechanical. In the chemical process, the woodchips are cooked with chemicals in a digester. In the mechanical process, the woodchips are ground mechanically in a refiner to separate the fibres.

At this stage, different pulps in the form of slurry from the chemical, mechanical and waste pulp processes can be combined in a blend chest. Also at this stage, additives such as dyes and bleach may be added. The mixture, the papermaking stock, is treated to separate the fibres. This is known as the refining stage.

Finally this pulp is pressed and dried in a mill. The finished paper is wound onto large rolls. It is converted into smaller rolls or sheets for ease of transport and use.

Different grades of paper have different properties; and paper also comes in different sizes and quantities.

Paper grades
- Bible
- bond
- book
- bristol
- groundwood
- kraft
- newsprint
- paperboard
- sanitary

Paper properties
- absorbance
- brightness
- colour
- durability
- gloss
- opacity
- porosity
- stiffness
- strength
- water resistance

Paper sizes and quantities
- octavo
- quire
- ream
- sheet

Paper has many uses. Here are some of them:
- brochures
- cartons
- catalogues
- envelopes
- games
- magazines
- maps
- matchboxes
- money
- newspapers
- packaging
- paper bags
- posters
- serviettes
- stamps
- tickets
- tissues
- wallpaper
- wrappers
- wrapping paper
1. Match the following words with their definitions.

<table>
<thead>
<tr>
<th>Word</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>fell</td>
<td>chemical to whiten paper</td>
</tr>
<tr>
<td>bark</td>
<td>to convert wood into a fibrous material by a mechanical or chemical process</td>
</tr>
<tr>
<td>chop</td>
<td>to crush into particles</td>
</tr>
<tr>
<td>pulp</td>
<td>to cut down a tree</td>
</tr>
<tr>
<td>grind</td>
<td>to cut into small pieces</td>
</tr>
<tr>
<td>slurry</td>
<td>liquid mixture consisting of fibres in water used in papermaking process</td>
</tr>
<tr>
<td>bleach</td>
<td>outer layer of a log</td>
</tr>
<tr>
<td>press</td>
<td>quantity of paper formed into a large cylinder or ball</td>
</tr>
<tr>
<td>wind</td>
<td>to squeeze out water between rollers</td>
</tr>
<tr>
<td>roll</td>
<td>to turn around so as to form a roll</td>
</tr>
</tbody>
</table>

2. Organize the following stages in the papermaking process into the correct order in the flowchart.

- Raw material preparation
- Cleaning the rags
- Cutting the logs into chips
- Chemical or mechanical pulping:
- Adding dyes and bleach
- Refining the stock
- Pressing and drying
- Cooking woodchips with chemicals
- Felling trees
- Removing the bark
- Blending the pulp
- Grinding woodchips
- Winding onto rolls
Telecommunications technology transmits information by electromagnetic means over media such as telephone wires or radio waves. The information may be voice, facsimile, data, radio, or television signals. The electronic signals that are transmitted can be either analogue or digital. The advantages of digital transmission are high reliability and low cost. Digital switching systems are much cheaper than analogue systems.

In analogue modulation, the signals are transmitted directly (without converting them to digital form) by amplitude modulation or frequency modulation. For digital transmission the analogue signals must be converted to a digital form. Then the digitized signal is passed through a source encoder, which reduces redundant binary information. After source encoding, the digitized signal is processed in a channel encoder, which introduces redundant information that allows errors (degradation by noise or distortion) to be detected and corrected. The encoded signal is made suitable for transmission by modulation onto a carrier wave. When a signal reaches its destination, the device on the receiving end converts the electronic signal back into an understandable message – sound on a telephone, images on a television, or words and pictures on a computer.

There are three main methods of electromagnetic signal transmission: wire, radio and optical.

**wire transmission**
- amplify
- attenuation
- coaxial cable
- copper wire
- metallic-pair circuit
- multipair cable
- open-wire pair
- repeater
- restore
- retransmit
- single-wire line

**radio transmission**
- antenna
- dish
- electromagnetic wave
- microwave
- radio wave
- receiver
- reflected propagation
- satellite
- surface propagation
- transmitter
- transponder

**optical transmission**
- fibre optic cable
- high bandwidth
- interference immunity
- laser
- lightweight
- light-emitting diode (LED)
- low attenuation
- low cost
- wavelength

Telecommunications is the fastest growing segment of technology today. Telecommunications technologists are needed to plan, install and maintain state-of-the-art telephone systems, cable TV and computer networks. Although technologists have knowledge of theoretical topics, they tend to focus on solving practical design and application problems. Training covers a wide range of telecoms-related topics. Here is the content from one such course:

<table>
<thead>
<tr>
<th>COURSE CONTENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part 1: Operating Systems</td>
</tr>
<tr>
<td>Part 2: Analogue Communications</td>
</tr>
<tr>
<td>Part 3: Telecommunications Fundamentals</td>
</tr>
<tr>
<td>Part 4: Telecommunications Fundamentals Lab</td>
</tr>
<tr>
<td>Part 5: Digital Electronics</td>
</tr>
<tr>
<td>Part 6: Telecommunications Networking</td>
</tr>
<tr>
<td>Part 7: Fundamentals of Optical Communications</td>
</tr>
<tr>
<td>Part 8: Data Communications Networking</td>
</tr>
</tbody>
</table>
TASKS

1. Match each of the following words with its definition.

<table>
<thead>
<tr>
<th>Word</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>wire</td>
<td>a device which maps the binary strings into coded bits or waveforms for transmission</td>
</tr>
<tr>
<td>wave</td>
<td>a device which maps the source into a set of binary strings</td>
</tr>
<tr>
<td>analogue</td>
<td>a system in which data is represented as 0 or 1</td>
</tr>
<tr>
<td>digital</td>
<td>a system in which data is represented as a continuously varying voltage</td>
</tr>
<tr>
<td>amplitude modulation</td>
<td>a thin piece of metal for conducting electrical current</td>
</tr>
<tr>
<td>frequency modulation</td>
<td>a wave suitable for modulation by an information-bearing signal</td>
</tr>
<tr>
<td>source encoder</td>
<td>an electric, electromagnetic, acoustic, mechanical or other form whose physical activity rises and falls as it travels through a medium</td>
</tr>
<tr>
<td>channel encoder</td>
<td>the deterioration in quality, level, or standard of performance</td>
</tr>
<tr>
<td>degradation</td>
<td>to fail to reproduce accurately the characteristics of the input</td>
</tr>
<tr>
<td>distort</td>
<td>where audio signals increase and decrease the amplitude of the carrier wave</td>
</tr>
<tr>
<td>carrier wave</td>
<td>where voltage levels change the frequency of a carrier wave</td>
</tr>
</tbody>
</table>

2. The following words are taken from three modes of transmission: wire, radio and optical. Link each term with the most appropriate mode of transmission.

- antenna
- coaxial cable
- copper wire
- fibre optic cable
- laser
- light-emitting diode
- microwave
- repeater
- satellite
- single-wire line
- transmitter
- wavelength

<table>
<thead>
<tr>
<th>Term</th>
<th>Mode of Transmission</th>
</tr>
</thead>
<tbody>
<tr>
<td>wire</td>
<td>wire</td>
</tr>
<tr>
<td>radio</td>
<td>radio</td>
</tr>
<tr>
<td>optical</td>
<td>optical</td>
</tr>
</tbody>
</table>

3. The following extract is taken from a description for a telecommunications technology course. Complete the text by choosing a suitable word or phrase from the box.

sharing • laser • information • electromagnetic transmission

<table>
<thead>
<tr>
<th>Course Name</th>
<th>Course Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Telecommunications Fundamentals</td>
<td>Introduction to the______ of information</td>
</tr>
<tr>
<td>Telecommunications Fundamentals Lab</td>
<td>Hands-on practical experiments to______</td>
</tr>
<tr>
<td>Analogue Communications</td>
<td>________ transmission of signals</td>
</tr>
<tr>
<td>Digital Electronics</td>
<td>________ signals</td>
</tr>
<tr>
<td>Fundamentals of Optical Communications</td>
<td>The advantages of ________ technologies</td>
</tr>
<tr>
<td>Fundamentals of Telecommunications Networking</td>
<td>Introduction to ________ information</td>
</tr>
<tr>
<td>Data Communications Networking</td>
<td>Sharing ________ between networks</td>
</tr>
</tbody>
</table>
A wide variety of information can be transferred through a telecommunications system, including voice and music, still-frame and full-motion pictures, computer files and applications, and telegraphic data.

The telephone is an instrument used for sending and receiving voice messages and data. Most phone calls involve two people, but the phone network can also be used to pay bills and retrieve messages from answering machines. Private individuals will usually have their own phone line; a large business will usually have its own switching machine, called a Private Branch Exchange (PBX), with many lines, all of which can be reached by dialling one number.

Radio transmission broadcasts signals that are intended for general public reception. With an omnidirectional antenna, radio signals are transmitted over a wide area. In a point-to-point radio channel, a directional transmitting antenna focuses the wave into a narrow beam, which is directed toward a single receiver. Broadcasts may be audible only, as in radio, or visual or a combination of both, as in television.

Two applications of telecoms are telephony and television.

Telephony
A videophone is a personal video camera and display, a microphone and speaker, and a data-conversion device.
A cordless telephone is a device which plugs directly into an existing telephone jack, allowing limited mobility within the home, garden or office.
Telephony has been revolutionized by cellular (cell or mobile) telephones, which are personal portable devices.
Facsimile, or fax, refers to the transmission of print: text, fixed images or drawings by wire or radio channels or undersea cable.

Television
- aerial • antenna • broadcast • cable television • dish
- relay station • television set • television station • visible

Mobile telephony is revolutionizing how we use the phone. Look at the range of features offered by the MobiPhone.

THE MOBIPHONE WORLD
The MobiPhone world is the latest in a line of WAP “smartphones” combining the best of both worlds – mobile phones and handy PDAs. All phones offer the full complement of features,
- 14.4 kbps data and fax transmission
- a vibrating alert
- a clock and alarm
- a currency converter
- a built-in personal organizer that holds up to 1,000 short memos.

THE TOP-OF-THE-RANGE World 1000 is GPRS enabled (General Packet Radio Service) offering:
- "always-on"
- higher capacity
- Internet-based content
- packet-based data services.

This enables services such as colour internet browsing, email on the move, powerful visual communications, multimedia messages and location-based services. With an LCD screen displaying up to ten times the amount of text you’d get on a traditional cell phone, the MobiPhone is tomorrow’s mobile phone today.

Also available: an infra-red computer connection.
Dimensions: 103mm × 51mm × 16mm (including battery). Weight: 69g (including battery).
## TASKS

### 1
Circle **all** the correct answers that apply.

1 A telecommunications system can transfer
   a voice b pictures c computer files d energy

2 The telephone is an instrument used for
   a sending messages b switching messages c receiving messages d retrieving messages

3 Broadcast signals can be
   a tactile b audible c visual d a combination of all three

4 A videophone combines
   a a video camera b a display c a microphone d a speaker

5 Fax can be used to transmit
   a sounds b moving pictures c drawings d images

6 A cordless phone
   a plugs into a jack b allows unlimited mobility c can be used within the home d is portable

### 2
Match a word in the left-hand column with a word on the right to form ten phrases from the field of telecommunications.

Now complete the following sentences using phrases from the table opposite.

1 The telephone can be used to pay bills and **______** from **______**.

2 With an omnidirectional antenna, **______** can be transmitted over a wide area.

3 A videophone incorporates a **______** and display, a microphone and speaker.

4 A **______** allows limited mobility in and around the home.

5 **______** allows access to many television stations.

### 3
Below is an extract from the review of the newly released MobiPhone World. Complete the text using the words/phrases in the box below.

<table>
<thead>
<tr>
<th>alert</th>
<th>browsing</th>
<th>cell phone</th>
<th>clock and alarm</th>
<th>currency converter</th>
</tr>
</thead>
<tbody>
<tr>
<td>email</td>
<td>organizer</td>
<td>PDA</td>
<td>screen</td>
<td>weight</td>
</tr>
</tbody>
</table>

MobiPhone World 1000 is the latest product from MobiCom. It is a fully featured, future-proof mobile, packed with exciting applications. Not only a mobile phone, it doubles as a handy **______**. As it is GPRS enabled, you can collect your **______** while you are on the move. In addition, the colour internet **______** makes word wide web searching a new experience. This is enhanced by the new LCD **______** which displays up to ten times the amount of text you’d get on a traditional **______**. When you go abroad, you don’t need to worry about missing that important meeting as the World 1000 comes with a **______**. You can also be one step ahead of the bank by checking how much you’ll get for your money with the **______**. And when you get to the business meeting, you won’t disturb your neighbours, as the vibrating **______** lets you know about incoming calls. You can even write short notes of the meeting on the built-in personal **______**. With a **______** of just 69 grams, the MobiPhone World 1000 is a must have.
Textiles

Textiles refers to:
- fibres that can be spun into yarn or made into fabric by operations such as weaving, knitting, braiding, and felting
- all fabrics (both natural and synthetic) produced by mechanically or chemically bonding fibres

Fibres, the basic raw materials, may be:
- obtained from natural sources, such as wool from sheep
- produced from various substances by chemical processes

After cleaning and blending, the fibres are spun into yarn. This is then processed into fabric in a weaving mill or knitting mill. The next stage, called finishing, includes various mechanical and chemical processes for:
- removal of defects or foreign matter
- bleaching
- removal of moisture
- dyeing
- printing

The appearance of the fabric may also be improved by napping, shearing, pressing, brushing, and polishing.

After finishing, the woven material is ready for delivery to:
- a manufacturer of textile products such as clothing, household linens and bedding, upholstery, rugs and carpets
- a retailer, who sells it to individuals to make clothes or household articles such as curtains

Various techniques and processes are used to produce fibres of different qualities.

Fibres
- acetate • cotton • linen • nylon • polyester • rayon • silk • wool

Techniques and processes
- blending • braiding • carding • embroidering • fibre processing
- knitting • lace-making • net-making • spinning • weaving

Qualities of fibres
- ability to withstand laundering or dry-cleaning
- absorption
- crease control
- elasticity
- fineness
- flexibility
- length
- reaction to heat and light
- shrinkage control
- strength
- wash and wear

Looking after your fabrics is important if you want to make them last. Care labels tell you about:

- washing: indicates that normal (maximum) washing conditions may be used at the appropriate temperature; the number indicates the maximum temperature
- bleaching: means that chlorine bleach may be used
- ironing: means that a hot iron may be used
- dry-cleaning: indicates that the garment must be professionally cleaned
- tumble drying: means that the garment may be tumble dried
1. Find eighteen textile-related products in the word square opposite.

2. Classify the following fabrics into their fibre type – natural (N) or synthetic (S). Then choose from the box opposite which characteristics best describe each fabric.

<table>
<thead>
<tr>
<th>Fabric</th>
<th>Fibre type</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>cotton</td>
<td>a</td>
<td></td>
</tr>
<tr>
<td>linen</td>
<td>b</td>
<td></td>
</tr>
<tr>
<td>nylon</td>
<td>c</td>
<td></td>
</tr>
<tr>
<td>polyester</td>
<td>d</td>
<td></td>
</tr>
<tr>
<td>silk</td>
<td>e</td>
<td></td>
</tr>
<tr>
<td>wool</td>
<td>f</td>
<td></td>
</tr>
</tbody>
</table>

- Good insulator; luxurious, soft to the touch
- Good strength, twice as strong as cotton; crisp to the touch
- Lightweight; easy to wash; resists shrinkage and wrinkling
- Luxurious; thinnest of all natural fibres
- Soft to the touch; absorbent
- Strong; resistant to most chemicals

3. Below are the instructions for how to look after your fabrics. Complete the texts using the words below.

- dry-cleanable
- dying
- hand-washable
- machine-washable
- shrinkage
- stain
- stretching
- sunlight

When caring for your fabrics, remember that:

**COTTON**
- is easy to care for. It is (a) ____________ and dry-cleanable and has good colour retention.

**LINEN**
- is twice as strong as cotton and is hand-washable or (b) ____________.

**SILK**
- is (c) ____________ or dry-cleanable, but has poor resistance to prolonged exposure to (d) ____________.

**NYLON**
- is easy to wash, resists (e) ____________ and wrinkling, is fast (f) ____________ but has poor resistance to continuous sunlight.

**POLYESTER**
- is resistant to (g) ____________; can be washed or dry-cleaned; is quick drying and wrinkle resistant; because of its low absorbency, (h) ____________ removal can be a problem.
Present tenses

A Sample sentences

The logistics department dispatches finished goods to our customers and receives raw materials from our suppliers. Delivery documentation is enclosed with the consignment, but the shipping papers aren’t prepared in this department. In this area here the goods are loaded onto trucks; and over there incoming goods which have just arrived are unloaded. A consignment is just being delivered over there. We have been using plastic packaging for many years; however, next year we are moving to more environmentally-friendly materials.

B Form

Present simple and Present continuous

<table>
<thead>
<tr>
<th>Present simple active</th>
<th>Negative</th>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>We receive raw materials from our suppliers.</td>
<td>The supervisor doesn’t prepare the papers.</td>
<td>Where do you store finished goods?</td>
</tr>
<tr>
<td>All goods are received at this depot.</td>
<td>The bill of lading isn’t dispatched.</td>
<td>Where are the goods stored?</td>
</tr>
<tr>
<td>The supervisor is checking the delivery.</td>
<td>I am not sending out a bill of lading with this shipment.</td>
<td>When are we moving to the new depot?</td>
</tr>
<tr>
<td>Goods are being unloaded over there.</td>
<td>At present the pallets are not being reused.</td>
<td>Why are those crates being moved?</td>
</tr>
</tbody>
</table>

Present perfect

<table>
<thead>
<tr>
<th>Present perfect simple active</th>
<th>Negative</th>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>Our contractor has built a supporting wall.</td>
<td>They have not drained the water yet.</td>
<td>How many tunnels have they dug?</td>
</tr>
<tr>
<td>The walls have been built.</td>
<td>The water has not been drained.</td>
<td>Has the cable been laid?</td>
</tr>
<tr>
<td>The supervisor has been checking the walls today.</td>
<td>I have not been working on that site since last year.</td>
<td>How long have they been excavating at the site?</td>
</tr>
</tbody>
</table>

Note: the present perfect continuous passive is very rare

C Uses

The present tenses are used to express a range of meanings.

The present continuous describes:

1. an activity at or around the time of speaking
   - At present we are using plastic packaging.
2. a fixed future plan
   - Next year we are building a new depot.

The present simple describes:

a regular or characteristic happening
- How often do you receive shipments?

The present perfect describes:

1. an activity at a non-specific time in the past
   - Our contractor has built a new supporting wall.
2. an activity which started in the past and continues to the present
   - We have been working on this project since last year.
Choose the correct verb form in each of the following.

1. In this process, the mixture is heated/is heating to 120°C.
2. Once the salts are dissolving/have dissolved, the heat is reduced.
3. Several people have survived/are surviving the earthquake and are treating/are being treated in hospital at the moment.
4. For security purposes the employees change/are changing their passwords regularly.
5. Up until now people in this area have taken/take waste plastic to recycling centres, but at present we have tried/are trying a curbside collection system.

A journalist is asking some questions. Complete the answers by putting the verb in brackets into the appropriate present tense in the active or passive.

1. A: Do you normally hold these products in stock?
   B: No. They are normally made to order. (make)

2. A: Is the chief engineer here at the moment?
   B: I'm afraid not. He is currently inspecting the plant in the north of Scotland. (inspect)

3. A: Can I see the new design?
   B: Yes, of course. It has just come off the production line. (come)

4. A: How many units do you produce a month?
   B: We produce 5,000 units a month and only a very small number reject (produce) (reject)

5. A: How long have you been using imported raw materials?
   B: We have imported rayon for many years but we are just beginning (begin) using imported polyester.

6. A: Is this the natural colour of the fabric?
   B: No, this fabric has just been (dye). off the production line. (come)

7. A: And how long will it be kept in store?
   B: Not long at all. We are dispatching (dispatch) this load tomorrow afternoon.

Complete the following text with the correct form of the verbs in brackets.

Over the past ten years, this area has experienced (experience) severe flooding. Houses have been damaged (damage) and roads have been destroyed (destroy). The local authority have decided (decide) to introduce a flood control system. At present our workforce are building (build) a dam on the west side of the town and dikes along the river bank. We must complete the work within two months, so at present we are working (work) 24 hours a day. We believe (believe) that these measures will solve the problem in the short term but on 1st May we are starting (start) work on a new watercourse. The plans are already (draw up) and we are ready to start next week.
A

Last year we began a study of airbags on our four wheel drive vehicles. First we analysed the results of the tests that we had carried out. After the results had been compiled, we used modelling software to evaluate the performance of the airbags. This showed how well they had performed under different conditions. While we were evaluating the physical performance, another study was assessing the materials that we were using. All the results were then recorded into a database.

B

Form

<table>
<thead>
<tr>
<th>Past simple and Past continuous</th>
<th>Positive</th>
<th>Negative</th>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>Past simple active</td>
<td>Last year we began a new study</td>
<td>We didn’t develop the software ourselves.</td>
<td>Where did you record the results?</td>
</tr>
<tr>
<td>Past simple passive</td>
<td>The performance of the airbags was assessed.</td>
<td>The results weren’t recorded.</td>
<td>Where were the findings published?</td>
</tr>
<tr>
<td>Past continuous active</td>
<td>While the analyst was carrying out the test…</td>
<td>… the other technicians were not recording the results.</td>
<td>What were you doing during the test phase?</td>
</tr>
<tr>
<td>Past continuous passive</td>
<td>While the test was being carried out…</td>
<td>… the results were not being recorded.</td>
<td>Why were the findings being written down?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Past perfect</th>
<th>Positive</th>
<th>Negative</th>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>Past perfect simple active</td>
<td>After we had compiled the results…</td>
<td>Because they had not recorded the data…</td>
<td>Had they carried out all the tests?</td>
</tr>
<tr>
<td>Past perfect simple passive</td>
<td>… after the results had been compiled.</td>
<td>… because the data had not been recorded.</td>
<td>Had all the tests been carried out?</td>
</tr>
<tr>
<td>Past perfect continuous active</td>
<td>The analyst had been checking the walls yesterday…</td>
<td>We had not been evaluating the physical characteristics…</td>
<td>How long had you been working on the project?</td>
</tr>
</tbody>
</table>

Note: the past perfect continuous active is quite unusual and the past perfect continuous passive is very rare

C

Uses

All the past tenses are used to express activities at a definite time in the past.

The past simple describes:
an activity at a definite time in the past
The study of airbags was started last year.

The past continuous describes:
an activity which is a time frame for another activity
While we were studying the airbags, we made a significant discovery.
While our team was studying performance, another team was looking at the characteristics.

The past perfect describes:
an activity that happened earlier than another activity in the past
Our studies showed how well the equipment had performed.

Notes:
We use the past tenses with these expressions:
yesterday yesterday morning/afternoon/evening
last last night/week/month/year
ago one hour/two weeks/three months/four years ago
in in 2005/the 1990’s/the 19th century
Six of the following sentences contain mistakes. Find the mistakes and correct them.

1. Sydney Harbour Bridge was building in 1932.
2. While they were carrying out tests in the laboratories, researchers were analysing past results.
3. The first real road builders in Britain was the Romans.
4. The Romans built roads of layers of broken stones of various sizes and were covering them with flat stones.
5. The system didn’t working because the loudspeaker had been wrongly connected.
6. Before factories were told to stop polluting the environment, waste was being dumped in rivers and in the sea.
7. Louis Pasteur was discovering the action of germs while he was studying fermentation in wines.
8. The production process had already been shut down when the leak in the fuel tank was found.
9. Nuclear energy began to be used from the mid-1950s.
10. In the second half of the 20th century, the electronics industry transforming the way we work in factories.

Make past tense questions and answers using the words given.

1. When were fibre optics first developed?
   1 When / be / fibre optics / first / develop?
2. The boxes / break / because they / make / of low quality materials.
   2 The boxes / break / because / they / make / of low quality materials.
3. The power supply / cut off / because / cables / come down / during the storm.
   3 The power supply / cut off / because / cables / come down / during the storm.
4. They / not complete / the foundations / by the time the building materials / arrive.
   4 They / not complete / the foundations / by the time the building materials / arrive.
5. When / they / install / the solar panels?
   5 When / they / install / the solar panels?
6. be / this / the first hydroelectric scheme / in Scotland?
   6 be / this / the first hydroelectric scheme / in Scotland?
7. They / not use / wood chip / for heating / when the engineer / visit / the factory.
   7 They / not use / wood chip / for heating / when the engineer / visit / the factory.
8. How / they / produce / gas / before they / discover / North Sea gas?
   8 How / they / produce / gas / before they / discover / North Sea gas?
9. be / the oil pollution along the coastline / cause / by an oil tanker spillage?
   9 be / the oil pollution along the coastline / cause / by an oil tanker spillage?
10. How / they prepare access to this mine?
    10 How / they prepare access to this mine?

Complete the following report of an accident which happened in a factory with the correct form of the verbs in brackets.

On Friday morning at 9.25 a worker in the chemical plant (a) ________ (find) by a female colleague. He (b) ________ (lie) on the floor. His colleague (c) ________ (check) that he (d) ________ (breathe) and then (e) ________ (call) the emergency services. The injured man (f) ________ (take) to hospital where he (g) ________ (recover). An investigation at the factory (h) ________ (find) that a bottle containing a dangerous chemical liquid (i) ________ (leave) open. Vapour from the liquid (j) ________ (escape) into the air. While he had been working in the room he (k) ________ (become) unwell. He (l) ________ (become) drowsy and then (m) ________ (fall) unconscious. Investigating officers are interviewing everyone who (n) ________ (work) in the factory that morning.
33 Future forms

A Sample sentences
A: When are we going to treat the first patients with the new drug?
B: The results from the tests won’t be available before next year.
A: When is PharEurop going to register the drug?
B: They are preparing the preliminary forms next month. So they’ll be ready before the summer.
A: And when are you going to publish that paper on the results?
B: I am submitting it to the medical journal after the summer.

B Form
1 There is no to after will or shall:
The results of the tests will be ready after the summer.
2 You need the verb to be with the present continuous and the going to forms:
I am submitting it to the medical journal after the summer.
When is PharEurop going to register the drug?

C Uses
Look at the differences in meanings between the following pairs of sentences:
I am going to upload the new web page next week. (I intend to do it: future with going to)
I am uploading the new web page next week. (It is my fixed plan to do it: future with present continuous)

We are going to digitize the pictures so that we can upload them to our website. (We intend to digitize them: future with going to)
The digital pictures will be uploaded to our website on 1st June. (The upload date is a fact: future with will)

Now look at this mini-dialogue. Notice the different shades of meaning between the three future forms:
A: When will the hardware be installed?
B: We are going to lay the network cables next Tuesday.
A: I’m seeing the electrical contractor tomorrow. We’re going to review the site plan.
B: Good. So when do you think the system will go live.
A: The file server will be delivered on Friday.
B: And the work stations?
A: They’re coming at the beginning of the following week.

Notes:
1 The present continuous needs an expression of future time to give it a future meaning.
The work stations are coming. (now)
The work stations are coming at the beginning of next week. (in the future)
2 Typical expressions of future time are:
tomorrow morning/afternoon/evening but tonight
next week/month/year
in two weeks/months/years
in the short/medium/long term
3 The negative of will is won’t:
The results won’t be ready this week.
1. Match these present tense situations with the future intention.

1. The building materials are being delivered.   a. We’re going to replace the faulty machine.
2. There is a backlog of orders.                b. We’re going to build a new warehouse.
3. We’re shutting down production.             c. The assembly line is going to be inspected.
4. The workers need different interesting jobs to do. d. We’re going to automate it in the near future.
5. This is a very slow manual process.         e. The workers are going to work overtime.
6. There have been too many faulty goods recently.    f. We’re going to introduce job rotation.

2. In the following situations choose the correct sentence, a) or b).

1. You are reminding a colleague about the programme for tomorrow.
   a) Remember that you’ll meet the supplier at 12 o’clock.
   b) Remember that you’re meeting the supplier at 12 o’clock.
2. Two colleagues are discussing the future visit by inspectors.
   a) The inspectors won’t allow us to store chemicals in this cupboard.
   b) The inspectors are not allowing us to store chemicals in this cupboard.
3. Designers are discussing the car models with airbags.
   a) The use of airbags is going to save more lives in the future.
   b) The use of airbags is saving more lives in the future.
4. Two managers need the results from some research before November.
   a) They won’t be able to complete the research before November.
   b) They aren’t completing the research before November.
5. A senior manager isn’t looking forward to next week because he’s worried about the tests.
   a) Tests will be carried out next week.
   b) Tests are being carried out next week.

3. A salesman is describing a new product to a customer. Complete what they say with will or won’t and a verb from the box.

**give • operate • deal • take • be • contact**
**install • provide • need • revolutionize • warm • see**

S: This is an excellent new material which (a) ____________ the use of solar panels.

C: I see, and how many hours of sunshine (b) ____________ we ____________ to produce energy?

S: It (c) ____________ necessary to have sunshine. It (d) ____________ in daylight only.

C: (e) ____________ it ____________ enough energy to warm the building in winter?

S: It (f) ____________ the building but you may need additional heating when it is very cold.

C: What about installation?

S: We (g) ____________ it for you. It (h) ____________ long and you (i) ____________ soon ____________ how effective it is. We (j) ____________ you a three year guarantee and if there are any problems we (k) ____________ with them immediately.

C: When will you be able to install it?

S: As soon as we receive your order we (l) ____________ you to discuss a suitable date.
Conditionals

Sample sentences

If you follow these measures, the risk of burns will be substantially reduced.
If you combined these two substances together there would be a serious risk of explosion.
If you hadn’t sealed the container, the vapour would have contaminated the environment.
If you feel unwell, seek medical advice immediately.
In case of contact with eyes, rinse immediately with plenty of water.

Form

A conditional sentence has two clauses: the if clause and the main clause.

<table>
<thead>
<tr>
<th>Conditional</th>
<th>if clause</th>
<th>main clause</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>present simple</td>
<td>future with will</td>
</tr>
<tr>
<td>II</td>
<td>past simple</td>
<td>conditional with would</td>
</tr>
<tr>
<td>III</td>
<td>past perfect</td>
<td>past conditional with would have</td>
</tr>
<tr>
<td>Universal</td>
<td>present simple</td>
<td>present simple</td>
</tr>
</tbody>
</table>

Note that the following contractions are common in speech:
will - 'll, e.g. I’ll
would have - ’d, e.g. we would ’ve
would/had - ‘d, e.g. they’d

Uses

We use conditional sentences to talk about the relationship between events and their consequences:
If our survey indicates the possibility of oil (event), then we will do some drilling (consequence).

Conditional I
Here the speaker sees the event as a real possibility:
If the oil field is productive, we will recover our exploration costs in a short time.

Conditional II
Here the speaker sees the event as a remote possibility:
If there was a blowout, we would evacuate the rig immediately.

Conditional III
Here the speaker recognizes that the event is an impossibility, i.e. cannot be fulfilled:
If we hadn’t made this find, we would have leased out our tankers.

Universal Conditions
Here the speaker indicates that the consequence always follows the event:
If a rock is permeable, it allows water or other fluids, such as oil, to pass through it.

Notes:
1 These expressions mean ‘if’ and ‘only if’:
   provided/providing (that) on condition that so long as
   Provided that the results of our surveys are positive, we will continue to drill here.
2 These expressions indicate that a future event may or may not happen.
in case in the case of in the event that in the event of
   In case of corrosion, stop all activity.
3 unless means ‘if ... not’
   Do not return to the rig unless the supervisor gives instructions to do so.
**TASKS**

1. Match two parts to form conditional sentences.

   1. If these tests produce positive results, **a** the accident would never have happened.
   2. If rubber is cooled to -200°C, **b** download them onto your computer.
   3. If safety measures had been followed, **c** we'd be able to do all the technical specifications in half the time.
   4. If you want to study the files from the internet, **d** we could estimate the experimental error.
   5. If we bought a new software package, **e** they would have taken nearly two months.
   6. If you want to use this software package on more than one system, **f** it becomes brittle and will break.
   7. If the goods had been sent by sea, **g** we'll continue with clinical trials.
   8. If we ran an additional test, **h** you'll have to get a site licence.

2. Complete these sentences using the words in brackets.

   1. The tests won't be continued unless **there/be/better safety measures**.
   2. He wouldn't have been injured if **he/follow/the correct procedures**.
   3. In the event of a collision, **the airbag/inflate**.
   4. If all vehicles were fitted with a catalytic converter, **there/be/less/pollution**.
   5. The reaction would be speeded up if **we/introduce/a catalyst**.
   6. If heat is applied, **the substance/decompose**.
   7. As long as disinfectant is used, **infections/not be/pass on**.
   8. If iron is left in contact with air and water, **it/rust**.

3. Two site workers are discussing the weather. Complete the conversation with the correct form of the verbs in brackets.

   A: We'll carry on with the work when the conditions **improve**.
   B: If we'd known the weather was going to be this bad, we **delay** the start of the project.
   A: Well, if the rain **stop** soon, we'll get the foundations laid by evening.
   B: It could have been worse. Do you remember building that bridge last year? If we **not build** the dike of sandbags, the river would have flooded the town.
   A: And if we hadn't brought in that earthmover, we **not make** it in time.
   B: If we get any more rain here, we **have to** repair the potholes in the road before we can use it.
   A: Provided it **stop** soon, we'll be able to start preparing the timber.
   If they'd chosen another time of year, we **not have** these problems.
   It would be much nicer if we **have** indoor jobs at this time of year!
35 Verb phrases

A Sample sentences
Next month the production department will start to control stock levels every week.
Next month the production department will start controlling stock levels every week.
Do you like working on the assembly line?
Do you like to work on the assembly line?

B Form
After some verbs we can use:
Verb ...ing or infinitive + to, e.g.
We will continue to automate the process.
We will continue automating the process.
You should never try to operate this machinery unless you are wearing protective clothing.
You should never try operating this machinery unless you are wearing protective clothing.

C Uses
Sometimes the meaning is the same; sometimes it is different.
1 The same meaning:
We can use both forms after these verbs:
begin • continue • intend • prefer • start
We prefer to inspect stock levels on a monthly basis.
We prefer inspecting them twice a month.
2 A different meaning:
We can use both forms after these verbs, but with a different meaning:
forget • remember • try
Please remember to check the bill of materials. (Don’t forget)
I remember checking the bill of materials. (I checked it and I remember it)
We tried to mix the two chemicals that you delivered (we attempted to do it)
We tried mixing the two chemicals that you delivered. (we experimented with it)
3 A slight difference of meaning:
The employees like rotating jobs, as it increases their motivation. (They enjoy it)
We like to use a subcontractor to maintain this equipment. (It is a good thing to do)

Notes:
1 We would like ______________ (as is)
2 We prefer to use organic products rather than chemical ones.
   We prefer organic products rather than chemical ones.
   We prefer carrying out thorough lab tests to field trials.
   We prefer carrying out thorough lab tests to trialling the products in the field.
We would like to introduce quality circles next year (not we would like introducing)
Choose the correct sentence in each of the following.

1. This new telephone system has been such a success.
   a. I really regret not making a change a long time ago.
   b. I really regret to not make a change a long time ago.

2. This unit is extremely heavy.
   a. Could you try moving it, please?
   b. Could you try to move it, please?

3. Security is very important.
   a. Don’t forget changing your password regularly.
   b. Don’t forget to change your password regularly.

4. This sounds as though it could work!
   a. Would you like setting up trials?
   b. Would you like to set up trials?

5. It was several years ago but
   a. I remember discussing the advantages of videoconferencing.
   b. I remember to discuss the advantages of videoconferencing.

Complete the following sentences with either to + infinitive or verb + ...ing. Choose from the verbs in the box:

- produce
- scratch
- visit
- overload
- deliver
- increase
- reduce
- switch

1. Installing another machine could risk ____________ the electricity supply.
2. Tell him ____________ off the power supply.
3. We expect ____________ production by 15%.
4. We’ll finish ____________ that model in November.
5. The suppliers have agreed ____________ the amount of packaging.
6. Please avoid ____________ the disc.
7. The firm refuse ____________ without payment in advance.
8. We want our customers ____________ our website for further information.

This is part of a memo sent from a computer consultant to a manufacturing company. Complete the memo using the words in brackets.

To: Helmut Pohl
From: Steve Banks
Re: computer software

I have begun work on the software for order processing. I had planned (a) ______ (come) and see you but I’ve decided (b) _______ (begin) _______ (work) on what I’ve got here. I am trying (c) _______ (develop) your existing software so that your office staff can keep (d) _______ (use) the existing routine. If we do that we can avoid (e) _______ (create) further training costs. The idea will involve (f) _______ (link) all the modules from quotations, order processing, bill of materials to invoicing. When we link them in this way we will hopefully prevent mistakes (g) _______ (happen).

I’d like to invite an associate (h) _______ (join) us on this project and if he agrees (i) _______ (do) this, we can hope (j) _______ (complete) the outline of the programme by July. I don’t want (k) _______ (delay) _______ (run) the demonstration and will try (l) _______ (arrange) a suitable time to discuss this further.
36 Active vs passive

A Sample sentences
For our research studies we normally produce a preliminary analysis. We then publish the findings and circulate them to various experts. This is exactly what we did when we applied for the current patent. We are therefore very surprised that you have contacted us in this matter. We can assure you that we completed all the relevant documentation. In the meantime we will investigate your claims further.

For our research studies a preliminary analysis is normally produced. The findings are then published and circulated to various experts. This is exactly what was done when the current patent was applied for. We are therefore very surprised that we have been contacted in this matter. We can assure you that all the relevant documentation was completed. In the meantime your claims will be investigated further.

B Form
Every active sentence has at least two parts:

We normally produce a preliminary analysis.

Every passive sentence has at least two parts:

A preliminary analysis is normally produced.

C Uses
We use the active verb form in speech and writing to describe actions and events. For example:

Paper still plays a vital role in our lives – newspapers tell us the events of the day, and books entertain and educate us. Paper has been with us since 105 A.D. The Chinese first used it to make records; later it spread to all parts of the world.

We can use the passive in the following situations:

1. We are not interested in the doer.
   *Ancient paper was made entirely of rags; modern paper is made from wood pulp - a faster and cheaper alternative.*

2. In process descriptions.
   *First the logs are stripped of bark, cut into smaller sections, and made into chips. The chips are put into a large tank called a digester and allowed to stew in a chemical mix under pressure. The wood pulp that is created by this process is then washed to remove any chemicals and pressed through screens to remove chunks and foreign objects. The pulp is then drained of water to form a mass that is then bleached and washed again.*

   The first two corresponding active sentences would be:
   *First we strip the logs of bark, then we cut them into smaller sections, and make them into chips. We then put the chips into a large tank called a digester and allow them to stew in a chemical mix under pressure.*

3. In impersonal language.
   *The chemicals in this process are toxic: safety clothing must be worn.*

   This is the typical style of a written order or instruction. The corresponding active sentence would be:
   *The chemicals are toxic: wear safety clothing.*
In the following sentences underline the verbs and decide if they are active or passive.

1. A repeater boosts the electrical signal so that longer cables can be used.
2. Men's ties are usually made of silk or polyester.
3. Nearly all paper can be recycled if it is sorted and contaminants are removed.
4. Geothermal energy is produced below the earth's surface.
5. The main sources of greenhouse gas emissions include fossil fuel generating plants and transportation vehicles.
6. Manufacturers choose plastic containers for many different reasons.
7. Oil was formed in underground rocks millions of years ago.

Here is a list of changes which have taken place in a town between 1960 and today. Use these notes and the verbs given to write sentences to describe these changes.

Example: Four hotels have been built.

<table>
<thead>
<tr>
<th>1960</th>
<th>today</th>
<th>verb</th>
</tr>
</thead>
<tbody>
<tr>
<td>no hotels</td>
<td>four hotels</td>
<td>build</td>
</tr>
<tr>
<td>wet land</td>
<td>no wet land</td>
<td>drain</td>
</tr>
<tr>
<td>small library</td>
<td>new library extension</td>
<td>open</td>
</tr>
<tr>
<td>three factories</td>
<td>no factories</td>
<td>close</td>
</tr>
<tr>
<td>river polluted</td>
<td>river clean</td>
<td>clean</td>
</tr>
<tr>
<td>few offices</td>
<td>new office block</td>
<td>build</td>
</tr>
<tr>
<td>no parks</td>
<td>two parks</td>
<td>establish</td>
</tr>
<tr>
<td>no airport</td>
<td>plans for airport</td>
<td>plan</td>
</tr>
</tbody>
</table>

In the following description of how plastics are shaped, put the verb in brackets in the correct form.

Injection moulding  Laminating  Blow moulding  Tube making – extrusion

There are many ways of shaping plastics. The most common way is by moulding. Blow-moulding (a) _______ (use) to make bottles. In this process, air (b) _______ (blow) into a blob of molten plastic inside a hollow mould and the plastic (c) ________ (force) against the sides of the mould.

Toys and bowls (d) _______ (make) by injection moulding. Thermoplastic chips (e) _______ first (heat) until they melt and then forced into a water-cooled mould under pressure. This method (f) _______ (suit) to mass production.

Laminating (g) _______ (produce) the heat-proof laminate which (h) _______ (use), for example, for work surfaces in kitchens. In this process, a kind of sandwich (i) _______ (make) of layers of paper or cloth which (j) _______ (soak) in resin solution. They (k) _______ then _______ (squeezed) together in a heated press.

Thermoplastics can (l) _______ (shape) by extrusion. Molten plastic (m) _______ (force) through a shaped hole or die. Fibres for textiles and sheet plastic may (n) ______ (make) by extrusion.
37 Causation

A Sample sentences

The application of civil engineering techniques has led to more secure structures.
Tighter environmental controls have made many companies use cleaner sources of energy.
These stains result from the extensive use of dyes.
We have moved over to water turbines because they offer significant cost savings.
Many accidents in mining happen due to poor security procedures.

B Form

We can express the relationship between a cause and an effect in a number of ways.

1 Verbs and verb phrases

Modern civil engineering techniques have led to the use of better construction methods.

Here A = the cause; B = the verb linking the cause to the effect; C = the effect.

Here are other verbs and verb phrases with a similar meaning.

account for cause • result in • bring about • give rise to • be responsible for

Alternatively we can reverse the elements in the sentence:

The use of better construction methods results from modern civil engineering techniques.

Here A = the effect; B = the verb linking the effect to the cause; C = the cause.

Here are other verbs and verb phrases with a similar meaning.

arise from • be attributable to • stem from

2 Clauses of cause

We have moved over to water turbines because they offer significant cost savings.

Here a subordinating conjunction links the effect and the cause.

Here are the other main subordinating conjunctions:

as • since

3 Phrases of cause

Many accidents in mining happen due to poor security procedures.

Here an adverb phrase introduces the cause.

Other expressions with a similar meaning are:

as a consequence of • because of • on account of • owing to

C Uses

Look at the following text which shows the above language in use.

Combustion is a reaction in which the oxidation of an element or compound leads to the release of energy. If the combustion results in a flame, it is called burning. Since combustion can be dangerous, it is important to take precautions against injury. However, not all combusions result in flames. For example, the combustion of carbon in oxygen causes an intense red-white light but no flame. Petroleum, on the other hand, requires special handling on account of its volatility.
1 Choose the correct phrase in each of the following.

1. Just-in-time manufacturing methods result from/result in a saving on storage costs.
2. The reject rate has fallen as a result of/giving rise to quality control.
3. Poor quality materials were responsible for/stem from product defects.
4. The machine broke down and resulted in/because of poor maintenance.
5. Steel was used in the construction caused by/on account of its strength.
6. Data was damaged as a result of/giving rise to a virus in the system.
7. Transport costs have increased accounting for/due to a rise in oil prices.
8. Stopping the use of certain chemicals in the process has brought about/arises from a reduction in the number of cases of allergic skin reactions.
9. Most British coal mines have been closed because/on account of they have become uneconomic.
10. The regeneration of plants and wildlife in rivers and waterways accounts for/is attributable to new legislation to stop pollution by industry.
11. There has been a large increase in the number of people who want to buy organic food products since/as a consequence of fears about chemicals in food.
12. Environmental problems resulting from the disposal of plastics led to/due to the development of biodegradable plastics.

2 Rewrite the following sentences using the verb or phrase in brackets.

1. Modern communication systems have resulted in more and more people working from home.
   More and more people working from home is a consequence of modern telecommunications systems. (have resulted in)
2. Cold weather leads to a rise in the volume of electricity required by consumers. (is caused by)
3. Reduced transportation costs stem from the use of more lightweight parts. (brings about)
4. Increased energy efficiency accounts for an annual saving of electricity. (is attributable to)
5. Friction during drilling causes the production of heat. (results from)
6. A reduction in the amount of waste being discharged into rivers has resulted in rivers beginning to support fish again. (is attributable to)
7. Cars and aeroplanes are partly responsible for air pollution. (partly stems from)
8. Water flowing through the turbines causes them to spin. (due to)

3 Place the preposition of, for, from, about, on, in, to or no preposition in each space below to complete the following description of global warming.

The earth is kept warm (a) __________ account (b) __________ a layer of gases which surrounds it. However, human activity has brought (c) __________ an increase in greenhouse gases which trap more heat and cause a rise in temperature. Scientists believe that CO₂ accounts (d) __________ nearly half of global warming. CO₂ results (e) __________ the burning of fossil fuels and forests. No one knows exactly what changes will take place because (f) __________ this warming. In addition to CO₂, CFCs may be responsible (g) __________ about 25% of global warming in the future. Most scientists believe that more extremes in the weather will also be attributable (h) __________ global warming. They also expect higher temperatures to result (i) __________ more evaporation from the seas and an increase in rainfall. As a consequence (j) __________ heating, water expands and this will give rise (k) __________ a rise in ocean levels.
Obligation and requirements

A Sample sentences
Our quality policy is to develop, produce, and deliver on time. In order to do this, we have implemented quality systems and processes that demand continuous improvement. To achieve this we need to constantly strive to upgrade our performance and inspire others by example. The competitive marketplace in which we operate requires us to be responsive to customer needs. On the other hand, peer needs must not be ignored. Staff have to be trained to enable them to carry out their tasks. Everyone will be encouraged to take on responsibility. However, no-one will be forced.

B Form
We can view the notion of obligation under the following headings:
- obligation to do something
- obligation not to do something, i.e. prohibition
- no obligation

We can also view the notion from the point of view of the person/situation causing the obligation (the obliger), and the person receiving the obligation (the obliged).

For the use of the verbs below see C 1–6.
Here is the range of verbs for the obliger:
1 Oblige someone to do something
   compel • demand • force • make
   oblige • require
2 Oblige someone not to do something
   ban • forbid • prohibit
3 Not oblige someone to do something
   not compel • not force • not make
   not require

Here is the range of verbs for the obliged:
4 Obliged to do something
   be forced to • be required to • be supposed to
   have to • must • need to
5 Obliged not to do something
   be prohibited from • cannot • may not
   must not • not be allowed to • not be permitted to
6 Not obliged someone to do something
   do not need to • need not • not have to

C Uses
1 To oblige someone to do something:
   We require the general contractor to supervise and co-ordinate the project.
   The general contractor made the sub-contractor sign a compensation clause for delays. (not: made the sub-contractor to sign)
2 To oblige someone not to do something:
   The use of asbestos is banned.
   Fire regulations prohibit builders from using flammable materials.
3 Not to oblige someone to do something:
   The construction engineers don’t normally force painters, plasterers and plumbers to use specific products.
4 To be obliged to do something:
   The contractor must apply flame-retardant chemicals to slow down the spread of fire.
5 To be obliged not to do something:
   A nonload-bearing wall must not support any other load except its own weight.
6 Not obliged:
   In this type of soil we needn’t dig the foundations deeper than 10 metres.
   Architects don’t have to/need to have the same qualifications as quantity surveyors.
Choose one correct sentence for each picture. There are more sentences than you need.

a. You must go to this point if there is a fire.
b. You are required to wear a hard hat in this area.
c. Authorized personnel are obliged to enter.
d. You mustn’t consume these.
e. A fire extinguisher needs to be placed here.
f. People without authorization are prohibited from entering.
g. You can get fire fighting equipment here.
h. Smoking is not allowed after this point.

Each of the following sentences contains a mistake. Find the mistakes and correct them.

1. You needn’t to enclose the invoice. It will be sent separately.
2. The customer will be needed to pay import duty before he can get the goods.
3. When bacteria were found in the food plant, the government made the company to shut down production.
4. They don’t required to wear safety clothes in this area.
5. Without just-in-time manufacturing, we would be permitted to hold large stocks of components.
6. Children are not allowed entering this area.

Below is an extract from a letter from an insurance agent to a manufacturing company about regulations. Complete the extract by choosing the correct word from the box.

needn’t • permit • permitted • forcing • have • supposed
prohibited • require • must (2) • banned

Following my visit to your factory last week, I am writing to confirm what we discussed. It is important that these points are followed; otherwise the insurance cover will not be valid.

- All empty crates **must not** be stacked in the production area. They are a health and safety problem and we will not **force** you to leave them there.
- The government has **banned** the dumping of waste chemicals in waste sites and are **requiring** companies to apply for a licence for waste disposal. However, prior to disposal, these chemicals **must** to be stored in sealed containers in a designated area away from the main plant.
- Containers that contain flammable materials **must be** at least 100 metres from the building.
- Present air conditioning systems are adequate, so you **must not** make any changes there.
- Walls are **supposed to** be kept clear of dust, so we **require** you to arrange to have the walls dusted and cleaned.
- The use of water fire extinguishers is still **allowed**, but they are **prohibited** from use near or on electrical equipment.
Cause and effect

**Sample sentences**

We are going to convert the assembly line because we believe it will improve overall effectiveness. Due to the frequent faults in finished products, we are going to install new machinery. As a result of the high cost of local raw materials, we are going to start importing from China. Plastics are a versatile family of materials; therefore they are suitable for a wide range of packaging applications. Since PET (polyethylene terephthalate) is a clear, tough polymer, it is ideal for use in soft drink bottles.

**Form**

1. **Clauses of cause:**
   - Here a subordinating conjunction links the effect and the cause:
   
   *The automotive industry uses plastics because they are durable, resistant to corrosion and lightweight.*
   
   Here are the other main subordinating conjunctions:
   
   - as
   - since

2. **Phrases of cause:**
   - Here an adverb phrase introduces the cause:
   
   *Polystyrene manufacturers phased out the use of chlorofluorocarbons (CFCs) in the late 1980s because of concerns about the ozone layer.*
   
   Other expressions with a similar meaning are:
   
   - as a consequence of
   - due to
   - on account of
   - owing to
   
   We always put a noun phrase after these expressions:
   
   *Because of the large number of back orders, we have put extra workers on the night shift.*
   
   (not: because the number of back orders is large)

3. **Sentence connectors of cause:**
   - Here a cause in one sentence is linked to an effect in the following sentence by a connector.
   
   *The maintenance team are here; therefore we’ll need to shut down the machinery after this shift.*
   
   The *connector* ‘therefore’ points backwards to the cause and forwards to the effect. Other connecting words and expressions are:
   
   - accordingly
   - as a consequence/result
   - because of this
   - consequently
   - hence (formal)
   - so
   - that’s why (informal)
   - that’s (the reason)
   - therefore
   - thus (formal)

**Uses**

Look at the following dialogue which demonstrates the use of expressions of cause and effect:

A: Why are we reviewing our quality control practices?

B: Because management is thinking of introducing a zero defect production initiative.

   So we are starting a project group to look at current practices in production.

A: So, that’s why everyone has been called to the meeting.

B: Exactly. We’ve scheduled a preliminary meeting on account of this new initiative.

B: But I thought productivity levels had increased.

A: Yes, but because of this it seems that the reject rate has risen, too.
1 Match one part of a sentence from A and one from B to form sentences of cause and effect.

A
- The reject rate has fallen
- There is now a backlog of orders
- They want to understand why customers buy a product.
- We have developed an improved product
- Computer software has been made easier to use
- They have set up a computer network.
- We are having to increase our prices
- This is a very dusty environment.
- He was not following safety regulations.

B
- owing to extensive research and development.
- due to more effective quality control.
- Consequently, users can share files and resources.
- therefore, all workers should wear masks.
- That's why they're studying customer attitudes.
- That's the reason he had an accident.
- as a result of machinery breakdowns.
- as a consequence of increased carriage charges.

2 The following sentences contain a mistake. Find the mistake and correct it.

1. Owing a danger of falling objects, workers must wear a hard hat.
   Owing to a danger of falling objects, workers must wear a hard hat.

2. The driver wasn't badly injured in the accident on account from the airbag.
   The driver wasn't badly injured in the accident on account of the airbag.

3. The car is cheap but reliable and that's the result for its popularity.
   The car is cheap but reliable and that's the result of its popularity.

4. The manufacture of paper uses bleach and other chemicals. Consequently of this, the waste must be treated before it can be disposed of.
   The manufacture of paper uses bleach and other chemicals. Consequently, the waste must be treated before it can be disposed of.

5. Due to oil is used in the manufacture of so many useful substances, it is a valuable raw material.
   Due to oil being used in the manufacture of so many useful substances, it is a valuable raw material.

6. Optical fibres carry more information more quickly than copper wires, since copper wires are being replaced by optical fibres.
   Optical fibres carry more information more quickly than copper wires, so copper wires are being replaced by optical fibres.

3 Here is part of a dialogue between an architect and someone who is interested in a local housing development. Fill in the blanks with words from the box.

A: So, these are the finished plans for the housing development. The site was previously used by heavy industry and (a) ______ of this we will have to remove a thick layer of soil. As a (b) ______ of this, costs will be higher than expected. As far as building design is concerned, the houses will all have a regular shape as you can see here on the plans on (c) ______ of cost considerations.

B: Why does that affect cost?
A: If you measure the surface area of the walls, you'll see that buildings with an irregular shape have a greater surface area. As a (d) ______ , more materials will be required and, (e) ______ , it will cost more.

B: I see. About the foundations?
A: Well, the soil is very stable, (f) ______ shallow concrete foundations will be sufficient. The walls will be wooden frame walls. That's the (g) ______ the houses can be erected very quickly. The external wall cladding will also be made of wood.

B: But won't the wind and rain damage the wood?
A: That's (h) ______ we will use pre-treated wood. As for the roofs - well, (i) ______ to local planning regulations, the roofs will have to be made of blue slate. It's the traditional stone from this area and (j) ______ of this we have to use it.
40 Ability and inability

A Sample sentences

With the new version of Web Discoverer you can specify better search criteria.
Applications are computer programs and systems which enable people to interface with the computer.
Anti-virus software is designed to prevent programs from damaging your data or halting operations on your system.
You can't make this type of jacket out of wool. It'll crease too easily.
This cloth is capable of being dyed; but this one doesn't dye well.

B Form

We can view the concepts of ability and inability in terms of:
1 making someone able or something possible
The database allows you to search for client names and addresses.
2 being able
This new monitor can display more than two million colours.
3 making someone unable or something impossible
The climate stops people from wearing this type of heavy jacket – it's just too hot.
4 being unable
You can't press this material with a hot iron as it is too sensitive.

Let's look at the use of language for the concepts 1–4 above:

1 make able
enable
allow
permit
2 be able
able
capable of
3 make unable
prohibit
prevent
stop
4 be unable
cannot
not able/unable to
incapable of

C Uses

Now look at the following short text which demonstrates the use of these verbs.

Now you can create your own website. So simple, anyone is capable of producing a quality site in minutes. You'll be able to add graphics and photos. This new software allows you to work with all types of graphic files. The text editing function enables you to work directly from your word processor. Remember: only one registered user is permitted to use this software.

Note:
1 We use the infinitive with to after able/unable, e.g.
You'll be able to add graphics and photos.
Synthetic fibre is unable to replace natural fibre.
2 After capable/incapable we use of + verb ...ing, e.g.
Anyone is capable of producing a quality site in minutes.
They are incapable of producing these shirts in a wider range of colours.
3 After prohibit, prevent and stop, we use the following constructions:
Local regulations prevent/stop us from importing tee shirts from certain countries. (from + verb...ing)
Local regulations prevent/prohibit the importation of tee shirts from certain countries. (noun)
1. Match one part of a sentence from A and one from B to form sentences of ability and inability.

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improving quality control will enable us</td>
<td>the storage of chemicals in plastic containers.</td>
</tr>
<tr>
<td>Shortage of space prevents us from</td>
<td>carrying the volume of data required today.</td>
</tr>
<tr>
<td>Regulations prohibit</td>
<td>see the person you are talking to.</td>
</tr>
<tr>
<td>A machine breakdown means that we can’t</td>
<td>producing more product lines.</td>
</tr>
<tr>
<td>Old copper cables are incapable of</td>
<td>now be used to send emails.</td>
</tr>
<tr>
<td>Using a videophone allows you to</td>
<td>to become more profitable.</td>
</tr>
<tr>
<td>Mobile phones can</td>
<td>unauthorized users accessing a network.</td>
</tr>
<tr>
<td>A firewall is used to stop</td>
<td>finish the order this week.</td>
</tr>
</tbody>
</table>

2. There is a mistake in each of the following sentences. Underline the mistake and correct it.
   1. All unauthorized personnel are prohibited to entering this area.
   2. Building regulations do not allow of the use of asbestos in public buildings.
   3. Only fully qualified electricians should be permitted repairing these appliances.
   4. Deep pile foundations are capable to support a high building.
   5. Water is unable to passing through the vapour barrier.
   6. Designers can to design complex structures using computer-aided design tools.
   7. Scientists are not yet able of curing cancer.
   8. Aspirin is known to prevent people of having a heart attack.

3. Read the following extract from a brochure advertising car features. Look at the prompts in bold and change them for a verb or verb phrase from the opposite page, changing the grammar to fit the sentence.

One feature common to all our models is the airbag. If the driver is involved in a crash, the airbag inflates and make unable stops/prevents the driver or the passenger hitting the steering wheel or front panel. It (a) make unable serious injury.

The anti-lock brake system equips the vehicle with speed sensors. If a driver brakes hard, this system (b) make unable wheel lockup. Valves control the brake pressure and (c) make able the driver to steer the car safely. All our models are fitted with disc brakes, which means the car (d) be able operate more efficiently in wet weather. Disc brakes also (e) make able better performance at high temperatures.

The catalytic converter is part of the car's exhaust system and (f) make able the exhaust gases to be converted into less harmful products. With a catalyst the car (g) be able of meeting new international pollution levels.

A very popular feature is four-wheel drive. In this range of vehicles the driver (h) be able select two or four wheel drive. Together with these off-road tyres, the vehicle (i) be able perform well on rough ground.

But if you are more concerned about economical driving, you may be interested in the overdrive facility. Here the highest gear ratio is less than a one-to-one ratio. This (j) make able you to save fuel and as a result also (k) make unable the engine wearing out so quickly.

The turbocharger forces more air into the cylinder than it can normally draw and (l) make able the engine to burn more fuel. As a result, the car is capable of greater speed and faster acceleration.
41 Scale of likelihood

A Sample sentences
The term engineering can have different meanings.
A scientist is unlikely to be able to solve engineering problems.
We are likely to see significant advances in robotics in the coming years.
The generators and turbines are bound to use a lot of electrical power.
These rainproof seals can’t possibly let water into the switchboard.

B Form and uses
If we consider that the scale of likelihood goes from 100% certainty to 0% certainty, we can identify the following segments. (The numbers below are only a general indication, not exact values.)
certainty (100%)
probability (75%)
possibility (50%)
improbability (25%)
impossibility (0%)

Now let’s look at the language for each of these categories.

<table>
<thead>
<tr>
<th>certainty</th>
<th>I am (absolutely) sure/certain/positive that power requirements will increase.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Power requirements will definitely/certainly increase.</td>
</tr>
<tr>
<td></td>
<td>Power requirements are certain/sure/bound to increase.</td>
</tr>
<tr>
<td>probability</td>
<td>It is (very) likely/probable that the pumps will use more electricity.</td>
</tr>
<tr>
<td></td>
<td>The pumps are (quite) likely to use more electricity.</td>
</tr>
<tr>
<td></td>
<td>They could use more electricity.</td>
</tr>
<tr>
<td>possibility</td>
<td>We may/might need more pumps on site.</td>
</tr>
<tr>
<td>improbability</td>
<td>It is (very/highly) unlikely/improbable that the pumps will use more electricity.</td>
</tr>
<tr>
<td></td>
<td>The pumps probably won’t use more electricity.</td>
</tr>
<tr>
<td></td>
<td>The pumps are (quite) unlikely to use more electricity.</td>
</tr>
<tr>
<td></td>
<td>The pumps shouldn’t use more electricity.</td>
</tr>
<tr>
<td>impossibility</td>
<td>I am sure/certain/positive that power requirements won’t increase.</td>
</tr>
<tr>
<td></td>
<td>Power requirements definitely/certainly won’t increase.</td>
</tr>
<tr>
<td></td>
<td>Power requirements can’t (possibly) increase.</td>
</tr>
</tbody>
</table>

C Uses

1 Definitely and certainly
   Notice the position of the adverbs in certainty and impossibility:
   We will definitely/certainly replace the fuses. (after will)
   The fuses definitely/certainly won’t fail. (before won’t)

2 Likely and unlikely
   These adjectives can take two constructions:
   It is likely/unlikely that the pumps will use more electricity. (adjective + that + clause)
   The pumps are likely/unlikely to use more electricity. (adjective + to + infinitive)

3 May and might
   Some speakers feel there is a slight difference in the strength of these two words:
   We may need more pumps on site. (50% likelihood)
   We might need more pumps on site. (45% likelihood)
### TASKS

1. Put the following words in the correct order to form sentences.
   1. The goods/ until next week/ won't /be delivered/ probably.
   2. I'm/ these crates/ sure/ are strong enough/ absolutely/ that.
   3. The goods/ to remain in the warehouse/ unlikely /for long/ are.
   4. It/ take long/ to load the ship/ shouldn't.
   5. They/ be sent by air freight/ won't/ definitely.
   6. The goods/ in transit/ be/ for four days/ may.
   7. They're/ the volume of imports/ quite/ to increase/ likely.

2. Rewrite the following sentences so that the meaning does not change. For example:
   The local authorities probably won't accept the plans for a concrete arch bridge.
   Thelocal authorÍtÍes are unHkelyto acceptthe plans for a concrete arch bridge.

   1. I'm absolutely sure that there will be advances in heat-exchange technology.
   2. It's unlikely that we will see more robots being used in the home in the next ten years.
   3. Glass fibre optics will very probably be replaced by plastic in the near future.
   4. Washing machines and dishwashers are certain to become more energy-efficient.
   5. A mat foundation can't possibly support a high building.
   6. We may need extra sound-deadening material in these walls.
   7. They definitely won't want to use wood for the ceiling.
   8. It is very probable that she's suffering from an allergy.
   9. Research being carried out at the moment may help find a cure for cancer.

3. Complete the following text about future sources of energy by choosing a suitable verb or phrase from the table in B on the opposite page. The figure in brackets indicates the likelihood.

   At present most of the energy we use comes from oil and gas, and scientists are becoming increasingly concerned about our future energy needs. Many scientists believe that fossil fuels are (a) **certain bound** (100%) to run out by the middle of this century, while others think that they are (b) **bound** (75%) to run out before then. Whatever the time scale, fossil fuels (c) **run out** (100%) run out sooner or later, and we must consider alternative sources of energy. In the short term, it (d) **can** (25%) that alternative energy will be able to supply the world's needs, however, in the long term, our energy needs (e) **will be met** (0%) by fossil fuels.

   The future of nuclear power is also uncertain. It (f) **will be** (50%) provide enough power, but public opinion is (g) **will be** (75%) to prevent any expansion. Some countries have promised to stop nuclear power production but it seems increasingly (h) **will be** (25%) that they will be able to do so. Atomic power is considered much safer and we (i) **can see** (50%) an expansion of this in the future. Alternative sources of energy are (j) **will increase** (100%) but they (k) **won't increase** (25%) won't provide 100% of our needs within the next 50 years. Solar thermal power will (l) **will be able to** (100%) be one of our future sources, but no one is sure what percentage it will provide. The US Department of Energy thinks that solar power plants are (m) **will be able to** (75%) be able to produce electricity almost as cheaply as fossil fuel plants within the next 50 years. However, due to global warming there (n) **will be** (50%) changes in the pattern of sunshine as changes in climate are (o) **will be** (75%). There (p) **will be** (50%) be more cloud in the future which is (q) **will be** (100%) to have a serious effect on solar concentrators.
Relative clauses

Sample sentences
Logistics is the business function which controls the movement of physical materials in a factory. Our logistics department, which controls the movement of physical materials in the factory, is headed by Barry Perks.
A mine is a place where ores, coal, and precious stones may be obtained.
A miner is a person who works in a mine.
You need to speak to John Martin, who is in charge of the coal mine.

Form
A relative clause is a type of subordinate clause.
Relative clauses begin with a relative pronoun.
Who and which are typical relative pronouns.
Blowholes are air or gas vents which carry off fumes from tunnels or underground passages.
Form a main clause [relative pronoun] subordinate clause
There are two types of relative clauses:
defining relative clauses and non-defining relative clauses
Logistics is the business function which controls the movement of materials. (defining)
Our logistics department, which controls the movement of materials in the factory, is headed by Barry Perks. (non-defining)
A defining relative clause is written without commas; a non-defining relative clause is written in commas.
The table shows the range of relative pronouns

<table>
<thead>
<tr>
<th>person</th>
<th>things</th>
</tr>
</thead>
<tbody>
<tr>
<td>who, whom, whose</td>
<td>which, that</td>
</tr>
</tbody>
</table>

Uses

1 Defining relative clauses give information which is essential to understand the sentence.
The packing list is a document which describes the contents of each package.
The clause which describes the contents of each package identifies the document; without this information, the sentence has a different meaning.
A haulier is a company or person who specializes in transporting goods by truck.
The clause who specializes in transporting goods by truck identifies the company or person.

2 Non-defining relative clauses give additional, non-essential information.
The packing list, which describes the contents of each package, is sent with the goods.
The clause which describes the contents of each package gives additional information; we can still identify the packing list without this information.
The mine, which has extracted diamonds since the 19th century, will be closed in two years.
The clause which has extracted diamonds since the 19th century gives additional information.

Notes:
1 The relative pronoun after the reason:
Thank you for explaining to us the reasons why/that the consignment was delayed.
(not: the reason because)

2 The relative pronoun after all, each, every and compounds:
All the mining shafts which/that lead to the surface are blocked.
Choose the appropriate relative pronoun in each of the following sentences.

1. A load-bearing wall is a wall that/where supports a vertical load as well as its own weight.
2. An architect is someone whose/who draws up plans for buildings and other structures.
3. An unheated building, a cellar or a basement are examples of places which/where are often damp.
4. Manufacturing takes place in factories when/where finished products are made.
5. Marconi was the scientist who/whom first received signals across the Atlantic.
6. You are invited to attend the meeting on Tuesday which/when details of the project will be discussed.
7. The company has opened a new workshop where/which engineering parts will be produced.
8. The operations manager, whom/whose office is on the first floor, is dealing with the problem.

In the following article, underline the relative clauses and write defining (D) or non-defining (ND) beside each one.

There has been a lot of controversy surrounding the Three Gorges Dam, which is being built in China. The dam, which will be 181 metres high, is expected to produce 18.2 million kilowatts of power. However, this is the reason why many people are unhappy. 15 million people, who used to live in the valley, have had to move. These people, whose homes have been covered in water, complain that they have been given land where very little grows. They also say that the living conditions, which they have to live in now, are unsatisfactory. But those who are in favour of the project say that the dam will provide extra electricity, which will stimulate the economy in eastern and central China, where development has been held back. However, critics say there will be an oversupply of power, which they will not be able to sell. There are people who are deeply worried about the effects of the dam on the environment. They say there is a danger to animals and fish which live in the area. But there are other people who claim that hydroelectric power is much cleaner than burning coal. There will be fewer emissions which contribute to the greenhouse effect. New ship locks, which are expected to increase shipping and reduce transportation costs, will be built. Navigation on the river, which is currently dangerous, will become much safer. But critics say there will be sedimentation which could increase flood levels.

Use the information in brackets to complete the following sentences.

For example: (The manufacturers provided some information.) We have used the information that ...

1. (The assembly line produces car parts.) They have automated the assembly line that ...
2. (Water is stored in a tank.) The water tank where is underground.
3. (Circuits can store large amounts of information.) Computers contain many circuits which ...
4. (W.C. Röntgen discovered X-rays by accident.) X-rays have been used since 1895 when ...
5. (Faraday was born in the south of England.) Faraday, who , developed the process of electromagnetic induction.
6. (The manager’s signature appears on the document.) The manager whose is responsible for purchasing.
7. (Several people work in this area.) Everyone who is responsible for regular maintenance of the machinery.
Subordinate clauses of result and purpose

A Sample sentences
Benton have defined quality standards (in order) to meet minimum product specifications.
Last year Markham introduced new quality standards so (that) they detected defective products before completion.
Mansell have initiated a quality review programme so as to meet customer expectations.
We sample and monitor all processes so that customers’ needs are exceeded.
For zero defects to be achieved, we will have to introduce tighter prevention controls.

B Form
Clauses of result and purpose are subordinate clauses. There are three possible constructions:
1 (in order/so as) to + infinitive
   Benton have defined quality control standards (in order) to meet minimum product specifications.
2 a subordinating conjunction followed by a verb
   We sample and monitor all processes so that customer needs are exceeded. (purpose)
   Last year Markham introduced new quality standards so (that) they detected defective products before completion. (result)
3 for + noun followed by an infinitive + to
   For zero defects to be achieved, we will have to introduce tighter prevention controls.
   (= so that zero defects can be achieved, we ...)

The main subordinating conjunctions are: in order that • so that
Before the infinitive + to you can put: for • in order (to) • so as (to)

Note the negative forms:
So as not to pay for unnecessary reworking, we sample all raw materials.
In order not to lose customers, we have a policy of continuous process improvement.

C Uses
Clauses of purpose answer the question why or what ... for. They present the purpose of the information in the main clause.
Clauses of result also answer the question why or what ... for. In contrast to clauses of purpose, they typically look to the past to see what result an action achieved.
Electricity is usually transmitted at the highest voltages possible to minimize energy losses. (purpose)
We tied together the electric utilities into large systems so that power was exchanged. (result)

Now look at the differences between the constructions in clauses of purpose and result.
1 We use to, in order to and so as to + infinitive when the subject of both clauses is the same.
   Energy is generated from different fuels in order to avoid reliance on one source.
2 We use so that or in order that where the subject of the clauses is different.
   Electricity producers are able to exchange power so that one utility can assist another
3 We use so that + clause for clauses of result.
   These electric utilities were then combined into larger systems so that power was exchanged.

Notes:
The following sentences are wrong:
We use coal for making energy. (to make)
We changed to gas for making energy. (in order to make)
We started producing hydroelectric power for making cleaner energy. (to make)
1. Rewrite the following sentences using the words in brackets.

1. They introduced computer-guided robots because they wanted to increase efficiency. (in order to)
2. Close the valve. That way the system won’t overheat. (so that)
3. Scientists are carrying out research. They want to find a cure for AIDS. (so as to)
4. Circuit breakers have been installed because they don’t want the system to overload. (so that)
5. The system is sealed. They want to stop water and dust getting in. (in order to)
6. He is taking anti-malarial drugs. He doesn’t want to get malaria. (so that)

2. An architect is explaining the features of an ecological house to some interested builders. Complete the following description choosing phrases from the box.

As you can see, there are several features in this house that have been designed to (a)____________ but still provide a comfortable living area. On one side you can see a large glazed greenhouse that faces south so as to (b)____________. It is in fact triple glazed in order to (c)____________. Inside this greenhouse, we would recommend plenty of green plants to (d)____________. Of course it can get quite hot on summer days so (e)____________. Wind turbines and solar panels are fitted to the roof in order to (f)____________. For the house to (g)____________, the foundations consist of a concrete raft. The inner layer is made of expanded polystyrene which is used to (h)____________. The roof comprises concrete beams with a thick soil covering and grass so that (i)____________. Of course, there are also people in the house to generate a certain amount of heat too. In addition, so as not to (j)____________, low energy equipment and lighting are used.
A Sample sentences

The engineers in the production department regularly assess the accuracy of the finished goods. We are concerned about the level of pollution; so the test equipment is checked each day for reliability.
Tools must be stored in a safe place after use.

B Form

We can identify two classes of nouns:

<table>
<thead>
<tr>
<th>countable</th>
<th>uncountable</th>
</tr>
</thead>
</table>

A countable noun typically has both a singular and plural form. Look at the following (production) words:

- component/components
- cycle/cycles
- defect/defects
- factory/factories
- line/lines
- machine/machines

An uncountable noun typically has only one form, which normally takes a singular verb. Look at the following (health and safety) words:

- dust
- environment
- friction
- harm
- inhalation
- waste

Notes:

1. A small number of countable nouns only have a plural form:
   - The report identified six major findings.

2. A small number of uncountable nouns take a plural verb:
   - briefs (textiles)
   - clothes (textiles)
   - eaves (construction)
   - goods (production)
   - jeans (textiles)

Also:
- gasworks (energy)
- waterworks (energy)
- and other compound words with works.

3. A small number of uncountable nouns look plural, but take a singular verb:
   - electronics
   - hydraulics (energy)

   Hydraulics is a branch of science that deals with practical applications (like the transmission of energy or the effects of flow) of liquid (like water) in motion.

C Uses

Look at the following sentences from the field of textiles which contrast countable and uncountable nouns.

We produce our cloth by knitting natural fibres. This cloth is then used in the manufacture of a range of clothes, mainly menswear. Our products include jackets and trousers. This jacket has been produced using our latest equipment which streamlines the sewing and final pressing of the garment.
1 Decide if the following nouns are countable or uncountable and write them in the appropriate column below.

<table>
<thead>
<tr>
<th>Countable</th>
<th>Uncountable</th>
</tr>
</thead>
<tbody>
<tr>
<td>drill</td>
<td>dye</td>
</tr>
<tr>
<td>electronic mail</td>
<td>equipment</td>
</tr>
<tr>
<td>factory</td>
<td>fault</td>
</tr>
<tr>
<td>information</td>
<td>laboratory</td>
</tr>
<tr>
<td>machine</td>
<td>machinery</td>
</tr>
<tr>
<td>packaging</td>
<td>pollution</td>
</tr>
<tr>
<td>reliability</td>
<td>silk</td>
</tr>
<tr>
<td>tunnel</td>
<td></td>
</tr>
</tbody>
</table>

2 Complete the sentences with a suitable noun from the box. Make it plural or add a/an if necessary.

- study
- paint
- pavement
- storage
- prevention
- disposal
- reservoir
- inspection

1. The European Community has prepared guidelines on waste ____________.
2. Companies usually want to deliver goods as soon as they have been completed because ____________ takes up a lot of room and is very expensive.
3. Government officials have carried out ____________ of the factory.
4. The main aim of the training is accident ____________.
5. Painters often use hot air guns to burn off old ____________.
6. During icy weather, the ____________ at the side of the road may become slippery.
7. Drinking water for the local population comes from ____________ in the mountains.
8. Scientists are carrying out ____________ of children’s eating habits.

3 In each of the numbered lines below there is a mistake. Underline the mistake and write in the correction.

1. The weather affects the clothes (clothes) that people choose to wear. In a warm
dry climate, a man may choose a pair of short and a short-sleeved shirt
made of cottons while a woman may prefer a thin dress. In colder climates
a thick jumper and a warm trousers would be more suitable and out of doors, a
coat, scarf and glove are necessary.
6. Different natural fibres was used by ancient cultures to produce textiles.
7. Linen were made in Egypt as long ago as 5000 BC, and cotton in India in
3000BC. Today, there are many different type of fibres available.
9. Synthetic, often mixed with natural fibres, are used widely and provide a wide choice for the
fashion industry.
Comparison of adjectives

A  Sample sentences
Working in a factory is more dangerous than working in a chemical laboratory.
There is a higher risk of accidents in a factory than in a chemical laboratory.
Flammable materials have a lower flash point and must be handled with more care.
A bipolar transistor is the most common form of transistor.
A bit is the smallest unit of binary data.

B  Form
Many adjectives have three forms: positive, comparative and superlative.
Manson's factory is noisy. (positive adjective)
Burton's factory is noisier than Manson's. (comparative adjective)
Denham's factory is the noisiest. (superlative adjective)

1 If the positive adjective has one syllable, we form the comparative by adding -er and the superlative by adding -est:

<table>
<thead>
<tr>
<th>positive</th>
<th>comparative</th>
<th>superlative</th>
</tr>
</thead>
<tbody>
<tr>
<td>safe</td>
<td>safer</td>
<td>safest</td>
</tr>
<tr>
<td>clean</td>
<td>cleaner</td>
<td>cleanest</td>
</tr>
</tbody>
</table>

If we compare two objects, we use than in the comparison:
Burton's factory is noisier than Manson's.
If we compare more than two objects, we use the in the superlative.
Denham's factory is the noisiest.

2 If the positive adjective has two syllables and ends in -y, -ow or -le, we form the comparative by adding -er and the superlative by adding -est:

<table>
<thead>
<tr>
<th>positive</th>
<th>comparative</th>
<th>superlative</th>
</tr>
</thead>
<tbody>
<tr>
<td>healthy</td>
<td>healthier*</td>
<td>healthiest*</td>
</tr>
<tr>
<td>narrow</td>
<td>narrower</td>
<td>narrowest</td>
</tr>
<tr>
<td>simple</td>
<td>simpler</td>
<td>simplest</td>
</tr>
</tbody>
</table>

*in two syllable adjectives ending in -y, the -y changes to -i in the comparative and the superlative.

3 For other adjectives with two syllables or more, we form the comparative with more and the superlative with most:

<table>
<thead>
<tr>
<th>positive</th>
<th>comparative</th>
<th>superlative</th>
</tr>
</thead>
<tbody>
<tr>
<td>dangerous</td>
<td>more dangerous</td>
<td>most dangerous</td>
</tr>
<tr>
<td>flammable</td>
<td>more flammable</td>
<td>most flammable</td>
</tr>
</tbody>
</table>

4 There is a small group of adjectives with irregular comparative and superlative forms:

<table>
<thead>
<tr>
<th>positive</th>
<th>comparative</th>
<th>superlative</th>
</tr>
</thead>
<tbody>
<tr>
<td>good</td>
<td>better</td>
<td>best</td>
</tr>
<tr>
<td>bad</td>
<td>worse</td>
<td>worst</td>
</tr>
<tr>
<td>little</td>
<td>less</td>
<td>least</td>
</tr>
<tr>
<td>much</td>
<td>more</td>
<td>most</td>
</tr>
<tr>
<td>far</td>
<td>farther/furthest</td>
<td>farthest/furthest</td>
</tr>
</tbody>
</table>

C  Uses
1 If we compare two objects, we use than in the comparison:
TV's today are smaller than ever before.
2 If we compare more than two objects, we use the in the superlative:
Today we have the cheapest and the most reliable electronic appliances.
1. Complete the table.

<table>
<thead>
<tr>
<th>adjective</th>
<th>comparative</th>
<th>superlative</th>
</tr>
</thead>
<tbody>
<tr>
<td>accurate</td>
<td>more accurate</td>
<td>the most accurate</td>
</tr>
<tr>
<td>pure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>stable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>hard</td>
<td></td>
<td></td>
</tr>
<tr>
<td>heavy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>thin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>far</td>
<td></td>
<td></td>
</tr>
<tr>
<td>impractical</td>
<td></td>
<td></td>
</tr>
<tr>
<td>bad</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. Five of the sentences below contain a mistake. Find the mistake and correct it.

1. This silk fabric is the best quality we produce.
   1. Correct: This silk fabric is the best quality we produce.

2. Following the fire, many more people have been affected by smoke as we had originally thought.
   2. Correct: Following the fire, many more people have been affected by smoke as we had originally thought.

3. Pollution of the ground is most serious in area A than in area B.
   3. Correct: Pollution of the ground is most serious in area A than in area B.

4. Please wear ear protection because it's noisier here than in the other areas.
   4. Correct: Please wear ear protection because it's noisier here than in the other areas.

5. The locked cabinet contains some of the most poisonous chemicals there are.
   5. Correct: The locked cabinet contains some of the most poisonous chemicals there are.

6. That was the loudest explosion I've ever heard.
   6. Correct: That was the loudest explosion I've ever heard.

7. These chemicals should be kept in good containers than these.
   7. Correct: These chemicals should be kept in good containers than these.

8. Sending the goods by air is certainly the most quick but it's also the most expensive.
   8. Correct: Sending the goods by air is certainly the most quick but it's also the most expensive.

3. Use the information from the table to complete the sentences below.

<table>
<thead>
<tr>
<th>Bridge</th>
<th>Type of bridge</th>
<th>Length of span in metres</th>
<th>Built</th>
</tr>
</thead>
<tbody>
<tr>
<td>Humber Bridge, England</td>
<td>suspension</td>
<td>1410</td>
<td>1981</td>
</tr>
<tr>
<td>Golden Gate Bridge, USA</td>
<td>suspension</td>
<td>1280</td>
<td>1937</td>
</tr>
<tr>
<td>Verrazano Narrows, USA</td>
<td>suspension</td>
<td>1298</td>
<td>1964</td>
</tr>
<tr>
<td>Quebec Bridge, Canada</td>
<td>cantilever</td>
<td>549</td>
<td>1917</td>
</tr>
<tr>
<td>Firth of Forth Railway Bridge, Scotland</td>
<td>cantilever</td>
<td>521</td>
<td>1890</td>
</tr>
<tr>
<td>Commodore John Barry, USA</td>
<td>cantilever</td>
<td>501</td>
<td>1974</td>
</tr>
<tr>
<td>New River Gorge, USA</td>
<td>steel arch</td>
<td>518</td>
<td>1981</td>
</tr>
<tr>
<td>Sydney Harbour Bridge, Australia</td>
<td>steel arch</td>
<td>509</td>
<td>1932</td>
</tr>
</tbody>
</table>

The Humber Bridge is the (a) ____________ (long) bridge listed in the table above.
It is (b) ____________ (long) than the Golden Gate Bridge in the USA but it isn’t as (c) ____________ (old).
The Verrazano Narrows Bridge in the USA is (d) ____________ (new) than the Golden Gate Bridge but (e) ____________ (old) than the Humber Bridge.
The (f) ____________ (long) cantilever bridge is the Quebec Bridge in Canada. It is 28 metres (g) ____________ (long) than the Firth of Forth Railway Bridge in Scotland which is over 110 years (h) ____________ (old).
The (i) ____________ (new) cantilever bridge is the Commodore John Barry which is also the (j) ____________ (short).
The Sydney Harbour Bridge is (k) ____________ (short) and (l) ____________ (old) than the New River Gorge.
Adjectives and adverbs

Sample sentences
R and D aims to develop new products and the means to produce them cheaply. Qualitative research investigates current product positioning; and why customers currently use a particular product. A coal field is an area containing significant coal deposits; the deposits in this coal field have been significantly reduced in recent years.

Form
Adjectives and adverbs are grammatical units.
1 Here are some typical adjective endings and adjective forms:

| -ate/-ite | accurate | -ic | scientific |
| -ful | harmful | -ous | dangerous |
| -al/-ial | artificial | -ing | mining |
| -ive | active | -ed | finished |
| -able/-ible | renewable | -ant/-ent | transparent |

2 Other adjectives, particularly short ones, do not have special endings

bad • big • good • old • small • young

3 Most adverbs are formed by adding -ly to the adjective

| adjective | harmful | active | scientific | dangerous | transparent | artificial |
| adverb | harmfully | actively | scientifically | dangerously | transparently | artificially |

4 Some adjectives have the same form as adverbs

early • fast • hard • late • straight

Uses
We use an adjective:
1 to give more information about a noun
We carry out pure research.

[adjective] [noun]
What type of research? Pure research

2 after the verb be
All research is scientific.

We use an adverb:
1 to give more information about a verb
The miners reached the surface safely.

[verb] [adverb]
How did they reach the surface? Safely

2 to give more information about an adjective
The mine is extremely dangerous.

[adverb] [adjective]
How dangerous is the mine? Extremely

3 to give more information about an adverb
Miners work very hard.

[adverb] [adverb]

4 to give more information about a sentence
Firstly, I’ll present the coal cutting equipment.
1. Form an adjective from the following words by adding the correct suffix: -ful, -ic, -ous, -y, -ant, -al, -able, -ent, -ed, -ial, -ive, -ible.

<table>
<thead>
<tr>
<th>Word</th>
<th>Adjective</th>
</tr>
</thead>
<tbody>
<tr>
<td>danger</td>
<td>rely</td>
</tr>
<tr>
<td>dirt</td>
<td>origin</td>
</tr>
<tr>
<td>magnet</td>
<td>expense</td>
</tr>
<tr>
<td>use</td>
<td>excel</td>
</tr>
<tr>
<td>industry</td>
<td></td>
</tr>
</tbody>
</table>

2. Complete the following sentences with the adjective and adverb in brackets. Use each word once only.

1. The system will shut down _______ . There is an ________ temperature control.
   (automatic/automatically)

2. New testing methods have made the process much more _______. Quality control now runs more _______ .
   (efficient/efficiently)

3. Our aim is to ensure _______ operation at the plant. The manufacturing process should run _______ .
   (smooth/smoothly)

4. Demand for electricity is _______ lower in the evening. Statistics show that there is a _______ fall in demand after 10 p.m.
   (general/generally)

5. People are becoming more interested in _______ friendly products. There is a growing interest in _______ issues.
   (environmental/environmentally)

6. Safety procedures must be _______ observed to avoid accidents. The manager in a coal mine must be _______ about activities underground.
   (strict/strictly)

3. Here is part of a presentation about the textile industry in the UK. Choose the correct word in bold.

The number of people who work in the textile (a) manufactured/manufacturing industry in the UK has fallen (b) considerable/considerably over the last 50 years. Today, it employs (c) approximately/approximate 130,000 people. Textiles for clothing and carpets have always been (d) important/importantly but today there is (e) increasing/increasingly trade in fabrics for (f) industrial/industrially applications. Fabrics are used (g) increasing/increasingly in the healthcare and automotive industries. The export of wool and (h) woollen/wool products has remained fairly (i) constantly/constant over the last 15 years. The UK also has a (j) significant/significantly silk industry, which produces over £170 million worth of goods (k) annual/annually. The UK linen trade has an (l) excellent/excellently reputation for quality and service and British exports remain very (m) healthy/healthily. The UK’s expertise in chemistry is (n) extensive/extensively and this is (o) important/importantly to the (p) dying/dyed industry.

The manufacturing of dyestuffs is (q) relative/relatively strong. The sale of carpets contributes to the sale of textiles (r) significant/significantly. The carpet industry has (s) particular/particularly strengths in the (t) high/highly quality end of the market.
Prepositions of time

A Sample sentences
The timetable looks like this. We will install the software on Monday afternoon. That means your system will be out of action from 2 o'clock till about 5 o'clock. We also need to download some programs before starting the system again. Then we'll start testing. That'll take until Wednesday. After that, we need to configure all the modules. We hope to finish that by Wednesday evening. That means that you'll be up and running with a brand new system on Thursday morning. So, please inform everyone that we will need to shut down the system next Monday.

B Form
A preposition comes before a noun, e.g. on Monday afternoon
[preposition] [noun]
Where the preposition is followed by a verb, we use the -ing form of the verb, e.g. We also need to download some programs before starting the system again. [preposition] [verb ... ing]
Not: We also need to download before to start the system again.

The most important prepositions of time are:

after • at • before • between • by • during • for from ....in • on • since • to .... • until/till • up to

The drug testing programme will start on 1st July.
We hope to get approval for sale of the drug by 2005.

C Uses
1 At, in, on, and by
At + clock time: at 8 o'clock
On + days of the week: on Tuesday
In + parts of the day: in the morning
but: at night
On + dates: on 1st July
In + months and years: in August
By + a deadline:
We hope to get approval by 2005.

2 By and until/till
We use by for an action which happens at or before a deadline:
We hope to finish configuring the system by Wednesday evening.
We use until/till for an action which continues up to a deadline:
We will work on configuring the system until+till Wednesday evening.

3 No preposition
In some time phrases, we do not use a preposition of time.
a. before this, last and next
We will need to shut down the system next Monday. (not: on next Monday)
b. with speed and frequency expressions
Megahertz is a unit of measurement equal to one million electrical vibrations or cycles a second. (not: in a second).
This laser printer prints twenty pages of text a minute. (not: in a minute)
You can also say per second, per minute, etc.
1. Five of the following sentences contain mistakes. Find the mistakes and correct them.

1. The interim report was completed to the end of last month.
2. These products have been on the market since nearly ten years.
3. The meeting has been arranged for 16th April at 10 a.m.
4. The results will be evaluated after the tests have been completed.
5. We intend to continue production during the new machinery is installed.
6. The road will be closed from 7 p.m and 7 a.m.
7. The jacquard loom for weaving cloth was created at 1801.
8. During the 19th and 20th centuries, great advances were made in treating illnesses.

2. Complete the following telephone conversation by adding the correct prepositions of time. If no preposition is required, leave the space blank.

ERIK: I was wondering if we could arrange a meeting (a) ________ next week?

MIRJAM: Yes, of course! I’m going to Washington (b) ________ Friday evening so can we arrange something (c) ________ that?

ERIK: Eh, Yes. I’m pretty busy (d) ________ the beginning (e) ________ the week but perhaps we could meet some time (f) ________ Wednesday?

MIRJAM: Could we meet (g) ________ the morning (h) ________ 9.30?

ERIK: That’s fine. I should have received the test results we’ve been waiting for (i) ________ then.

MIRJAM: I’m looking forward to seeing the latest results. I haven’t heard anything (j) ________ we spoke (k) ________ last month.

3. Look at the Gantt chart and complete the memo. If no preposition is required, leave the space blank.

The project is running according to plan so far. (a) ________

October, negotiations for the site were carried out and a contract

signed. (b) ________ the beginning (c) ________

November we had meetings with the architects. Plans were

submitted to the local planning authority (d) ________

12 December. Services to the site were laid (e) ________

November and completed (f) ________ December. Planning

permission was received (g) ________ last week and we

intend to start construction of the building early (h) ________

next month. We expect construction to take about three months.

(i) ________ the middle (j) ________ April, work will

begin on fixtures and fittings and plant and machinery is due for

delivery (k) ________ 4 May. Commissioning of the machines

will last (l) ________ about two weeks (m) ________

June. (n) ________ the same time, training courses will begin

for operators and maintenance staff. These will continue

(o) ________ mid-July. All going well, start up will be

(p) ________ 8 months’ time (q) ________ 6 August

and if all goes smoothly we hope to be working at full capacity

(r) ________ the middle (s) ________ September.
Prepositions of place

Sample sentences
Let me give you a brief update about developments in the production area. On Monday, components will be moved from the old storage area to the new one. This means that fork lift trucks will need to move components out of warehouse 1 and into warehouse 2. You will find more details in the email I sent last week. There are two stages to the movement of old parts. In the new storage area, the parts will be stored on pallets on the top two shelves. From there they will be moved to their final destination according to the plan in the email attachment.

Form
A preposition comes before a noun, e.g. in the production area

The most important prepositions of place are:

- at
- from
- in
- into
- on
- out of
- to

Oil is transported from the oil field to the terminal by pipeline.

Corrosion in the pipes is extremely dangerous.

Uses
1. at
   - We use at to describe a place in general rather than specific terms:
     In the event of a blowout at the terminal we evacuate everyone immediately.
     We employ some 30 people at the pumping station. cf Twenty men sleep in the terminal, i.e. inside

2. to
   - We use to to describe movement to a place:
     Then the oil is transported to the terminal.
     The roughnecks fly out to the oil rig on a Sunday evening.

3. from
   - We use from to describe movement from a place:
     After the blowout we managed to pull everyone from the water.
     The safety officer has just arrived from headquarters.

4. in and into
   - We use in to describe a place:
     Corrosion in the pipes is extremely dangerous.
   - We use into to describe movement into a place:
     The drill bit is fitted into the drill.

5. into and out of
   - Into and out of describe movement; they describe opposite movements:
     Drilling mud is pumped into and out of the well during drilling.

6. on and onto
   - We use on with objects which have a surface:
     We’ve found some new deposits on the Continental Shelf.
   - We use onto to describe movement onto a place which has a surface:
     The oil is then loaded onto tankers. (Here the tanker is seen as a two-dimensional floating object.) cf. The oil is then loaded into tankers. (Here the tanker is seen as a three-dimensional object.)
1. Complete the following texts using the correct preposition. You may have to use some prepositions more than once.

**between • from • on • along**

**above • through • to**

Signals pass \(a\) \(\) **between** a telephone \(b\) \(\) **from** the local exchange \(c\) \(\) **on** copper cables. Most exchanges are linked by optical fibre cables \(d\) \(\) **through** which the signals travel as pulses of laser light. Microwave beams sent \(e\) \(\) **to** dishes \(f\) \(\) **on** tall towers, link some signals. International calls go \(g\) \(\) **under** undersea optical fibre cables or via satellites high \(h\) \(\) **around** the Earth.

Refrigerators keep food \(a\) \(\) **at** a temperature \(b\) \(\) **around** about 5°C. They work by evaporation. When a liquid changes \(c\) \(\) **into** a vapour, it takes heat \(d\) \(\) **into** its surroundings. In a fridge, the cooling process is done by a refrigerant which circulates \(e\) \(\) **in** a system \(f\) \(\) **on** sealed pipes.

2. Complete the following description of an oil rig with the correct prepositions. Choose from those in the box. You will need to use some more than once.

**above • on • in • from • to • in between**

**around • close to • of • beside • at • along • below**

The Magnus oil rig stands \(a\) \(\) **above** huge steel legs \(b\) \(\) **resting** resting \(c\) \(\) **from** the seabed. To prevent movement, a large anchor is firmly embedded \(d\) \(\) **into** the seabed.

A production platform is built \(e\) \(\) **in** sea level. \(f\) \(\) **on** the centre \(g\) \(\) **of** the well, is the drilling derrick. Oil and gas are separated \(h\) \(\) **between** the bottom \(i\) \(\) **to** the derrick and a pipeline takes oil \(j\) \(\) **around** the platform \(k\) \(\) **to** shore.

Helicopters carrying operators land \(l\) \(\) **on** the helipad located on one side of the platform. \(m\) \(\) **around** this pad there is an accommodation block.

The recreation area is found \(n\) \(\) **above** the first level \(o\) \(\) **along** the top floor the workers sleeping quarters are to be found. The dining area is on the floor \(p\) \(\) **at**. Walkways run \(q\) \(\) **from** one side of the accommodation block and \(r\) \(\) **around** the outside of the platform. Lifeboats can be found \(s\) \(\) **on** the accommodation block. Supply boats, carrying supplies for the rig, can tie up \(t\) \(\) **at** one side \(u\) \(\) **close** the rig and goods are lifted \(v\) \(\) **from** the boats using a crane. Drinking water is stored \(w\) \(\) **in** large tanks located \(x\) **at** the electricity generators.
Quantifiers

A Sample sentences
If you have no customer feedback, it is very difficult to understand their needs. That's where qualitative research comes in. It has many common uses. It can help you to understand why some customers buy and use a product. It can also investigate a lot of alternative communication messages. Most of our clients use our services to understand their customers better. And all of them use this information in the development of new products.

B Form

<table>
<thead>
<tr>
<th>Countable</th>
<th>all</th>
<th>most</th>
<th>many</th>
<th>a lot of</th>
<th>some</th>
<th>a few</th>
<th>few</th>
<th>no</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uncountable</td>
<td>all</td>
<td>most</td>
<td>much</td>
<td>a lot of</td>
<td>some</td>
<td>a little</td>
<td>little</td>
<td>no</td>
</tr>
</tbody>
</table>

We use countable quantifiers with plural countable nouns; we use uncountable quantifiers with uncountable nouns. If you have no customer feedback, it is difficult to understand their needs.

C Uses
Below are some examples of quantifiers in use, first in a short dialogue and then in an extract from a presentation.

A: Is there much demand for civil engineers these days?
B: You wouldn't believe it, but most of the vacancies are for civil engineers.
A: Really? With what type of qualifications?
B: All our vacancies require people with a thorough knowledge of surveying.
A: Don't most civil engineers need to know about surveying?
B: Yes, but there are some jobs in areas not directly linked to construction.
A: Such as?
B: We have a few vacancies for engineers to work in the aircraft industry.
A: Anything in nuclear power?
B: No vacancies in that area at the moment, I'm afraid.
A: Well, please let me know if anything turns up.

In all turnkey contracts we undertake to finance, design, specify, construct, and commission the whole project. As many of our clients ask for a follow-up maintenance agreement, most maintenance will be included in the project price. However, there are some repairs which will not be covered. But, I wish to assure you that in other contracts there have been very few of these.
Put the following in order from the most to the least.

1. Some of our clothing is made of silk.
2. None of our clothing is made of silk.
3. Most of our clothing is made of silk.
4. Little of our clothing is made of silk.
5. Much of our clothing is made of silk.
6. A lot of our clothing is made of silk.
7. A little of our clothing is made of silk.
8. All of our clothing is made of silk.

Complete the sentences with the words given in brackets.

1. There aren’t ___________ people working at night. ___________ of the staff work during the day. (most, many)
2. ___________ of the timber which was delivered last week was of very poor quality. We had to return ___________ of the boards. (a few, some)
3. We don’t manufacture ___________ jackets of pure wool. There isn’t ___________ demand for them. (many, much)
4. Fibre optic cabling will be used in the future for ___________ land-based communications. But, today, only ___________ of these communications use fibre optics. (all, some)
5. At present, only a ___________ paper is recycled in the UK. In the future, a ___________ more paper will have to be collected and recycled. (little, lot)
6. In the UK, ___________ electricity is generated from nuclear energy or fossil fuels and very ___________ renewable energy sources have so far been developed. (few, most)

The table below shows how the methods of transportation used by a company have changed over a period of 30 years. Complete the text below with words from the table in B on the opposite page.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>rail</td>
<td>100%</td>
<td>85%</td>
<td>60%</td>
<td>40%</td>
<td>0%</td>
</tr>
<tr>
<td>road</td>
<td>0%</td>
<td>12%</td>
<td>35%</td>
<td>40%</td>
<td>70%</td>
</tr>
<tr>
<td>air</td>
<td>0%</td>
<td>3%</td>
<td>5%</td>
<td>20%</td>
<td>30%</td>
</tr>
</tbody>
</table>

In 1970 (a) ___________ transportation was carried out by rail. (b) ___________ goods were carried by road or by air. Ten years later, (c) ___________ goods were transported by rail and a (d) ___________ were taken by road. For the first time goods were being transported by air but there weren’t (e) ___________ goods being transported in this way.

In 1990 the picture had changed. A (f) ___________ goods were still being transported by rail. However, (g) ___________ more transportation was by road and a (h) ___________ transportation was being done by air. By the year 2000, (i) ___________ transportation was by rail, (j) ___________ by road and a (k) ___________ was by air.

By the year 2010, it is expected that (l) ___________ goods will be transported by rail. (m) ___________ goods will be transported by road and (n) ___________ will be taken by air.
Contrasting ideas

Sample sentences

Although email is a very convenient form of personal communication, most people have never
sent one. But the number of users is increasing very quickly. Despite improvements in telecoms
networks, connection speeds are often very slow; however ADSL promises faster connections.

Form

We can use the following language techniques to contrast ideas:

1. Clauses of contrast
   These consist of two clauses: the main clause and the contrast clause.
   
   Even though the number of mobile phones users has increased, call charges remain high.

   [ contrast clause ] [ main clause ]

   The main conjunctions of contrast are:
   although • but • even though • though • whereas • while

   Notice the difference in use between but and the others:
   Videoconferencing is very convenient, but it is not as personal as face-to-face contact.
   [ main clause ] [ main clause ]

   Although videoconferencing is very convenient, it is not as personal as face-to-face contact.
   [ contrast clause ] [ main clause ]

2. Phrases of contrast
   The phrase of contrast consists of a preposition (or prepositional phrase) + a noun.
   Despite improved security, hackers can still access many networks.
   [ phrase of contrast ]

   The phrase of contrast can also come at the end of the sentence.
   Hackers can still access many networks despite improved security.

   The main words to introduce a phrase of contrast are:
   despite • in spite of

3. Sentence connectors of contrast
   These words or expressions link two sentences together which are in contrast to each other.
   You can download Google from many sites worldwide. However, some are faster than others.

   The main sentence connectors are:
   all the same (informal) • but • even so • however • nevertheless • still • yet

Uses

Study the mini dialogue below.

A: Although we can share many resources, some are not shared. Even so, we should see this as a
vast improvement.

B: I don’t understand why all the printers aren’t available to all.

A: In fact, everyone can use all the printers; however, one has been designated as default for each
work group.

A: I’d prefer to use the colour laser printer.

B: I know you would, but it’s very expensive to print each page in colour. And in most cases, 
colour isn’t necessary.
1. Complete the following sentences by choosing a suitable ending from the box.

- accidents sometimes occur.
- those are a mixture of polyester and wool.
- people in developing countries often have to drink polluted water.
- there are places in the country where it doesn’t work.
- careful packing.
- he washed it.

1. The contents of the crate were broken despite ...
2. Although the care label said the coat should be dry-cleaned, ...
3. These carpets are 100% wool whereas ...
4. Mobile phone coverage is fairly extensive; however, ...
5. In spite of strict safety regulations, ...
6. While we enjoy clean piped drinking water, ...

2. Complete the following text by using one of the words in the box.

whereas • however • but • despite • while

The first cantilever bridges were built in China and Tibet (a) ________ they were made of timber and could not carry heavy loads. (b) ________, once cheap, reliable steel became available in the 1870s, it was possible to build long spans capable of carrying rail traffic. (c) ________ the first modern cantilever bridge was built in Germany, the Forth Railway Bridge in Scotland held the record for the longest for over 30 years. The Forth Railway Bridge is made of huge steel tubes, (d) ________ the Oosterschelde Bridge in Holland is made of prestressed concrete. Some bridges look a little confusing in design. (e) ________ having cable stays, Lake Maracaibo Bridge in Venezuela is a cantilever type bridge.

3. A small company is looking for a new site to build a new factory. The Director is discussing three possible sites. Join the sentences in A and B using the connector in C to form part of her speech.

Example. Site 1 provides a suitable amount of space but it’s the most expensive.

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site 1 provides a suitable amount of space.</td>
<td>It’s the most expensive.</td>
<td>but</td>
</tr>
<tr>
<td>It could be difficult.</td>
<td>It’s worth considering.</td>
<td>although, still</td>
</tr>
<tr>
<td>Road and rail connections are not far away.</td>
<td>It will be necessary to build a bridge across the river.</td>
<td>although</td>
</tr>
<tr>
<td>It’s surrounded by trees and close to the mountains.</td>
<td>It’s only four kilometres from the nearest town.</td>
<td>however</td>
</tr>
<tr>
<td>There is a large labour market.</td>
<td>Workers in this area are unskilled.</td>
<td>even though</td>
</tr>
<tr>
<td>Site 1 is close to road and rail connections.</td>
<td>Site 2 is close to the airport.</td>
<td>while</td>
</tr>
<tr>
<td>Government finance is available for companies moving into the area.</td>
<td></td>
<td>nevertheless</td>
</tr>
<tr>
<td>Site 2 is fairly small.</td>
<td>Site 3 is almost too big.</td>
<td>whereas</td>
</tr>
<tr>
<td>Site 3 is not expensive.</td>
<td>It’s in the centre of town.</td>
<td>despite</td>
</tr>
<tr>
<td>It may be difficult to get planning permission for new industrial buildings.</td>
<td></td>
<td>even so</td>
</tr>
</tbody>
</table>
Glossary of grammatical terms

The following list will help you understand the terms used in this book.

**Active** A verb or verb phrase which is not in the passive voice, e.g. We normally produce a preliminary analysis. See also Passive and Voice.

**Auxiliary verb** The verbs be, have and do when used in the following constructions:
- continuous verbs (be), e.g. the supervisor is/was checking the delivery,
- passive verbs (be), e.g. all goods are/were received at this depot.

**Infinitive** without to The base form of a verb, e.g. develop, receive, deliver.

**Infinitive + to** The base form of a verb with the particle to, e.g. to develop, to receive, to deliver.

**Main clause** A group of words with a subject and verb, normally between full stops, e.g. We manufacture packaging.

**Modal verb** The following verbs and their negative forms are modals: can, could, may, might, must, shall, should, will, would. Modal verbs are followed by an infinitive, e.g. This new monitor can display more than 2 million colours.

**Participle** A non-finite verb form, e.g. researching (present participle); researched (past participle).

**Voice** The grammatical category of verbs which differentiates the present from the past.

**Quantifier** Words which describe quantity and amount, e.g. all, many, some, few and no.

**Relative clause** A clause beginning with a relative pronoun (who, whom, whose, which, that or zero) or a relative adverb (when, where, why).

**Simple** A verb construction in either the present simple or past simple tense. See also Continuous and Perfect.

**Subordinate clause** A group of words with a subject and verb which depends on a main clause, e.g. We sample and monitor all processes so our needs are exceeded. See also Main Clause.

**Subordinating conjunction** A word which introduces a subordinating clause, e.g. because, as, when.

**Tense** The grammatical form of verbs which differentiates the present from the past.

**Time line** A line which shows the three real-world times of past, present and future, in order to show tenses in terms of their relative position on the line.

**Time marker** A phrase to describe the timing of an event, e.g. last year, at the moment, next week.

**Uncountable** A noun which has only one form, which normally takes a singular verb, e.g. Dust has a damaging effect on health. See also Countable.

**Verb...ing** The same as the present participle e.g. researching.

**Voice** The grammatical category of either active or passive verb form. See also Active and Passive.
## Answer key

### UNIT 1

**Exercise 1**
- quality control
- finished products
- industrial process
- production manager
- large-scale manufacturing
- assembly lines
- raw material
- productivity levels

**1.** quality control
**2.** industrial process
**3.** raw material
**4.** productivity levels
**5.** finished products
**6.** assembly lines
**7.** large-scale manufacturing
**8.** production manager

**Exercise 2**
- batch
- assemble
- outputs

**1.** batch
**2.** assemble
**3.** outputs

**Exercise 3**
- a factory
- b site
- c layout
- d fixtures
- e equipment
- f machinery
- g workshops
- h breakdowns
- i maintain
- j repair
- k stock
- l faulty

### UNIT 2

**Exercise 1**
- a analysis
- b analyst
- c analytical
- d innovative
- e inventor
- f invention
- g developers
- h developmental
- i experimental
- j engineers

**Exercise 2**
- analysis
- analyst
- analytical
- innovative
- inventor
- invention
- developers
- developmental
- experimental
- engineers

**Exercise 3**
- a design
- b innovative
- c patent
- d prototype
- e engineers
- f developmental
- g experiment
- h breakthrough

### UNIT 3

**Exercise 1**
- a applied research
- b clinical research
- c pilot study
- d experimentation
- e pure basic research
- f product development
- g innovation
- h analysis

**Exercise 2**
- a statistics
- b median
- c mean
- d mode
- e distribution
- f sampling
- g random
- h scale
- i frequency
- j 14.99
- k 14.98
- l 14.99

**Exercise 3**
- a demand
- b make-to-stock
- c to-order
- d uncertainty
- e forecast
- f lead time
- g lead time
- h overtake
- i backlog
- j shift
- k bottlenecks
- l stock-outs
- m slack
- n idle

### UNIT 4

**Exercise 1**
- a statistics
- b median
- c mean
- d mode
- e distribution
- f sampling
- g random
- h scale

**Exercise 2**
- a compiled
- b recorded
- c investigate
- d improve
- e search
- f find

**Exercise 3**
- a demand
- b make-to-stock
- c to-order
- d uncertainty
- e forecast
- f lead time
- g lead time
- h overtake
- i backlog
- j shift
- k bottlenecks
- l stock-outs
- m slack
- n idle

### UNIT 5

**Exercise 1**
- a statistics
- b median
- c mean
- d mode
- e distribution
- f sampling

**Exercise 2**
- a compiled
- b recorded
- c investigate
- d improve
- e search
- f find

**Exercise 3**
- a demand
- b make-to-stock
- c to-order
- d uncertainty
- e forecast
- f lead time
- g lead time
- h overtake
- i backlog
- j shift
- k bottlenecks
- l stock-outs
- m slack
- n idle
UNIT 7
Exercise 1
1 d 2 f 5 b 3 g 4 a 6 i 8 e 9 h 7 c
Exercise 2
1 bill of lading
2 materials management
3 import
4 depot
5 package
6 cargo
7 channel
8 in transit
9 load
10 carriage
Exercise 3
a dispatched
b consignment
c carrier
d crate
e packing list
f delivery note
g shipped
h delivery
i warehouse

UNIT 8
Exercise 1
1 check
2 bar
3 detect
4 prevent
5 inventory
6 repair
7 failures
8 scrap
9 prioritize
10 value
Exercise 2
Let us consider what happened when Japanese cars were first imported into the UK and America.
Local manufacturers thought they were cheap and of low quality. But soon people noticed that they didn’t break down as often as British or American cars.
At the same time, Japanese manufacturers started trying to meet customer needs in terms of style and design.
Customers were delighted with the new cars which exceeded their expectations.
The cars did more than simply satisfy customers’ requirements, they provided value for money.
Exercise 3
a cause/effect
b improvement
c defective
d Pareto
e sampling
f monitor
g analysis
h prevent
i defects
j continuous
k zero

UNIT 9
Exercise 1
1 well-ventilated
2 wash
3 recycled
4 toxic
5 disposed
6 handling
7 cancer
8 defects
9 impaired
10 drains
11 Avoid
12 fumes
Exercise 2
anneal to make materials tough by cooling them slowly, e.g. glass
anodize to give a metal a protective coat by using it as an anode in electrolysis, e.g. car components
electroplate to cover with a thin layer of metal using electrolysis, e.g. car components
forge to shape metals by heating and then hammering, e.g. horse shoes
found to melt metal and then pour it into a form, e.g. iron components
galvanize to protect from rusting by coating in zinc, e.g. food cans
grind to polish or sharpen by rubbing on a rough surface, e.g. stone
roll to make thin sheets of metal by passing it between large rollers, e.g. steel
plate to cover one metal with a thin layer of another, e.g. silver plate
soften to make something softer, e.g. fibres
temper to heat and then cool metals to obtain the required hardness and elasticity, e.g. steel
Exercise 3
a physics
b chemical
c civil
d highway
e electronic
f mechanical
g electrical
h develop
i production
j machines

UNIT 10
Exercise 1
1 anneal
2 anodize
3 electroplate
4 forge
5 found
6 galvanize
7 grind
8 roll
9 plate
10 soften
temper to heat and then cool metals to obtain the required hardness and elasticity, e.g. steel
Exercise 2
1 chemical, chemists
2 industrial
3 mechanical
4 structural
5 harden
6 mining, miners
Exercise 3
a physics
b chemical
c civil
d highway
e electronic
f mechanical
g electrical
h develop
i production
j machines

UNIT 11
Exercise 1
e c i d h g a f b
Exercise 2
steering wheel used by the driver to turn the car
exhaust manifold carries waste gases to the exhaust pipe
radiator cools water from the engine
fuel tank holds fuel
brake line connects the brake cylinder to the brakes
muffler/silencer reduces the exhaust noise
battery stores electricity
clutch disconnects the engine from the gearbox while the gears are changed
differential ensures that the rear wheels turn at a different speed to each other when a car corners
engine provides the power
brake cylinder holds brake fluid
accelerator makes the car go faster when it is pressed
distributor sends an electric current to the spark plugs
alternator produces electricity
Exercise 3
a tests
b desert
c family
d air conditioning
e sunroof
f electric
g central locking
h Power assisted steering

i advanced braking system
j airbags
k alarm
l immobilizer
m mini
n people carrier
o van
p alloy wheels

Exercise 1
1 acute - a chronic
2 unlikely - likely
3 infectious - emotional
4 asthma - malaria
5 walking - breathing
6 digestive - nervous
7 salt - sugar
8 physiotherapist - pharmacist

Exercise 2
1 midwife/obstetrician
2 radiologist
3 anaesthetist
4 nutritionist
5 paramedic
6 occupational therapist
7 dentist
8 physiotherapist
9 paediatrician
10 radiographer

Exercise 3
a heart attack
b tablet
e stroke
d side effect
e cancer
f doses
g chronic
h arthritis

UNIT 12
Exercise 1
benezene contains 6 carbon atoms in a ring
aromatics chemicals that contain the benzene ring
ethylene the simplest olefin: it is a sweet-smelling gas that is used to make plastics
olefins a group of compounds made by cracking alkanes and used to make plastics and antifreeze
fluorides inorganic compounds of fluorine that are added to toothpastes
carbonates compounds that react with acids to give off carbon dioxide
chlorides compounds containing chlorine and another element
methanol an alcohol with the formula CH₃OH
nitrates contain NO₃⁻ and a metal cation
polypropylene made from propene and often used for kitchen tools, for example

Exercise 2
1 insecticide
2 synthetic
3 fertilizers
4 fast drying

Exercise 3
a soaps
b basic
c acids
d alkalis
e fertilizers
f paints
g glass
h oil
i Intermediate

Exercise 1
1 panelboard
2 watertight
3 rainproof
4 switchboard

Exercise 3
a turbines
d generators
e transformers
cables
e power
e transmission lines

UNIT 13
Exercise 1
1 detection
2 hospital. observe
3 seized
4 inspections
5 labelling
6 therapeutic
7 diagnosis
8 licence

Exercise 2
1 viscosity
2 boiling point
3 aerobic
4 distil
5 ferment
6 inorganic
7 odour
8 preservatives
9 extract

Exercise 3
a treatment
b laboratories
c stringent
d healthy
e patients
f suffering
g disease
h regulatory
i approved
j harmful
k safety
l placebo
m evaluate

UNIT 14
Exercise 1
1 Transistors
2 semiconductor
3 electronic
4 receives
5 storage
6 reliability
7 microprocessors
8 communication

Exercise 2
1 laser
2 device
3 signal
4 radar
5 fibre optics
6 robotics
7 cable
8 fuse
9 circuits
10 light

Exercise 3
a turbines
b generators
c transformers
d cables
e power
e transmission lines

UNIT 15
Exercise 1
1 felt
2 partitions
3 vapour
4 structure
5 ventilating
6 deadening
7 deep
8 Caisson piers

Exercise 2
1 beam
2 column
3 steel girder
4 curtain wall

Exercise 3
a loads-bearing
b surveyor
c architect
d quantity surveyor
e foundations
f carpenters
g masons
h roofers
i plasterers
j electricians
k plumbers
l painters

UNIT 16
Exercise 1
1 panelboard
2 watertight
3 rainproof
4 switchboard

Exercise 2
1 laser
2 device
3 signal
4 radar
5 fibre optics

Exercise 3
a turbines
d transformers
cables
e power
e transmission lines

UNIT 17
Exercise 1
1 Transistors
2 semiconductor
3 electronic
4 receives
5 storage
6 reliability
7 microprocessors
8 communication
UNIT 18
Exercise 1
Devices: robot, radio, television, altimeter, computer
Functions: develop solutions, transmit data, diagnose problems, evaluate results, provide support
Applications: transportation systems, automotive industry, pharmaceutical industry, chemical industry, defence
Exercise 2
1. space technology
2. satellite communications
3. personal computer
Exercise 3
a. medical
b. technicians
c. repair
Exercise 3
a. Transistors
b. Resistors
c. electronics
d. Diodes
e. Capacitors
f. integrated circuits
g. semiconductor
h. silicon
i. germanium
j. devices
UNIT 19
Exercise 1
1. sun
2. biofuel
3. wind
4. plutonium
5. wave
6. petroleum
Exercise 2
Across
1. commissioned
2. electrical
3. geothermal
4. gasworks
5. sun
6. uranium
7. solar cell
8. kinetic
9. scheme
10. biofuel
Exercise 3
a. fossil fuels
b. coal
c. power stations
d. produce
e. gas
f. non-renewable
g. renewable
h. water
i. turbines
j. generators
k. Wave
l. tidal
m. barrage
Exercise 2
1. dam
2. dike
3. viaduct
4. aqueduct
5. lock
6. sluice
7. well
8. tunnels
9. desalination
10. bulldozer
11. dredger
12. road roller
UNIT 20
Exercise 1
1. suspension
2. cantilever
3. clapper
Exercise 2
1. dam
2. dike
3. viaduct
4. aqueduct
5. lock
6. sluice
7. well
8. tunnels
9. desalination
10. bulldozer
11. dredger
12. road roller
UNIT 21
Exercise 1
feasibility study: investigation to assess both financial and engineering aspects of a project
site investigation: study of the proposed location to assess geology of the area
maintenance: activities carried out after the project to ensure problems are solved
soil mechanics: extensive investigation to evaluate the load-bearing qualities and stability of the ground
specifications: dimensions and measurements
technical drawings: detailed plan of proposed structures
costing system: to order a plan to be carried out
commission a project: procedure to monitor the costs of a project so that management can get information on development
tender: offer of a bid for an engineering contract
turnkey project: building or installation which is built, supplied, or installed complete and ready to operate
Exercise 2
Phase | Tasks
--- | ---
Before construction | feasibility study
preliminary site investigation
extensive site investigation
detailed design

During construction | employment of consulting engineer
consulting engineer contact with contractors
consulting engineer communications with client

After construction | maintenance

Exercise 3
a. engineer
e. scheduling
b. industrial
f. draft
c. construction
g. site
d. claims
h. client
UNIT 22
Exercise 1
deposit: a natural occurrence of a useful mineral in sufficient quantities for exploitation
excavate: remove soil and/or rock materials from one location and transport them to another
explore: search for coal, minerals, or ore
extract: remove coal or ore from a mine
mineral: a natural resource extracted from the earth for human use, e.g. ores, salts, coal, or petroleum
mining: the science, technique, and business of mineral discovery and exploitation
ore: the naturally occurring material from which a mineral or minerals of economic value can be extracted
prospect: examine a territory under for its mineral wealth
quarry: an open or surface mineral working, usually for the extraction of building stone, such as slate and limestone
Exercise 2
1 headframe
2 cage
3 drill
4 dragline
5 shovel

6 drill
7 conveyor
8 dump truck
9 mining skip

Exercise 3
a explosives
b mine
c earth
d minerals

6 drill
7 conveyor
8 dump truck
9 mining skip

Exercise 2
1 separated
d Collectors
e Distillation
f heated

5 impurities
6 lubrication
7 pollution
8 refinery

Exercise 3
a barrel
b refining
c transporting
d refineries
e distillation
f separate
g audits

UNIT 23
Exercise 1
derrick

drill
extract
flammmable
offshore
platform
reservoir
rig
upstream
well

Exercise 2
1 derrick
2 rotary table/turntable
3 blowout preventer
4 casings

Exercise 3
1 Place the drill bit, (a) collar and drill pipe in the hole.
2 Attach the (f) kelly and (g) turntable and begin drilling.
3 As drilling progresses, circulate drilling (e) mud through the
   pipe and out of the (d) bit to float the rock (e) cuttings out of
   the hole.
4 Add new sections (joints) of drill (a) pipes as the hole gets
deeper.
5 (i) Remove the drill pipe, collar and bit when the pre-set depth
   is reached.
6 Place (b) casing pipe sections into the hole to prevent it from
collapsing in on itself.
7 (j) Pump cement down the casing (k) pipe.
8 Allow the (b) cement to harden.

UNIT 24
Exercise 1
PEOSINCJBU
MOSJQ
FUEL
SIXGVPQLLS
PETROLY
XKNTMYLU
TFTBKACV
ACPLPPX
XPLOSIYVE

Exercise 2
A B C
bread baking to cook by dry heat especially in an
even
fish canning to preserve by sealing in airtight
containers
flour grinding to make grains into very small
particles for human or animal feed

UNIT 25
Exercise 1
1 T
2 F Monomers are made into polymers by joining the carbon
   atoms together.
3 F Thermoplastics soften with heat and harden with cooling.
4 T
5 F Incineration is a hazardous way to dispose of plastics
   because of air emissions and other pollutants.
   6 T

Exercise 2
Article How made Plastic
bucket injection moulding polyethylene
shoe sole reaction injection moulding polyurethane
ballpoint pen injection moulding styrene
electric cable extrusion PVC
ruler injection moulding styrene
plastic bag blow extrusion polyethylene
water pipes extrusion PPR
milk bottle blow moulding polyethylene
audio cassette injection moulding styrene

UNIT 26
Exercise 1

Exercise 2
A B C
bread baking to cook by dry heat especially in an
even
fish canning to preserve by sealing in airtight
containers
flour grinding to make grains into very small
particles for human or animal feed

footwear manufacturing to make from raw materials by
machinery
leather tanning to convert animal skin into a
material that can be worn
oil pressing to extract liquid by squeezing
pulp producing to make paper
quick freezing to make chilled with cold
spray drying to remove liquid
textile weaving to make cloth
Introduction to food hygiene
Hygiene is important for anyone working in a food business. Good hygiene prevents food poisoning and protects your reputation with customers.

Food handling
While you are working, clean up any spills immediately and clean work surfaces, equipment and floors frequently.

Bacteriology
Cross-contamination can easily occur when one food touches (or drips onto) another, or indirectly, for example from hands, equipment, work surfaces, or knives and other utensils.

Prevention of contamination
Food handlers must protect food and ingredients against risks which may make them unfit for human consumption or a health hazard.

Premises
The place where you work has to be kept clean, maintained in good repair and be designed and constructed to permit good hygiene practices.

Cleaning and disinfection
Floors, walls, ceilings and surfaces (which come into contact with food) must be adequately maintained, easy to clean and where necessary disinfected.

Staff
People who work in food areas can spread food poisoning germs very easily.

Legislation
Owners and managers of food businesses must ensure that their businesses comply with the law.

UNIT 27

Exercise 1
fall to cut down a tree
bark outer layer of a log
chop to cut into small pieces
pulp to convert wood into a fibrous material by a mechanical or chemical process
grind to crush into particles
slurry liquid mixture consisting of fibres in water used in papermaking process
bleach chemical to whiten paper
press to squeeze out water between rollers
wind to turn around so as to form a roll
roll quantity of paper formed into a large cylinder or ball

Exercise 2

Exercise 3
Introduction to the telecommunications Fundamentals
Hands-on practical experiments to transmit signals
Analogue Communications
Digital Electronics
Fundamentals of Optical Communications
Introduction to sharing information
Networking
Data Communications
Sharing information between networks

UNIT 29

Exercise 1
1 a, b, d
2 a, c, d
3 b, c

Exercise 2
answering machine radio signal video camera relay station cable television television set retrieve messages transmitting antenna cordless phone telephone jack
1 The telephone can be used to pay bills and retrieve messages from answering machines.
2 With an omnidirectional antenna, radio signals can be transmitted over a wide area.
3 A videophone incorporates a video camera and display, a microphone and speaker.
4 A cordless phone allows limited mobility in and around the home.
5 Cable television allows access to many television stations.

Exercise 3

a PDA
b email
c browsing
d screen
e cell phone
f clock and alarm
g currency converter
h alert
i organizer
j weight
UNIT 30

Exercise 1

| S I L K | Q U P | F F | I O G R A F |
| P S E N Y L O N | B X | D R P G B |
| I V C A Z L U K A Y S Q Q P |
| N Z S T E S Y N T H E T I O T |
| Y S G H B L E L W T Y P Z T W |
| D L M J L K | S H R I N K A G E |

Exercise 2

<table>
<thead>
<tr>
<th>Fabric</th>
<th>Fibre type</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>cotton</td>
<td>natural</td>
<td>Soft to the touch; absorbent</td>
</tr>
<tr>
<td>linen</td>
<td>natural</td>
<td>Good strength, twice as strong as cotton; crisp to the touch</td>
</tr>
<tr>
<td>nylon</td>
<td>synthetic</td>
<td>Lightweight; easy to wash; resists shrinkage and wrinkling</td>
</tr>
<tr>
<td>polyester</td>
<td>synthetic</td>
<td>Strong; resistant to most chemicals</td>
</tr>
<tr>
<td>silk</td>
<td>natural</td>
<td>Luxurious; thinnest of all natural fibres</td>
</tr>
<tr>
<td>wool</td>
<td>natural</td>
<td>Good insulator; luxurious, soft to the touch</td>
</tr>
</tbody>
</table>

Exercise 3

- a machine-washable
- b dry-cleanable
- c hand-washable
- d sunlight

UNIT 31

Exercise 1

1. is heated
2. have dissolved
3. have survived, are being treated
4. change
5. have taken, are trying

Exercise 2

1. are, made
2. is, inspecting
3. has, come
4. produce, are rejected

Exercise 3

a has experienced
b have been damaged
c (have been) destroyed
d has decided/decided
e is building
f are being heightened

UNIT 32

Exercise 1

1. was built
2. —
3. were
4. covered
5. work
6. —
7. discovered
8. —
9. —
10. transformed

Exercise 2

1. overloading
2. to switch
3. to increase
4. producing
5. to reduce
6. scratching
7. to deliver
8. to visit

UNIT 33

Exercise 1

1 b 2 e 3 c 4 f 5 d 6 a

Exercise 2

1 b 2 a 3 a 4 a 5 b

Exercise 3

a will revolutionize
b will we need
c won’t be
d will operate
e will provide
f will warn
g will install
h won’t take
i will soon see
j will give
k will deal
l will contact

UNIT 34

Exercise 1

1 g 2 f 3 a 4 b 5 c 6 h 7 e 8 d

Exercise 2

1 there are greater safety measures
2 he had followed the correct procedures
3 the airbag will inflate
4 there would be less pollution
5 we introduced a catalyst
6 the substance will decompose/decomposes
7 infections won’t be passed on
8 it rusts

Exercise 3

a improve
b would have delayed
c stops
d hadn’t built
e wouldn’t have made
f ’ll have to
g stops
h wouldn’t have had
i had

UNIT 35

Exercise 1

1 a 2 b 3 b 4 b 5 a

Exercise 2

1 overloading
2 to switch
3 to increase
4 producing
5 to reduce
6 scratching
7 to deliver
8 to visit
Exercise 1
1 boosts (active); can be used (passive)
2 are made (passive)
3 can be recycled (passive); sorted (passive); are removed (passive)
4 is produced (passive)
5 include (active)
6 choose (active)
7 was formed (passive)

Exercise 2
Four hotels have been built.
The wetland has been drained.
The factories have been closed.
A new office block has been built.
A new airport has been planned.

Exercise 3
a boost is made
b is blown
c is forced
d are made
e are first heated
f is suited
g produces
h is used
i are made
j are squeezed
k be shaped
l be made

UNIT 36
Exercise 1
1 leads to
2 is a result of
3 was a consequence of
4 is due to
5 is attributable to
6 as a result of
7 due to
8 has brought about
9 because
10 is attributable to
11 as a consequence of
12 led to

Exercise 2
1 Modern communications systems have resulted in more and more people working from home.
2 A rise in the volume of electricity required by consumers is caused by cold weather.
3 The use of more lightweight parts brings about reduced transportation costs.
4 An annual saving of electricity is attributable to increased energy efficiency.
5 The production of heat results from friction during drilling.
6 Rivers beginning to support fish again is attributable to a reduction in the amount of waste being discharged into rivers.
7 Air pollution partly stems from cars and aeroplanes.
8 Turbines spin due to water flowing through them.

Exercise 3
a on b of c about d for e from f of g for h to i in j of k to

UNIT 37
Exercise 1
1 result in
2 as a result of
3 were responsible for
4 because of
5 on account of
6 as a result of
7 due to
8 has brought about
9 because
10 is attributable to
11 as a consequence of
12 led to

Exercise 2
1 Modern communications systems have resulted in more and more people working from home.
2 A rise in the volume of electricity required by consumers is caused by cold weather.
3 The use of more lightweight parts brings about reduced transportation costs.
4 An annual saving of electricity is attributable to increased energy efficiency.
5 The production of heat results from friction during drilling.
6 Rivers beginning to support fish again is attributable to a reduction in the amount of waste being discharged into rivers.
7 Air pollution partly stems from cars and aeroplanes.
8 Turbines spin due to water flowing through them.

Exercise 3
a on b of c about d for e from f of g for h to i in j of k to

UNIT 38
Exercise 1
1 h 2 g 3 e 4 f 5 b 6 d

Exercise 2
1 leads to
2 is as a result of
3 was a consequence of
4 is due to
5 has brought about
6 because
7 is attributable to
8 as a consequence of
9 led to

Exercise 3
a boost is made
b is blown
c is forced
d are made
e are first heated
f is suited
g produces
h is used
i are made
j are squeezed
k be shaped
l be made

UNIT 39
Exercise 1
1 Owing to
2 from
3 result
4 Consequently – Because
5 Owing to – As
6 since – hence/thus

Exercise 3
a because
b consequence
c account
result
d result
consequently
because

UNIT 40
Exercise 1
Improving quality control will enable us to become more profitable.
Shortage of space prevents us from producing more product lines.
Regulations prohibit the storage of chemicals in containers.
A machine breakdown means that we can't finish the order this week.
Owing to cold weather. Old copper cables are incapable of carrying the volume of data required today.
Using a videophone allows you to see the person you are talking to.
A firewall is used to stop unauthorized users accessing a network.

Exercise 2
1 to
2 off
3 repairing – to repair
4 to support – of supporting

Exercise 3
a make – unable to
b make – incapable of
make – unable to permit
c make – unable to enable/permit
d because – is able to operate/ is capable of operating/ can operate
e make – unable to allow/permit
f make – unable to allows/enable/permit

g because – can/is able to
h because – can/is able to
Exercise 1
1. The goods probably won’t be delivered until next week.
2. I’m absolutely sure that these crates are strong enough.
3. The goods are unlikely to remain in the warehouse for long.
4. It shouldn’t take long to load the ship.
5. They definitely won’t be sent by air freight.
6. The goods may be in transit for four days.
7. They’re quite likely to increase the volume of imports.

Exercise 2
1. I’m absolutely certain that there will be advances in heat-exchange technology.
2. fj is improbable that we will see more robots being used in the home in the next ten years.
3. Glass fibre optics could very probably be replaced by plastic in the near future.
4. Washing machines and dishwashers will definitely become more energy efficient.
5. A mat foundation definitely won’t support a high building.
6. We might need extra sound-deadening material in these walls.
7. I am certain they won’t want to use wood for the ceiling.
8. It is very likely that she’s suffering from an allergy.
9. Research being carried out at the moment might help find a cure for cancer.

Exercise 3
Suggested answer. Other forms are possible.

Exercise 1
1. that
2. who
3. which
4. where
5. who
6. when
7. where
8. whose

Exercise 2
There has been a lot of controversy surrounding the Three Gorges Dam, which is being built in China (ND). The dam, which will be 181 m high (ND), is expected to produce 18.2 million kilowatts of power. However, this is the reason why many people are unhappy (D). 15 million people, who used to live in the valley (ND), have had to move. These people, whose homes have been covered in water (ND), complain that they have been given land where very little grows (D). They also say that the living conditions which they have to live in now (D) are unsatisfactory. But those who are in favour of the project (D) say that the dam will provide extra electricity, which will stimulate the economy in eastern and central China (ND). Where development has been held back (ND). However, critics say there will be an oversupply of power, which they will not be able to sell (ND).

There are people who are deeply worried about the effects of the dam on the environment (D). They say there is a danger to animals and fish which live in the area (D). But there are other people who claim that hydroelectric power is much cleaner than burning coal (D). There will be fewer emissions which contribute to the greenhouse effect (D).

New ship locks, which are expected to increase shipping and reduce transportation costs (ND), will be built. Navigation on the river, which is currently dangerous (ND), will become much safer. But critics say there will be sedimentation which could increase flood levels (ND).

Exercise 3
1. produces car parts
2. water is stored
3. can store large amounts of information
4. W.C. Rontgen discovered them by accident
5. was born in the south of England
6. signature appears on the document
7. works in this area

Exercise 1
1. They introduced computer-guided robots in order to increase efficiency.
2. Close the valve so that the system doesn’t overheat.
3. Scientists are carrying out research so as to find a cure for AIDS.
4. Circuit breakers have been installed so that they don’t overload the system. Circuit breakers have been installed so that the system isn’t overloaded.
5. The system is scaled in order to stop water and dust getting in.
6. He is taking anti-malarial drugs so that he doesn’t get malaria.

Exercise 2
a. save energy
b. receive the maximum amount of sun
c. prevent the loss of heat
d. purify the air
e. the temperature can be controlled
f. produce power for the house
g. be kept dry
h. provide insulation
i. heat doesn’t escape
j. use too much power within the house
UNIT 45

Exercise 1

<table>
<thead>
<tr>
<th>adjective</th>
<th>comparative</th>
<th>superlative</th>
</tr>
</thead>
<tbody>
<tr>
<td>accurate</td>
<td>more accurate</td>
<td>the most accurate</td>
</tr>
<tr>
<td>pure</td>
<td>purer</td>
<td>the purest</td>
</tr>
<tr>
<td>stable</td>
<td>more stable</td>
<td>the most stable</td>
</tr>
<tr>
<td>hard</td>
<td>harder</td>
<td>the hardest</td>
</tr>
<tr>
<td>heavy</td>
<td>heavier</td>
<td>the heaviest</td>
</tr>
<tr>
<td>thin</td>
<td>thinner</td>
<td>the thinnest</td>
</tr>
<tr>
<td>far</td>
<td>farther/furthest</td>
<td>the farthest/furthest</td>
</tr>
<tr>
<td>impractical</td>
<td>more impractical</td>
<td>the most impractical</td>
</tr>
<tr>
<td>bad</td>
<td>worse</td>
<td>the worst</td>
</tr>
</tbody>
</table>

Exercise 2

1 - 
2 as - than
3 most - more
4 -
5 some of ... most - some of the most
6 -
7 good - better
8 most quick - quickest

Exercise 3

a longest
b longer
c old as
d newer
e older
f longest
g longer
h old
i newest
j shortest
k shorter
l older

UNIT 46

Exercise 1
dangerous, reliable, experimental, dirty, original, washed, magnetic, expensive, flexible, useful, excellent, resistant, industrial

Exercise 2

1 automatically, automatic
2 efficient, efficiently
3 smooth, smoothly
4 generally, general
5 environmentally, environmental
6 strictly, strict

Exercise 3

a manufacturing
b considerably
c approximately
d important
e increasing
f industrial
g increasingly
h woollen
i constant
j significant
k annually
l excellent
m healthy
n extensive
o important
p dying
q relatively
r significantly
s particular
t high

UNIT 47

Exercise 1

1 to - at
2 since - for
3 -
4 -
5 during - while
6 from - between or and - to
7 at - in
8 -

Exercise 2

a for
b on

c before
d of
e of
f on

g in
h at
i by
j since
k -

Exercise 3

a in
b at
c of
d on
e in
f in

g - h -
i in
j of
k on
l for
m in
n At
o until
p in
q on
r by
s of

UNIT 48

Exercise 1

Text 1

a from
to
c along
d through
e between
f on
g along

Text 2

a at
b of
c to
d from
e around
f of

Exercise 2

a on
b on
c in
d above
e in
f of
g above
h at
i of
j from
k to
l on
m Below
n on
o on
p in
q along
r around
s close to
t on
u of
v from
w in
x beside

UNIT 49

Exercise 1

1 100%
2 83%
3 7%
4 4%
5 26%
6 1%
7 0%

Exercise 2

1 many, Most
2 Some, a few
3 many, much
4 all, some
5 little, lot
6 most, few

Exercise 3

a all
b No
c most
d few
e many
f lot of
g much
h little
i some
j some
k little
l no
m Most
n some

UNIT 50

Exercise 1

1 careful packing
2 he washed it
3 those are a mixture of polyester and wool
4 there are places in the country where it doesn't work
5 accidents sometimes occur
6 people in developing countries often have to drink polluted water

Exercise 2

a but
b However
c While
d Whereas
e Despite

Exercise 3

Site 1 provides a suitable amount of space but it's the most expensive. Although it could be difficult, it's still worth considering. Although road and rail connections are not far away, it will be necessary to build a bridge across the river. It's surrounded by trees and close to mountains. However, it's only four kilometres from the nearest town. Even though there is a large labour market in this area, workers are unskilled. While site 1 is close to road and rail connections, site 2 is close to the airport. Nevertheless, government finance is available for companies moving into the area. Site 2 is fairly small whereas site 3 is almost too big. Site 3 is not expensive despite being in the centre of town. Even so, it may be difficult to get planning permission for new industrial buildings.
Checklist

The checklist below contains all the items which appear in the relevant vocabulary unit. For the definitions, refer to the glossary.

**PROFESSIONAL ACTIVITIES**

1. Production 1
2. Production 2
3. Research & Development 1
4. Research & Development 2
5. Information technology 1
6. Information technology 2
7. Logistics
8. Quality
9. Health and safety

10. Engineering
11. Automotive
12. Chemical
13. Pharmaceutical 1
14. Pharmaceutical 2
15. Construction
16. Electrical
17. Electronics 1
18. Electronics 2
19. Energy
20. Civil engineering 1
21. Civil engineering 2
22. Mining
23. Petroleum 1
24. Petroleum 2
25. Plastics
26. Agroindustry
27. Pulp & paper
28. Telecomms 1
29. Telecomms 2
30. Textiles

**COMPANY PROFILES**

- **Production 1**: analyse, assemble, assembly line, batch, breakdown, component, controlling, convert, distribute, effectiveness, efficiency, equipment, evaluate, factory, failure, fault, finished product, fixtures, flow, input, inventory, layout, line, logistics, lot, machinery, maintain, manufacturing, materials handling, maximize, measure, operations, optimize, planning, plant, process, produce, productivity, quality, raw materials, repair, site, stock, storage, store, unit, workshop.

- **Production 2**: aggregate, backlog, back order, bottleneck, breakdown, capacity, component, cycle, delivery, demand, downtime, flow, forecast, idle, lead time, lot, machinery, make-to-order, make-to-stock, material, optimization, output, overtime, productivity, prototype, requirement, run, satisfy, schedule, sequence, set up, set-up time, shift, slack, stock, stock-out, throughput, uncertainty, update, workforce, work in progress, workload, workshop.

- **Research & Development 1**: academic research, analyse, analysis, analyst, analytical, applied research, basic research, breakthrough, carry out, clinical research, develop, developer, development, development and evaluation, research, developmental, engineer, experiment, experimental, experimental development, experimentation, experimenter, feasibility, feasible, file a patent, findings, improve, innovate, innovation, innovative, innovator, lab technician, laboratory (lab), make-to product, patent, pilot, pipeline (in the pipeline), practical application, product development, prototype, pure basic research, pure research, register a patent, research assistant, scientific, scientist, search.

- **Research & Development 2**: strategic basic research, technical know-how (TKH), technician.

- **Research & Development 2**: analyse, assess, compile, constant, correlation, determine, develop, derivation, discover, distribution, evaluate, experiment, explore, feedback, frequency, identify, improve, innovate, interview, investigate, mean, measurement scale, median, mode, modify, norm, qualitative research, random, record, reliability, report, research, response, sampling, search, standard, statistics, study, survey, test, trial, validity, variable, variance.
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<td>grind</td>
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<td>harden</td>
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<td>highway</td>
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<td>hydraulic</td>
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<td>material</td>
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<td>materials management</td>
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<td>movement</td>
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<td>pack</td>
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<td>packaging</td>
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<td>packing list</td>
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<td>pallet</td>
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<td>picking list</td>
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<td>ship</td>
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<td>shipment</td>
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<td>shipper</td>
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<td>storage</td>
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<td>tanker</td>
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<td>transportation</td>
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<td>van</td>
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<td>warehouse</td>
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<td>accident</td>
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<td>adverse effects</td>
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<td>avoid contact with</td>
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<td>birth defect</td>
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<td>burn</td>
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<td>cancer</td>
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<td>combustion</td>
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<td>contamination</td>
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<td>dangerous</td>
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<td>dispose of</td>
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<td>dizziness</td>
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<td>drains</td>
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<tr>
<td>drowsiness</td>
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</tr>
</tbody>
</table>
### 11 Automotive

- **ABS** (= Advanced Braking System)
- Accelerator
- Advanced braking system
- Air conditioning
- Airbag
- Alarm
- Alloy wheel
- Alternator
- Arctic cold
- Automobile
- Body panel
- Brake line
- Brake pedal
- Brake system
- Bus
- Cast
- Central locking
- Climate control
- Coil spring
- Component
- Construct
- Coolant reservoir
- Crash
- Cut
- Desert heat
- Design
- Development
- Differential
- Disc brake, disk brake
- Distributor
- Drawing board
- Drum brake
- Dust tunnel
- Electric window
- Electrical system
- Engine
- Executive
- Exhaust manifold
- Exhaust system
- Feature
- Fiberglass
- Forge
- 4×4
- Fuel line
- Fuel system
- Fuel tank
- Immobilizer
- Intake manifold
- Lorry
- Luxury
- Machine operator
- Master brake cylinder
- Medium
- Mini
- Model
- Mould (AmE mold)
- MPV
- Muffler (AmE)
- Multi-purpose vehicle
- Paint shop
- Part
- PAS
- People carrier
- Pickup
- Power assisted steering
- Power train
- Press shop
- Prototype
- Radiator
- Research
- Set up
- Shock absorber
- Showroom
- Silencer (AmE muffler)
- Small family
- Sports
- Spray gun
- Stamp
- Steel
- Steering system
- Steering wheel
- Sunroof
- Supermini
- Support system
- Tailpipe
- Test
- Track
- Transmission
- Truck
- Van
- Water-proof
- Wind tunnel

### 12 Chemical

- Acid
- Agricultural chemical
- Agriculture
- Aircraft
- Alcohol
- Alkali
- Aromatic
- Artificial
- Automobile
- Bake
- Basic and intermediate chemicals
- Beauty aid
- Benzene
- Carbonate
- Chemical
- Chloride
- Coal
- Crack resistant
- Dye
- Easy flow
- Ethylene
- Explosive
- Fertilizer
- Fibre
- Flame resistant
- Flame-retardant
- Flavour
- Fluoride
- Fungicide
- Glossy
- Hard
- Heat resistant
- Herbicide
- Industrial gas
- Insecticide
- Matt
- Methyl alcohol
- Nitrate
- Nutrient management
- Oil
- Olefin
- Oxide
- Paint finish
- Paints and coatings
- Pest management
- Pesticide
- Petrochemical
- Pharmaceuticals
- Plastic
- Plastics and fibres
- Polyethylene
- Polypropylene
- Process
- Propylene
- Reaction
- Rubber
- Salt
- Soap
- Soil management
- Specialty chemicals
- Stiff
- Sustainable production systems
- Sweetener
- Synthetic
- Synthetic fibre
- Tough
- Toxic
- Transparent

### 13 Pharmaceutical 1

- Acrobic
- Affliction
- Approve
- Biological product
- Boiling point
- Certificate
- Chemical purity
- Chronic depression
- Clinical
- Concentrate
- Crude drug
- Cultivate
- Cure
- Density
- Detection
- Diagnosis
- Disease
- Distil
- Double-blind technique
- Evaluate
- Exemption
- Extract
- Factory inspection
- FDA
- Ferment
- Food and Drug Administration
- Harmful
- Harvest
- Healthy
- Hospital
- Illness
- Inorganic elements and compounds
- Inspect
- Investigate
- Laboratory (lab)
- Licence
- MCA
- Medicinal drug
- Medicines Control Authority
- Melting point
- Mitigation
- Observe
- Odour
- Organic compound
- Particle size
- Patient
- Placebo
- Plant
- Preservative
- Product labelling
- Purity standards
- Regulatory authority
- Safety risk
- Safety standard
- Seize
- Solubility
- Stringent conditions
- Substance
- Suffer
- Test
- Therapeutic practice
- Treatment
- Validate
- Viscosity

### 14 Pharmaceutical 2

- Abnormality
- Acute
- Ageing
- AIDS (= Acquired Immuno-deficiency Syndrome)
- Allergy
- Anaesthetist
- Arthritis
- Asthma
- Bronchitis
- Cancer
- Carer
- Chronic
- Congenital
- Dentist
- Diabetes
- Disorder
- Dispersion
- Dosage
- Drug
- Epilepsy
- Haemorrhage
- Heart attack
- Hereditary
heating
high voltage
hydraulic power
hydroelectric energy
hydroelectric scheme
kinetic energy
magnetic energy
motor
natural gas
nuclear energy
nuclear plant
nuclear power plant
oil
open coal fire
petroleum
plutonium
power plant
power station
powerhouse
solar cell
solar energy
solar panel
steam power
sun
tidal barrage
tidal power
tide mill
town-gas
transmission network
transport network
turbine
urnium
water
water power
waterfall
waterworks
wave
wave power
wind
wind farm
wind power
windmill

20 Civil Engineering 1
aircraft
airport
aqueduct
arch
barrage
bridge
builder
cable
camber
canal
dam
dike
docks (also dock)
drainage
dredger
drift
energy
excavator
fluid mechanics
flume
footbridge

harbour (AmE harbor)
hydraulics
irrigation
kerb (AmE curb)
lift bridge
lock
macadam
main
manhole
mechanics
metal
nuclear power station
paddle
pavement
pedestrian crossing
pier
plate girder
pothole
pylon
railway line
road
road roller
sewer
shovel
sluice
soft shoulder
soil
span
strand
structural works
structure
survey
suspender
suspension bridge
swing bridge
tarmac
tower
tunnel
underdrain
viaduct
water desalination
water main
watercourse
water-supply system
waterway
weir
well

21 Civil Engineering 2
analyse
attribute
borehole
building contractor
commission
costing system
design
detailed design
dimension
draft
drawings
estimate
feasibility study
finished design
geology
hydraulics
load-bearing
maintenance
nuclear physics
preliminary design
preliminary feasibility study
process
proposal
scheme
secondary feasibility study
site investigation
soil mechanics
specification
stability
step
technical drawings
tender
thermodynamics
trial pit
turnkey
work plan

22 Mining
access
anthracite
asbestos
audit
bauxite
bituminous
borax
burial
cage
chute
coal
conveyor
copper
crust
deposit
drugline
drift
drill
drill
drill supervisor
dump truck
earth
environmental engineer
excavate
exploit
explore
explosive
extract
feldspar
geochemist
geologist
geophysicist
gold
granite
headerframe
hydrogeologist
inspection
iron
lead
lignite
limestone
manganese
marble
mechanical loader
metalliferous
mine
mine car
miner
mineral
mining
mining engineer
nonmetalliferous
open-pit
ore
ornamental
peat
phosphate rock
prospect
prospector
pump
quarry
quartz
raise
removal
rock
safety engineer
sediment
shovel
skip
slate
stope
strip mining
stripping machine
sump
surface
swamp
talc
tin
traprock
travertine
trona
underground
ventilation shaft
zinc

23 Petroleum
bitumen
blowout
casing
collar
crude oil
cuttings
deposit
derrick
dig
downhole
downstream
drill
drill bit
drill pipe
drill string
drilling mud
evacuate
exploratory
extract
flammable
flow rate
formation
gas field
hydrocarbon
inject
kelly
layer
licence
mapping
offshore
oil field
oily
onshore
permit
platform
pressure
pump
recover
reserve
reservoir
rig
| carrier wave | transponder | mobility |
| channel encoder | wave | network |
| coaxial cable | wavelength | omnidirectional antenna |
| convert | wire | packet-based |
| copper wire | wire transmission | PDA (Personal Digital Assistant) |
| degradation | | personal organizer |
| digital | | phone line |
| dish | | portable |
| distort | | Private Branch Exchange (PBX) |
| electromagnetic | | receive |
| electromagnetic wave | | reception |
| electronic | | relay station |
| fibre optic cable | | retrieve |
| frequency modulation | | signal |
| high bandwidth | | speaker (= loudspeaker) |
| interference | | still-frame |
| interference immunity | | switch |
| laser | | telephony |
| LED (light-emitting diode) | | television station |
| lightweight | | transfer |
| light-emitting diode | | transmission |
| low attenuation | | video camera |
| metallic-pair circuit | | videophone |
| microwave | | visible |
| modulation | | voice |
| multipair cable | | wallpaper |
| noise | | WAP (Wireless Application Protocol) |
| open-wire pair | | 30 Textiles |
| optic cable (also optical cable) | | absorption |
| optical communications | | acetate |
| optical transmission | | bedding |
| radio transmission | | bleach |
| radio wave | | blend |
| receiver | | braiding |
| redundant | | brocaded |
| reflected propagation | | brush |
| repeater | | card |
| restore | | carpet |
| retransmit | | chlorine bleach |
| satellite | | clothes |
| signal | | clothing |
| single-wire line | | corduroy |
| source encoder | | cotton |
| surface propagation | | crease control |
| switching system | | curtains |
| transmit | | defect |
| transmitter | | dry-cleaning |
| | | dye |
| | | embroider |
| | | fabric |
| | | felting |
| | | fibre |
| | | fibre processing |
| | | foreign matter |
| | | gauze |
| | | knit |
| | | knitting mill |
| | | lace-making |
| | | launder |
| | | linen |
| | | nap |
| | | net-making |
| | | nylon |
| | | polish |
| | | polyester |
| | | press |
| | | rayon |
| | | reversible fabric |
| | | rug |
| | | satin |
| | | shear |
| | | shrinkage |
| | | silk |
| | | spin |
| | | synthetic |
| | | textile |
| | | tumble dry |
| | | twill |
| | | upholstery |
| | | velvet |
| | | wash and wear |
| | | weave |
| | | weaving mill |
| | | wool |
| | | yarn |
The number(s) after each entry show the vocabulary unit(s) in which the word/phrase appears.

<table>
<thead>
<tr>
<th>Entry</th>
<th>Vocabulary Unit(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 x 4, 11</td>
<td>a drive system where both axles get power from the engine</td>
</tr>
<tr>
<td>abnormality 14</td>
<td>something which is not normal or regular; a physical or mental defect or disorder</td>
</tr>
<tr>
<td>ABS (= Advanced Braking System) 11</td>
<td>See advanced braking system</td>
</tr>
<tr>
<td>absorb 17</td>
<td>to take in</td>
</tr>
<tr>
<td>absorbance (also absorbency) 27</td>
<td>the ability of paper to absorb fluids such as water or printing ink</td>
</tr>
<tr>
<td>absorption 30</td>
<td>the property of a fibre, yarn or fabric to attract and hold gases or liquids</td>
</tr>
<tr>
<td>academic research 3</td>
<td>study that is carried out for theoretical purpose without a practical application</td>
</tr>
<tr>
<td>accelerator 11</td>
<td>a car pedal which regulates the amount of fuel sent to the engine</td>
</tr>
<tr>
<td>access 22</td>
<td>the way to the entrance of a mine</td>
</tr>
<tr>
<td>accident 9</td>
<td>something unpleasant that happens unexpectedly and causes loss, damage or injury</td>
</tr>
<tr>
<td>accurate 8, 18</td>
<td>correct (according to the specifications)</td>
</tr>
<tr>
<td>acetate 30</td>
<td>a man-made fibre (made of cellulose) which is crease and shrink resistant, soft to the touch and luxurious in appearance</td>
</tr>
<tr>
<td>acid 12</td>
<td>a water-soluble, sour chemical compound that produces positive ions in solution. An acid is the opposite of an alkali; together, an acid and an alkali neutralize each other and react to form water and a salt. See also alkali.</td>
</tr>
<tr>
<td>acoustical 15</td>
<td>describing materials that can absorb sound</td>
</tr>
<tr>
<td>acrylic sign 25</td>
<td>a notice made from a plastic synthetic resin</td>
</tr>
<tr>
<td>activate 17</td>
<td>to make active</td>
</tr>
<tr>
<td>activation 17</td>
<td>the state of being active</td>
</tr>
<tr>
<td>active 17</td>
<td>an active device needs energy for its operation. See also passive.</td>
</tr>
<tr>
<td>acute 14</td>
<td>severe, serious, very painful</td>
</tr>
<tr>
<td>add value 8</td>
<td>to increase the worth (value) of a product or service from the perspective of the customer</td>
</tr>
<tr>
<td>additive 26, 27</td>
<td>a substance added to food to improve it</td>
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<tr>
<td>advanced braking system 11</td>
<td>an automated way of applying braking. With ABS sensors detect if the wheels are locking; if so, then the system takes over, pumping the brake much faster than is humanly possible (also known as anti-lock brakes).</td>
</tr>
<tr>
<td>adverse effects 9</td>
<td>unpleasant results, e.g. loss, damage or injury</td>
</tr>
<tr>
<td>aerial 29</td>
<td>a radio or TV antenna, especially one suspended in or extending into the air</td>
</tr>
<tr>
<td>aerobic 13</td>
<td>living in air; requiring oxygen</td>
</tr>
<tr>
<td>aeroplane 24</td>
<td>a vehicle that carries passengers or goods by air</td>
</tr>
<tr>
<td>aerospace 18</td>
<td>describing the air around the earth and the space beyond it</td>
</tr>
<tr>
<td>affliction 13</td>
<td>an illness</td>
</tr>
<tr>
<td>ageing 14</td>
<td>the process of getting old</td>
</tr>
<tr>
<td>aggregate 2</td>
<td>total, e.g. of all planned production</td>
</tr>
<tr>
<td>alcoholic 12</td>
<td>a family of organic compounds, the most common of which is ethyl alcohol or ethanol, CH₃CH₂OH</td>
</tr>
<tr>
<td>alkali 12</td>
<td>a group of water soluble mineral compounds. An alkali is the opposite of an acid; together, an acid and an alkali neutralize each other and react to form water and a salt. Also called base. See also acid.</td>
</tr>
<tr>
<td>alert 29</td>
<td>a written or acoustic signal that warns or informs the user of a special situation</td>
</tr>
<tr>
<td>allergy 14</td>
<td>an extreme reaction or sensitivity to something eaten, breathed in or touched</td>
</tr>
<tr>
<td>alloy wheel 11</td>
<td>any non-steel road wheel, usually made of aluminium or magnesium</td>
</tr>
<tr>
<td>alternator 11</td>
<td>a device which produces alternating current (AC) by converting the engine's turning (mechanical) energy into alternating electrical current</td>
</tr>
<tr>
<td>amplification 17</td>
<td>the activity of making a signal stronger</td>
</tr>
</tbody>
</table>
amplify 17, 28
to make a signal, e.g. sound, stronger
amplitude modulation 28
a change in the level of a signal
anæsthetist 14
a doctor who is qualified to give an
anæsthetic
analog 5
See analogue
analogue 5, 28
a system in which data is represented
as a continuously varying voltage,
as opposed to digital which can
only be distinct whole numbers. See
also digital.
analyse 1, 3, 4, 21
to examine carefully
analysis 3, 8
the study of the parts and their
relationship to one another
animal feed supplement 26
what is added to food for livestock to
make it more effective
annual 10
to make materials tough by cooling them
slowly, e.g. glass
anodize 10
to coat a metallic surface with a protective
oxide, e.g. car components
answering machine 29
a tape recorder which serves as a
telephone answering device
antenna 28, 29
a device used to transmit and/or receive
radio waves
anthracite 22
a hard, black shiny coal containing a high
percentage of fixed carbon and a low
percentage of volatile matter (also called
hard coal)
apparatus 10
equipment
applet 5
a program written in the JavaTM
programming language that can be
included in an HTML page. The applet's
code is transferred to your system and
executed by the browser's Java Virtual
Machine (JVM).
appliance 16
a piece of equipment, e.g. a TV, washing
machine
application 29
a computer program
application software 5
gives a computer instructions which
provide the user with tools to perform a
task, e.g. word processing
applied research 3
branch of research that looks at how
scientific theory can be used in
practice
approve 13
to agree to, give permission to
aqueduct 20
a structure which carries water (canal or
river) across land, usually over a valley
arch 20
a curved structure, e.g. under a bridge
architect 15
a person who designs and supervises the
construction of buildings or other
structures
Arctic cold 11
very cold conditions used to test cars
aromatic 12
an organic compound with a benzene-like
ring
arthritus 14
da disease which causes pain in the joints
artificial 12
not natural
asbestos 22
a fibrous material made from silica. As it is
very heat resistant, it was often used in the
past in buildings for insulation. It is now
banned because it is a health risk.
asphalt 24
a petroleum-based black sticky material
used to cover roads
assemble 1
to put pieces together to make a finished
product
assembly 15, 16
1. the process of putting building elements
together 2. a collection of (electrical)
parts in an appliance
assembly line 1
the layout of workers and machines where
the work passes from one worker to the
next, usually along a moving belt, until it
is finished
assess 4
to measure and evaluate something
asthma 14
da disease which causes problems of
breathing
atomic energy plant 19
a power station which produces nuclear
energy. See also nuclear plant
attenuation 28
the loss in power of a signal between
transmission and reception
attribute 21
a special feature or requirement
audible 29
that can be heard
audio signal 17
a signal intended to be heard
audit 22
1. to examine officially; 2. an official
examination
automobile 11, 12, 24
a car
automotive 18
relating to cars and other vehicles, e.g.
automotive industry
avoid contact with 9
not to touch, usually with a part of the
body
axis 8
a line, usually horizontal or vertical, used
as a reference on a graph
backlog 2
tasks that have not been done on time
back order 2
an order for goods that has not been
processed on time
bacteriology 26
the science that deals with bacteria and
their relations to agriculture, medicine,
and industry
bake 12
to heat, often at high temperatures to
make hard
baking 26
the activity of cooking food, e.g. bread and
cake, by dry heat especially in an oven
bandwidth 6, 28
the range of frequencies, expressed in
Hertz (Hz), that can pass over a
given transmission channel. The
bandwidth determines the rate at
which information can be transmitted
through the circuit; the greater the
bandwidth, the more information that
can be sent in a given amount of time.
Analogue bandwidth is measured in
Hertz (Hz) or cycles per second; digital
bandwidth is the amount or volume of
data that can be sent through a channel,
measured in bits per second, without
distortion.
bar graph 8
a chart that uses either horizontal or
vertical bars to show comparisons among
categories
bark 27
the outer layer of a log
barrage 20
a barrier across a stream with a series of
gates to control the water-surface level
barrel 24
a unit of measure for petroleum, equal to
42 gallons
basic and intermediate chemicals 12
basic chemicals are made from mined
materials like crude oil, natural gas and
minerals, or from crops and other natural
substances. Chemical companies use
basic chemicals to produce intermediate
products like polyethylene, polyethylene
oxide (PO), ethylene oxide (EO) and
ethylen glycol, or final products like
phosphate and nitrogen agricultural
fertilizers. These basic and intermediate
chemicals are called commodity
chemicals and are produced mainly by
large companies and as byproducts of
petroleum refining, using common
manufacturing processes.
basic research 3
a systemic, intensive study, which aims to
gain a fuller knowledge or understanding
of the subject under study rather than a
practical application
batch 1
a quantity of items which are made at the same time
baud 6
the speed at which information is transferred, generally referred to as bps
(bits per second)
bauxite 22
the mineral from which aluminium is extracted
beam 15, 29
horizontal structural member that sits on posts or walls and supports the structure above it. Sometimes called a "girder".
beauty aid 12
any product that improves the appearance of skin, hair, etc.
bedding 30
sheets and fabrics used on a bed
benzene 12, 24
a colourless, liquid, flammable, aromatic hydrocarbon that boils at 80.1°C and freezes at 5.4–5.5°C; it is used as a solvent and in making other chemicals, e.g. dyes and drugs
bible 27
a type of thin printing paper, especially for use in high quality productions; e.g. bibles and dictionaries
bill of lading 7
a transportation document that is the contract of carriage containing the terms and conditions between the shipper and carrier
binary 28
characters and codes specified as a combination of 0 and 1
biodegradable 25
describing the ability of some plastics to breakdown into safe products by the action of living organisms
biofuel 19
fuel made from biological materials including crops (especially trees) and animal waste
biological product 13
a pharmaceutical product that is derived from a biological source (human plasma or cell culture) rather than being synthesized from a chemical source
birth defect 9
something imperfect that you are born with e.g. a mark
bits per second (bps) 6
the number of bits that are transferred in one second by a computer
bitumen 23
one of various sticky substances, e.g. crude petroleum, asphalt or tar, that occur naturally
bituminous 22
containing bitumen, a general name for various solid and semisolid hydrocarbons
bleach 27, 30
1. to treat chemically in order to remove impurities and whiten the fabric 2. the chemical that removes impurities and whiten a fabric
blend 30
1. to mix different fibres together; 2. a mix of different fibres
blender chest 27
a container in which different pulps are combined according to customer specifications
blow extrusion 25
a process where hot molten plastic is blown up like a balloon, with compressed air. This stretches the plastic and makes it thin. The end of the balloon is pinched together by rollers, to hold the air in and make it flat. The flat tube is then wound on to a big roll
blow moulding 25
a process in which a little bit of hot soft plastic is squeezed into the end of a mould. Compressed air is used to blow a big bubble inside the plastic. The plastic swells out like a balloon until it fills up the whole mould
blowout 23
an uncontrolled activity in an oil or gas well
body panel 11
a sheet of metal that forms the outside body of a car
boiler 10
equipment to make water hot
boiling point 13
the temperature at which a liquid boils; for water it is normally regarded as 100°C
bond 27
a type of paper made from either cotton, chemical wood pulp, or a combination of the two. This grade of paper is used for stationery and business forms and is made with superior strength for its weight
book 27
type of woodfree or mechanical paper used for printing books
borax 22
a mild alkali used in fine grain developing solutions to speed up the action of the solution
borehole 21
a hole drilled in the earth to explore what is below the earth
bottleneck 2
a step in production where a number of stages come together and cause a slow down in production
bowl 25
a deep round container; often made of plastic, which can hold liquid
breakdown 1, 2
to stop working, especially for a machine
breaded 30
1. a diagonal tie that interconnects scaffold members; 2. a temporary support for aligning vertical concrete formwork
braiding 30
a way of making a textile without a loom. Yarns going in the same direction are crossed over and under other yarns in their paths
brake line 11
the system of hoses and metal tubes through which the brake fluid flows
brake pedal 11
a foot operated device which operates the brakes to stop or slow the wheels
brake system 11
the equipment in a car which makes it slow and then stop
branch circuit 16
a circuit where the current has a choice of paths
break down 1, 2
to stop working, especially for a machine
breakdown 1, 2
a situation where a machine has stopped working
breaker (circuit breaker) 16
a device that can be used to open or close a circuit manually and can also open a circuit automatically when current is too high
breakthrough 3
a discovery
breeding 26
the business of keeping animals with the purpose of obtaining young ones for sale
bridge 20
a structure, usually built of wood, iron or stone, which carries a road over a valley or river
brightness 27
a measure of the whiteness of pulp and paper
bristol 27
a grade of paper used for folders, index cards, covers and postcards
broadcast 29
to transmit a radio or TV programme over the airwaves for public reception
brocade 30
a heavy rich-looking fabric with contrasting surfaces or a multicolour design; it is used in upholstery and evening wear
brochure 27
a small book, often with glossy pages, that advertises a company
bronchitis 14
an illness of the bronchial tubes
browser 5
to access the World Wide Web and allows the user to use the multimedia resources of the World Wide Web internet
brush 30
to use wire brushes or other abrasive materials to raise a nap on surface of the fabric
building contractor 21
a building firm that agrees to perform work
bulldozer 20
a large powerful vehicle which uses a large blade to move earth and rocks
carrier wave 28
a wave that transports the signal wave.
The carrier is modulated or altered by the signal wave.
carry out 3
to do, especially an experiment, a study or research
carton 7, 27
a box made from thick, stiff paper, used to protect goods in transit
casing 23
a steel pipe in a well to strengthen it and stop it from caving in
cast 22
to shape hot metal by pouring it into a mould
catalyst 24
a substance which causes a chemical activity without changing itself
catalytic cracking 24
a refining process by which petrol (gasoline) is made from crude petroleum
catering 26
the activity of providing food
cause/effect analysis 8
da diagram which shows the main causes leading to an effect (symptom). The cause and effect diagram is one of the "seven tools of quality".
cell 29
type of wireless communication in mobile telephony. It is called 'cellular' because the system uses many base stations to divide a service area into multiple 'cells'. Cellular calls are transferred from base station to base station as a user travels from cell to cell.
cellular 29
See cell

cellular radiotelephone system 17
a high-capacity system of one or more multichannel base stations designed to provide radio telecommunications services to users over a wide area

central locking 11
the locking or unlocking of all the doors by locking from one location, either by turning a key in a door lock or using an electronic device.
central processing unit (CPU) 5
either the main microchip that the computer is built around or the box that houses the main components of the computer.
certificate 13
an official document which shows that something can be done
chain 25
a number of atoms that are linked together
channel 7, 29
the way that goods will be transported, e.g. by road, rail, sea, air
channel encoder 28
a device which maps the binary strings into wave for transmission
check 8
1. to test, examine something in order to see if it is correct; 2. a test, examination to see if something is correct

chemical 10, 12, 18
a substance with a definite molecular composition, concerning the science which deals with the elements that make up the earth, the universe and living things. See also chemistry.
chemical process plant 20
a factory in which chemicals are made and used
chemical purity 13
the extent to which a chemical is clean and free from unclean substances
chemistry 10
the science which deals with the elements that make up the earth, the universe and living things
chip 27
a small piece of wood used to produce pulp
catalyst 24
a compound containing chlorine and another element
clorine bleach 30
a chemical used for cleaning, sterilizing and whitening
chop 27
to cut into small pieces
chronic 14
to describe a medical condition that lasts for a long time
chronic depression 13
a state of deep sadness that lasts for a long time and is a sign of a mental health problem
chute 22
a channel or shaft underground
circuit 16
a set of electrical parts in an appliance, e.g. a TV or radio
circuit board 18
a panel or assembly along which the electric current can pass

civil 10
for private people, i.e. not for military purposes
cleansing agent 24
an agent used to clean impurities
climatic control 11
a lever or button which you can move to change the temperature in the passenger compartment of a vehicle
clinical 13
connected to a hospital
clinical research 3
branch of research that looks at the effects of drugs or treatments on patients
clothes 30
coveting for the human body
clothing 30
coveting for the human body; clothes
coal 12, 19, 22
a combustible mineral formed from organic matter (mostly plants) that lived about 300 million years ago
coastline 24
the land next to the sea
cable, 28
one of four basic types of wire found in telecommunications. this is a conducting wire in a dielectric insulator and an outer conducting shell; this type of cable is commonly used because of its insensitivity to noise interference. the other types are single-wire line, open-wire pairs, and multpair cables.

coil spring, 11
a section of spring steel used in both front and rear suspension systems.

collar, 23
a thick tube of steel through which drilling fluids are pumped.

collect, 5
to gather together; to bring together.

collector, 24
equipment which collects different components as petroleum is broken down.

column, 15
a supporting pillar consisting of a base, a cylindrical shaft, and a capital.

commission, 19, 21
1. to place an order for (a power plant); 2. an order (for a power plant).

commitment, 8
a promise, an agreement to do something in a certain way, usually to improve the way of working.

commodity, 26
a product of agriculture.

communal environment, 20
a place where a group or community, e.g. old people or students, can live comfortably.

communicate, 6
to send information between two places or within an area.

communications, 16
the area that deals with sending information between 2 places or within an area.

compatible, 6
describing the ability of data processing equipment to accept and process data prepared by another machine without conversion or code modification.

compile, 4
to put together data gathered from several sources.

comply with, 8
to act according to the rules or regulations.

component, 1, 2, 11
1. piece of machinery; 2. part that goes into the final product.

compressed air, 25
air that has been pressed into a volume smaller than it normally occupies.

computer, 16, 18
an electronic device that can store and recall information, and make calculations very quickly.

computer network, 5
a group of computers connected by cables or other means which exchange information and share equipment, such as printers and disk drives.

computer-aided design, 17
the use of computers to assist the design process.

concentrate, 13
to remove water.

condense, 24
to cause a gas to become liquid by making it cooler.

configure, 6
1. to arrange in a certain shape; 2. to prepare all the devices in a computer system so that they operate.

congenital, 14
to describe a disease which has existed since birth.

connect, 6
1. to join or fasten together; 2. to link a piece of equipment to an energy source, e.g. electricity, or to another piece of equipment; 3. to establish a communication path for the transfer of information.

conservation, 26
protection and management of natural resources to prevent exploitation, destruction, or neglect.

consignment, 7
a collection of goods to be transported from one place to another.

constant, 4
something that does not change.

construct, 10, 11
to build.

consumer goods, 18
products, e.g. TVs, hi-fis and washing machines, for personal, domestic or home use.

consumption, 26
the act of eating and drinking.

contamination, 9, 26
the result of mixing something with dirty or poisonous matter.

continuous process improvement, 8
the many management practices and techniques used to find and eliminate waste and to improve business processes.

control, 5, 17
1. to make sure that something is correct; 2. a test that makes sure that something is correct.

control system, 16
a system that regulates an operation.

controlling, 1
stage in a process when you check what you have done (see also planning).

convert, 1, 28
to change, e.g. from input to output.

conveyor, 22
a mechanical device like a belt, generally electrically driven, which transports material between two points.

cool, 25
to make cold;

coolant reservoir, 11
liquid in the cooling system.

copper, 22
a reddish metallic element that heats quickly and cools rapidly; its symbol is Cu.

copper wire, 28
a popular medium, made of copper, for low-cost networking but limited to a few hundred metres.

cordless, 29
without a wire.

corduroy, 30
a strong, durable, woven fabric with vertical cut pile stripes or cords with a velvet-like nap.

correlation, 4
a measure of the link between two variables.

costing system, 21
a procedure to monitor the costs of a project so that management can get information on development.

cotton, 27, 30
a tall plant with white hair from which cloth is made.

CPU, 5
See central processing unit.

crack, 24
to separate oil into simple compounds.

crack resistant, 12
describes a finish (paint) that does not easily split.

crane, 10
a machine for lifting and moving heavy objects.

crash, 11
this happens when one vehicle hits another vehicle or a stationary object.

damage control, 30
a fabric finish often used with linen and cotton to help the fabric resist wrinkles and creases.

damage, 5
to make something new, e.g. a file.

crops (often pl), 26
plants that can be grown and harvested for profit or subsistence.

crossover, 20
a place where one road goes over another.

crown, 20
the highest point of a road.

drug, 13
any raw or unrefined medicinal compound in its natural form, especially one taken from a plant.

druck oil, 23
untreated oil.
crust 22
the outermost layer or shell of the earth
cultivate 13
to cause a plant or other vegetable matter to grow
cultivation 26
the activity of using land to raise crops
culvert 20
a pipe or small bridge for drainage under a road or structure
curb 20
See kerb
cure 13, 25
1. to make a person better; 2. to harden by heat; 3. medicine that makes a person better
currency converter 29
a web service that calculates the value of your money in another currency
curtain wall 15
an exterior wall that provides no structural support
curtains 30, 25
material that hangs in front of a window as a decoration, shade, or screen
customer needs 8
what the customer needs from a product or service
cut 11
to form or shape with a sharp tool
cuttings 23
small pieces of rock that break away due to the action of the bit
cycle 2
the series of activities following one another to produce a product
dairy farming 26
farming that is concerned with the production of milk, butter, and cheese
dam 20
a manmade structure across a river to hold back the water to produce power, improve navigation or control flooding
dangerous 9
likely to cause loss, damage or injury data 29
information
database 6
a structured set of data
database software 5
a program that allows the user to create a structured set of data (a database) and then to access it and manipulate it
data-conversion device 29
a piece of equipment which translates data from one format to another so that the receiving device can interpret it
depth 15
going far down, usually into the ground
defect 30
something that makes a product imperfect
defect prevention 8
the action to stop a fault from happening, usually before it happens
defective 8
not working (properly)
defence 18
the industry which protects a country against attack
define 8
1. to state something in detail, e.g. the dimensions of a product
degradation 28
the deterioration in quality, level, or standard of performance
dehydration 26
the removal of all liquid from food
delighted 8
very happy, very satisfied
delivery 7
to carry goods to their destination
delivery note 7
a document which accompanies goods in transit and provides basic information about the goods, the sender and the receiver
demand 2
the number of items that are needed
demodulation 17
the process of extracting the message from a modulated signal for reception by phone, TV or radio
density 13
the amount of darkness or light in an area of a scan
dentist 14
a tooth specialist
deposit 22, 23
a natural occurrence of a useful mineral in sufficient quantities for exploitation
depot 7
the place where goods are (temporarily) stored, either before they are sent out or after they have been received
derrick 23
a pyramid of steel erected over a bore hole to drill for oil
desert heat 11
extremely hot conditions to test a car design 10, 11, 18, 21
to plan, either in one's mind or with drawings
desktop (desk top) 5
1. the screen background in most graphical user interfaces (GUIs) on which windows, icons, and dialogue boxes appear; 2. a type of computer that sits on a desk and is not easily portable. See also lap top
detailed design 21
the development stage in which the geology of the area is studied in order to prepare a detailed plan
detect 8
1. to find out what is causing a particular situation, especially a problem
detection 13
the process of finding out the cause of a problem
determine 4
to find out
develop 3, 4, 10, 18
to change the form of something
developer 3
a person who or organization which produces new ideas or products
development 3, 11
the systematic use of the knowledge or understanding gained from research to produce useful materials, devices, systems, or methods
development and evaluation research 3
the systemic use of scientific knowledge to produce useful materials, devices, systems or methods
developmental 3
1. describing the systemic use of scientific knowledge to the production of useful materials, devices, systems or methods

deviation 4
the difference between an observed value and the expected value of a variable
device 29, 16, 18
any piece of equipment made for a specific purpose
device size 17
refers to the ability to reduce the size of electronic devices, such as computers, walkmans, etc., mainly as a result of the miniaturization of components
diabetes 14
a disease where there is too much sugar in the blood
diagnose 18
1. to find the cause of a problem
diagnosis 13
the activity of finding the cause of an illness
dial 29
to make a telephone call or connection
differential 11
a unit that takes the power of the rotating driveshaft and passes it to the axle
dig 23
to make a hole
digester 27
that part of a chemical pulp mill where cooking takes place
digital 5, 28
a system in which data is represented as 0 or 1
digital communications 5
a system of sending information in which data is represented electronically as 0 or 1
digitalization 17
the conversion of analogue data into a digital form (0 or 1)
dike 20
a manmade structure built along the banks of a river or along the coast to hold back water and prevent flooding
dimension 21
a measurement, e.g. length, width, height
diode 17
a component with two terminals (anode and cathode) that passes current primarily in one direction
directional 29
a transmitter with more than one tower
to send the station's signal in a particular
direction

disc brake, disk brake 11
type of brake that has two basic
components: a flat disc that turns with
the wheel and a caliper that is stationary

discover 4
to find

disease 13
illness, usually serious

dish 28, 29
a device used for collecting satellite TV
signals

disinfection 26
the process of cleaning by destroying
harmful organisms

disintegrate 25
to fall apart, especially into small pieces

disorder 14
a disease

dispatch 7
to send out

dispersion 14
the process of spreading a
pharmaceutical in a gas, liquid or solid
(tablet) form

display 8, 29, 25
1 to show 2 something that is shown, e.g.
a graphic 3 a device for showing
something i.e. a monitor

disposable 25
describing something that can be thrown
away

dispose of 9
to throw away (often because it is
dangerous)

distil 13, 24
to make a liquid into gas by heating and
then to convert the gas into different
liquids again

distillation 24
the process of making a liquid into gas by
heating and then converting (separating)
the gas into different liquids

distort 28
to fail to reproduce accurately the
characteristics of the input

distribute 1
to send goods from the producer to
another person or organization

distribution 4, 7
a set of numbers and their frequency
of occurrence collected from
measurements

distribution centre 7
a large, centralized warehouse that
receives finished goods from a factory

distribution network 19
the system of pipes and tubes that carries
energy from the production plant to the
user

distributor 11
a unit in the ignition system designed to
make and break the ignition and to
distribute the resultant high voltage to the
proper cylinder at the correct time

dizziness 9
unpleasant feeling in one's head that
things are going round and round
docks (also dock) 20
a place where ships are loaded and
unloaded

documentation 7, 18
all the papers which describe the
goods

dosage 14
the amount of a medicine to be taken at
one time

dot matrix printer 5
a printer which uses a pattern of dots to
form characters or other graphic
information.

double-blind technique 13
a type of clinical study in which neither
the participants nor the person
administering treatment know which
treatment any particular subject is
receiving. Usually the comparison is
between an experimental drug and a
placebo or standard comparison
treatment. See also placebo.
downhole 23
a well
download 6
to transfer data or code from one
computer to another. The distinction
between download and upload is not
always clear, but download often refers
to transfer from a larger server system
to a smaller client system.
downstream 23
downstream refers to all activities from
the processing of refined crude oil into
petroleum products to the distribution,
marketing, and shipping of the products.
See also upstream.
downtime 2, 6
time when equipment is not
working because of a breakdown or
maintenance
draft 21
preliminary
dragline 22
a type of excavating equipment consisting
of a bucket on a long rope

drainage 20, 26
the network of pipes through which
rainwater runs off

drains 9

the system of pipes and tubes that carry
away waste water
draw 24
to take out
drawing board 11
a flat piece of wood on which a piece of
paper is put to design a plan
drawings 21, 29
a plan or sketch

dredger 20
a machine or ship used to take away sand
and mud from the bottom of a river or a
harbour
drift 22
an entry, generally on the slope of a hill, which
usually goes in a horizontal
direction into a coal seam
drill 22, 23
1. to make a hole through a material with
a cutting tool; 2. the cutting tool that
makes a hole
drill bit 23
a tool used to crush
cut rock

drill pipe 23
a tube made of steel which connects
the rig surface equipment with the
bottomhole assembly

drill string 23
the combination of the drill pipe, the
bottomhole assembly and any other tools
used to make the drill bit turn at the
bottom of the well bore

drill supervisor 22
the person who is in charge of a group of
workers who drill (see above)
drilling mud 23
fluids used in drilling
drowsiness 9
a feeling of tiredness
drug 14, 24
a medicine
drum brake 11
type of brake using a drum-shaped
metal cylinder which is attached to the
wheel and rotates with it
dry 9, 27
1. to take out the fluid; 2. not wet
dry-cleaning 30
a chemical cleaning process
drying 26
the removal of all liquid
dump truck 22
a vehicle that carries and then dumps
rock or ore
durability 27
the ability of a product, e.g. paper, to last
a long time
dust 9
a powder made of small particles of
waste
dust tunnel 11
a test environment in which a car is
exposed to small particles of waste

dustproof 16
describing the ability to exclude dust
dye 12, 24, 27, 30
1. to treat chemically in order to change a
fabric's colour; 2. a chemical which
changes a fabric's colour
earth 22
the soil which must be removed to reach
the valuable minerals
earthmover 20
a machine, e.g. a bulldozer to excavate,
push or transport large quantities of
earth in road building
easy flow 12
describes a liquid that runs easily
effectiveness 1
the ability to do things in the right way
efficiency 1
the ability to do the right things
electric cable 25
the wire used for conducting electricity
together with the outer plastic cover
electric window 11
a side window which goes up and down with an electric motor operated by a switch
electrical 10
dealing with electricity
electrical appliance 19
a piece of equipment, e.g. a TV, washing machine, which is powered by electricity
electrical energy 19
electricity
electrical power supply 24
the use of oil to generate electricity which can be used to supply electrical power to users
electrical system 11
the system that generates, stores, and distributes electrical current to the engine to start it and keep it running; the electrical system also gives power to the lights, the heater motor, radio, and other accessories
electrician 15
a craft worker who installs, maintains, and repairs electrical systems in buildings
electromagnetic 28
magnetism developed by a current of electricity
electromagnetic wave 28
a wave generated by an electromagnetic field. Examples includes radio waves, infrared, visible light, ultraviolet, X rays, and gamma rays.
electron 17
one of the elementary particles of an atom
electronic 10, 28
concerning the science (and its application) that deals with the behaviour of electrons in equipment such as TV's, computers, and radios
electronic circuit 16
a set of electronic parts in an appliance, e.g. a TV or radio
electronic message 6
a message which is sent and received as data, often through a network
electronic processing 17
the activity of performing calculations with a device, such as a calculator or a computer
electronic system 17
a device which is based on the principles and behaviour of electrons, e.g. a computer
electronics lab 18
the place (laboratory) where a scientist works to examine and test electronic equipment
electroplate 10
to cover with a thin layer of metal using electrolysis, e.g. car components
email software 5
a program that allows you to send and receive electronic messages
embroider 30
to decorate a fabric with needlework stitching, either by hand or machine
emission 17, 25
the production of radiation by a radio transmitting station
emit 17
to send out (electrons)
energy 17, 18, 20
the capacity of a physical system to do work; usable power, such as heat or electricity
engine 11, 10
a device for changing fuel energy to mechanical energy
engineer 3, 10
a person who uses scientific knowledge to solve practical problems
entertain 17
to amuse, interest or inform, e.g. by means of radio, TV, music, etc.
entertainment 17
programmes on TV, films at the cinema, etc., that give pleasure, amusement or information
envelope 7
a paper covering for a letter
environmental 18
relating to the natural conditions, e.g. air, water, and land, in which mankind lives
environmental control 15
a system for remote control of electronic devices. Using it, a person can independently turn lights, radio, and television on and off, answer or make phone calls, and unlock a door.
environmental engineer 22
a technical person who checks that the mining activities do not damage the natural conditions, e.g. air, water, and land
epilepsy 14
da disease causing uncontrolled movements
equipment 1
machines used in production
erection 15
a building or structure, or the activity to construct one
error 8
a mistake
estimate 21
1. to make an approximate calculation; 2. an approximate calculation
ethylene 12
the simplest olefin; it is a sweet smelling gas that is used to make plastics
evacuate 23
to take all the people away from a place because of risk to their safety
evaluate 1, 4, 13, 18
to calculate the value of something
excavate 22
to remove soil and/or rock materials from one location and transport them to another
excavator 20
a tool to dig out and take away earth or minerals
exceed 8
to be greater than
executive 11
a range of large, comfortable cars designed for executives
exemption 13
the state of being free from something, often an obligation to pay for something
exhaust manifold 11
the connecting pipes between the exhaust ports and the exhaust pipe
exhaust system 11
the system of pipes and equipment that carry the exhaust gases from the exhaust manifold out into the atmosphere
expansion card 5
you plug this into a slot to add features such as video, sound, modem and networking
expectation 8
how the customer sees an organization's products and services and the extent that these will meet their needs and requirements
experiment 3, 4
a study
experimental 3
describing a situation in which investigators are testing something
experimental development 3
the process of working out something new in a laboratory
experimentation 3
the process of tests and trials to see what happens under different conditions
experimenter 3
a research worker who conducts experiments
explode 24
to undergo a rapid chemical reaction which produces a loud noise
exploit 22
to turn a natural resource into an economic, i.e. saleable, resource. For example, to exploit a mineral deposit
exploratory 23
done to find out if there is oil or gas
explore 4, 22
to investigate, to look for; to search for coal, mineral, or ore
explosion 9
a loud noise made by a bomb or something similar
explosionproof 16
a device that is capable of undergoing a explosion
exploitation 12, 24
a research worker who conducts experiments
export 7
a shipment of goods to a foreign country
exterior skin 15
includes all the surfaces of the roof, chimney, exterior walls, window, porches, doors, and the above-ground portion of the foundation
exterior wall 15
an outer wall other than a party wall
extract 13, 17, 22, 23
1. to take out, usually something useful; to remove coal or ore from a mine; 2. the useful thing that is taken out
extraction 17
the process of taking out information from a signal
extrusion 25
a process in which hot molten plastic is squeezed through a nozzle to make long lengths of special shapes like pipes

fabric 30
a cloth produced especially by knitting or weaving.

fabrication 25
a process in which sheets of plastic are cut to shape and then folded by heating a narrow line through the plastic. When it is soft, the sheet will bend along the heated line. Sheets can be joined together by gluing, or by welding. The joint is heated with hot air and a thin filler rod is forced into the gap.

facilitate 8
to make easier

facsimile 29
a system of telecommunication for the transmission of fixed images which can be received in a permanent form, usually on paper

factory 1, 7
a place where goods are made

factory inspection 13
a detailed check of a factory, especially to ensure that production meets legal requirements

failure 1.8
breaking down; stopping working

fast drying 12
describes a finish (paint or other liquid) that dries quickly

fault 1
when a machine does not work properly

fax 29
See facsimile

FDA 13
See Food and Drug Administration

feasibility 3
the possibility that a project or development will completed successfully and within a reasonable time.

feasibility study 21
an investigation to assess both financial and engineering aspects of a project.

feasible 3
capable of being done successfully and within a reasonable time

feature 11
an additional characteristic in a car, usually at an extra cost, which makes the car more exclusive, e.g. alloy wheels, climate control

feed 26
1. to give food; 2. food given to animals

feed supplement 26
See animal feed supplement

feedback 4
the information that tells you how well you have performed

feeder 16
a set of conductors that starts at a main distribution centre and supplies power to one or more secondary or branch distribution centres

feldspar 22
a group of rock-forming minerals that make up 60% of the earth’s crust

fell 27
to cut down a tree

felting 30
a method for creating fabric by using heat, moisture, and pressure

ferment 13
to change chemically as the result of the addition of an organic compound, e.g. yeast

fermentation 26
a chemical change such as when a carbohydrate is transformed to carbon dioxide and alcohol

fertilizer 26, 12, 24
a substance which makes soil more fertile

fibre 12, 30
a long thin thread of material used to make textiles

fibre optic cable 28
a high-bandwidth transmission wire that uses light to carry digital information. See also optic cable.

fibre optics 16
glass fibres that are used for data transmission

fibre processing 30
the treatment of fibres into finished products – cloth, fabric or textile

fibreglass 11
a mixture of glass fibres and resin that produces a very light and strong material; it is used to build car bodies and to repair damaged areas

fidelity 17
the extent to which a signal (sound or picture) is close to the original, as in hi-fi (high fidelity)

file 5, 29
a program, document, utility, in fact anything that isn’t hardware on a computer

file a patent 3
to apply for an exclusive right by law to make use of and exploit an invention for a limited period of time

findings 3
a written statement of facts and conclusions based on the evidence presented

finished design 21
the final design stage in which the drawings for the construction are prepared

finished product 1
a product sold as completed: finished products are products ready for sale

fire 19
a device in a house that produces heat

firmware 18
software that is stored in a hardware device and that controls the device

fixture 16
a piece of equipment that cannot (easily) be moved, e.g. a junction box

fixtures 1
machines or equipment which are attached to the land or factory building, and are therefore classified as real property

flame resistant 12
describes a substance that can prevent burning

flame-retardant 12
describes a substance that can reduce, or delay burning

flammable 9, 23
describing a material that burns easily

flavour 12
the characteristics of a food that cause a simultaneous reaction of taste on the tongue and odour in the nose

flexible 25
that can be easily bent

floor 15
a level of a building, e.g. the first floor in a block of flats

flour milling 26
the process of grinding wheat into flour

flow 1, 2, 7
to move smoothly and without stopping

flow rate 23
the rate at which oil flows out of a well

fluid mechanics 20
a branch of mechanics that deals with the properties of liquids and gases

flume 20
a sloping passage or pipe to carry water, e.g. to a power plant

fluoride 12
a compound which occurs naturally in both groundwater and surface water; it is added to toothpaste to provide protection against tooth decay

Food and Drug Administration 13
the U.S. Agency responsible for overseeing food and pharmaceutical products. See also Medicines Control Authority.

food hygiene 26
the practice of keeping food clean in order to avoid illness

food packing 26
the process of putting food into packaging for sale

food poisoning 26
illness caused by bacteria or unwanted chemicals in food

food preservation 26
the activity of keeping food safe for eating

footbridge 20
a bridge for pedestrians

footwear 26
shoes

forecast 2
1. to say in advance how many items will need to be produced; 2. the number of items which will need to be produced

foreign matter 30
something that should not be there

forge 10, 11
to shape metals by heating and then hammering, e.g. horse shoes
forklift truck 7
a machine which picks up and moves goods

formation 23
the rock around the borehole

forward 7
to send on

fossil fuel 19
combustible material which comes from ancient living things

found 10
to melt metal and then pour it into a form, e.g. iron components

foundation 15
the supporting part of a structure below the first floor construction

fraction 24
either a pure chemical compound or a mixture which is distilled from petroleum

fractional distillation 24
the process to distill either a pure chemical compound or a mixture from petroleum

freeze 26
to make something, e.g. food, very cold

frequency 4
the number of times an event happens

frequency modulation 28
where voltage levels change the frequency of a carrier wave

glass 27
a highly reflective, shiny surface

glossy 12
shiny; describes a surface from which much more light is specularly reflected than is diffusely reflected

goggles 9
large glasses which some workers wear to protect their eyes

goat 22
a soft, yellow, valuable metal. It is used for coins, jewelry, decoration, dental work, plating, and for coating certain space satellites. It is a standard for monetary systems in many countries.
grade 27
paper is classified into different grades according to the end use, the pulp used and the treatment of the paper

graphic software 5
a program that allows the user to see text and images on a computer screen

granite 22
a rock in which quartz constitutes 10% to 50%
greenhouse effect 19
the warming of the earth caused by the presence of certain gases in the atmosphere
ground 16, 27
1. to polish or sharpen by rubbing on a rough surface, e.g. stone; 2. to crush into particles

groundwood 27
unintentionally flows to ground circuit failure where current

growth 133
the act or rate of increasing in size
growth regulator 26
plant substance that controls how plants or crops grow
back 6
to gain illegal access to a computer or network
haemorrhage 14
an uncontrollable flow of blood
handle 9
to touch with one’s hands
harbour (AmE harbor) 20
a protected place where boats can stop
hard 12
describes a material that is compact, solid, and difficult to deform
hard hat 9
hard hat which some workers wear to protect their head (from falling objects)

harden 10, 25
to make a material strong, e.g. steel
hardware 5
computer machinery, such as the CPU, disk drives, monitor, and printer. Contrast with software.
harmful 9, 13
causing damage or injury to a person
harvest 13
to gather in the crops when they are fully grown: the crops which are ready to be gathered in
haul 7
to carry, especially heavy goods
hazard 9
danger
hazardous 25
dangerous
headframe 22
the steel or timber frame at the top of a mine shaft
healthy 13
not having any illness
heart attack 14
a medical condition caused by irregular beating of the heart
heat 24, 25
1. to make hot; 2. a high temperature
heat exchanger 19
equipment or process to control the flow of heat at a desired rate
heat resistant 12
relating to the ability of a material to prevent heat from flowing through it
heating 15, 19
the system needed to keep a building at a required temperature, especially during the winter
herbicide 12, 26
a substance that destroys unwanted plants, e.g. weeds
hereditary 14
to describe a disease which is passed on from parent to child
high bandwidth 28
the bandwidth determines the rate at which information can be transmitted through the circuit: high bandwidth allows more information to be sent in a given amount of time
high speed 17
very fast
high voltage 19
See voltage
highway 10
a wide main road
home computer 18
a computer (an electronic device that can store and recall information, and make calculations very quickly) that is normally used at home rather than in a company
hospital 13
a place where ill people are treated
hub 6
a device which handles data arriving from one or more directions and forwards it in one or more other directions
hydraulic 10
concerning the pressure of water or other liquid
hydraulic power 19
the energy produced by the movement of water
hydraulics 20, 21
a branch of science that deals with practical applications of water in motion
hydrocarbon 23
a naturally occurring organic compound made up of hydrogen and carbon
hydroelectric energy 19
the electrical energy produced by the power of falling water
hydroelectric scheme 19
a system for producing electrical energy by the power of falling water
hydrogeologist 22
a person who studies and works with groundwater
hygiene 26
practices which keep a place, e.g. a kitchen, clean
hygienic 25
good for health, not causing disease
identify 4
to find out the identity of something
idle 2
not working, especially for a piece of equipment
illness 13
mental or physical problem
image 17, 29
a two-dimensional representation of a scene, a picture
imaging equipment 18
a piece of equipment, e.g. a scanner, that can produce a visual representation of an object, such as a body part, for the purpose of medical diagnosis or data collection
immobilizer 11
a device that makes a car immobile (unable to move)
impair fertility 9
to damage the ability to have normal children
impairment 14
reduced ability
import 7
to receive goods from a foreign country
improve 4, 3
1. to make better; 2. to become better
improvement 8
the situation where something is better
impurity 24
a substance which is mixed with the oil so that it is not pure
in transit 7
in passage
incineration 25
the process of burning a material to dispose of it
increased reliability 17
describing the ability to work for a longer time without breaking down
inductor 17
a passive electronic component that stores energy in the form of a magnetic field
industrial 10
concerning factories
industrial automation 18
the practice of using equipment in a factory which does not need (much) human control
industrial gas 12
a gas used in an industrial process, e.g. the production of steel, plastics, chemicals, pulp and paper, microchips, auto parts, rubber, textile, glass, etc.
infectious 14
describing a disease that can be spread, especially in the air or water
influenza (flu) 14
da disease in which the patient has a usually mild fever
information extraction 17
technology which takes the meaningful message from the electronic signal
infra-red computer connection 29
a type of connection that allows data to be wirelessly transmitted from one device, e.g. a computer directly to another device, e.g. a computer, when the infrared window on one device is lined up with an infrared sensor on the other device
inject 23
to put in a liquid
injection moulding 25
a process in which molten plastic is squeezed into a mould to make lots of identical objects. They can be very small like a washer or quite large, like a bowl or a clothes basket.
inlink printer 5
a printer that places extremely small droplets of ink onto paper to create an image
innovate 3, 4
to begin or introduce (something new) for or as if for the first time
innovation 3
a new technique or idea
innovative 3
being or producing something new
innovator 3
someone who helps to open up a new line of research or technology
inorganic elements and compounds 13
substances made with the use of chemicals
input 1
work or materials which go into production
insultor 25

a material, e.g. plastic, which does not allow heat or electricity to pass through

intake manifold 11

the tubes that connect the base of the carburettor to the intake ports

integrate 17

1. to put together so that the resulting product can work more efficiently, 2. the process of putting together so that the resulting product can work more efficiently

interconnect 6

to connect a telecommunications device or service to the public switched telephone network

interference 28

undesirable signals caused by two or more signals combining together; interference can be constructive or destructive

interference immunity 28

the ability of equipment to receive signals without the loss of accuracy

interior partition 15

an inside wall that separates two rooms

internet 6

a worldwide collection of interconnected networks, providing a wide variety of services

internet service provider (ISP) 6

a company that provides businesses and consumers with access to the internet.

interview 4

1. to ask a person asks questions in order to collect information; 2. the meeting at which a person asks questions in order to collect information

intranet 6

a network internal to an organization that uses the same methodology and techniques as the internet

inventory 1

items held in stock, work in progress and finished items

inventory control 8

to control and maintain the right amount of each item in stock or to provide the required level of service at minimum cost

investigate 4, 13

to search or inquire into

iron 22

the fourth most common element, by weight, making up the crust of the earth. Its symbol is Fe

irradiation 26

the application of X rays or ultraviolet light to make food last longer

irreversible effects 9

a result that cannot be changed back to its original state

irrigation 20

the system of supplying land with water by artificial means

ISP 6

See Internet service provider

jack 29

a socket which is used to complete an electrical connection. A plug is inserted into a jack to connect switches to electronic devices.

jelly 24

a material that is between liquid and solid

join 25

1. to bring together, to connect; 2. the place where two or more materials are connected

juncture (electrical) box 16

a connection point where several cables are connected

keep...dry, clean, away from children, etc. 9

to cause something to continue to be... dry, clean, away from children, etc.

kelly 23

a long square steel bar with a hole drilled through the middle through which fluids flow

kerb (AmE curb) 20

a line of raised stones between the pavement and the road

kerosene (AmE) = paraffin (BrE) 24

an oil made from petroleum which can be burned to give heat and light

keyboard 5

the device, consisting of letters, numbers and symbols, that a user types on to input information to a computer

kinetic energy 19

the power of something moving, e.g. running water

knit 30

1. to construct a fabric by looping yarns together either by hand or by machine

knitting mill 30

a factory where knitted fabrics are made

kraft 27

a high-strength paper made almost entirely of unbleached kraft pulp. Kraft paper is suitable for the production of paper sacks and paper bags.

lab technician 3

a technical specialist who works on scientific experimentation or research.

laboratory (lab) 3, 13

a place where experiments are carried out

lace-making 30

the activity of making lace (a decorative fabric made by knotting or twisting threads)

lading 7

the freight shipped; the contents of a shipment

LAN (local area network) 6

a group of personal computers linked together in order to share resources, such as programs, data, and peripherals

laptop (lap top) 5

a type of computer that is easily portable.

laser 28, 16

a narrow beam of light that can be used to read barcodes in a supermarket, play compact discs, etc.

laser printer 5

a printer that uses a laser beam to produce fast, high-quality output

laundry 30

to wash clothes

layer 23

a thicknless of rock laid over oil or gas

layout 1

the arrangement of equipment and tools

LCD screen 29

a liquid crystal display consisting of two plates of glass with liquid crystal material between them

lead 22

a bluish-white shiny metal; it is very soft, highly malleable, ductile, and a poor conductor of electricity; it is very resistant to corrosion; its symbol is Pb

lead time 2

the time between two events, e.g. between an order being placed and its delivery

LED (light-emitting diode) 28

a semiconductor that produces light when activated

licence 13, 23

(1he written document that gives) permission to do something, usually in return for payment

lift (bridge) 20

a bridge that can be lifted to allow boats to pass through

light 16

the electric system that produces artificial light

light-emitting diode 28

See LED

lighting 15

the electrical system that lights a room or building.
the control of the movement of materials

See also attenuation.

lubricant 24
a substance, often oil, which makes solid surfaces move more easily together

lubricate 24
to put a substance, often oil, onto a solid surface to make it move more easily against another solid surface

lubricating oil 24
an oil which makes a solid surface move more easily against another solid surface

lubrication 24
the process of putting a substance, often oil, onto a solid surface to make it move more easily against another solid surface

luxury 11
top-of-the-range cars, offering speed, comfort and lots of features, at a high cost

machine part 10
a part of a machine

matchbox 27
a small box for matches

mechanical 10
describing something that is moved or operated by machinery

mechanical shovel 22
a mechanical shovel or other machine for loading coal, ore, mineral, or rock
mechanics 10, 20
the science of the action of forces on objects
median 4
the middle value in a distribution
medical instrumentation 18
objects used in the field of medicine, also medical instruments
medicinal drug 13
a drug that is taken for healing, rather than recreational purposes
Medicines Control Authority 13
the U.K. Agency responsible for overseeing food and pharmaceutical products. See also Food and Drugs Administration.
medium 11
a range of medium-size cars sold at a moderate cost
meet 8
to reach the expected level
melting point 15
the temperature at which a solid turns into a liquid
memo 29
a short communication that reminds someone of something
message 29
a communication sent from a person or program to another person or program
metal 20
small, broken stones used to make the surface of roads
metallic-pair circuit 28
a pair of wires which connect the subscriber's network termination to the fixed public phone network
metallicous 22
containing metal or metals of the heavier type
methanol 12
a colourless, toxic, flammable alcohol with the formula CH₃OH, which boils at 64.5°C, and mixes with water, ether, alcohol; used in manufacture of formaldehyde, chemical synthesis, antifreeze for autos, and as a solvent
me-too product 3
a product that has been made using principles, practices, or designs copied from and closely similar to a competitor
microphone 29
a device which modulates an electric current so that it can transmit or record sound
microwave 28
1. the portion of the electromagnetic spectrum above about 760 megahertz (MHz); 2. high-frequency transmission signals and equipment that employ microwave frequencies, including line-of-sight open-air microwave transmission and, increasingly, satellite communications
midwife 14
a medical professional who delivers babies
mill 27
the factory where paper is made
mine 22
1. to get ore, metals, coal, or precious stones out of the earth; 2. an opening or excavation in the ground for the purpose of extracting minerals
mine car 22
a car that can be loaded at production points and hauled to the pit bottom or surface in a train
miner 22
a person engaged in the business or occupation of getting ore, coal, precious substances, or other natural substances out of the earth
mineral 22
a natural resource extracted from the earth for human use; e.g. ores, salts, coal, or petroleum
mini 11
a range of small cars, usually sold at a cheap price and offering good fuel economy
mining 10, 22
the process of removing soil and/or rock materials from one place and transporting them to another; the science, technique, and business of mineral discovery and exploitation
mining engineer 22
a specialist in one or more branches of work. Activities may include prospecting, surveying, sampling and valuation, technical underground management, ventilation control, geological examination, and company administration.
mint 10
to make a metal piece by stamping, e.g. coins
mitigation 13
steps taken to avoid or minimize negative environmental influences
mobile 29
able to move
mobility 29
the capacity or ability to move or be moved
mode 4
the single category among the categories in the distribution with the largest number of observations
model 11
a vehicle can be identified by features, e.g. manufacturer, make, engine size
modify 4
to change
modifying compound 25
chemical combinations of materials which make a finished plastic product
modulation 17, 28
the process of changing a signal for transmission by phone, radio or TV
molten 25
the liquid state that results when a solid, e.g. plastic, is heated to a very high temperature
monitor 5, 8
1. a piece of equipment, like a TV, on which the user can see text and graphics; 2. to check
monomer 25
the simple form of a chemical (derived from oil, coal or natural gas) from which plastic is made. See also polymer
motor 19, 16
a machine that changes power, especially electrical power, into movement
mould (AmE mold) 11, 25
a hollow form into which very hot metal or plastic is poured to form a product in the desired shape
mouse 5
a small device with a ball on the bottom. As you move the mouse across a surface, the ball turns, turning receptors inside the mouse, which send signals to the computer.
movement 7
transportation
MPV 11
See multi-purpose vehicle
muffler (AmE) 11
See silencer
multipair cable 28
one of four basic types of wire found in telecommunications, a multiconductor cable with a single outer insulation and many internal balanced (twisted-pair) lines bundled into a common sheath. The other types are single-wire line, open-wire pairs, and coaxial cable.
multiple sclerosis 14
a disease which, over time, causes loss of movement and control of bodily actions
multi-purpose vehicle 11
a range of cars which combines comfort for 6-8 passengers and their luggage, style and performance
nap 30
1. to raise the surface of a fabric by brushing; 2. the soft, brushed surface of a fabric
natural gas 19
gas which is taken from under the earth or seabed
navigation 18
used to describe the equipment that keeps a vehicle, e.g. a car, ship or plane, on the right course
needs (usually pl) 8
what someone, usually the customer, needs. See also requirements.
net-making 30
the activity of making net (an openwork fabric made of threads or cords that are woven or knotted together at regular intervals)
network 6, 29
any number of computers (e.g. PCs and servers) and devices (e.g. printers and modems) joined together by a physical communications link
neurosis 14
a mental disorder in which the sufferer has unreasonable fears about the real world
newspaper 27
an inexpensive type of paper made from wood pulp or recycled paper, used mainly for newspapers
nitrate 12
a compound containing NO₃ and including nitrogen and oxygen with more oxygen than a nitrite
noise 9, 28
unwanted or unpleasant sound
noisy 9
loud
non-load-bearing wall 15
a wall that doesn't support a vertical load
nonmetalliferous 22
not containing metal. See also metalliferous.
non-rusting 25
the quality of plastic not to oxidize (rust)

norm 4
a standard
notebook (note book) 5
a small compact computer, smaller than a lap top
nozzle 25
the narrow end through which hot plastic is squeezed
nuclear energy 19
energy which is produced in a power station using the nucleus of an atom
nuclear physics 21
the study of an atom's nucleus, and the interactions of its parts
nuclear plant 19
a power station which produces nuclear energy
nuclear power plant 19
See nuclear plant
nuclear power station 20
a place where atomic energy is produced
nurse 14
a medical professional who looks after the sick, often in hospital
nutrient management 12
the use of a combination of fertilization techniques to ensure healthy growth of crops
nutritionist 14
a medical professional who specializes in food and food disorders
nylon 30
a synthetic fibre that is strong, silky, resistant to creases and stains, and washable
observe 13
to watch closely
obstetrician 14
a medical professional who specializes in the birth of children
occupational health 9
the area that deals with your health at work
occupational therapist 14
a medical professional who helps patients recover from their illness by helping them to start work again
octave 27
the size of a piece of paper after it has been folded 3 times, i.e. there are 8 pieces
odour 13
smell
offshore 23
places in oceans, seas or large lakes. See also onshore.
oil 12, 19
a viscous, combustible liquid that does not mix with water
oil and gas 18
used to describe the industry which looks for, extracts and produces oil and gas for industrial or commercial use
oil field 23
a place where oil can be extracted
oily 23
covered with oil; having the feel of oil
olefin 12
a family of unsaturated, chemically active hydrocarbons with one carbon-carbon double bond, made by cracking alkanes and used to make plastics and antifreeze omnidirectional antenna 29
an antenna that is equally effective in all directions
onshore 23
on the land. See also offshore.
opacity 27
the quality of paper to let the light through
open coal fire 19
a small open area (without doors) in a house where coal is burned to produce heat
open-pit 22
a type of mine where the minerals are extracted from the surface. See also strip mine.
open-wire pair 28
one of four basic types of wire found in telecommunications, this is a parallel copper wire for the forward and return current path. The parallel arrangement produces a balanced transmission circuit; however, cross talk is more difficult to eliminate. The other types are single-wire line, coaxial cable, and multipair cable.
operating system 5
the basic set of instructions that a computer uses to operate
operations 1
the production system in a service industry
optic cable (also optical cable) 28
a cable made of glass fibres through which signals are transmitted as pulses of light. It is a broadband medium that can easily provide capacity for a large number of channels.
optical communications 28
a technology which transmits signals in the form of light along fibres made of glass or plastic
optical fibre 6
a plastic or glass (silicon dioxide) fibre no thicker than a human hair that carries signals in the form of laser light pulses. An optical fibre pair can carry thousands of telephone calls at the same time, or a combination of video and voice. An optical fibre cable can contain tens or even hundreds of fibres.
optical transmission 28
a process which sends signals in the form of light along fibres made of glass or plastic
 optimization 2
the process of using equipment in the best possible way
optimize 1
to get the best use of something, e.g. a machine
ore 22
the naturally occurring material from which a mineral or minerals of economic value can be extracted
organic compound 13
a compound (material made up of two or more elements) containing carbon
organize 5
to plan to put together in an orderly way
ornamental 22
describing any stone of beauty and durability used for decoration
orthodontist 14
a medical professional who specializes in putting teeth straight
orthopaedist 14
a medical professional who specializes in straightening (children's) bones
osteopath 14
a medical professional who treats patients by moving and applying pressure to muscles and bones
output 2
the volume of goods which are produced
overcurrent 16
a current higher than the rated current for a device or conductor. An overcurrent can result from an overload, short circuit, or ground fault.
overload 16
the result of too much electricity passing through the system
overtime 2
the working time in addition to normal working time
oxide 12
a compound of oxygen and another element; magnetic tape is coated with fine particles of manganese oxide
pack 7
1. to put into containers, e.g. boxes, cartons, packaging, ready for transportation; 2. the goods in a container
packaging 7, 27
materials, either paper or plastic, used to protect goods in transit
packet 6
a block of information; a collection of bits that contains both control information and data, and is the basic unit of transmission in a packet-switched network
packet-based 29
a method of transmitting messages through a communication network, in which long messages are subdivided into short packets and routed to their final destination
packing list 7
a document prepared by the shipper listing the kinds and quantities of goods in the shipment
paddle 20
a sluice that is raised and lowered to allow water in or out of a lock
paediatrician 14
a medical professional who specializes in children's diseases

paint 24
1. to put a liquid (a pigment plus oil or water) on a surface to change its colour; 2. a liquid (a pigment plus oil or water) that can be put on a surface to change its colour

paint finish 12
a paint's finish affects how shiny the finished paint surface will look

paint shop 11
the place in automobile manufacturing where the body of a car is painted

painter 15
a worker who uses pigments to decorate and protect coatings

paints and coatings 12
a group of emulsions generally consisting of pigments suspended in a liquid medium for use as decorative or protective coatings. Modern paints and coatings consist of very many compounds designed to fulfill the different requirements of hundreds of thousands of applications.

pallet 7
a platform with or without sides, on which a number of packages or pieces may be loaded so that they can be moved more easily, e.g. by forklift truck

panelboard 16
electrical power distribution device in commercial and industrial applications which provide circuit control and overcurrent protection for light, heat or power circuits

paperboard 27
thicker paper

papemaking stock 27
a mixture of water and fibres

paraffin (BrE) = kerosene (AmE) 24
an oil made from petroleum which can be burned to give heat and light

paramedic 14
a medical professional who helps at the scene of an accident, but who does not have the same training as a doctor

Pareto chart 8
a graphical tool for showing causes from most significant to least significant. It is based on the suggestion that most effects come from relatively few causes; that is, 80% of the effects come from 20% of the possible causes. The Pareto chart is one of the "seven tools of quality".

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part 11
a component of a vehicle

particle size 13
the size of a tiny mass of material

PAS 11
See power-assisted steering

passive 17
a passive device does not need a source of energy for its operation. See also active.

pasteurization 26
process to destroy dangerous organisms in liquids, e.g. milk, by heating

patent 3
an exclusive right by law for inventors to make use of their inventions for a limited period of time

patient 13
a person who goes to hospital for treatment

pavement 20
a special area where pedestrians can walk

PBY 29
See Private Branch Exchange

PDA (Personal Digital Assistant) 29
a handheld computer that serves as an organizer for personal information

peat 22
peat is formed in marshes and swamps from the dead and partly decomposed remains of the marsh vegetation

pedestrian crossing 20
a place where pedestrians can cross a busy road

people carrier 11
a range of large vehicles, which combine size and comfort

permit 23
a document which allows you to do something

personal organizer 29
See PDA

pest 26
an animal or insect which damages food

pest control 26
the activity of stopping animals or insects from damaging food, either by better hygiene or by chemicals

pest management 12
the reduction of pest problems

pesticide 12, 26
a substance that kills or destroys small animals

petrochemical 12, 24
a chemical derived from petroleum or natural gas

petrol (BrE) 24
an oil made from petroleum used to power cars, planes, etc.

petroleum 19
mineral oil found under the earth or seabed which is used to produce petrol and other chemicals

petroleum production 10
the process which takes crude oil and turns it into petrol

pharmaceutical 18
relating to the production of medicine

pharmaceuticals 12
describing drugs or medicines in general

pharmacist 14
a medical professional who sells medicines

phone line 29
includes all wires, cables, instruments, etc., to make a phone call

phosphate rock 22
a mineral containing the element phosphorus, a basic plant nutrient; it is essential to all forms of life and is used in the manufacture of fertilizer

physical 10
concerning material things

physical connection 6
a link made with cables

physics 10
the science which deals with matter and natural forces

physiotherapist 14
a medical professional who uses exercise to help patients to use their bodies again

picking list 7
the list of products to be taken to fulfill an order

pickup 11
a truck with a closed cab and an open box

pic chart 8
a graphical tool, drawn like a cake, that helps you to visualize the relative importance of several categories of a variable

pier 20
a structure built out into the water, usually a sea or a lake, which can be used as a landing place for boats, in a walking area for pedestrians or to protect a harbour

pile 15
a long substantial pole of wood, concrete or metal, driven into the earth or sea bed to secure a firm foundation, on which the foundation footing is laid

pill 14
a tablet

plumber 3
a small-scale experiment

pipeline (in the pipeline) 3, 24
undergoing preparation, production, or completion

placebo 13
a substance which is given in place of a real medicine

planning 1
the stage in a process when you say what you are going to do (see also controlling)

plant 1, 13
a factory

plasterer 15
a craft worker who covers walls and ceilings with a material, usually made of portland cement mixed with sand and water

plastic 12, 24
a carbon-based substance consisting of long chains (polymers) of simple molecules

plastics and fibres 12
man-made polymers, made by the chemical industry, using raw materials obtained from crude oil

plate 10
1. to cover one metal with a thin layer of another, e.g. silver plate; 2. the metal covering

plate girder 20
a horizontal iron or steel place in a building or bridge that supports vertical loads

platform 23
an offshore structure from which wells are drilled
pneumonia 14
a serious disease of the lungs which causes
difficulty in breathing

poison 9, 14
a substance which is harmful if eaten or
drank

polish 30
1. to smooth the surface of a fabric;
2. material used to smooth the surface of a fabric

pollutant 24
something that makes the air, water or soil
dirty

pollute 24
to make the air, water or soil dirty

pollution 24
the effect caused by making the air, water or soil dirty

polyester 30
a synthetic fibre that is crease resistant,
quick drying and strong, used in clothing
and carpets

polyethylene 12
a polymer made from ethylene; it is a
tough, sturdy plastic film having very
good, low temperature characteristics

polymer 25
the compound form of a chemical made
from a number of monomers. See also
monomer.

propylene 12
a derivative of propylene used to make
plastics and fibres, with a wide range of
applications, e.g. kitchen tools and carpets

porosity 27
the porosity describes the extent to which a
paper’s surface allows air to pass through
and ink to penetrate. Generally, coated
papers have low porosity and hold ink on
the surface well.

portable 29
describing something that can be easily
carried

poster 27
a type of highly mechanical, highly filled,
mostly coloured paper that has been made
weather resistant by sizing

post-harvest handling 26
activities in the food and fibre sector that
occur after agricultural products are sold
from, or leave, the farm

pothole 20
a hole in the surface of a road caused by
traffic or bad weather

power 15, 16, 18, 24
the force generated by electricity or other energy

power assisted steering 11
a steering system in which a hydraulic
pump helps the driver to turn the steering wheel

power plant 19
a place where energy is produced, e.g.
nuclear power plant, gas power plant

power station 19
see power plant

power train 11
an engine and transmission combination

powerhouse 19
See power plant

practical application 3
the action of using something for a
particular purpose

precautionary 9
describing action taken to stop loss,
damage or injury

preliminary design 21
the development stage in which
dimensions, materials and costs are
estimated

preliminary feasibility study 21
an investigation to assess both financial and
engineering aspects of a number of
proposals in order to choose one or more
for more detailed examination

preservative 13
a substance, usually a chemical, that
helps to keep something good for a longer time

press 26, 27, 30
to squeeze out liquid by pressure:
to squeeze out water between rollers (in
papermaking)

press shop 11
the production stage in automobile
manufacturing when the bodywork
panels are pressed into shape

pressure 23
the natural force of the oil underground
which can push it naturally out of the well
prevent 8
to stop something happening

prevention 8
the action of stopping something from
happening

prioritize 8
to organize activities according to their
importance

Private Branch Exchange (PBX) 29
a private telephone network used within
an organization. Users of the PBX share a
certain number of outside lines for
making external calls.

process 5, 8, 21, 1, 12, 24
1. to examine data; 2. a system(s) used to
manufacture products; 3. to change a raw
material into a finished product

process control 8
methods to keep a process within
boundaries and minimize the variation of the
process

processing 26
the treatment of agricultural outputs into
finished (food) products

produce 1
to make

product approval 18
the process which gets permission for a
product to be used

product development 3
changing and improving a product to
achieve the best possible result

product labelling 13
the use of written, printed, or graphic
materials with a product or its container or
wrapper, giving information about the
product and its use

production 10
1. the department of a company
concerned with making something, often
in a factory; 2. the activity of making
something in a factory

productivity 1. 2
the output rate per worker or per machine

proposal 21
a suggested plan for a structure, usually
giving technical and price information

prospector 22
a person who looks for valuable minerals

protect 9
to keep safe from loss, damage or injury

protection 9
the act or material to keep someone or
something safe from loss, damage or injury

protective 9
describing something that keeps someone
or something safe from loss, damage or injury, e.g. clothing

protocol 6
rules for communicating, particularly for
the format and transmission of data

prototype 2, 3, 11
the first version of a product

psychosis 14
a serious disease of the mind, where the
patient loses touch with reality

pulp 27
1. to convert wood into a fibrous material
by a mechanical or a chemical process;
2. a cellulose plant fibre cleaned and
beaten into a wet mixture used to form
sheets of paper

pulp and paper 18
the industry which converts wood into
paper

pump 10, 22, 23
1. to force a liquid, air or gas out of or into
something; 2. a machine to force a
liquid, air or gas out of or into something

pure basic research 3
the study of pure scientific principles

pure research 3
research carried out to increase
knowledge about an area with little
concern for any immediate or practical
benefits that might result.
purity standards 13
the extent to which a substance is free from harmful or damaging matter
pylon 20
a tall tower to support the ends of a number of power wires over a long span
qualitative research 4
this type of research gives an in-depth understanding of why people hold particular views. It is used to identify not only what people think but also more importantly, the reasons they hold such views.
quality 1
the level of goodness: the concept of quality concerns how well and for how long a product or service meets the requirements of the customer.
quantity surveyor 15
a person who measures and prices building work
quarry 22
an open or surface mineral working, usually to extract building stone, such as slate and limestone
quartz 22
a mineral which includes amethyst, rock crystal and tigereye
query 5
a question which allows a computer user to extract data from a database
quick-freezing 26
process which keeps flavours in food by reducing the temperature of the food very quickly
quire 27
24 identical pieces of paper
radio 16, 18
a device that uses electromagnetic waves to calculate the distance of an object
radiation 9, 14
the (harmful) effects of heat, light or other energy in the form of energy
radiator 11
equipment which keeps the engine cool
radio 18
a device to receive wireless audio signals
radio transmission 28
the process and technology of sending signals as radio waves through the atmosphere
radio wave 17, 28
a sound wave which is sent or received through the air
radioactive dosage form 14
a medical preparation based on X-rays
radiographer 14
a medical professional who uses X-rays to treat patients
radar 16, 18
the two main radar fibres used in papermaking are cotton and linen. Rag paper consists of 25-60% rag fibre and the rest is chemical wood pulp.
railway line 20
the metal tracks along which trains run
raing 16
describing the ability to stay dry in spite of the rain
raingtight 16
describing the ability to keep rain out
raise 22, 26
1. to keep animals and help them to grow;
2. a vertical or inclined opening in a mine driven upward from a level to connect with the level above, or to explore the ground for a limited distance above one level
RAM (Random Access Memory) 5
the memory that can be used by applications to perform necessary tasks while the computer is on
random 4
having no specific pattern
rate process 10
the speed at which a manufacturing step is carried out
raw materials 1
items which are used in the conversion process from input to output
rayon 30
an early synthetic textile like silk, made from fibres produced chemically from cellulose. It is similar to polyester but more elastic.
react 25
to change when mixed with another chemical
reaction 12
the recombination of two substances using parts of each substance to produce new substances
reaction injection moulding 25
a process in which two chemicals are mixed together and squirted into a mould. The chemicals react together. This is how they make car bumpers, some disposable cups and plates, and the meat trays in supermarkets.
ream 27
500 identical pieces of paper
receive 6, 17, 29
to obtain a signal; to turn electrical waves into sound and pictures
receiver 28
a device that captures a broadcast over the air, or a transmission by satellite or cable or microwave, and then presents it for listening, data processing, or viewing
reception 17, 29
the ability of a radio or television to turn electrical waves into sound and pictures
receptive 17
being willing to take in new ideas (usually of a person)
record 4, 5
1. to set down in writing; 2. all documentary material set down in writing; data which can be stored in an electronic form, e.g. as a file or in a database
recovery 17
the process of returning something, e.g. a radio or TV signal, to its former or normal state so that the information in the signal can be heard or seen
rectify 8
to correct a problem
recurrent 14
something that happens again and again
recycle 9, 25
to prepare a material so that it can be used again, e.g. paper, glass
rededent 28
describing that part of the total information contained in a message that can be taken away without loss of essential information
refine 24, 27
to make pure or clean; to break down into fibres for pulp making
refiner 27
a machine containing rotating disks between which wood chips are broken down into fibres for pulp making
refinery 24
a plant or equipment to clean petroleum
reflected propagation 28
the movement of energy in the form of waves which have contact with a very large object when compared to the wavelength of the propagating wave. Reflection occurs from the surface of the earth and from buildings and walls. See also surface propagation.
refrigeration 26
the keeping of food cool to preserve it
register a patent 3
to record an exclusive right to an invention for a limited period of time
regulated 9
controlled
regulator 26
something which controls, e.g. a plant growth regulator controls the speed at which plants grow
regulatory authority 13
the organization that checks whether rules and regulations are being followed
reinforced-concrete 15
a combination of steel and concrete
relay station 29
an intermediate station that passes information between terminals or other relay stations
release 18
a new version of a product that is offered to users
the extent to which different experiments using the same data produce consistent results.

reliability 4, 17

the quality that an item has when it can perform a required function under stated conditions for a specified period of time

rely 17
to trust someone or something to perform a required function under stated conditions for a specified period of time

removal 22
the process of taking out minerals

repair 1, 8, 18
to mend

repeater 28
a device inserted at intervals along a circuit to boost and amplify an analogue signal

report 4
1. to make or present often official, formal, information; 2. the official, formal, information collected

requirement 2
something that is needed for a particular process

requirements (usually pl) 8
what someone, usually the customer, needs (see also needs)

research 4, 11
1. to investigate the causes and effects of a subject of interest; 2. an investigation into the causes and effects of a subject of interest

research assistant 3
a person who helps with research

reserves (normally pl) 23
the total quantity of oil or gas which can still be extracted

reservoir 23
rock formation containing oil and/or natural gas

resistor 17
an electrical component that limits or regulates the flow of electrical current in an electronic circuit

response 4
a reply, an answer

restore 28
to return a signal to its previous state

retransmit 28
to transmit again

retrieve 5, 29
to get back, e.g. data which has been stored on a disk

reverse osmosis 26
filtration process to remove particles from a solution. It is used to purify water and remove salts and other impurities in order to improve the colour, taste or properties of the fluid.

reversible fabric 30
a fabric that can be worn in two different ways by simply reversing it to the other side

rework 8
to correct a fault in a product

rice milling 26
the process of crushing rice into small grains

rig 23
a structure that contains all the necessary equipment for drilling

rigid connection 15
a connection between two structural members that prevents end rotation of one relative to the other

rinse 9
to wash in clean water

risk 9
danger

road 20
a general word for open ways along which vehicles, persons, and animals can move

road roller 20
a machine with heavy wide smooth rollers used in road making to make the surface smooth

robot 18
computer software that runs continuously and responds automatically to a user's activity; machine that is programmed to do some of the work of man

robotics 16
the study of how robots are made and used

rock 22
in geology, the material that forms the essential part of the earth's solid crust; a combination of one or more minerals

rock formation 23
the particular location and type of rock

rock mapping 23
the activity of drawing a map to show the location and type of rock

rocket 24
a vehicle for space travel

roll 10, 25, 27
1. to turn over; 2. to make flat by pressure applied by a roller, e.g. to make thin sheets of steel by passing it between large rollers; 3. a mass of material in cylindrical or rounded form; a quantity of paper formed into a large cylinder or ball

roof 15
the top cover of a building or structure

roofing felt 15
a fibrous material saturated with asphalt used under the roof

rotary table 23
the revolving or spinning section of the drillfloor that provides power to turn the drill string in a clockwise direction (also called turntable)

rubber 12
a natural, synthetic, or modified high polymer with elastic properties; it is a good insulator

rubbery 25
flexible, easy to bend, like rubber

rug 30
small carpet

run 2
1. to operate equipment; 2. the time when equipment operates; 3. the output from the operation of equipment

safety engineer 22
an employee who inspects all dangerous places in a mine or plant

safety risk 13
da danger; something that can cause injury or damage

safety standard 13
rules or models to ensure freedom from danger

salt 12
the chemical sodium chloride (NaCl), which is used in baking and cooking to add or improve the flavour of food

sampling 4, 8
the process of choosing cases or elements for a study

sanitary 27
a type of paper made from waste paper and/or chemical pulp. These grades are used to make toilet paper and other sanitary products, such as handkerchiefs, kitchen wipes, towels and cosmetic tissues.

sanitary engineering 26
the treatment of animal waste with machines

satellite 28
a man-made object that is sent into orbit around the earth, the moon, etc., for some purpose

satellite communications 18
the use of a man-made object that is sent into orbit around the earth, the moon, etc., to send and receive electronic signals

satin 30
a very shiny, soft fabric made of silk, rayon or polyester. It is often used for formal dresses and men's evening wear.

satisfy 2
to give customers what they want, need or expect

scanner 5
device which analyses an image, and then captures and processes it so that it can be saved to a file on your computer

schedule 2
1. to timetable (a part of) production; 2. a production timetable

scheme 21
a plan

scientific 3
describing knowledge obtained by the collection of evidence or data.

scientist 3
a person who collects evidence or data in order to convert it into knowledge

scrap 8
a product which cannot be used, usually because it has a defect

screen 5
a monitor on which the user can see text and graphics

seal 9
to fasten or close tightly so that air or water cannot get in
search 3
1. to make a thorough examination of;
2. the act of making a thorough examination of or exploration for
search engine 5
a special site on the web that is designed to help you find information stored on other sites. A search engine searches the internet, based on important words, keeps an index of the words it finds, and where they find them, and allows you to look for words or combinations of words found in that index.
secondary feasibility study 21
an investigation to choose the best scheme from those that have been shortlisted
sediment 22
solid broken material that comes from weathering of rocks and is carried or deposited by air, water, or ice
seize 13
to take, usually by force
semiconductor 18, 17
a special type of material with more resistance than a conductor, but less than that of an insulator.
separate 24
to divide into parts
separation 24
the process of dividing into parts
sequence 2
the order of steps in which production will be carried out
server 5
a networked computer that provides services to client computers. Servers include file servers, disk servers, print servers, etc.
service panel 16
main power cabinet through which electricity is brought into a building
serviette 27
soft paper for wiping one’s mouth when eating
set up 2, 11
1. to put in place ready for use; 2. the physical organization of equipment in a workshop or factory
set-up time 2
the time needed to change the physical organization of equipment
severe 14
serious
sewer 20
an underground structure to carry off waste and surface water
shallow 15
not going far down, usually into the ground. See also deep.
share files 6
when two or more users give each other access to electronic information
shear 30
to cut off the wool from sheep
sheet 27
a cut piece of paper
site 1
the place where a factory is built
site investigation 21
a survey of the area where a structure will be built
solution 14
something in the form of a liquid
solvent 24
a chemical substance that dissolves other substances
sort 25
to arrange things into different groups
sound-deadening material 15
a material which prevents the passage of sound
source encoder 28
a device which maps the source into a set of binary strings
space technology 18
practical science which deals with what is outside the earth's air
span 20
the stretch between two supports on a bridge
speaker (= loudspeaker) 29
a device that converts electrical signals into sound waves
speciality chemicals 12
a group of chemicals that improve the performance of paints and coatings, computers and electronic devices, household goods, adhesives, personal care products, etc.
specification 8, 18, 21
detailed plan which states, e.g. the size, weight, functionality of a product
spill 24
to allow a liquid to pour or fall out
spillage 24
the act of allowing a liquid to pour or fall out; the quantity that pours or falls out
spin 26, 30
to draw out and twist fibre into thread
spoilage 26
the action or waste that results when something, e.g. food goes bad
sports 11
a range of small and fast cars
spray drying 26
process to change a liquid into a dry powder or particles
spray gun 11
equipment shaped like a gun which delivers an atomized mist of liquid for painting
spraying 9
the act of scattering liquid in very small drops usually under pressure, e.g. spraying water on a fire
spread footing 15
a type of foundation with a large base, which distributes the weight over a large area, rather than concentrating it
spreadsheet 5
the computer equivalent of a paper ledger sheet, it consists of a grid made from columns and rows, which can make number manipulation easy
squeeze 25
to press a liquid through a narrow hole or space
stability 15, 21
ability to restore to original condition after being disturbed by some force
stamp 11
to form or cut out
standard 4
1. an accepted measure which can be used for comparison; 2. serving as an accepted measure
statistics 4
techniques and procedures for analysing, interpreting and displaying data
steam cracking 24
a process in which hydrocarbon molecules are broken into small fragments by steam at very high temperatures
steam power 19
energy which is produced by the vapour (steam) given off by very hot water
steel 11
hard, shiny metal made from iron
steering system 11
the equipment (steering wheel, steering column, steering gear, linkages, and the front wheel supports) that allows the driver to guide the car and turn the wheels as he wishes
steering wheel 11
the wheel which controls the car's movement
step 21
a part of an activity
stereo 18
a hi-fi or other sound system which gives out sound from 2 places, creating a three-dimensional sound effect
sterile medicament 14
a medicine that is free from germs
stiff 12
describes a material that does not bend easily
stiffness 27
the ability of paper not to bend too easily
still-frame 29
a single image transmitted over a communications link
stock 1, 2
products or materials which are stored and ready to sell or use
stock-out 2
the situation where there is no product for delivery to customers
stope 22
an excavation from which ore has been removed in a series of steps
storage 1, 7, 17
see store
storage capacity 17
the maximum quantity of data that a device can keep (store) in any form, usually for the purpose of orderly retrieval and documentation
storage device 5
a piece of equipment, e.g. a floppy disk, hard disk or CD, on which you can record your data for later retrieval
storage system 17
a physical or electronic method to store items so that they can be easily retrieved at a later date
store 1, 5, 17, 24
1. to put something into a system so that it can easily been found again; 2. the place where materials are kept, e.g. a warehouse storage
strand 20
one of the wires twisted together to form the cable which supports a bridge
stringent conditions 13
demanding strict attention to rules and regulations
practices that set hard standards
strip mining 22
the mining of coal by surface mining methods as distinguished from the mining of metallic ores by surface mining methods
stripping machine 22
a machine used in strip mining to cut the rock
stroke 14
a sudden and serious disorder in the brain which can lead to paralysis of the body
structural 10
concerning the main part of a building
structural works 20
any building work
structure 15, 10, 20
a building
study 4
1. to investigate; 2. the results of an investigation
substance 9, 13
a material: It can be a liquid, a solid or a gas
subsurface 23
the area under the surface
suffer 13
to be ill or in pain
sump 22
an excavation made underground to collect water, from where it is pumped to the surface
sun 19
burning star in the sky
sunroof 11
a panel in the roof of a car which can tilt or slide open, either manually or electrically, to provide extra light and/or ventilation
supercomputer 17
a very powerful computer
superconductor 16
a material that allows electricity to pass through freely at the lowest possible temperature
supermini 11
a range of cars between mini and small family
supplement 26
something that is added, e.g. to animal food, to make it better
support 15
the structural foundation for essential building elements
surface 22
the top of the ground
surface propagation 28
the movement of energy in the form of waves through the lowest portion of the atmosphere close to the earth
surgeon 14
a medical professional who specializes in operations
survey 4, 20
1. to carry out a well-planned research study; to collect data for measurement; 2. a well-planned research study
suspended 20
a structure on which a part of a bridge can be hung
suspension (bridge) 20
a bridge that has its roadway hanging from two or more cables
sustainable production systems 12
a sustainable production system benefits society, the manufacturer and the customer
swamp 22
land which is very wet
sweetener 12
a substance used instead of sugar to make food or drink sweet
swing (bridge) 20
a bridge that moves through 90 degrees to open and allow boats to pass along the river
switch 6, 16
1. to select the paths or circuits to be used for transmission of information; 2. a device that selects the paths or circuits to be used for transmission of information and establishes a connection
switchboard 16
a large panel or assembly of panels containing switches, overcurrent protective devices, buses, and associated instruments
switching machine 29
a device that opens or closes circuits or selects the paths or circuits to be used for transmission of information
switching system 28
a set of one or more systems that act together to route data from its source to its destination
symptom 14
a change in the mind or body that shows that someone is ill
synthesize 24
to make or put together
synthetic 12, 30
artificial
synthetic fibre 12
a fibre made from materials such as glass, rayon, or nylon
synthetic rubber and fibre 24
products which are used in place of rubber and fibre, typically derived from petroleum
synthetics 24
man-made materials that are made by putting together various chemicals
system 16
a group of related (electrical) parts
system failure analysis 8
an investigation into why (a part of) the production system has not worked as intended
systems analysis 10
a study carried out to help a person or organization to take a better course of action and make a better decision than they might otherwise have made
tablet 14
a medicine in a small round form
tail pipe 11
exhaust pipe which runs from the silencer to the rear of the vehicle
talc 22
a mineral which has a greasy or soapy feel, easily cut with a knife
tan 26
to convert animal skin to leather
 tanker 7, 24
1. a vehicle for carrying liquid goods by road; 2. a large ship for carrying liquids, especially oil
tarmac 20
a mixture of tar and very small stones used to make the surface of roads
technical drawings 21
specialist designs and plans
technical know-how (TKH) 3
technical specialist knowledge
technical support 18
scientific help
technician 3, 18
a person who is skilled in carrying out operations in a specific field; usually someone who understands and can work in fields using modern technology
technique 6
the systematic procedure by which a complex or scientific task is accomplished
telecommunications 18
the use of different technologies to send and receive messages
telephony 19
the science behind telephones
telemetry 18
the method of sending electrical signals (audio and visual) which can then be received (viewed and heard)
television station 29
the organization or business that produces and/or broadcasts television content
temper 10
to heat and then cool metals to obtain the required hardness and elasticity, e.g. steel
tender 21
1. to make an offer to carry out works, e.g. an engineering contract; 2. an offer to carry out works
terminal 5, 24
a computer work station which is usually part of a network
test 4, 13, 18
1. to put to test or proof; 2. a critical examination, observation, or evaluation
test 11
to put the car through a series of tests under hard working conditions
textile 30
any cloth or fabric produced by weaving, knitting, or felting
therapeutic practice 13
actions that treat medical conditions
thermal cracking 24
the process by which petroleum is heated to a high temperature and the heavier parts of the oil are cracked (converted) into petrol (gasoline)
thermal processing 26
process to treat food with heat to make it safe
thermodynamics 10, 21
the science which deals with the relationship between and the power that works and drives machines
thermoplastics 25
a type of plastic which softens with heat and hardens with cooling
thermoset 25
a type of plastic which is cured or hardened by heat
throughput 2
the volume of products that can be made within a certain period of time
tidal barrage 19
a manmade bar built in a shallow part of the sea to change the energy of the water into electrical power
tidal power 19
the electricity produced by the sea
tide mill 19
a power plant where tidal power is converted into electricity
tightly 9
closed so that neither air nor water can get in
tin 22
a soft, bluish white mineral, used as a coating to protect iron and copper
tinplate 10
to cover a metal with a thin layer of tin, e.g. food cans. See also plate.
tissue 27
a type of light paper mainly used to wrap delicate items and for hygienic purposes
tough 12
describes a material that is hard; difficult to break
tower 24, 20
a large tower (cylindrical column) used to separate the different liquids in crude oil
town-gas 19
gas produced from coal which is used in homes and in industry
toxic 9, 12
poisonous
toy 25
something that children play with
track 11
area where cars are put through a series of something that children play with
tractor 24
a machine that pulls farming machines
transducer 17
a device which converts energy from one form into another, e.g. microphone, loudspeaker
transfer 6, 29
to move (data)
transfer process 10
a manufacturing process which takes laboratory tests and applies them to a practical application
transformer 16
a piece of electrical equipment to convert electric power from one voltage to another
transistor 17
a tiny electrical device that can amplify an electrical signal and switch a device on and off
transmission 11, 17, 29
a device that changes the ratio between engine rpm (revolutions per minute) and driving wheel rpm
transmission line 16
a power line to carry large quantities of high-voltage electricity between regions
transmission network 19
the system of pipes and wires that is used to carry electricity from the power plant to the users (homes and industry)
transmission speed 6
the rate at which information is passed through communications lines, generally measured in bits per second (bps)
transmit 6, 17, 18, 28
to send information from one location to another
transmittable 17
describing the ability of a signal to be sent
transmitter 28
a piece of radio equipment capable of transmitting electromagnetic signals but not capable of receiving them
transparent 12
describes a material that allows light to pass through
transponder 28
a combined receiver and transmitter whose function is to transmit signals automatically
transport 24
to move from one place to another by a vehicle
transport fuel 19
petrol used in vehicles, e.g. cars and trucks
transportation 7, 18, 24
the movement of goods from one place to another
trap 23
a configuration of rocks that may contain hydrocarbons
traprock 22
any dark-coloured fine-grained nongranitic rock, such as a basalt
travertine 22
a dense, finely crystalline, limestone: generally white, tan, or cream
treatment 13
the process or substances given to an ill person to make them better (healthier)
trial 4
the act of trying and testing
trial pit 21
a shallow hole, usually dug by an excavator, to assess the ground and what is under it
trona 22
a mineral, Na2(CO3)(HCO3).2(H2O); soft; vitreous; colourless to white; alkaline tasting; found in saline lake deposits and desert soils
truck 7, 11, 24
a large vehicle for transporting goods by road
truss 15
a prefabricated framework of girders, struts and other items which support a roof or other load-bearing elements
tuberculosis 14
a serious disease, especially of the lungs
trumble dry 30
to make or become dry by turning about in the heated drum of a clothes dryer
tumour 14
when diseased cells grow too quickly and cause swelling and sickness
tunnel 20
an underground passage, often for a road or a railway, through a mountain or under a river
turbine 10, 19, 16
an engine or motor in which the pressure of a liquid or gas turns a wheel, usually to produce energy
turnkey 21
a building or installation which is built, supplied, or installed complete and ready for use
turntable 23
See rotary table
twill 30
one of the three basic weaves - Plain, Satin and Twill. Twill has diagonal patterns throughout the fabric
twisted pair 6
two insulated wires twisted together, which can be shielded (STP) or unshielded (UTP)
ulcer 14
a break in the skin (inside or outside the body) which may bleed and cause poisonous matter
ultrahigh image definition 17
an image which is very clear on a TV or other visual device
uncertainty 2
the situation when the future is not clearly known
underdrain 20
a drain below the surface of the road
underground 22
below the earth’s surface
unit 1
an item of production
upload 7
to remove a shipment from a vehicle, e.g. boat, truck, etc.
update 2
1. to provide more precise information about the present situation; 2. more precise information about the present situation
upholstery 30
the cloth covering on padded furniture such as sofas and armchairs
upload 6
to transfer data or code from a client to a larger server (see also download)
upstream 23
exploration and production activities for oil and natural gas. See also downstream
uranium 19
heavy radioactive metal used to produce nuclear power
vacuum tube (AmE) 17
a sealed glass tube with no air in it, used to control the flow of electricity, e.g., in radio or TV
validate 13
to ensure that something is legitimate or correct
validity 4
the extent to which a test measures what it is intended to measure
valve (BrE) 17
See vacuum tube
van 7, 11
a small vehicle for carrying goods by road
vaporize 24
to turn into gas
devaporous 24
like gas
vapour 9, 24
a mixture of liquid and gas, e.g. steam
vapour barrier 15
a building product installed on exterior walls and ceilings under the drywall and on the warm side of the insulation
variability 8
the extent to which the results of production are different from their specifications
variable 4, 8
any characteristic in a study that is not fixed and can change in numerical value
variance 4
a measure of how spread out, or scattered, a distribution is
velvet 30
a soft fabric made of silk rayon or nylon
velvet 30
vendor 18
a seller

ventilating 15
a system through which vapour or dirty air is removed from a room or fixture

ventilation shaft 22
a channel in a mine that delivers air to miners underground

viaduct 20
a structure which carries a road or railway across water

vibration 9
a continuous shaking movement, for example when using a power drill

video camera 29
a hand-held camera used for taking moving pictures. A video camera can record data on magnetic tape or it can be uploaded to a computer.

video game 18
an electronic game which the player can control with a keyboard and view on a television screen

video signal 17
a signal intended to be seen

videophone 29
a telephone-like service with a picture as well as sound

viscosity 13
the measurement of a fluid's resistance to flow, often used to describe its thickness

visible 29
describing something that can be seen

visual 29
producing something that can be seen

voice 29
speech

(high) voltage 19
electrical force measured in volts; a volt is the standard measure of force

vomiting 9
the act of being sick

wall 15
a member, usually vertical, used to enclose or separate spaces

wallpaper 27, 29
a type of paper that is suitable to cover the walls inside a house.

WAN (wide area network) 6
a network linking computers, terminals, and other equipment over a large area

WAP (Wireless Application Protocol) 29
a global standard which enables WAP devices such as mobile phones or Personal Digital Assistants (PDAs) to access internet services and information (like email and news bulletins)

warehouse 2
a place for the reception, delivery, distribution, and storage of goods

wash 9
to make clean in water

wash and wear 30
describing clothes that do not need ironing after washing

wastafel 25
a ring of plastic which is put between two surfaces to make a better joint

waste 27
what is thrown away

waste disposal 15
the process of permanently isolating waste

water 19
one of the renewable sources of energy used in hydroelectric schemes and wave power

water desalination 20
the process of removing salt and other unwanted matter from groundwater to make it drinkable

water main 20
a chief pipe which supplies water

water power 19
the energy produced by water in hydroelectric schemes and wave power

water resistance 27
the quality of paper not to absorb water (see also absorbance)

water supply 15
the system in a building which is composed of the water service pipe, the water distributing pipes and the various connecting pipes, control valves and fittings

watercourse 20
a natural or manmade channel through which water flows

waterfall 19
water falling from a great height sometimes used to produce energy

water-proof 11
to cover the outer materials so that rain does not go through

water-supply system 20
the network of reservoirs, tunnels, and pipelines that supplies water to users in a community

watertight 16
describing the ability to stay dry

waterway 20
a way or channel for water

waterworks 39
network of buildings, pipes and water supplies within a public water system

wave 19, 28
1. movement of the sea; 2. an electric, electromagnetic, acoustic, mechanical or other form whose physical activity rises and falls as it travels through a medium

wave power 19
the energy produced by the sea

wavelength 28
the distance travelled by a wave in one period (the period is the time required to complete one cycle)

wax 24
a solid or semi-solid material derived from petroleum, which is resistant to water and scratches

weapons system 17
the collection of instruments used for attack or defence

weatherproof 16
describing the ability to stay in good condition in spite of bad weather

weave 26, 30
to make cloth with thread

weaving mill 30
a factory where fabric is made by weaving (by interlacing yarns on a loom)

web page 6
a World Wide Web document, usually based on HyperText Markup Language (HTML), that may contain text, graphics, online audio, video, Java or ActiveX objects

website 6
a collection of files that covers a particular theme or subject and managed by a particular person or organization. Its opening page is called a home page. A website is accessed through a web address known as a uniform resource locator (URL)

well 20, 23
1. a deep hole in ground where people can get water; 2. a hole drilled into the earth to recover oil or gas

wellbore (= borehole) 23
well

well-ventilated 9
allowing fresh air to enter and circulate in a room

wide area network 6
See WAN

wildcat (wildcat well) 23
an exploration well

wildcat well 23
See wildcat

wind 19
one of the renewable sources of energy produced by the air moving at a high speed

wind (wound – wound) 27
to turn around so as to form a roll

wind farm 19
a place where the energy produced by the wind is changed into electrical energy

wind power 19
the energy produced by the wind

wind tunnel 11
a test area where vehicles are tested to check their aerodynamic properties and the effects of wind pressure

windmill 19
a device consisting of large sails that are driven by the wind to produce electrical power

wire 28
a thin piece of metal for conducting electrical current

wire transmission 28
the process and technology of sending signals along metal wire

wood pulp 27
wood reduced to a pulp for papermaking

woodchip 27
small pieces of wood which have been cut from logs in chippers before conversion into pulp in a digester
wool 30
the soft, curly hair of a sheep which is
spun into yarn

word processing 5
a program which provides the user with
the tools necessary to create, edit and
format text

work in progress 2
goods that are not yet finished

work plan 21
a document which lists all planned
activities, the date of completion, the
resources that will be needed, and the
people responsible for carrying out the
activities

work station (workstation) 5
a desktop machine, usually considered
more powerful than a personal computer

workforce 2
all the people who work in a particular
company

workload 2
the amount of work that has to be
done

workshop 1, 2
a part of a factory where an item is made
or a product is assembled

World Wide Web 6
a collection of internet sites offering text,
graphics, sound, and animation resources
in an easy to use way

wrap 27
to cover with paper

wrapper 27
paper that is used to cover a product, e.g.
a chocolate bar

wrapping paper 27
a type of paper that is used to cover
products, e.g. presents. This type of paper
is often attractively designed.

yarn 30
continuous strand of textile fibres

zero defects 8
the policy and practice of making
products which meet specifications

zinc 22
a bluish-white metal used in alloys with
other metals including brass, nickel silver,
and commercial bronze; it is used
extensively by the automotive, electrical,
and hardware industries
Technical English: Vocabulary and Grammar is a reference and practice book for learners of technical English at intermediate level and above.

- Helps learners increase their knowledge of technical vocabulary and grammar.
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- 20 units review core grammar in technical contexts.
- The glossary covers and defines 1500 key technical terms.
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