

Patrizia Caruzzo

FLASH on English

for CONSTRUCTION



ESP
Series

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 1 MP3 audio files downloadable from www.elionline.com

1

Ecology

Ecology: a general overview

1 Read the questionnaire and tick (✓) the best answers for you. Then read the text below and check your answers.

	Yes	No	Don't know
1 Ecology is a science.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2 It deals with living organisms.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3 It also deals with the environment of living organisms.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4 Climate, solar insolation and geology influence the environment.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5 Ecology is also called 'ecological science'.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6 Ecology makes use of other sciences.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



You can say 'yes' to every question in the questionnaire above.

Ecology is the science that studies the number of living organisms in the environment and how they are distributed. It also studies how the quantity and distribution of organisms are influenced and in turn influence their interactions with the environment.

The environment of an organism includes factors such as climate, solar insolation, geology and the other organisms that share its habitat.

Ecology is also called 'ecological science' and it is multi-disciplinary: this means that it draws on other branches of science, such as biology, geology, geography, meteorology, chemistry and physics.

2 Read the text again and choose the correct option.

- | | | |
|---|-----------------------------|---------------------------|
| 1 Ecology studies... | 2 Ecology is also called... | 3 Ecology makes use of... |
| A the quantity of organisms in the environment. | A meteorology. | A other sciences. |
| B how organisms are distributed. | B ecological science. | B the environment. |
| C both of these. | C physics. | C solar insolation. |

3 Put these words in the correct column.

minerals atoms living organisms cells rocks lands
history of the Earth chemical bonds rivers

Biology	Geography	Geology	Chemistry

Ecology and its sub-disciplines

4 Complete the interview with the expressions from the box. The listen and check.

at different levels the dynamics of population the sphere of water behavioural ecology
about ecology and its sub-disciplines the sphere of air you can also examine communities of species

Interviewer: Mr Hale, could you tell us something
(1) _____?

Mr Hale: Well, as you know ecology has a great number of sub-disciplines. Some are more complex than others. For example, physiological and (2) _____ focuses on the adaptations of the individual to his environment; population ecology examines (3) _____ of a single species; community ecology studies the interactions between species in an ecological community. Ecosystem and landscape ecology are even more complex.

Interviewer: Can ecology be studied
(4) _____?

Mr Hale: Yes, of course. If you study the population level, you focus on individuals of the same species, but (5) _____, ecosystem or biosphere levels.

Interviewer: Can you explain how the outer layer of the planet Earth can be divided?

Mr Hale: Yes, there are basically three compartments: the hydrosphere is (6) _____, the lithosphere is the sphere of soil and rocks and the atmosphere is (7) _____.

Interviewer: And what about the biosphere?

Mr Hale: Well, that's the sphere of life. In short, it is the part of our planet occupied by life.



5 Read the interview again and decide if the statements below are true (T) or false (F).

- 1 The sub-disciplines of ecology are all very complex. _____
- 2 Population ecology examines the population dynamics of a single species. _____
- 3 Ecosystem and landscape ecology are more complex than other forms of ecology. _____
- 4 If you study the population level, you concentrate on communities of species. _____
- 5 The outer layer of the planet Earth can be divided into four compartments. _____
- 6 The hydrosphere is the sphere of water. _____
- 7 The biosphere is the sphere of soil and rocks. _____

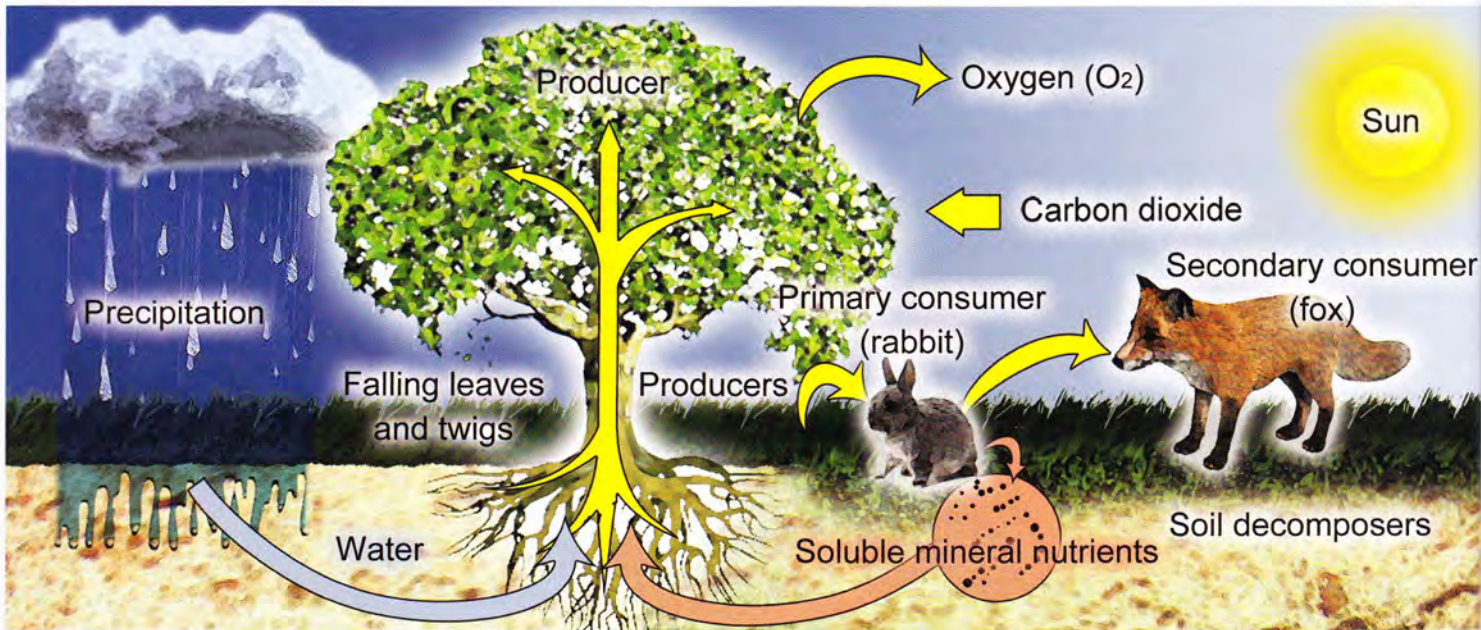
6 Now answer the questions.

- 1 What are the sub-divisions of ecology?
- 2 What does community ecology study?
- 3 What do you focus on if you study the population level?
- 4 How can the outer layer of the planet Earth be divided?
- 5 What is the lithosphere?
- 6 What is the atmosphere?
- 7 What is the biosphere?

The ecosystem and food chains

7 Look at the picture and answer these questions.

- 1 Do you know what a food chain is?
- 2 Do you think that you are part of it?



8 Read the text about food chains and check your answers.

Every living organism has a constant relationship with every other element in the environment. An **ecosystem** is a situation where there is interaction between organisms and their environment. An ecosystem can vary in size: it can be a pond, a field, a piece of dead wood or a rainforest.

In an ecosystem, species are connected by food chains. A **food chain** begins when energy from the sun is captured by plants and trees (primary producers) through photosynthesis. Then primary consumers (herbivores) eat plants and later secondary and tertiary consumers (carnivores) eat primary consumers. The energy they create by eating and digesting is lost as waste heat. When animals and plants die, very small bacteria break down their tissue (decomposition) and the chemicals that make up those living organisms are released into the soil and act as fertilisers to help green plants to grow. In this way the food chain starts all over again.

9 Read the text again. Match the two parts of the sentences.

- | | |
|--|--|
| 1 A food chain begins | a <input type="checkbox"/> release chemicals into the soil during decomposition. |
| 2 Carnivores are | b <input type="checkbox"/> help green plants to grow. |
| 3 Herbivores are | c <input type="checkbox"/> primary consumers. |
| 4 When they die, living organisms | d <input type="checkbox"/> secondary and tertiary consumers. |
| 5 The chemicals released into the soil | e <input type="checkbox"/> when plants and trees capture energy from the sun. |

10 Look at the picture of a food chain again and use your own words to explain the process.

In this ecosystem there is interaction between...

Human ecology

11 Read the text about human ecology and the ecosystem and match each paragraph with a heading.

- A Human beings and the ecosystem
- B What human ecology is about
- C Are human beings different?

1 _____

Ecology often studies ecosystems without humans in them. In fact humans consider themselves as a separate, unnatural component different from other species of animal in many ways. But we are the species that has the greatest impact on the changes in ecology today.

2 _____

The main difference between humans and other species is that we are conscious beings and we express our ambitions and aspirations through our relationship with the natural world. Our knowledge, principles, values and goals affect our behaviour. And we are also influenced by the society, culture, communities. As a consequence, cooperation and conflict between individuals and groups have an impact on our biosphere.

3 _____

Human ecology deals both with the influence of human beings on their environment and with the effect of the environment on human behaviour. It also investigates their strategies to adapt to different situations as they understand their impact on each other better.



12 Read the text again and answer the following questions.

- 1 Why do humans sometimes consider themselves different from other species?
- 2 What are the main differences between human beings and other living beings?
- 3 What are we influenced by? What are the consequences?
- 4 What does human ecology deal with and investigate?

13 What have you learnt about ecology? Write a short report using the information from the texts in this unit. Follow these guidelines:

- What is ecology? What does it study?
- How is it a multidisciplinary science? What are its sub-disciplines?
- How do food chains work?
- What is human ecology?

MY GLOSSARY

to act as /tu: ækt əz/ _____
 to affect /tu: ə'fekt/ _____
 aim /eɪm/ _____
 behaviour /bɪ'heɪvjə(r)/ _____
 to break down /tə breɪk daʊn/ _____
 compartment /kəm'pɑ:tmənt/ _____
 to deal with /tə diəl wɪð/ _____
 to draw on /tə drɔ: ɒn/ _____
 earth /ɜ:θ/ _____
 environment /ɪn'vaɪənmənt/ _____
 food chain /fu:d tʃeɪn/ _____

goal /gəʊl/ _____
 to make up /tu: meɪk ʌp/ _____
 outer layer /'aʊtə(r) 'leɪə(r)/ _____
 to result in /tə rɪ'zʌlt ɪn/ _____
 relationship /rɪ'leɪʃnʃɪp/ _____
 to share /tə ʃeə/ _____
 soil /sɔɪl/ _____
 species /spi:'si:z/ _____
 tissue /'tɪʃu:/ _____
 value /'vælju:/ _____

2

Environment and Pollution

- 1 What do we need land for? Look at the pictures and make a list of all the types of activities you can think of.
- 2 Read the text and check your answers.

The quality of the land around us is very important for our well-being. We need land to create energy, to grow fruit and vegetables and to bury waste. We also need it for mineral resources, for building houses, factories, schools and hospitals, for transportation, for free time activities and much more. Land is also a vital habitat for plants and animals. But many human activities, such as industry, agriculture and transportation, and their by-products, as well as intentional or accidental pollution, can damage the soil and harm the quality of land.

Soil is extremely important for the environment, because water and vital substances such as vitamins, minerals and fibres are stored and regenerated in it. It is also an essential medium for growing crops. And it has another fundamental function: it acts as a barrier between the atmosphere and aquatic ecosystems. However, this barrier is lost if soil is damaged or contaminated, with the consequence that the soil becomes a source of pollutants that can enter surface or groundwater and even damage the quality of air and consequently the health of plants, animals and people. Toxic substances can be dangerous for individual species and have long-term effects on ecosystems.



- 3 Match the words with their definitions.

- | | |
|---------------|--|
| 1 waste | a <input type="checkbox"/> something created while producing or processing another product |
| 2 habitat | b <input type="checkbox"/> water found under the ground |
| 3 groundwater | c <input type="checkbox"/> substances that pollute the environment |
| 4 by-product | d <input type="checkbox"/> material that is no longer wanted because its valuable part has already been used |
| 5 medium | e <input type="checkbox"/> natural environment where animals and plants grow |
| 6 pollutants | f <input type="checkbox"/> a substance which acts as a vehicle for a particular purpose |

4 Read the text about the forms of pollution and decide which of these are represented in the pictures.

Pollution is the release of chemical, biological, physical or radioactive substances in the environment. Among the main kinds of pollution are:

- **Air pollution:** due to the release of chemicals and particulates (solid particles forming dust) such as nitrogen oxides that create smog and hydrocarbons. Other examples of air pollution are carbon monoxide and sulphur dioxide.
- **Water pollution:** caused by industrial waste, agricultural drainage and sewage.
- **Soil contamination:** the most significant soil contaminants are heavy metals, hydrocarbons, herbicides and pesticides.
- **Radioactive contamination:** caused by accidents in nuclear power stations and by the production and use of nuclear weapons.
- **Noise pollution:** including roadway, aircraft and industrial noise and high-intensity sonars.
- **Light pollution:** including light trespass and over-illumination.
- **Visual pollution:** referring to the presence of overhead power lines, motorway billboards or open storage of junk and municipal solid waste.



5 Read the text again and fill in the chart.

Type of pollution	Examples
air pollution	<i>carbon monoxide</i>
water pollution	_____
soil contamination	_____
noise pollution	_____
light pollution	_____
visual pollution	_____
radioactive contamination	_____

6 Write down a list of the sources of pollution that exist in the area where you live and write a short essay about the possible solutions to these problems.

In my area there is a lot of air and water pollution due to the chemicals the farmers use on their fields...

MY GLOSSARY

billboard /'bɪlbɔ:d/ _____
 to bury /tə 'berɪ/ _____
 by-product /'baɪ prɒdʌkt/ _____
 crop /krɒp/ _____
 to damage /tə 'dæmɪdʒ/ _____
 drainage /dreɪnɪdʒ/ _____
 dust /dʌst/ _____
 groundwater /graʊnd'wɔ:tər/ _____
 to grow /tə grəʊ/ _____
 to harm /tə hɑ:m/ _____
 health /helθ/ _____

to increase /tu: ɪn'kri:s/ _____
 junk /dʒʌŋk/ _____
 overhead /'əʊvəhed/ _____
 particulate /pə'tɪkjʊlət/ _____
 pollutant /pə'lju:tənt/ _____
 release /rɪ'li:s/ _____
 sewage /su:ɪdʒ/ _____
 to store /tə stɔ:(r)/ _____
 trespass /trespəs/ _____
 waste /weɪst/ _____

3

Traditional Building Materials

1 Look at these materials and match the names with the photographs.

stones cement timber bricks



1 _____



2 _____



3 _____



4 _____

Building materials can be divided into two main groups: natural and man-made. Stone and timber are natural materials, used by man since ancient times. Man-made materials include bricks, cement, concrete, steel, glass, metal and more modern materials including plastic and synthetics.

Stone

2 Read the text and then match the two parts of the sentences.

Stone walls are one of the oldest construction methods known to mankind. The first stone walls were made laying up stones without any mortar. With this method stones are held together by gravity. These walls are usually larger at the base. In Ireland and north-eastern UK counties this kind of wall was made by farmers to create fences. It was quite a long and labour-intensive method, but with no costs. When cement appeared, the first mortared stone walls were created, where cement paste fills the gaps between the stones. The first cements were made using burnt gypsum or lime, mixed with water. Concrete includes Portland cement mixed with sand, gravel and water, which makes it resistant to cracking. To make it even more resistant, steel reinforcing bars can be added. Most stone walls today are made using this method, because it is fast and cheap.

- 1 The first stone walls were made
 - 2 When cement appeared
 - 3 The first cements were created using
 - 4 Concrete is Portland cement
 - 5 Steel reinforcing bars can be added
-
- a burnt gypsum or lime, mixed with water.
 - b to make concrete even more resistant.
 - c the first mortared stone walls were created.
 - d without any mortar.
 - e mixed with sand, gravel and water.



Timber

3 Read the text about timber framing and answer the questions below.

Timber framing and conventional wood framing are two different forms of construction. Timber framed structures use fewer, larger timbers with dimensions from 15 to 30 cm and mortice and tenon or wooden pegs as fastening methods, whereas conventional wood-framed buildings have a greater number of timbers with dimensions from 5 to 25 cm, and nails or other mechanical fasteners are used to join the timbers.

Today timber structures are often surrounded in manufactured panels, such as Structural Insulating Panels (SIPs). They are made up of two rigid wooden-based composite materials with a foamed insulating material inside. This method is used because these structures are easier to build and they provide more efficient heat insulation.

Timber-framed construction offers a lot of advantages. It is kind to the environment (when the wood used is taken from sustainable forests) and the frames can be put up quickly. Its design is elegant and simple, and also both practical and adaptable. It can give a house character, both inside and outside. Thanks to its strength, large open spaces can be created, something which is not so easy to obtain with other techniques. It is very versatile, so timber-framed houses can also be clad with stone or brick. This offers two more advantages: the house can blend in with the surrounding area (both urban and rural) and it is very energy-efficient. Timber is also cheaper than other materials.



- 1 Do timber-framed structures use larger or smaller timbers compared to conventional wood framing?
- 2 Which fastening methods do the two different methods use?
- 3 What structures have been recently used? How are they made up?
- 4 What are the advantages of this method?

4 2 Listen to an expert speaking about the disadvantages of timber frame and complete the table.

water	Water can be (1) _____ into the material causing it to rot and mould.
fire	Wood is very (2) _____.
bugs	Ants and termites eat wood (3) _____.
environmental impact	Producing boards and beams for timber frame construction requires (4) _____ trees.
sound	Wood is an excellent (5) _____ of sound waves so any noise inside or outside is easily heard.
strength	Timber frames are quite strong up and down but not as strong as other materials (6) _____.

Brick

5 Read the text and then write a list of the advantages and disadvantages offered by brick.

Masonry construction is a method that has been used for centuries around the world. It is usually used for walls of buildings, retaining walls and monuments. The most frequent type of masonry is brick, but concrete block is also becoming more and more popular. Brick was one of the first building materials that man used and has been used since the times of the ancient Egyptians because it offers a great number of advantages. First of all, it has an affordable price and it is made of accessible raw material, which has long durability and good insulating properties. It is a strong material and is perfect for load-bearing systems where the loads are compressive. It is the size of a man's hand and therefore simple to use. The appearance of the final work depends on the ability and expertise of the bricklayer. Another advantage of using brick is that, like stone, it offers increased comfort in the heat of the summer and the cold of the winter. Being heat resistant, this material also offers good fire protection.

One of the disadvantages of using this material is that masonry must be built on a firm foundation to prevent settling and cracking, and in the presence of expansive soils the foundation may need to be elaborate. Moreover, this is a heavy material, consequently the structural requirements will have to be increased, especially if the area is subject to earthquakes.



Advantages	Disadvantages
<i>affordable price,</i> _____	_____
_____	_____
_____	_____

Cement and concrete

6 Listen to the text and complete it with the words from the box.

blocks bricks concrete (x2) ingredient materials mixture walls

The most common type of cement is Portland cement, which is the basic (1) _____ of concrete and mortar.

It is made of Portland cement clinker (calcium silicates, aluminium and other compounds) and other minor constituents.

Portland cement clinker is produced by heating a mixture of raw (2) _____ up to 1450° C in a kiln.

There are three production stages:

- preparation of the raw mixture,
- production of the clinker,
- preparation of the (3) _____.

Limestone is the main raw material for the production of clinker, followed by sand, shale, iron ore, bauxite, fly ash and slag. About 2% gypsum is also added and then the (4) _____ is pulverised. The resulting powder will react when water is added.

Portland cement is commonly used to produce (5) _____, which is made of gravel, sand, cement and water. Blocks of cinder concrete, ordinary concrete and hollow tile are known as Concrete Masonry Units (CMU). They are larger than ordinary (6) _____ and used for applications where appearance is not very important, such as in factory walls, garages and industrial buildings. One of the advantages of concrete (7) _____ is that they can be reinforced, grouting the voids, inserting rebar or using grout, so that they are stronger than typical masonry (8) _____.



7 Read the text in exercise 6 again and choose the best alternative.

- 1 Portland cement is the basic ingredient of *concrete/aluminium*.
- 2 The main raw material for the production of clinker is *brick/limestone*.
- 3 Portland cement is used to produce *gravel/concrete*.
- 4 Concrete Masonry Units are larger than ordinary *bricks/stones*.
- 5 Concrete blocks can be *reinforced/industrial*.
- 6 Reinforced concrete blocks are stronger than masonry *industries/walls*.

8 Match the words with their definitions.

- 1 masonry
 - 2 brick
 - 3 concrete
 - 4 mortar
 - 5 limestone
- a a mixture of cement, sand, small stones and water
 - b brick work
 - c white rock often used for making cement
 - d a mixture of sand, water and cement or lime
 - e a reddish-brown rectangular block used to build walls and houses

9 Create four groups. Each group chooses one material from this unit (stone, timber, brick, cement and concrete). Use your own words to describe it to the other groups.

10 Use the information from exercise 9 and the texts in this unit to complete the following table.

	Stone	Timber	Brick	Cement and Concrete
Advantages	_____	_____	_____	_____
Disadvantages	_____	_____	_____	_____

MY GLOSSARY

- bricklayer /'brɪkleɪər/ _____
- to blend in /tə blænd ɪn/ _____
- cinder concrete /'sɪndə(r) 'kɒŋkri:t/ _____
- clad /klæd/ _____
- compound /'kɒmpaʊnd/ _____
- concrete /'kɒŋkri:t/ _____
- cracking /'krækɪŋ/ _____
- to fasten /tə 'fɑ:sn/ _____
- fence /fens/ _____
- fly ash /flaɪ æʃ/ _____
- foamed /fəʊmd/ _____
- frame /freɪm/ _____
- gap /gæp/ _____
- gravel /'græv(ə)l/ _____
- grout /graʊt/ _____
- to grout /tə graʊt/ _____
- gypsum /'dʒɪpsəm/ _____
- heat insulation /hi:t ɪn'sju:leɪʃn/ _____
- hollow tile /'hɒləʊ taɪl/ _____
- iron ore /'aɪən ɔ:(r)/ _____
- to join /tə dʒɔɪn/ _____
- kiln /kɪln/ _____
- to lay /tə leɪ/ _____
- lime /laɪm/ _____
- limestone /'laɪmstəʊn/ _____
- masonry /'meɪsənri/ _____
- mortar /'mɔ:tə(r)/ _____
- mortice /'mɔ:tɪs/ _____
- mould /məʊld/ _____
- nail /neɪl/ _____
- peg /peg/ _____
- to put up /tə pʊt ʌp/ _____
- rebar /rɪ'bɑ:/ _____
- settling /'setlɪŋ/ _____
- shale /ʃeɪl/ _____
- slag /slæg/ _____
- to surround /tə səraʊnd/ _____
- tenon /tenən/ _____
- timber /'tɪmbə(r)/ _____
- void /vɔɪd/ _____

4

Modern Building Materials

Steel

1 Read the text and complete the sentences with words from the text.

Steel is resistant to corrosion, rusting and general deterioration. It can be used both for exterior as well as internal infrastructure. Compared to conventional concrete buildings, steel buildings offer a longer lifetime and they cause less harm to the environment thanks to the resistance and durability. Because steel buildings are usually pre-fabricated or made in sections and parts that are assembled on the construction site, they are cheaper than conventional buildings.



The quantity of carbon contained in steel determines whether the alloy is hard or soft. Nowadays steel buildings are often appreciated for their design. In fact, the flexibility of this material allows different forms and shapes. More than any other building material, steel has a high strength-to-weight ratio. This means that it is easy and cheap to span large distances elegantly eliminating columns. Thanks to this, it is easier to subdivide and customise office and warehouse space.

- 1 Steel can be used both for the exterior and the interior _____ of a building.
- 2 Steel is _____ to corrosion, rusting and general deterioration.
- 3 Steel buildings have a longer _____ compared to conventional concrete buildings.
- 4 Steel buildings are usually _____ than _____ buildings.
- 5 It is easy and cheap to span large _____ elegantly.
- 6 By eliminating _____, it is easier to subdivide and customise office and warehouse space.

2 Read the text again and match the words to their definitions.

- | | |
|-----------------|---|
| 1 rusting | a <input type="checkbox"/> a composite metal made by mixing other metals together |
| 2 flexibility | b <input type="checkbox"/> the period of time for which a building is expected to last |
| 3 alloy | c <input type="checkbox"/> when a metal becomes reddish brown because of air and water |
| 4 deterioration | d <input type="checkbox"/> to change the appearance or characteristics of something according to someone's taste or needs |
| 5 lifetime | e <input type="checkbox"/> becoming worse in quality or condition |
| 6 to customise | f <input type="checkbox"/> being bent easily without breaking |

Glass and metals

3 Read the text and match each paragraph with a heading.

- A Advantages and disadvantages of different kinds of metals
 B Transparent buildings: problems and possible solutions
 C An interesting experiment

1 _____

Glass is a fashionable material in contemporary architecture. Transparent buildings and structures are very popular in contemporary architecture. Structural glass components such as columns and beams are often required, but this material seems structurally unsafe because of its brittleness. For this reason a new construction technique has been developed using:

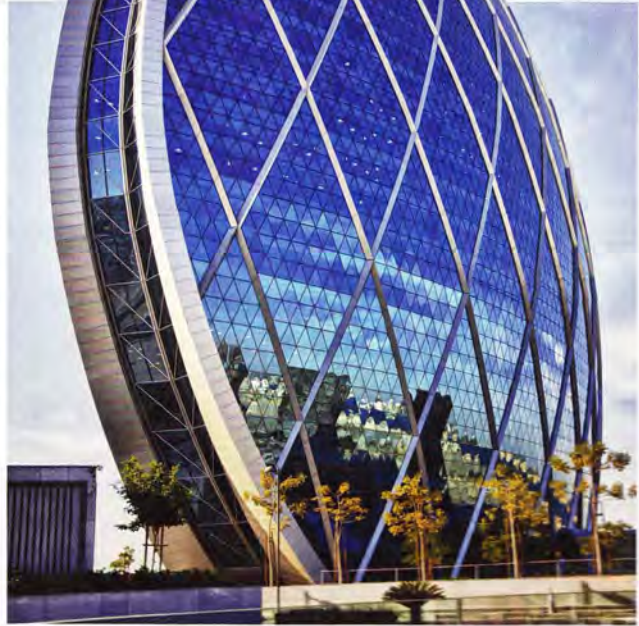
- very long overlapping glass segments to create glass beams. These are made by bonding the segments adhesively;
- a small stainless steel profile that has been added to the layout of the glass beam to reinforce it.

2 _____

To prove that glass structures can be as safe as reinforced concrete, an experimental transparent pavilion has been designed (with dimensions $9 \times 9 \times 3.6 \text{ m}^3$) that combines a number of innovative ideas. Many different kinds of glass and glass systems have been used. The outermost and the triple-layered insulating glass units have been tempered and sometimes laminated and some glass has also been coated with solar control glass to reflect some of the unwanted sunshine outwards. In other cases glass that can be heated electrically and glass panes free of iron oxide have been used to make the inside light more natural.

3 _____

Painted, stainless, hot dip galvanised and weather resistant steel, as well as aluminium, have also been used for supporting structures. Aluminium has some advantages (it is light, resistant to corrosion and easy to work) but also some disadvantages (its thermal expansion and conductivity are high and it has low elastic modulus and fire resistance). Stainless steel also offers some advantages (it has good fire resistance and it is easy to keep) but its high price is a major disadvantage. Both hot dip galvanised and painted steel are not as expensive, but they are difficult to work on site and are not resistant to corrosion.



4 Read the text again and decide if these statements are true (T) or false (F).

- 1 Glass is very popular in contemporary architecture. _____
- 2 There is no way to create a glass structure that is as safe as reinforced concrete. _____
- 3 A transparent pavilion has been recently designed as an experiment that uses some innovative ideas. _____
- 4 There is only one type of glass in this pavilion. _____
- 5 Glass has also been used for supporting structures. _____
- 6 Hot dip galvanised steel is not resistant to corrosion. _____

5 Match the words with their definitions.

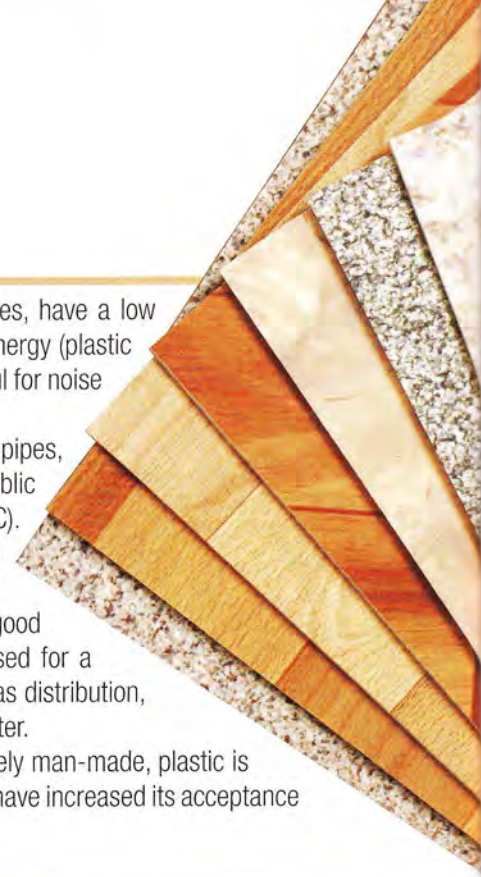
- | | |
|-------------------|---|
| 1 outermost | a <input type="checkbox"/> a metal made from steel that does not rust |
| 2 stainless steel | b <input type="checkbox"/> fragility |
| 3 galvanised | c <input type="checkbox"/> external |
| 4 brittleness | d <input type="checkbox"/> flat sheet of glass |
| 5 pane | e <input type="checkbox"/> coated with zinc to protect it from rust |

Plastic

6 Read the text and then choose the correct option.

Plastic products offer a number of ecological advantages: they save resources, have a low maintenance cost and can be recycled. Furthermore they contribute to save energy (plastic foams are used for thermal insulation in many applications). Plastic is also useful for noise protection and insulation.

The main fields of application of these materials are pipes, insulation, wall covering, flooring (both in houses and in public areas) and, quite recently, window frames (made of PVC). PVC stands for Polyvinyl Chloride and it is the plastic which has seen the most rapid growth in recent times in industry. PVC is often used in piping systems because of its good chemical resistance to corrosive fluids. PVC pipes are used for a great number of applications: to drain waste, for natural gas distribution, for electrical and communications wiring, for municipal water. As it is the newest primary construction material and entirely man-made, plastic is extremely versatile. Improvements made through research have increased its acceptance among designers, contractors and building code officials.



- 1 Plastic products save...
 - A industry.
 - B materials.
 - C resources.
- 2 Plastic insulation is also useful for ... protection.
 - A recycled
 - B resources
 - C noise
- 3 PVC is the plastic whose use has grown more...
 - A recently.
 - B slowly.
 - C primary.
- 4 The ... fields of application of these materials are in flooring.
 - A alternative
 - B main
 - C useful
- 5 PVC has good ... resistance to corrosive fluids.
 - A physical
 - B public
 - C chemical
- 6 PVC pipes are used for ... gas distribution.
 - A natural
 - B chemical
 - C piping

7 Read the text again and answer the questions.

- 1 What are the advantages offered by plastic products?
- 2 How can plastic save energy?
- 3 What is plastic insulation useful for?
- 4 What are the main fields of application of plastic?
- 5 What does PVC stand for?
- 6 What are PVC pipes used for?

8 Make a list of advantages and disadvantages of each material.

	Steel	Glass and Metals	Plastic
Advantages	_____	_____	_____
Disadvantages	_____	_____	_____

Sustainable materials

9 Read the text and answer the questions below.

Due to the rise in global population and prosperity over the last few decades, one of the consequences of this phenomenon has been the increase in volume and variety of the materials used (such as raw materials, food, manufactured products and waste) with a consequent increase in the transport distances. This has created a series of negative effects on the environment, especially different kinds of pollution, leading to an ecological emergency and growing preoccupation about health. This is why the aim of eco-design is to create buildings with low ecological impact, where people can live in a comfortable, healthy way.

This is possible by using building materials that are traditionally considered eco-friendly and sustainable: timber from forests that have been certified; quickly renewable plant materials (such as straw or bamboo); some typical traditional materials such as brick, stone, clay and cork; non-toxic, renewable and recyclable materials (natural paints, waxes and varnishes). Waste materials can also be reused as a resource for construction purposes.



- 1 What has happened to population and wealth in the last few decades?
- 2 What has been one of the results of this?
- 3 What is the aim of eco-design?
- 4 Can you name some eco-friendly and sustainable materials you have found in the text?

10 Work in pairs: what is your opinion of modern building materials? Which would you use if you could build your own house? Tell your partner about it using the information given in this unit.

MY GLOSSARY

alloy /'æləʊ/ _____
 beam /bi:m/ _____
 brittleness /'brɪtlɪnəs/ _____
 coated /kəʊtɪd/ _____
 customise /'kʌstəmaɪz/ _____
 to drain waste /tə drem weɪst/ _____
 durability /dʒʊərə'bɪləti/ _____
 endurance /ɪn'dʒʊərəns/ _____
 hot dip galvanised /hɒt dɪp 'gælvnəaɪzɪd/ _____
 iron /aɪən/ _____
 layout /leɪaʊt/ _____

outermost /'aʊtəməʊst/ _____
 outwards /aʊt'wɔːdz/ _____
 overlapping /əʊvə'læpɪŋ/ _____
 pane /peɪn/ _____
 pipe /paɪp/ _____
 rust /rʌst/ _____
 to span /tə spæn/ _____
 stainless steel /'steɪnləs 'sti:l/ _____
 straw /strɔː/ _____
 strength to weight ratio /streŋθ tə weɪt 'reɪʃəʊ/ _____
 window frame /'wɪndəʊ freɪm/ _____

Mapping

1 Read the text and fill in the missing sentences from the box.

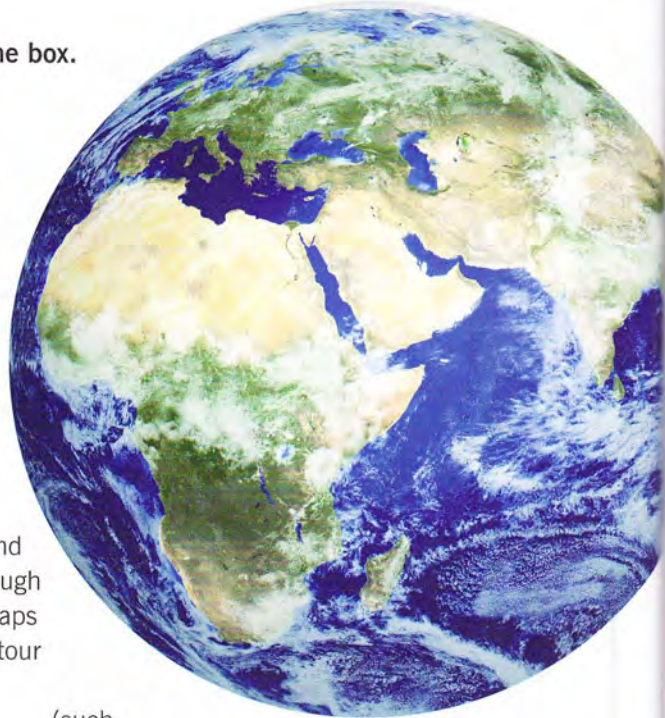
- because they offer a great amount
- images taken from different elevated positions
 - offer cultural information about countries
 - specific subjects such as population density
 - they explain differences in elevation

Maps are a useful method of illustrating a lot of information into a format that people can understand and learn from. Mapping is the job of a mapmaker or cartographer.

There are different types of maps that give different types of information:

- **Physical maps** show landforms, mountains, deserts and lakes. (1) _____ through hypsometric tints or changes in colour. Topographic maps show the shape and elevation of the land through contour lines.
 - **Political maps** (2) _____ (such as their borders and main cities) and some physical characteristics (like oceans, rivers and lakes).
 - **Thematic maps** give information about (3) _____, natural resources, climate, primary imports and exports. Some specialised thematic maps show information that can be useful to analyse different kinds of trends.
- In short, maps are very important (4) _____ of information in a very small space.

Photogrammetry is a measurement technology that can determine the three-dimensional coordinates of points of an object using different photographic (5) _____. This kind of technology is used in different fields, such as topographic mapping, engineering, architecture, police investigation, geology and archaeology and also in movie post-production. This measurement technology provides high performance, wide application and accurate measurements, and it is easy and quick to use.



2 Read the text again and answer the following questions.

- 1 What do physical maps show and explain?
- 2 What kind of information do political maps offer?
- 3 What kind of information do thematic maps offer?
- 4 Can you explain what photogrammetry is?
- 5 Which fields is it used in?

3 Match the words with their definitions.

- | | |
|--------------|--|
| 1 elevation | a <input type="checkbox"/> one or two numbers or letters indicating a particular point on a map |
| 2 contour | b <input type="checkbox"/> something useful that can be used to increase the wealth of a country |
| 3 resource | c <input type="checkbox"/> tendency, a development of events |
| 4 trend | d <input type="checkbox"/> the shape or outline of an object |
| 5 coordinate | e <input type="checkbox"/> height above the sea level |

Sketch stage and working drawings

4 Read the text and decide if the statements below are true (T) or false (F).

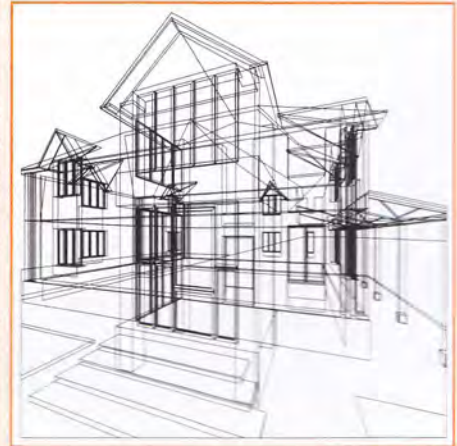
Designing a project involves a number of vital stages: sketch design, design development and working drawing.

During the design development stage all kinds of helpful information are gathered, so that materials and methods proposed for the project can be checked. The working drawing stage is the most demanding, because every project is unique as far as design and assembly of the parts are concerned. At this stage all the architectural drawings, schedules and specifications required for building consent are prepared. Sometimes all this material is also needed to get prices from builders. In some cases 2D or more commonly 3D formats are used to describe the building. The builders will need working drawings, consisting of plans, sections, elevations, details, schedules, specifications and other consultants' documents. During this stage all the architectural drawings are produced using the most recent

computer design software, which is very similar to the software used by other consultants. This way all the information can be coordinated easily. It is important to make very precise drawings because they must conform to all the latest building standards, otherwise the council

will not give building consent. Another reason is that this will help builders know as much information as possible, thus reducing their guesswork.

Engineering graphics are very important for engineers because it is the language with which they think and communicate. Years ago the AutoCAD replaced the old T-square and, more recently, the 3D parametric solid modelling software has been used to learn graphics.



- 1 The first stage when designing a project is sketch design. _____
- 2 The specifications necessary for obtaining building consent are drawn up during the working drawing phase. _____
- 3 Builders will never provide a price until they have these documents. _____
- 4 These documents help builders to work as accurately as possible. _____
- 5 Building consent to start work on building depends on the accuracy of these drawings. _____
- 6 AutoCAD is the latest form of software in this field. _____

5 Find the synonyms of these words in the text.

- | | | | |
|--------------|-------|--------------|-------|
| 1 step | _____ | 5 papers | _____ |
| 2 controlled | _____ | 6 newest | _____ |
| 3 cost | _____ | 7 essential | _____ |
| 4 technique | _____ | 8 estimation | _____ |

6 Write the questions for these answers.

- | | |
|---|--|
| 1 _____ ?
During this stage all kinds of helpful information are gathered. | 4 _____ ?
They consist of plans, sections, elevations, details, schedules, specifications and other consultants' documents. |
| 2 _____ ?
Because every project is unique. | 5 _____ ?
Because it is the language with which engineers think and communicate. |
| 3 _____ ?
2D or more commonly 3D formats. | 6 _____ ?
The old T-square. |

AutoCAD

7 Read the text and answer the questions below.

At the beginning of the 1980s Computer-Aided Design (CAD) programs drastically cut the needs of draftsmen. Today students in universities do not learn drafting techniques, they learn computer-aided design instead. But what exactly is CAD and what is it used for? CAD is software which allows the use of computer technology for the development of design and design documentation. It is used to design curves and figures in two-dimensional space or curves, surfaces and solids in 3D objects.

CAD has a great number of applications: automotive, shipbuilding and aerospace industries, industrial (in the design of tools and machinery and throughout the engineering process from conceptual design and layout of products) and architectural design (of all types of buildings), prosthetics and also computer animation for special effects in movies, advertising and technical manuals. Moreover, it is used for the creation of photo simulations often required in the preparation of Environmental Impact Reports.

The objects and features created are adjustable and modern CAD can also allow rotations in 3D, so that the designed object can be viewed from any angle.

Nowadays CAD systems exist for all the major platforms and no special hardware is required for most CAD software (except for some systems that do graphically and computationally-intensive tasks and require a modern graphics card). The human-machine interface is usually via a computer mouse or a pen and a digitizing or graphics tablet. The advantages of CAD are lower product development costs and a greatly shortened design cycle.



- 1 What does CAD stand for?
- 2 What is it exactly? What is it used for?
- 3 When did a drastic change in design take place?
- 4 What was the consequence of this change?
- 5 Can you name a few CAD applications?
- 6 Is there any need for special hardware if you use CAD?
- 7 Can you explain what the 'human machine interface' is?
- 8 What are the main advantages of this design program?

8 4 Listen to Tony Davies talking about AutoCAD and fill in the missing words.

- 1 CAD is the designer use of computer _____ for the design of objects.
- 2 It is generally used by product designers, engineers, architects and _____ decorators.
- 3 CAD is mainly used for the detailed engineering of physical _____.
- 4 It is also used for the whole of the engineering _____, from theoretical design to the layout of products.
- 5 CAD allows the _____ to be viewed from any angle and it can be quite helpful as texture and colours can be easily manipulated.
- 6 No special hardware is required for most CAD _____.

Rendering

9 Read the text and reorder the words below to make accurate sentences describing the processes of rendering.

The process of generating an image from a model by means of computer graphics is known as 'rendering'. It is an engineered program, based on disciplines connected to light physics, visual perception, mathematics and software development. It is a method used by architectural illustrators to create two-dimensional images or animations from a three-dimensional model (prepared scene) thanks to computer programs. These images or animations show the characteristics of a planned architectural design. Scene files contain objects in a special language or data structure (such as geometry, viewpoint, texture, lighting, and shading information) to describe a virtual scene. The data is then passed to a rendering program to be processed.

Rendering software can be used to create life-like images for presentation, marketing and design analysis. It is used in architecture, video games, films and TV visual effects and also in real estate sales for experimenting with building design or to make decisions before a building is created.

There is a wide range of different kinds of renderers. They may be integrated into modelling and animation packages, stand-alone, or be free open-source projects.

In the case of 3D graphics pre-rendering is used for creating films, whereas real-time rendering is often used in producing 3D video games.



- 1 is / engineered / illustrators / program / used / by / an / architectural / Rendering

- 2 Architectural / use / illustrators / rendering / animations / create / two-dimensional / to / images / or

- 3 for / This / is / used / presentation, / software / and / analysis / marketing / design

- 4 for / It / used / be / design / experimenting / can / building / with

- 5 the / Pre-rendering / used / in / is / industry / film

- 6 the / 3D / production / For / of / video / real-time / rendering / is / games / used

10 Read the text again and decide if the statements below are true (T) or false (F).

- 1 Rendering and computer-generated graphics are the same thing.
- 2 When using rendering illustrators create 3D models from 2D images.
- 3 Rendering is used in the fashion industry.
- 4 The images produced by rendering software are very realistic.
- 5 Rendering software is also used for designing houses before they are built.
- 6 Films are created using real-time rendering techniques.

Town planning

11 Read the following text about planning. What is it? What do planners typically do?

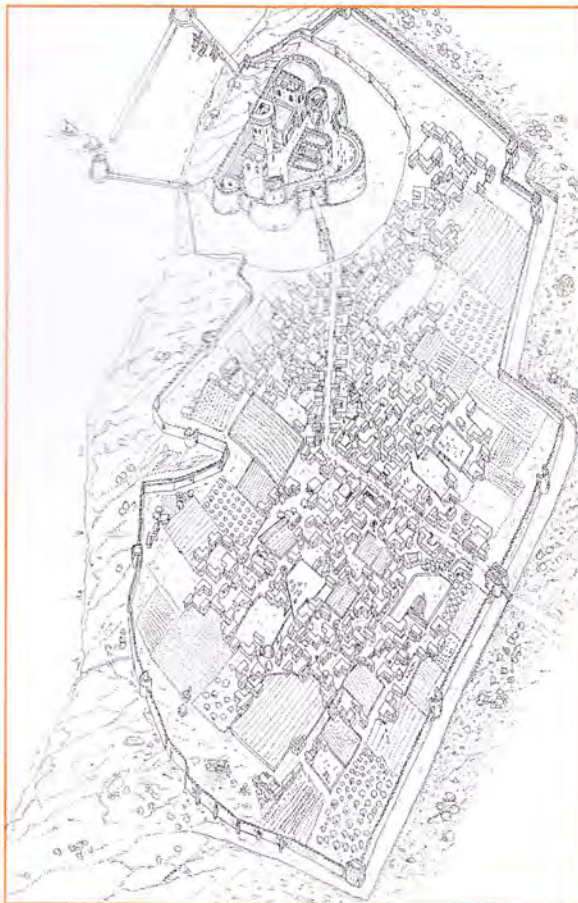
Planning is a balancing act between constructing modern communities and conserving our natural and built heritage to create sustainable places where people can live, work and play. It implies decisions about transport, facilities, the development of new shops, schools, dwellings, parks, etc. It supports our ongoing use of the environment.

Some of the things that planners do include:

- developing and creating affordable housing;
- regenerating socially-deprived areas;
- requalifying historic buildings;
- creating policies for managing the traffic and improving energy efficiency;
- discussing with communities about how to improve their quality of life.

12 5 Read and listen to the text and fill in the blanks with the words from the box.

agricultural centre Renaissance human rational situated streets towns



The first stable (1) _____ settlements appeared when agriculture replaced nomadic existence. The first cities were centres for commerce, politics, defence and distribution of (2) _____ surplus. The earliest examples of planned cities in history were in modern-day Iraq and India. In these cities some (3) _____ were paved and there were both commercial and residential streets.

The first examples of cities in the West were in Greece and in Italy. Many European (4) _____ are still based on schemes that date back to the times of the Romans, who put all the streets at right angles, set out in a square grid. During the Middle Ages there was no trace of (5) _____ urban planning in Europe. Cities grew around a fortress or a fortified abbey. Most of them were (6) _____ on high defensible ground and their plans followed the irregularities of elevation contours. They offered protection both to urban city and rural inhabitants during enemy attacks.

Things changed again during the (7) _____. A great number of important artists created beautiful buildings in many cities which were accurately designed by architects and city planners.

In Florence, for example, radial streets extended outward from a defined (8) _____.

13 Read the text again and decide if the statements below are true (T) or false (F).

- 1 The first cities were centres for commerce, politics and defence. _____
- 2 The earliest examples of planned cities in history are in the West. _____
- 3 Many European towns date back to the times of the Romans. _____
- 4 Urban planning was extremely important during the Middle Ages. _____
- 5 Cities in Europe grew around a fortress or a fortified abbey during the Middle Ages. _____
- 6 During the Renaissance radial streets extended outward from a defined centre in Florence. _____

Master Plan

14 Read the text and answer the questions below.

A Master Plan is a document describing how a city is developed and how it can develop in the future. It is written by city planners and experts after examining the land.

Here is an example of the aims of a Master Plan:

- to create a structure for the best quality City Centre;
- to create the best possible environment for all users;
- to find key problem areas;
- to treat improvements as priorities;
- to create an attractive area for businesses;
- to develop existing resources.

Modern city planning is increasingly concerned with the social and economic aspects of city living.

The process of city planning usually involves a series of surveys and studies, development of a land-use and transportation plan, preparation of a budget, and the approval of a unified

Master Plan by various agencies or legislative bodies. City planners have to tackle problems of traffic, pollution, security, fire and sanitation services, limitations and other regulations, and the problems of funding. In recent years planners have worked closely with community groups who wanted to take part in the planning of their own neighbourhood.



- 1 Who writes a Master Plan?
- 2 What does it include?
- 3 What are its aims?

- 4 What does modern city planning involve?
- 5 What problems do city planners have to tackle?
- 6 How are trends in recent years?

15 Find the synonyms of these words in the text in exercise 14.

- 1 specialist _____
- 2 inspecting _____
- 3 structured _____

- 4 suggestions _____
- 5 enhancements _____
- 6 restrictions _____

MY GLOSSARY

border /bɔːdə(r)/ _____
 building consent /'bɪldɪŋ kən'sent/ _____
 to conform /tə kən'fɔːm/ _____
 consultant /kən'sʌltənt/ _____
 contour /kɒntʊə/ _____
 demanding /dɪ'mɑːndɪŋ/ _____
 deprived /dɪ'praɪvd/ _____
 draftsman /'draːftsmən/ _____
 dwelling /'dwelɪŋ/ _____
 to engineer /tuː ɛndʒɪ'nɪə(r)/ _____
 funding /'fʌndɪŋ/ _____
 grid /grɪd/ _____
 guesswork /'geswɜːk/ _____

hypsometric tint /'hɪpsə'metrɪk tɪnt/ _____
 ongoing /'ɒŋgəʊɪŋ/ _____
 open-source /'əʊpən 'sɔːs/ _____
 paved /peɪvd/ _____
 prosthetics /prɒs'thetɪks/ _____
 real estate /'riəl rɪsteɪt/ _____
 sanitation /sæn'ɪteɪʃn/ _____
 schedule /'fedʒuːl/ _____
 shading /'ʃeɪdɪŋ/ _____
 stand-alone /'stænd ə'ləʊn/ _____
 survey /'sɜːveɪ/ _____
 to tackle /tə 'tækl/ _____

6

Building Elements

Foundations

1 Read the text and then answer the questions below.



The foundations, walls, floor, stairs and roof are some of the building elements that all types of building have in common.

Foundations are structures that transfer weights from walls and columns to the ground. There are two types of foundations: **shallow foundations** and **deep foundations**. Shallow foundations are usually embedded a metre into the soil, whereas deep foundations are embedded more in depth. They are recommended in case of very large design loads, a poor soil at shallow depth or site constraints, such as property lines. There are different types of deep foundations and they can be made of timber, steel and reinforced or pretensioned concrete.

Geotechnical engineers design foundations to ensure that they have an adequate load capacity with limited settlement. When designing foundations, it is also important to consider scour (when flowing water removes supporting soil from around a foundation) and frost heave (when water in the ground freezes and forms ice lenses).

- 1 What are foundations? How many types of foundations are there?
- 2 What are the main features of shallow foundations?
- 3 What are the main features of deep foundations?
- 4 What do geotechnical engineers design?
- 5 What must be considered?
- 6 What are scour and heave?

Walls

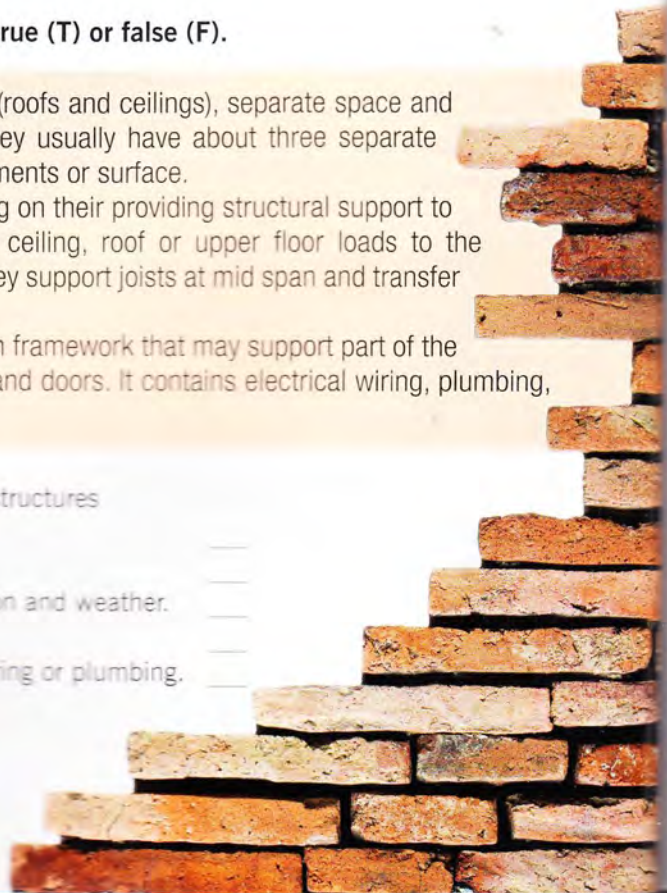
2 Read the text and decide if the sentences below are true (T) or false (F).

Building walls support the superstructures of building (roofs and ceilings), separate space and give protection against intrusion and the weather. They usually have about three separate components: structural elements, insulation, finish elements or surface.


Walls can be loadbearing or non loadbearing depending on their providing structural support to the building or not. Exterior loadbearing walls carry ceiling, roof or upper floor loads to the foundation. Some bearing walls are inside buildings: they support joists at mid span and transfer loads down to the foundation.

Usually conventional house walls have an inner wooden framework that may support part of the house, but does not support wall coverings, windows and doors. It contains electrical wiring, plumbing, insulation, and other utilities.

- 1 Walls can define and protect areas, support the superstructures of buildings and delineate a space. _____
- 2 There are two kinds of structural walls. _____
- 3 Exterior boundary walls give protection against intrusion and weather. _____
- 4 Loadbearing walls can only be exterior walls. _____
- 5 Conventional house walls usually contain electrical wiring or plumbing. _____



Floor

3  6 Listen and complete the text with the words from the box.

electrical wood surface covering underfloor strength

Floor structure contributes to the general (1) _____ of the building system. It is formed of a steel I-beam frame with a horizontal upper (2) _____ to which a number of adjacent composite floor panels is fastened firmly.

Floors consist of a subfloor for support and a floor (3) _____ used to give a good walking surface. In modern buildings the subfloor often has (4) _____ wiring, plumbing, and may provide other services built in, like (5) _____ heating.

There is a wide variety of floor covering materials: carpet, ceramic tiles, (6) _____ flooring, laminated wood or stone.

Roofs

4 Read the text and decide if the statements below are true (T) or false (F).

Roofs can be divided in **cut roofs**, where a carpenter measures, cuts and places every length of wood needed for the frame; and **fixed roofs**, made of pre-built and assembled trusses. Trusses are custom-designed by computer so as to adapt to the typical weather conditions of the house. As they generally rest only on outside walls, they leave the inside free to move walls and to accommodate different room sizes.

When the frame of the roof is ready, a waterproof membrane is placed over it and it is held in place by battens (long pieces of wood) that are nailed into the truss and are the supporting system for the tiles. Tiles are then nailed to the wood. The top of the roof is finished off with ridge tiles that cover both sides of the roof's top row of tiles. Then the end of the wood at the bottom of the roof is covered by a fascia. The fascia allows air to flow safely through the membrane. To take away the water from the building, guttering is attached to the fascia. As heat can go straight out of the roof, insulation is also necessary.

When designing the roof structure it must be remembered that all the load on the roof has to be transferred to the supporting beams, bearing walls, building foundation and the earth.



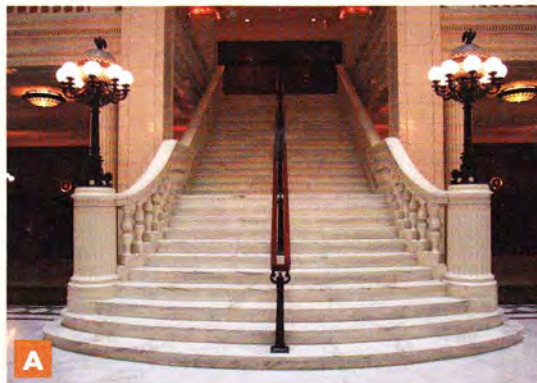
- 1 Trusses are designed to adapt to the typical weather conditions of the house. _____
- 2 Battens are long pieces of wood supporting the tiles. _____
- 3 The top of the roof is finished off with a waterproof membrane. _____
- 4 Then the end of the wood at the bottom of the roof is covered by the guttering. _____

Stairs

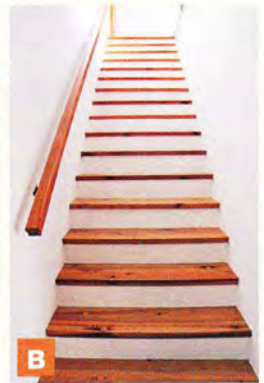
5 Read the text and say what the stairs in the picture are like.

Staircases are powerful design elements and an opportunity for creative expression. They can be **spiral** (twisting around a centre pole with steps radiating out of it), **straight** (they stretch from lower to upper level in one straight run), **circular** (sweeping in a broad curve from one level to another) or they can have other shapes. They can be **wide** or **narrow**, **steep** or **gradual**, **return** (dividing the run, reversing direction 180 degrees at a landing) or **'L' stairs** (making a 90 degree turn at a landing).

Their design is influenced by their function and their style varies according to how their parts are built and combined. Staircases are built according to rules that are important for safety, indicating the heights of risers, depth and width of treads and placement of handrails. The first measurement to take when building a staircase is the distance between the two finished floors. This determines the height of the staircase. Its riser must not exceed 22 cm in residential buildings. The average width is 80 cm, and anyway it should not be less than 60 cm.



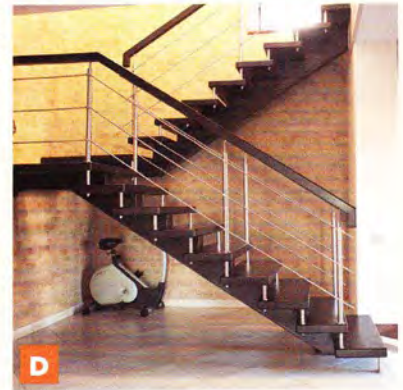
A



B



C



D

6 Work in pairs: use your own words to explain which kind of stairs you would choose for your home and why.

7 Think about the stairs in your house or a building you know well. Write a short paragraph answering the questions below.

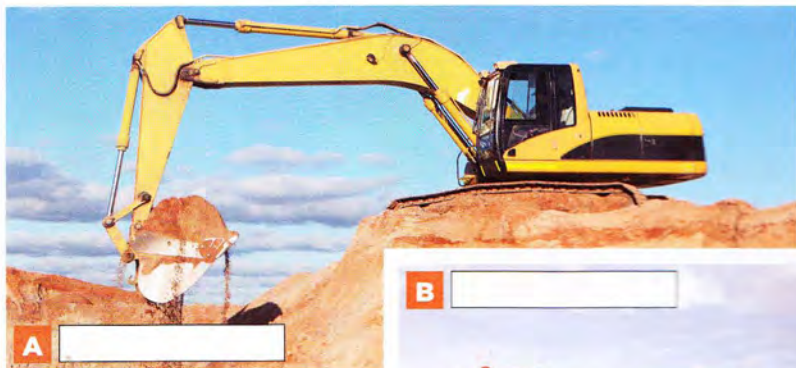
- What kind of stairs are they?
- Do you think this is the best solution? Why/Why not?
- Would you replace them with another kind of stairs? Why/Why not?

MY GLOSSARY

average /'ævərɪdʒ/	row /rəʊ/
batten /'bætən/	run /rʌn/
carpenter /'kɑ:pɪntə(r)/	scour /'skaʊə(r)/
constraint /kən'streɪnt/	settlement /'setlmənt/
electrical wiring /ɪ'lektɪrɪkl 'waɪərɪŋ/	shallow /'ʃæləʊ/
embedded /ɪm'bedɪd/	span /spæn/
framework /'freɪmwɜ:k/	firmly /'fɜ:mli/
guttering /'gʌtərɪŋ/	steep /sti:p/
handrail /'hændreɪl/	to stretch /tə streɪtʃ/
heave /hi:v/	to sweep /tə swi:p/
I-beam /aɪbi:m/	tile /taɪl/
joist /dʒɔɪst/	tread /tred/
landing /'lændɪŋ/	truss /trʌs/
plumbing /'plʌmɪŋ/	turn /tɜ:n/
ridge tile /rɪdʒ təɪl/	utility /ju:'tɪlɪti/
riser /'raɪzə(r)/	waterproof membrane /'wɔ:təpru:f 'membreɪn/

Construction machinery

1 Read the text and label the pictures with the words in bold in the text.



A **tower crane** is used to build tall buildings. Its short arm carries a counterweight of concrete blocks and its long arm carries lifting gear. The operator can sit in a cabin at the top of the tower just below the horizontal boom or control the crane by radio remote control from the ground. The lifting hook is controlled by a system of sheaves.

Digging machines are used for digging trenches for subterranean utility lines, storm sewers, etc. They use a vehicle (such as a front loader) and digging implements (such as a bucket-style backhoe or a rotary digging one). The rotary digging instruments use a rotating structure that is rotated along an elongated path.

A **concrete mixer** (or cement mixer) mixes cement aggregate (such as cement or gravel) and water to form concrete. There are also portable concrete mixers for smaller volume work.

2 Read the text again and answer the questions.

- | | |
|---|---|
| 1 What is a tower crane used for? How does it work? | 4 What do the rotary digging instruments use? |
| 2 Where can the operator sit? | 5 What does a concrete mixer do? |
| 3 What are digging machines used for? | 6 What is usually used for smaller volume work? |

3 Find the words in the text for the following definitions.

- | | |
|--|-------|
| 1 a person who is employed to operate or control a machine | _____ |
| 2 a curved device used for catching or holding things | _____ |
| 3 narrow holes which are dug into the ground | _____ |
| 4 longer and narrower than is normal | _____ |
| 5 small enough to be easily carried or moved | _____ |

Health and safety

4 Match the safety signs with their explanations.

- 1 danger high voltage
- 2 harmful or irritating substances
- 3 inflammable substances
- 4 mandatory safety helmet
- 5 protective footwear required
- 6 no unauthorised entry
- 7 protective gloves required
- 8 suspended loads
- 9 wear safety harness



5 Read the text and answer the questions below.



The improvement of safety, health and working conditions depends upon governments, managers, supervisors and workers. Construction and maintenance of safety facilities, installation of safety signs, testing of lifting machinery, emergency and evacuation plans must all follow precise safety procedures. The aim of all this is to avoid accidents and ill health by eliminating potential dangers. The materials, equipment and tools on the site should also meet some safety standards.

The main safety measures involve:

Work platforms: every work platform must be provided with safe access and have enough strength to bear the load placed on it. It must also be secured to avoid separation from the supporting structure to which it is attached.

Scaffold stability: scaffolds must be assembled with the vertical members plumb and be secured to a building if their height is over 3 times their minimum base dimension. Their bases must have bearing plates resting on a solid surface and strong enough to support their weight.

Electrical hazards: a scaffold must be grounded if it is situated near a high voltage source.

- 1 What do site safety procedures concern?
- 2 What should also meet some safety standards?
- 3 What is the main aim of these measures?
- 4 What must every work platform be provided with? Why must it also be secured?
- 5 How must scaffolds be assembled? What must their bases have?
- 6 When must a scaffold be grounded?

MY GLOSSARY

backhoe /bækhəʊ/ _____

boom /bu:m/ _____

front loader /frʌnt ləʊdər/ _____

gear /gɪə(r)/ _____

grounded /graʊndɪd/ _____

harness /hɑ:nəs/ _____

mandatory /mændətəri/ _____

plumb /plʌm/ _____

safety /seɪfti/ _____

scaffold /skæfəʊld/ _____

sheaf /ʃi:f/ _____

storm sewer /stɔ:m 'suə(r)/ _____

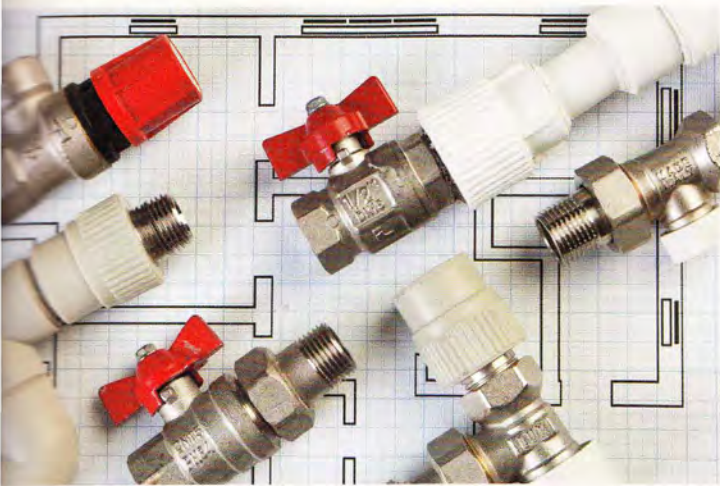
subcontractor /sʌbkən'træktə(r)/ _____

tower crane /taʊə(r) k'reɪn/ _____

trench /trentʃ/ _____

Plumbing systems

1 Read the text and answer the questions below.



The plumbing system, consisting of pipes and fixtures, concerns the distribution of tap water and the removal of waterborne waste in a building.

Plumbing installation must follow some regulations to ensure safe, quality construction.

Water systems of ancient times used pipes or channels made of clay, lead or stone. Today water supply systems use high pressure pumps and pipes made of non-toxic materials, such as copper, brass, steel, cast iron and plastic. The domestic hot water supply is provided by means of water heater appliances, or through district heating.

Used water and wastes are carried away by the drainage, waste and vent system.

- 1 What does a plumbing system consist of?
- 2 What materials were used in water systems of ancient times?
- 3 What materials are used in water systems today?

Electrical systems

2 Read the text and decide if the statements below are true (T) or false (F).

An electrical system includes the electrical service, lighting outlets and hard-wired appliances. The electrical service is usually between 100 and 200 amps. Electrical lines run from the street to a meter box (situated outside the house), then to the electric panel board which contains the switches to control the electricity in each room of the house. It is there that the amps are divided up across circuits to supply the different areas of the house with electricity.

Electrical systems must follow a number of safety measures including, for example, circuit breakers, ground fault circuit interrupters and smoke alarms.

If you have specific needs, you can ask your electrician for advanced wiring systems, which may also include modern computer lines to help you work at home.



- 1 An electrical system and an electrical service are the same thing.
- 2 A meter box should not be placed inside the house.
- 3 There is an electric panel board in each room of the house.
- 4 There are many circuits for supplying the different areas of the house with electricity.
- 5 Modern computer lines can be installed by an electrician.

Heating systems

3 Read the text and label the pictures with the expressions in bold.

All climate-control devices or systems have three basic components: a source of warmed or cooled air, a means of distributing the air to the rooms being heated or cooled, and a control used to regulate the system (e.g. thermostat). A variety of technologies are available for heating your house:

- In a **central heating system** a furnace or boiler consumes the fuel (e.g. gas, oil, or electricity) that powers it. As fuel is burned, pipes take hot water to radiators. You get hot water at the same time as heating, depending on how you set the controls.
- **Electric heat pumps** remove heat from outdoor air, ground, surface water or the earth and move heat from one place to another. They can also be used as air conditioners when the weather is warm. The thermostat will also include controls for air conditioning.
- **Radiant skirting board heaters** are long, metal units with electrical elements inside. They are sometimes the only source of heat in a house, or they can be an extra heating device in cooler rooms.
- **Radiant ceiling or floor systems** are installed in floors, ceilings or (occasionally) walls. They warm objects in much the same way as the sun does.
- In **hydronic heating** a boiler warms the circulating water and hot water flows through tubes under the floor or through units that are similar to skirting board heaters. They can also be installed in ceilings. They are sometimes used under concrete in driveways to keep snow and ice from accumulating.
- **Portable space heaters** are either freestanding or attached to a wall and work with electricity, gas or kerosene. Their area cannot be qualified as heated living space.



4 Read the text again and complete the table. More than one answer is possible.

Your demands	What can you use?
1 I want a freestanding heater.	<i>a portable space heater</i>
2 I have a cool room downstairs.	
3 I want to install heating in the ceiling.	
4 I need to move heat from one place to another.	
5 I want to install a radiant element in the floor.	
6 I need an extra heating device.	
7 I want to use my heater as an air conditioner too.	

5 What kind of heating system is used in your home? Work in small groups and discuss the advantages and disadvantages of each system thinking of the costs of installation, maintenance, efficiency.

Solar heating

- 6 Do you know the difference between the solar photovoltaic system and the solar thermal system? Label the pictures.



- 7 Complete the text with the words from the box. Then listen and check.

tank roof common pollution sunlight storing

Solar energy is the electricity produced from the sun's rays and captured by means of solar panels, which are becoming increasingly (1) _____ nowadays. The two types of solar panel systems are solar photovoltaic systems and solar thermal system.

In the **solar photovoltaic systems** the solar thermal panels contain cells whose semiconductors react with (2) _____. Electricity is produced when sunlight hits them. This kind of technology is still quite expensive and its disadvantage nowadays is the problem of (3) _____ energy.

In the **solar thermal system** solar energy is used for water heating. The panels are positioned either on the (4) _____ or a wall facing the sun and contain flowing water. When the thermal collectors in the panel are exposed to the sun, they heat the water (stored in a hot water cylinder) that is either pumped or driven by natural convection through it. The storage (5) _____ is mounted immediately above or below the solar collectors on the roof. This system is not very expensive and offers a number of advantages, including being renewable, creating less environmental (6) _____, reducing costs and maintenance and saving resources. Hot water can be produced for most of the year.

A conventional boiler can be used to make the water hotter, or to provide hot water when solar energy is not available.

- 8 Read the text again and then match the two parts of the sentences.

- | | |
|--|--|
| 1 Solar energy | a <input type="checkbox"/> we can produce energy using solar panels. |
| 2 Thanks to solar thermal systems and solar photovoltaic systems | b <input type="checkbox"/> are contained whose semiconductors are able to react with sunlight. |
| 3 The solar thermal panels are usually installed | c <input type="checkbox"/> when solar energy is not available or to make water hotter. |
| 4 In thermal panels special cells | d <input type="checkbox"/> next to the solar collectors on the roof, either above or below. |
| 5 Water is heated by | e <input type="checkbox"/> hot water for most of the year. |
| 6 The storage tank is mounted | f <input type="checkbox"/> means producing electricity from the sun's rays. |
| 7 Thanks to these panels you can produce | g <input type="checkbox"/> exposing the thermal collectors in the panel to the sun. |
| 8 Sometimes a conventional boiler is used | h <input type="checkbox"/> on house roofs. |

- 9 Now answer these questions.

- | | |
|---|--|
| 1 How can electricity be produced using the sun's energy? | 5 What is solar energy also used for? |
| 2 What do solar thermal panels contain? | 6 What happens when the thermal collectors are exposed to the sun? |
| 3 How is electricity created? | 7 Can you name some of the advantages of this system? |
| 4 What are the two main disadvantages of this energy? | 8 What can a conventional boiler be used for? |

Ventilation and air conditioning

10 Read the text and label the pictures with the words in bold from the text.

Ventilation – the exchange of indoor air with outdoor air – is important to reduce indoor moisture, odours, and other pollutants.

Contaminants such as volatile organic compounds, and radon (that may cause health problems) can accumulate in poorly ventilated homes. Excess moisture needs to be removed before high humidity levels lead to physical damage to the home.


There are three main types of ventilation:

- **Natural ventilation** which is uncontrolled air movement through cracks and small holes (infiltration) and through vents such as doors and windows. The disadvantage of this is that it is uncontrollable.
- **Spot ventilation** which means using localised fans in the rooms where contaminant substances are generated (for example kitchen extractor fans and bath fans).
- **Whole-house ventilation** is a system that works thanks to fan and duct systems to exhaust stale air and supply fresh air to the house. Whole-house ventilation systems are usually classified as exhaust ventilation when the air is forced out of the house, supply ventilation if it is forced inside and balanced ventilation if the same amount of air is forced inside and outside the house.



11 Read the text again and answer the questions.

- 1 Why is ventilation important?
- 2 What happens if too much moisture is not removed from the inside of your home?
- 3 What is the disadvantage of natural ventilation?
- 4 What is spot ventilation?
- 5 How does whole-house ventilation work?

12  Listen to this interview with an expert speaking about the importance of ventilation and fill in the gaps.

- 1 Thanks to ventilation, we can dispose of unwanted _____, water vapour and pollution.
- 2 The amount of ventilation we need is determined by a number of different factors, such as the type of pollution _____ and the number of people who are in the room.
- 3 Usually modern _____ are provided with fittings which can both draw and force out air.
- 4 Thanks to heat _____ warm air can be saved.
- 5 To attain cross _____, you can use controllable trickle ventilators in every room.
- 6 Mechanical extractor fans are controlled by a _____ control switch.

Passive solar building

13 Read the text and decide if the statements below are true (T) or false (F).

One of the latest trends in energy conservation is **passive solar building design**. This means making windows, walls and floors in such a way that they are able to collect, store and distribute solar energy (heat) in winter and reject it in summer. This kind of design implies avoiding the use of mechanical and electrical devices. The best way to design a passive solar building is to pay great attention to window placement, glazing type, thermal insulation, thermal mass and shading. In most cases these design techniques are applied to new buildings, but even existing buildings can be adapted.

If emissions decrease, this will help to reduce climate change. Energy conservation makes the replacement of non-renewable resources with renewable energy easier. According to the European Union pledges of 2006, the annual consumption of primary energy in the EU should be reduced by 20% by 2020.

The EU's SAVE Programme is expected to promote energy efficiency and encourage energy-saving behaviour. The European Commission is currently giving financial support to large-scale research projects that will try to understand the factors for effective energy conservation programmes.



- 1 Mechanical and electrical devices are used in passive solar building design. _____
- 2 These techniques can only be applied to new buildings. _____
- 3 Thanks to the decrease in emissions, climate change can be reduced. _____
- 4 By 2020 yearly consumption of primary energy in the EU should be reduced by 10%. _____
- 5 The European Commission is supporting some energy conservation research projects. _____

14 Find the synonyms of these words in the text.

- | | |
|----------------------------|-----------------|
| 1 tendency _____ | 5 promise _____ |
| 2 piece of equipment _____ | 6 support _____ |
| 3 decrease _____ | 7 plan _____ |
| 4 facilitate _____ | |

MY GLOSSARY

amp /æmp/ _____	ground fault /'graʊnd 'fɔ:lt/ _____
appliance /ə'plaiəns/ _____	hydronic /'haɪdrənɪk/ _____
brass /brɑ:s/ _____	lead /li:d/ _____
cast iron /kɑ:st aɪən/ _____	lighting outlet /'laɪtnɪŋ 'aʊtlet/ _____
circuit breaker /'sɜ:kɪt 'breɪkə(r)/ _____	moisture /'mɔɪstʃə(r)/ _____
compound /kəm'paʊnd/ _____	pledge /pledʒ/ _____
driveway /draɪvweɪ/ _____	skirting board /'skɜ:tɪŋ bɔ:d/ _____
to exhaust /ɪg'zɔ:st/ _____	stale /steɪl/ _____
fan /fæn/ _____	tank /tæŋk/ _____
fixture /'fɪkstʃə(r)/ _____	waterborne waste /'wɔ:tə(r)bɔ:n weɪst/ _____
glazing /'gleɪzɪŋ/ _____	wiring system /'waɪərɪŋ 'sɪstəm/ _____

Bio-architecture: general definitions

- 1 Try to explain what bio-architecture is, starting from the meaning of its prefix (bio-). Then read the text and check your answers.

Bio-architecture is a new building approach that respects life and earth. Its aim is to create 'healthy' buildings with little ecological impact, creating harmony between buildings and nature. For this reason two basic principles have to be followed:

- using the natural presence of the sun, good thermal insulation and natural ventilation to reduce energy consumption;
- using renewable energy resources (solar, wind, water and geothermal) to achieve energy autonomy.

Bio-architects and designers follow the principles of natural design that rule all nature, so by studying and understanding the regularity and balance that we can find in nature, they try to establish rules that can be applied to architecture. They use special geometric shapes, symmetries, proportions, natural patterns and universal symbols to create pleasant and harmonious spaces. Bio-architects follow simple rules that include:

- designing spaces using natural geometries, shapes and growth patterns in order to create sustainable systems;
- avoiding 'negative' forms such as sharp angles, and creating harmonious spaces;
- using all kinds of biological materials and avoiding steel, aluminium and plastics when possible.



- 2 Read the text again and decide if the statements below are true (T) or false (F).

- 1 Sustainable architecture aims at creating harmony between man and nature. _____
- 2 Bio-architecture tries to mirror the balance we find in nature. _____
- 3 The rules of bio-architecture are very complex. _____
- 4 Sharp angles are a good example of harmonious spaces. _____
- 5 Steel and plastics are widely used in bio-architecture. _____

Eco-materials

- 3** Read the text about eco-materials. Name two examples of them. What characteristics should eco-materials have?



The materials used in bio-architecture should be chosen paying attention to the damage (production of toxic gases, water and soil pollution) that they may cause to the environmental ecosystem.

Eco-materials should:

- be biodegradable and recyclable;
- not be dangerous for our health;
- contribute to a more sustainable

environmental future.

Examples of materials that can be used in bio-architecture are timber, brick, stone, cork and natural paints and varnishes. It is easy to choose eco-friendly materials thanks to certifications.



Eco-design

- 4** Read the text and choose the best title for each paragraph.

- A New choices in materials and energy
 B Recent trends in building
 C Eco-design: a new attitude

1 _____

The objective of new building is increasingly becoming that of searching for environmentally-friendly solutions by finding different sources of energy production and paying more attention to the materials used.

2 _____

Thanks to eco-design, the attitude towards the design of a product takes into consideration the environmental impact of it during its life cycle (which includes its manufacturing, use and disposal). According to eco-design, not only should the material used to create a product be taken into account, but also the waste, the energy and the final emissions created and their environmental impact.

3 _____

The principles of eco-design used in building design and construction range from the choice of materials to the type of energy system the building will use and the disposal of the materials at the end of their useful life. For example, local materials are less expensive, their transport cost is lower and consequently CO₂ emissions are also limited. Recyclable and recycled materials can be used provided they do not create any further waste during their production or at the end of their lifetime. Renewable and unlimited sources of energy or passive energy systems are always considered (such as green roofs to insulate a building or positioning a building in order to use the sun's rays as a heating method).



- 5** Read the text again and answer the questions.

- 1 What are the objectives of new building?
- 2 What are the stages of a product life-cycle?
- 3 What are the advantages of local materials?
- 4 Which are the types of energy considered?

Sustainable design

6 Match these words with their pictures.

solar water heating low-flow tap aerator insulation double glazing



A



B



C



D

7 Read the text and answer the questions below.

The main goals in designing an environmentally-friendly building are:

- **Reduction of energy consumption:** one of the strategies used by designers to decrease the use of energy is good insulation in walls, floors and ceiling and energy efficient windows with double glazing. Another approach is to orient walls and windows so as to make the most of the use of natural light (so decreasing the use of electric lighting when daylight is available) and place trees and sun shelters in effective positions to provide shade in the summer. Another way to decrease energy costs is through the use of solar water heating, so the environmental impact of the building can be further reduced.
- **Reduction of water consumption and protection of water quality:** this can be attained through facilities that improve the collection, purification and reuse of water. Low-flow taps and ultra-low flush toilets can also be used to reduce waste water.
- **Improving air quality and ventilation systems:** indoor air quality can be improved during the design and construction processes by choosing construction materials and interior finish products with zero or low VOC emissions. The control of moisture accumulation, thanks to a well-insulated envelope and adequate ventilation is also very important for the health of those living in a building. The choice of flooring is important too. Wood is hypo-allergenic and, by using smooth surfaces, the creation of unhealthy particles can be avoided.



- 1 Can you name an efficient way to reduce the use of energy?
- 2 How can designers make the most of natural light?
- 3 How can the environmental impact of a building be further reduced?
- 4 How can the reduction of water consumption be attained?
- 5 How can the indoor air quality be improved?
- 6 Why is the control of moisture accumulation important?



Eco-living

8 Read the text and decide if the statements below are true (T) or false (F).

There are a lot of very simple ways to save energy. Employ just a few of the following suggestions and you can cut your annual energy bills considerably.

- When you substitute your old domestic devices, choose the most energy-efficient models (AAA labelled ones are very energy efficient).
- Turn off domestic electrical appliances (instead of using the stand-by mode).
- Use fluorescent light bulbs: they may be more expensive, but they use only 1/4 the energy of an ordinary incandescent bulb and last 8-12 times longer.

- Make sure your dishwasher is full before using it.
- Turn down your water heater thermostat.

You can even generate your own energy and heat by using wind turbines, solar electricity panels, solar water heating and wood fuel or biomass boilers. If there is a river nearby, you can even create hydroelectricity. These are all renewable sources of energy, so they have a much lower impact on the environment and can help you save money.

- 1 High energy saving home appliances have AAA labels. _____
- 2 Your bills will be lower if you turn off home electronics and use fluorescent light bulbs. _____
- 3 In the future we will be able to generate our own energy. _____
- 4 Recent technology does not yet allow us to create hydroelectricity if there is a river nearby. _____

9 Work in small groups. Make a list of the energy-saving methods that you and your family use at home. Then compare your habits with those of the others.

10 Listen to this text about the reduction of energy, water and materials waste used during construction and fill in the gaps.

The (1) _____ of environmentally-friendly buildings is to decrease the (2) _____ of waste material. If a building is designed well, the amount of waste produced by the people living in it will be (3) _____ thanks to on-site solutions such as compost bins.

(4) _____, a building is usually demolished at the (5) _____ of its life and most of the waste is taken to landfills, but now, thanks to (6) _____, some material is kept and used again, with (7) _____ advantages:

recycling materials that are still usable (for example (8) _____) and reducing waste. Also waste water from dishwashing or washing machines can be used again, for (9) _____ for irrigation, and rainwater can be collected for a number of useful purposes.

Converting waste and waste water into fertiliser is a good (10) _____ for cutting down costs: liquid fertiliser can be created by collecting human and other (11) _____ waste.



11 Imagine you have decided to build your own energy-saving house. What would it be like? Which methods would you use to save energy? Write a short paragraph (100 words).

MY GLOSSARY

approach /ə'prəʊtʃ/ _____
 biodegradable /'baɪəʊdɪ'greɪdəbəl/ _____
 bill /bɪl/ _____
 boiler /'bɔɪlə(r)/ _____
 certification /sɜ:tɪfɪ'keɪʃn/ _____
 compost /'kɒmpɒst/ _____
 consumption /kən'sʌmpʃn/ _____
 cork /kɔ:k/ _____
 emission /ɪ'mɪʃn/ _____
 envelope /'envələʊp/ _____

environmentally-friendly /ɪn'vaɪərən'metəli frendli/ _____
 expertise /ekspɜ:'ti:z/ _____
 heating /'hi:tn/ _____
 landfill /'lændfɪl/ _____
 low-flow tap /ləʊ fləʊ tæp/ _____
 shade /ʃeɪd/ _____
 shelter /'ʃeltə(r)/ _____
 to attain /tu: ə'teɪn/ _____
 varnish /'vɑ:nɪʃ/ _____
 waste /weɪst/ _____

Bridges

1 Read the text and answer the questions below.

A bridge is a structure which provides passage over a gap or physical obstacles such as valleys, rivers and roads. The first bridges were probably fallen tree trunks (later supported by stones or logs) and bridges made of long ropes across rivers or valleys. The first great bridge builders were the Ancient Romans (some of their bridges are still standing today). The design of a bridge depends on its purpose, the kind of ground it is built on and the material used to build it.



Tower Bridge, one of the best known symbols of London, is an example of a **double-decker** bridge (two levels). It was designed by Sir Horace Jones and completed in 1894. A mechanism contained in its two Gothic Towers allows the roadway to be raised (creating a 40-metre-high and 60-metre-wide space) when large ships need to go through it. Before 1976 – when the system was electrified – the lifting equipment was commanded by a steam engine.

- 1 What are bridges built for?
- 2 What were the first bridges like? Who were the first great bridge builders?
- 3 What does the design of a bridge depend on?
- 4 What is Tower Bridge famous for?

Roads

2 Read the text and answer the questions below.

The earliest rough pathways appeared in 10000 BC. They were trails made by animals or created by humans who followed animals. The first stone and brick-paved roads were created in the Middle East and India between 4000 and 3000 BC, and in the same period the first European roads were built in England using logs.

The **Ancient Romans** were great road builders. Some of their roads still survive today. Their armies built a great number of paved roads in Europe and North Africa using stone and gravel and included gutters for drainage. Around the 8th century AD a great number of roads (paved with tar) were built in the Arab Empire, but it was not until the **Industrial Revolution** that modern road building started.

Today roads are used both for pedestrian and vehicular traffic. The first stages in road building are planning, designing and approval of the project following official guidelines. After deciding where to move gas, water, sewer, electricity and phone lines and compensating and relocating landowners, construction can start by removing earth, rock and vegetation. Then the pavement material is laid using a great quantity of building equipment. Modern roads are built with smooth layers of tar or asphalt, over concrete or macadam. The kind of road surface depends on its expected use and on economic factors.



- 1 Where and how were the first roads built?
- 2 How did the Ancient Romans build roads?
- 3 Which are the stages of modern road building?

Schools

3 10 Listen and complete the text with the missing words.

Schools have a very special importance in everyone's (1) _____ and consequently architects should think carefully and sensitively when (2) _____ them. During the 19th century the first to understand the economic importance of universal (3) _____ were the British and the Prussians, whose schools were disciplinarian places that could be built quite cheaply. In Great Britain, as well as in France and Germany, we can still see examples of these great, late nineteenth-century, four-storey schools with their classrooms double



banked along central (4) _____. School building gradually changed after World Wars I and II. A great number of new schools were built and educational theories and practices shifted from strong discipline to encouragement in learning and liberal egalitarian programmes. Consequently, school design changed too. New schools are places full of (5) _____, with multivalent spaces. More recently, schools have become buildings where the environment is more and more (6) _____ and where solutions are found to meet practical demands, such as health, (7) _____ and financial concerns. In the future, architects will have to consider a series of important aspects, such as creating increasingly friendly, comfortable, stimulating buildings, with spaces such as gyms, laboratories, libraries and (8) _____.

Airports

4 Match these words with their definitions.

- | | | |
|-----------------|----------------------------|---|
| 1 runway | a <input type="checkbox"/> | a large building where planes are kept, built, or repaired |
| 2 control tower | b <input type="checkbox"/> | a place at an airport where planes wait or turn round |
| 3 hangar | c <input type="checkbox"/> | a long piece of ground with a smooth hard surface on which aircraft take off and land |
| 4 apron | d <input type="checkbox"/> | a large building at an airport where passengers arrive and leave |
| 5 air terminal | e <input type="checkbox"/> | a building at an airport from which air traffic is watched and directed |

5 Read the text and check your answers to exercise 4.

An airport is a place where aircraft take off and land. In smaller airports there is usually a single **runway**, shorter than 1000 metres and made of gravel, grass or dirt, whereas larger airports usually have paved runways of about 2 km or even longer. Airports also include **control towers** (if the air traffic is high, air traffic is controlled by radio from there), **hangars** (where aircraft are stored and maintained), **aprons** (parking areas away from terminals) and **air terminals** (departure and arrival buildings).



In terminals passengers can get flight information, buy tickets, clear security control, claim their luggage and board aircraft through waiting areas, boarding gates and ramps (where aircraft park next to a terminal to board passengers).

Large airports usually have air traffic control, fixed base operator services, and **passenger facilities** such as shops, restaurants, emergency services, rental car counters, customs and immigration facilities.

Gardens and parks

6 Read the text and answer the questions below.

Parks are open spaces, usually large and protected areas, in cities and towns. They may be in a **natural** (wilderness parks) or **semi-natural** state (in this case they are planned spaces) and they are created for human benefit (leisure, relaxation, entertainment and recreation) or to protect animals (some of which are threatened species) or the environment.

Usually you can find both natural and man-made materials in parks: trees (chosen either for their beauty or for their shade), grass, flowers and landscape features such as fountains, benches, picnic areas, statues, pathways, and ponds.

There are active and passive recreation parks: **active recreation parks** have a high level of development and include playgrounds, ball fields and skateparks, whereas **passive recreation parks** focus on the open-space characteristics of the place and offer trails and picnic areas.

Before designing and creating a garden, its use must be carefully considered. The most important consideration in any garden design is how the garden will be used, followed closely by the desired stylistic genre and the way the garden space will connect the other structures in the surrounding areas.



Central Park lies in Manhattan, New York, and it is the most visited urban park in the USA (about 35 million visitors every year). It was opened in 1857 since an area to escape from the chaotic life of the city was needed because of the increasing number of citizens. About 1500 species of trees, shrubs and plants were planted in the park and today a great number of animals live there.

Although it has a very natural appearance, the park is completely landscaped: there are artificial lakes and ponds, lawns and grassy areas, playgrounds, walking tracks, ice-skating rinks, a zoo, a conservatory garden, an area of natural woods, a running track, an outdoor amphitheatre and many other indoor structures. Festivals, concerts and other kinds of performances are regularly organised.

- 1 What can you usually find in parks?
- 2 Can you explain the difference between active and passive recreation parks?
- 3 What has to be considered before designing and creating a garden?
- 4 Why was Central Park opened?
- 5 The text says that Central Park is completely landscaped. Can you explain how?

Tunnels

7 Read the text and answer the questions below.

Tunnels are long and narrow underground passages with an opening on each end, built for pedestrian or vehicular (rail or road) traffic and for canals. Some tunnels are important for water supply or for hydroelectric stations, others are sewers or include communication or electricity cables. Before building a tunnel it is important to examine the conditions and type of ground and groundwater. Different methods can be used to build a tunnel, depending on the type of ground.

If the rock is hard, the tunnel is blasted out with explosives, whereas if the ground is softer, tunnel shields (steel tubes the same size as the tunnel) are pushed into the ground to dig out the earth. Typical examples of tunnels are underground train lines and road tunnels (created when there is an obstacle like a mountain).



- 1 What and who are tunnels built for?
- 2 Before building a tunnel, what is it important to examine?
- 3 Which are the main techniques when building tunnels?

8 Listen to an expert talking about the Channel Tunnel and complete the sentences.

- 1 The Channel Tunnel (also called 'Chunnel') opened in _____.
- 2 It is one of the _____ tunnels in the world and the tunnel with the longest _____ portion.
- 3 It is only used for _____.
- 4 The journey between London and Paris takes _____.

9 Choose one of the main topics in this unit (bridges, roads, schools...) and write a short essay (about 100 words) following these guidelines:

- When were the first examples built?
- Which features must it have?
- Is there an example you know that you particularly like? Why?

MY GLOSSARY

air terminal /eə(r) 'tɜ:mɪnəl/ _____

apron /'eɪprən/ _____

banked /bæŋkt/ _____

bench /bentʃ/ _____

to blast out /tə blɑ:st aʊt/ _____

cable /keɪbl/ _____

control tower /kən'trəʊl taʊə(r)/ _____

to dig out /tə dɪg aʊt/ _____

facility /fə'sɪlɪti/ _____

gutter /'gʌtə(r)/ _____

hangar /'hæŋə(r)/ _____

lawn /lɔ:n/ _____

leisure /'leɪʒə(r)/ _____

log /lɒg/ _____

macadam /mə'kædəm/ _____

pathway /pɑ:θweɪ/ _____

playground /'pleɪgraʊnd/ _____

pond /pɒnd/ _____

recreation /ˌrekri'eɪʃn/ _____

rental /rentəl/ _____

rink /rɪŋk/ _____

rope /rəʊp/ _____

rough /rʌf/ _____

runway /'rʌnweɪ/ _____

sewer /suə(r)/ _____

shrub /ʃrʌb/ _____

storey /'stɔ:ri/ _____

tar /tɑ:(r)/ _____

threatened /θretənd/ _____

track /træk/ _____

trail /treɪl/ _____

wilderness /'wɪldənɪs/ _____

Roman heritage in Britain

1 Look at the photos and match the places with the information.

- | | |
|------------------|---|
| 1 London | a <input type="checkbox"/> defence system |
| 2 Bath | b <input type="checkbox"/> new road system |
| 3 Hadrian's Wall | c <input type="checkbox"/> famous for its hot springs |

2 Read the text and answer the questions below.

London

The origin of London dates back to Roman times. The first bridge on the River Thames was probably built by the Romans between 55 BC (during Julius Caesar's expeditions) and 43 AD (during Emperor Claudius' invasion of Britain). For the first time the river was used for commercial trade with the continent. As a consequence, London became richer and larger and walls were built around it to provide protection. The Romans remained in Britain for almost 400 years. They left behind a very changed nation to the one they had invaded. They introduced a road system and established new towns that often had a rectangular space in the centre called the 'forum'.



Bath

Bath was the centre of fashion, luxury and leisure of Roman society in Britain. Today, Bath is famous for its healthy mineral water, hot springs, Roman baths (which are still open to the public) and Georgian buildings.

It became a World Heritage Site in 1987 and today it is a major centre for tourism. Every year in May and June there is an important festival of classical music. Bath is rich in history and it is surrounded by fascinating countryside.



Hadrian's Wall

Roman Emperor Hadrian built this famous wall in northern England between 122 and 127 AD. He decided that the Empire needed securing. The wall served as a defence across the northern border to keep out people from northern Scotland. It was 120 km long and up to five metres high. Along the wall the Romans built a series of small forts called 'milecastles'. Chester's Roman fort is one of the best conserved. Today, long sections of the wall can still be seen and it remains a popular attraction with many visitors every year.

- | | |
|--|---|
| 1 When was the first bridge built in London? | 4 What takes place in Bath during May and June? |
| 2 What is Bath famous for? | 5 Who decided to build a wall across the northern border? |
| 3 What happened in 1987? | 6 What did the Romans build along the wall? |

The Middle Ages: the Gothic period

3 Read the text and then choose the correct option.

The Gothic style was mainly introduced in Britain by the monastic order of Cistercians. They brought a simplified version of Gothic from their homeland in Burgundy, France. Many of the finest and largest works of English architecture, particularly the medieval cathedrals of England, were built in this Gothic style which flourished during the Middle Ages.

Characteristic features of this style include tall pointed arches and tall narrow windows and columns. This choice was due to the fact that the Cistercians wanted to show their ideas of spiritual elevation in all expressions of monastic life, including architecture.

There are three main periods in Gothic architecture:

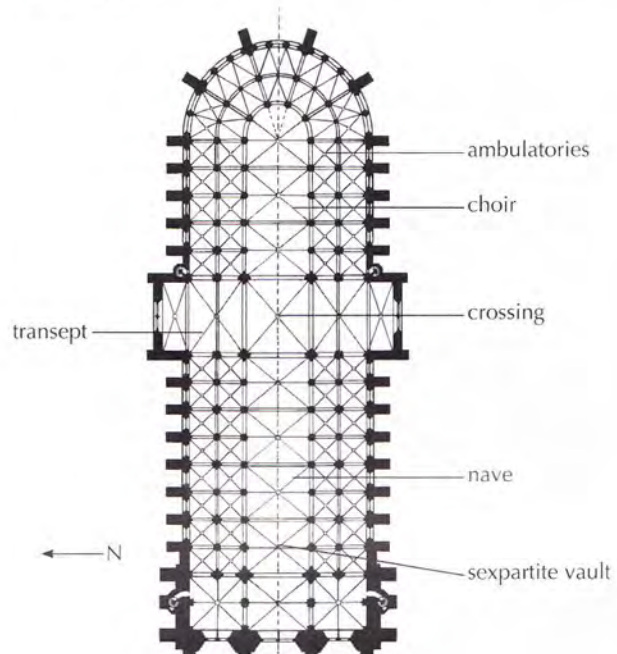
- Early English style dates back to the 13th century and its main features are tall, narrow, pointed windows with no decorative stonework.
- The Decorated style was typical of the first half of the 14th century and introduced more decorative patterns of ornamental stone carving around windows and doors. The simple geometric shapes of the Early English period gave way to the use of more complex curves.
- Perpendicular style is the third phase of Gothic architecture in England. It features large windows, vertical lines and fan vaulting (ceiling patterns in stone). This style characterised the second half of the 14th and 15th century.



York Cathedral

- 1 The Cistercians came from...
 - A Spain.
 - B France.
 - C Wales.
- 2 They wanted to express their ideas of ... in architecture.
 - A spiritual elevation
 - B monastic life
 - C decorative stonework
- 3 Early English style is characterised by...
 - A simple and plain stonework.
 - B ornamental stone carving.
 - C fan vaulting.
- 4 Decorated style is typical of the ... century.
 - A 13th
 - B 14th
 - C 15th
- 5 The main features of Perpendicular style are...
 - A narrow, pointed windows.
 - B stone carving around windows.
 - C large windows and fan vaulting.

Most Gothic churches have a cruciform plan. The **nave** is the main body of the church and is longer than the other three arms. Across the main body of the church is the **transept**. The **aisles** are on both sides of the nave, which is higher and wider. The nave receives direct lighting from a **clearstorey** – the windowed area above the aisles. **Masonry vaulting** over the aisles and nave is another typical characteristic.



British castles

4 Read the text and answer the questions below.

In the 11th and 12th centuries the Normans introduced large numbers of **castles** and **fortifications** – they were a sign of their power. Norman architecture in England had a defensive purpose. They built strong castles made of stone and wood, following a variation of the Romanesque style that was quite common in Europe during the Middle Ages. They chose strategic positions for their castles, so that they could defend themselves from the attacks of the natives (the Saxons).

Castles were usually surrounded by thick walls. The strongest part of the building was the inner tower, which was the last defensive point. Later, these castles developed into **manor halls** and their defensive aim was gradually replaced by residential and entertainment functions. The most famous examples of this kind of architecture in England are the **White Tower**, a central tower at the Tower of London, **Warwick Castle**, **Dover Castle** and **Windsor Castle**.



Warwick Castle

- 1 What purpose did Norman architecture have in England?
- 2 What materials did the Normans use to build the castles?
- 3 Where did they build their castles? Why?
- 4 How did castles change over time?



Windsor Castle

Windsor Castle is a medieval castle situated in Windsor, a town to the west of London. It is one of the official residences of the British monarch and the oldest and largest inhabited castle in the world. The original castle was built by William the Conqueror and it was a military base. The oldest surviving parts of the castle date back to the time of Henry II, around the middle of the 12th century. In the upper part are the private Royal Apartments and the state room including the famous St. George's Hall with its decorated ceiling.

5 Listen to the history of Windsor Castle and match the two parts of the sentences.

- | | |
|--|---|
| 1 In 1350 | a <input type="checkbox"/> the castle began to be used as a royal palace, rather than a bastion. |
| 2 In 1390 | b <input type="checkbox"/> Charles III began once again to use Windsor Castle as a royal residence. |
| 3 After the Wars of the Roses | c <input type="checkbox"/> King Edward III demolished most of the existing castle. |
| 4 1558-1603 | d <input type="checkbox"/> are Elizabeth I's date of birth and death. |
| 5 In 1804 | e <input type="checkbox"/> St. George's chapel began being restored. |
| 6 In the second half of the 20th century | f <input type="checkbox"/> Windsor Castle became one of the most important tourist attractions in the UK. |

The Renaissance style

6 Read the texts and answer the questions.



The Renaissance style started in England in the middle of the 16th century. The Renaissance style placed emphasis on symmetry, geometry and regularity. Columns and domes were typical features. The move toward a classical style in England was largely the work of an English architect called **Inigo Jones**.

St Paul's Cathedral in London, designed by **Sir Christopher Wren**, is a beautiful Renaissance building with a huge dome and two Baroque towers above a double portico façade. Most of the cathedral is made of stone. Inside, the visitor is fascinated by its great dimensions and decorations.

- 1 When did the Renaissance style start in England?
- 2 What did this style consist of?
- 3 What is the majority of St Paul's Cathedral made of?
- 4 What are visitors to St Paul's impressed by?

Georgian architecture

7 Read the text. Which feature is typical of the Georgian style?

The name Georgian comes from the three Georges who ruled Britain between 1714 and 1820. The type of building which most characterises the Georgian period is the simple but elegant 'Townhouse'. These tall, narrow buildings were often built in rows called 'terraces'. During the 18th century the population of urban areas increased considerably. Therefore, there was a need to pack a lot of houses into a small space and the 'terraces' provided a good solution.



The Gothic Revival and Neoclassicism

8 Read the texts and then answer the questions.

Between the middle of the 18th and 19th centuries, **Gothic style** returned to British architecture. Often the churches and manor houses designed according to the new Gothic style were much more decorated than the older originals. The most important architect and designer during this period was **Augustus Pugin**, who designed the **Houses of Parliament**, situated in the centre of London beside the River Thames. **Tower Bridge** with its neo-Gothic style towers, is another famous building in London, built at the end of the 19th century.

Neoclassicism became popular both in North America and Europe in the second half of the 18th century. This style was influenced by ancient Greek and Roman architecture. Its main characteristics are geometrical forms, straight lines and Greek columns. The use of antique forms in a new context was the main feature of neoclassical architecture.

Among the most famous neoclassical buildings in London are the **British Museum**, **Mansion House** (the official home of the Lord Mayor of London) and **Covent Garden Theatre** (the Royal Opera House).




- 1 When did Gothic style reappear in British architecture?
- 2 What were the new buildings like, compared to the original ones?
- 3 What was the Neoclassical style influenced by?
- 4 What are the main features of Neoclassicism?

Modern and contemporary masters of architecture

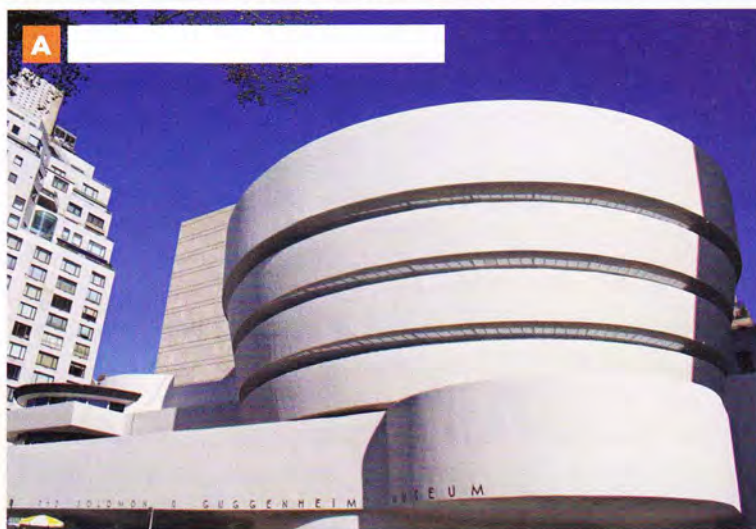
9 Look at the photographs and label the pictures with the names of the buildings from the box.

Guggenheim Museum (NYC) Jubilee Church Villa Savoye Lloyd's building
Pompidou Centre The Gherkin Guggenheim Museum (Bilbao)

10  13 Now complete the texts with the architects from the box, then listen and check.

Renzo Piano Frank Lloyd Wright Richard Meier Richard Rogers
Le Corbusier Norman Foster Frank Gehry

One of the most influential American architects of the first half of the 20th century was (1) _____. His works are based on the idea of organic architecture, which gives great importance to the relationship between the site, the building and the client's requirements. The Guggenheim Museum in New York is one of his most famous works. It has a spiral form and the interior looks like the inside of a seashell. The artworks are viewed by walking up the walkway.



Born in Switzerland, Charles-Édouard Jeanneret, known as (2) _____ was an architect famous for his contributions to what is now called Modernism and for providing better living conditions for citizens in crowded cities. His 'Villa Savoye' (1929-1931) was the one that best summarised his five main ideas about architecture which are:

- reinforced concrete stilts or pillars;
- a free-façade with no supporting walls;
- an open floor plan without any supporting walls;
- long strips of horizontal ribbon windows on the second floor;
- a ramp joining the ground to the roof garden level.

(3) _____ is an American architect. His works have been particularly influenced by Le Corbusier's ideas, many of which were expanded by him. The Jubilee Church (opened in 2003) is a church and a community centre located in the suburbs of Rome. A work of contemporary architecture, it was conceived as a centre to revitalise an isolated quarter of Rome. Meier used three large curved walls or 'shells' made of pre-cast concrete which appear like white sails. In between these 'shells' are glass walls and skylights.





(4) _____ is one of the most significant British architects of our time and the winner of a great number of prizes and awards. His ideas of prefabrication, structural simplicity and energy-efficient buildings are typical of his modernist and functionalist designs. In 1971 Rogers started a partnership with Italian architect (5) _____. In that same year, they won the design competition for the Pompidou Centre in Paris. This project made him world-famous and Roger's characteristic high-tech styling can be seen: water, heating and ventilation ducts and stairs, typical elements of the interior, are exposed in a new inside-out style. The same controversial style, taken to the extremes, was used for his Lloyd's building in London, where staircases and lift towers are situated in towers and shafts on the exterior.



(6) _____ is one of the most innovative British architects of our time. Between 1968 and 1983 he had a long-lasting partnership with American architect, Richard Buckminster Fuller. Their projects were mainly focused on the development of environmentally sensitive approaches to design. As their client wanted to bring back a sense of community into the workplace, Foster's innovative idea was to design open-plan office floors, roof gardens, a swimming pool and a gym for the employees. He designed 30 St Mary Axe (known today as 'The Gherkin') that included several sustainable energy ideas. Other famous works include the Millau Viaduct in southern France which is the tallest bridge in the world, and the iconic New Wembley Stadium in London.



(7) _____ is a Canadian prize-winning contemporary architect. His style is called Deconstructivism and unlike modernism, it goes against social goals and functional necessity. Some experts have criticised his works because his buildings waste structural resources by creating functionless forms and do not seem to belong in their surroundings. However, his buildings have become very famous tourist attractions and are often regarded as the most important works in contemporary architecture. His most famous works are the Guggenheim Museum in Bilbao (1997), the Walt Disney Concert Hall in Los Angeles (2003) and the Vitra Design Museum in Germany (1990).



11 Choose one of the buildings on these pages, connect to the Internet and find out more about your chosen building. Write a text (about 100 words) summarising the information you have found.

12 Now present your findings from exercise 11 to the class using the following guidelines:

- Why have you chosen this building?
- Do you like it? Why?/Why not?
- What are its main characteristics?

MY GLOSSARY

aisle /aɪl/ _____
 arch /ɑːrtʃ/ _____
 bastion /bəˈstɪən/ _____
 baths /bɑːðz/ _____
 border /bɔːdə(r)/ _____
 ceiling /ˈsiːlɪŋ/ _____
 clearstorey /klɪə(r)ˈstɔːri/ _____
 column /kɒləm/ _____
 cruciform /kruːsɪfɔːm/ _____
 curve /kɜːv/ _____
 decorative /deɪkəreɪv/ _____
 defence /dɪfens/ _____
 dome /dɒm/ _____
 duct /dʌkt/ _____
 façade /fəˈsɑːd/ _____
 fort /fɔːt/ _____
 high-tech /haɪtek/ _____

inside-out /ɪnˈsaɪd aʊt/ _____
 luxury /lʌkʃəri/ _____
 manor hall /ˈmænə(r) hɔːl/ _____
 manor house /ˈmænə(r) haʊs/ _____
 nave /neɪv/ _____
 pillar /ˈpɪlə(r)/ _____
 portico /pɔːtɪkəʊ/ _____
 ramp /ræmp/ _____
 ribbon /ˈrɪbən/ _____
 seashell /ˈsiːʃel/ _____
 shaft /ʃɑːft/ _____
 stonework /stəʊnwɜːk/ _____
 terrace /terəs/ _____
 thick /θɪk/ _____
 to flourish /tə ˈflaʊrɪʃ/ _____
 transept /trænsept/ _____
 vaulting /vɔːlɪŋ/ _____
 world heritage /wɜːld ˈherɪtɪdʒ/ _____

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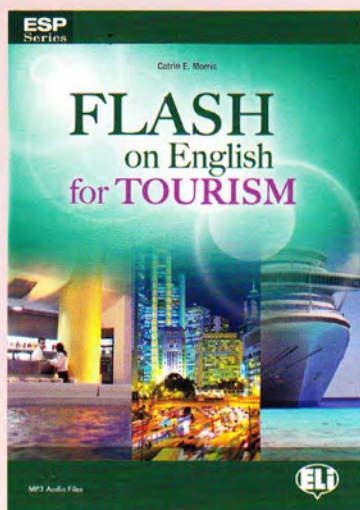
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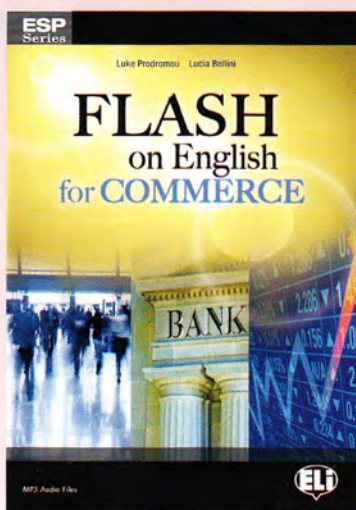
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FLASH on English for CONSTRUCTION is specifically designed for students who are studying for a career in the construction industry. It introduces the vocabulary and the language functions specific to this language sector, and includes practice exercises in all four skills.

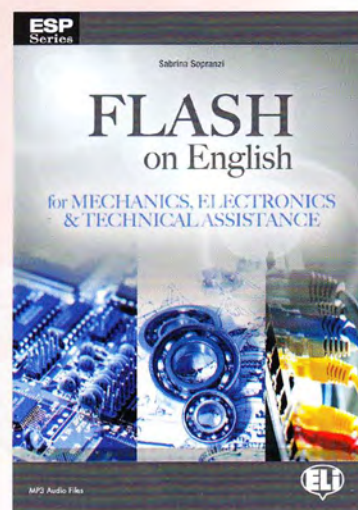
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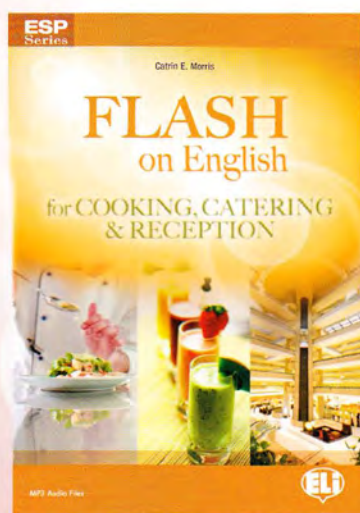
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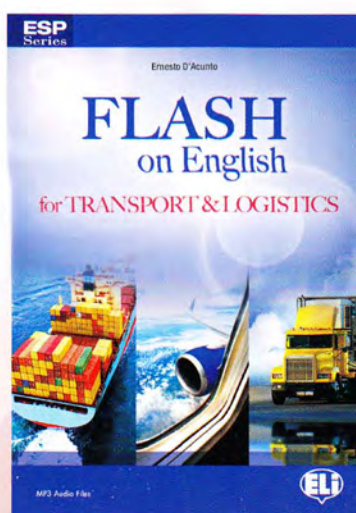
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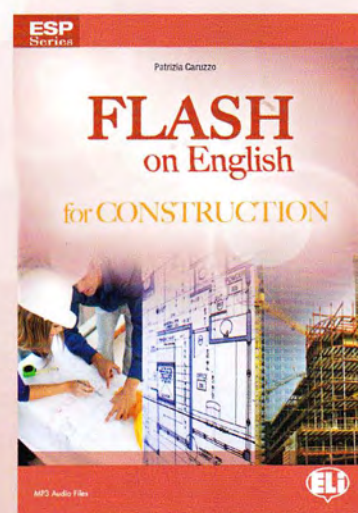
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