

# Flash on English for Construction

## Answer Key and Transcripts

### Unit 1 – pp. 4-7

1

1 Yes 2 Yes 3 Yes 4 Yes 5 Yes 6 Yes

2

1 C 2 B 3 A

3

Biology	Geography	Geology	Chemistry
living organisms	lands	minerals, rocks	atoms
cells	rivers	history of the Earth	chemical bonds

4



**Interviewer** Mr Hale, could you tell us something (1) **about ecology and its sub-disciplines?**

**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) **behavioural ecology** focuses on the adaptations of the individual to his environment; population ecology examines (3) **the dynamics of population** 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) **at different levels?**

**Mr Hale** Yes, of course. If you study the population level, you focus on individuals of the same species, but (5) **you can also examine communities of species**, 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 sphere of water**, the lithosphere is the sphere of soil and rocks and the atmosphere is (7) **the sphere of air**.

**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

1 F 2 T 3 T 4 F 5 F 6 T 7 F

6

- Ecology is subdivided into physiological and behavioural ecology, population ecology, community ecology, ecosystem and landscape ecology.
- Community ecology studies the interaction between species in an ecological community.
- You focus on individuals of the same species.
- The outer layer of the planet Earth can be divided into the hydrosphere, the lithosphere and the atmosphere.
- The lithosphere is the sphere of soil and rocks.
- The atmosphere is the sphere of air.
- The biosphere is the sphere of life.

7-8

Personal answers

9

1 e 2 d 3 c 4 a 5 b

10

Sample answer:

In this ecosystem there is interaction between the sun, the rain and the soil which feeds the producers (plants and grass). The producers feed the primary consumers, which in turn feed the secondary consumers. These die, decompose and return to the atmosphere, thus restarting the cycle.

11

First paragraph: C Are human beings different?

Second paragraph: A Human beings and the ecosystem

Third paragraph: B What human ecology is about

12

- Because they are conscious beings and can contaminate the world that surrounds them.
- The main difference is that human beings are conscious and can impact heavily on the biosphere.
- We are influenced by our society, culture, communities and by our ideals and aims in relation to nature. As a consequence, the cooperation and conflict between individuals and groups contribute to those interactions having an impact on our biosphere.
- Human ecology deals with the influence of human beings on their environment and with the effect of the environment on human behaviour. It investigates humans' strategies to adapt to different situations.

13

Personal answer

### Unit 2 – pp. 8-9

1-2

Personal answers

3

1 d 2 e 3 b 4 a 5 f 6 c

4

radioactive contamination, light pollution, noise pollution

5

Type of pollution	Examples
air pollution	carbon <i>monoxide</i> , sulphur dioxide, nitrogen oxides, hydrocarbons
water pollution	industrial waste, agricultural drainage and sewage
soil contamination	heavy metals, hydrocarbons, herbicides, pesticides
noise pollution	roadway, aircraft and industrial noise and high-intensity sonars
light pollution	light trespass and over-illumination
visual pollution	overhead power lines, motorway billboards or open storage of junk and municipal solid waste
radioactive contamination	Accidents in nuclear power stations and production and use of nuclear weapons

6

Personal answer

### Unit 3 – pp. 10-13

1

- 1 bricks
- 2 cement
- 3 timber
- 4 stones

2

- 1 d 2 c 3 a 4 e 5 b

3

- 1 They use larger timbers.
- 2 Timber framing uses mortice and tenon or wooden pegs, whilst conventional wood framing uses nails or other mechanical fasteners.
- 3 Timber structures surrounded in manufactured panels. They are made up of two rigid wooden-based composite materials with a foamed insulating material inside.
- 4 The advantages are: the structures are easier to build and they provide more efficient heat insulation.

4 2

There are several advantages to timber frame construction but there are also disadvantages that you should be aware of before deciding if it meets your needs.

Wood is a porous and very combustible material, susceptible to water, fire and bugs. Water can be absorbed into the material, causing it to rot and mould, which can compromise the strength and cause adverse health effects. This can be a major problem in humid or damp climates. Wood is also very flammable, which makes the material a fire hazard. Ants and termites eat wood framing, with serious effects on the strength of the construction. Logging for timber framing can have a major environmental impact. Producing boards and beams for timber frame construction requires cutting down trees. Large, old-growth forests are sometimes clear cut to produce wood for timber construction, which can lead to other problems such as soil erosion and destruction of wildlife habitats.

Wood is an excellent transmitter of sound waves so any noise inside or outside is easily heard throughout the home. This can be a major problem if there are several people living in the house or if it is located near a noisy street as sounds are transmitted very clearly.

Timber frames are quite strong up and down but not as strong as other materials horizontally. So if your building design has a large room with a long span, it will be difficult for timber frame construction to handle the weight. You may need to have a post in the middle to absorb some of the weight.

<b>water</b>	Water can be <b>absorbed</b> into the material causing it to rot and mould.
<b>fire</b>	Wood is very <b>flammable</b> .
<b>buges</b>	Ants and termites eat wood <b>framing</b> .
<b>environmental impact</b>	Producing boards and beams for timber frame construction requires <b>cutting down</b> trees.
<b>sound</b>	Wood is an excellent <b>transmitter</b> of sound waves so any noise inside or outside is easily heard.
<b>strenght</b>	Timber frames are quite strong up and down but not as strong as other materials <b>horizontally</b> .

5

Advantages	Disadvantages
<i>affordable price</i> , accessibility of raw material, long durability, strong insulating properties (increased comfort in the heat or in the cold), perfect for load-bearing, small size makes it easy to use, no painting needed, good fire protection	extreme weather condition such as frost can damage the surface, structure must have a firm foundation to prevent settling and cracking, it is heavy therefore higher structural requirements are needed

6 3

The most common type of cement is Portland cement, which is the basic (1) **ingredient** 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) **materials** 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) **concrete**.

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) **mixture** is pulverised. The resulting powder will react when water is added.

Portland cement is commonly used to produce (5) **concrete**, 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) **bricks** 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) **blocks** is that they can be reinforced, grouting the voids, inserting rebar or using grout, so that they are stronger than typical masonry (8) **walls**.

7

- 1 concrete
- 2 limestone
- 3 concrete
- 4 bricks
- 5 reinforced
- 6 walls

8

- 1b 2 e 3 a 4 d 5 c

9

Personal answer

10

	Stone	Timber	Brick	Cement and Concrete
Advantages	cheap, resistant	low environmental impact, easy to put up, practical and adaptable design, versatile material, energy-efficient, cheap, quite strong up and down	affordable price, accessibility of raw material, long durability, strong insulating properties (increased comfort in the heat or in the cold), perfect for load-bearing, small size makes it easy to use, no painting needed, good fire protection	very strong, concrete can be reinforced with rebar or grout, quite cheap
Disadvantages	long and labour-intensive method of construction	ruined by water or bugs, inflammable, no insulation against noises, not very strong horizontally	extreme weather condition such as frost can damage the surface, structure must have a firm foundation to prevent settling and cracking, it is a heavy therefore higher structural requirements are needed	high environmental impact, pollutant

## Unit 4 – pp. 14-17

1

- 1 infrastructure
- 2 resistant
- 3 lifetime
- 4 cheaper, conventional
- 5 distances
- 6 columns

2

- 1 c 2 f 3 a 4 e 5 b 6 d

3

- 1 B 2 C 3 A

4

- 1 T 2 F 3 T 4 F 5 F 6 T

5

- 1 c 2 a 3 e 4 b 5 d

6

- 1 C 2 C 3 A 4 B 5 C 6 A

7

- 1 Plastic products save resources, have a low maintenance cost, can be recycled, contribute to saving energy, are useful for noise protection and insulation.
- 2 Plastic can save energy because plastic foams are used for thermal insulation in many applications.
- 3 Plastic insulation is useful for noise protection.
- 4 The main fields of application of plastic are pipes, insulation, wall covering, flooring and window frames.
- 5 PVC stands for Polyvinyl Chloride.
- 6 PVC pipes are used to drain waste, for natural gas distribution, for electrical and communications wiring, for municipal water.

8

	Steel	Glass and Metals	Plastic
Advantages	resistant to corrosion, rusting and general deterioration, it helps stability, long lifetime, endurance, less harm to the environment, cheap, flexible, high strength-to-weight ratio	<b>glass</b> can reflect some of the unwanted sunshine outwards; can be heated electrically; can be used to make the inside light more natural; <b>aluminium</b> is light, resistant to corrosion and easy to work; <b>stainless steel</b> has got good fire resistance and is easy to keep	it saves resources, has a low maintenance cost and can be recycled, saves energy and protects from noise; good chemical resistance to corrosive fluids
Disadvantages		<b>glass</b> is structurally unsafe because of its brittleness; <b>aluminium</b> has got high thermal expansion and conductivity and low elastic modulus and fire resistance; <b>stainless steel</b> has a high price	it damages the environment because it takes a long time to decompose and can kill animals

9

- 1 They have been growing very quickly.
- 2 The increase in volume and variety of the materials used and an increase in transport distances.
- 3 The aim of eco-design is to create buildings with low ecological impact, where people can live in a comfortable, healthy way.
- 4 Timber from forests that have been certified to a third-party standard; straw or bamboo; brick, stone, clay and cork; natural paints, waxes and varnishes; and also some waste materials.

10

Personal answers

## Unit 5 – pp. 18-23

1

- 1 They explain differences in elevation...
- 2 ... offer cultural information about countries
- 3 ... specific subjects such as population density
- 4 ... because they offer a great amount
- 5 ... images taken from different elevated positions.

2

- 1 Physical maps show landforms, mountains, deserts and lake. They explain differences in elevation.
- 2 Political maps offer cultural information about countries.
- 3 Thematic maps offer specific information such as population density.
- 4 Photogrammetry is a measurement technology that can determine the three-dimensional coordinates of points of an object using different photographic images from different elevated positions.
- 5 It is used in different fields, such as topographic mapping, engineering, architecture, police investigation, geology and archaeology and also movie post-production.

3

- 1 e 2 d 3 b 4 c 5 a

4

- 1 T 2 T 3 F 4 T 5 T 6 F

5

- 1 stage
- 2 checked
- 3 price
- 4 format
- 5 documents
- 6 most recent, latest
- 7 needed, important
- 8 guesswork

6

- 1 What do you do during this stage?
- 2 Why is the working drawing the most demanding stage?
- 3 What are the formats used to describe buildings?
- 4 What do working drawings consist of?
- 5 Why is the engineering graphic so important?
- 6 What software did the AutoCAD replace years ago?

7

- 1 CAD stands for Computer-Aided Design.
- 2 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.
- 3 At the beginning of the 1980s.
- 4 The consequence was that students in universities stopped

learning drafting techniques and learnt computer-aided design instead.

- 5 CAD has a great number of applications: automotive, shipbuilding and aerospace industries, industrial and architectural design, prosthetics and also computer animation for special effects in movies, advertising and technical manuals. It is also used for the creation of photo simulations often required in the preparation of Environmental Impact Reports.
- 6 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).
- 7 The human-machine interface is usually via a computer mouse or a pen and a digitising or graphics tablet.
- 8 The advantages of CAD are lower product development costs and a greatly shortened design cycle.

8  4

CAD is the designer use of computer technology for the design of objects. These objects can be either real or virtual. This two-dimensional graphic is generally used by product designers, engineers, architects and interior decorators. CAD is mainly used for the detailed engineering of physical components, both 3-dimensional models or 2-dimensional drawings. It is also used for the whole of the engineering process, from theoretical design to the layout of products and it can be used to design objects. CAD allows the designs to be viewed from any angle and it can be quite helpful as texture and colours can be easily manipulated. No special hardware is required for most CAD software. One of the advantages of CAD systems is that they can do graphically and computationally-expensive tasks.

- 1 technology
- 2 interior
- 3 components
- 4 process
- 5 designs
- 6 software

9

- 1 Rendering is an engineered program used by architectural illustrators.
- 2 Architectural illustrators use rendering to create two-dimensional images or animations.
- 3 This software is used for presentations, marketing and design analysis.
- 4 It can be used for experimenting with building design.
- 5 Pre-rendering is used in the film industry.
- 6 For the production of 3D video games real-time rendering is used.

10

- 1 T 2 F 3 F 4 T 5 T 6 F

11

Planning implies decisions about transport, facilities, the development of new shops, schools, parks, etc. Planners develop affordable housing, regenerate deprived areas, requalify historic buildings, deal with policies to manage the traffic and improve energy efficiency.

12  5

The first stable (1) **human** settlements appeared when agriculture replaced nomadic existence. The first cities were centres for commerce, politics, defence and distribution of (2) **agriculture** surplus. The earliest examples of planned

cities in history were in modern-day Iraq and India. In these cities some (3) **streets** 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) **towns** 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) **rational** urban planning in Europe. Cities grew around a fortress or a fortified abbey. Most of them were (6) **situated** 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) **Renaissance**. 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) **centre**.

13

1 T 2 F 3 T 4 F 5 T 6 T

14

- 1 A Master Plan is written by city planners and various experts.
- 2 This document includes current and future development proposals and identifies the themes, aspirations and structures for an integrated approach to design through analysis and consultation.
- 3 The aims of a Master Plan are 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.
- 4 The process of city planning 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.
- 5 City planners have to tackle problems of traffic, pollution, the availability of police, fire and sanitation services, limitations created by zoning and other regulations, and the problems of funding.
- 6 In recent years, residents of many communities have demanded greater participation in the planning of their own neighbourhoods, so planners have worked closely with community groups during various stages of the planning process.

15

- 1 expert
- 2 examining
- 3 organised
- 4 proposals
- 5 improvements
- 6 limitations

## Unit 6 – pp. 24-26

1

- 1 Foundations are structures that transfer weights from walls and columns to the ground. There are two types of foundations: shallow foundations and deep foundations.
- 2 Shallow foundations are usually embedded a metre into the soil.
- 3 Deep foundations are embedded more in depth. They can be made of timber, steel and reinforced or pretensioned concrete.
- 4 Geotechnical engineers design foundations to ensure that they have an adequate load capacity with limited settlement.

5 Scour and frost water must be considered.

6 Scour is when flowing water removes supporting soil from around a foundation. Frost heave is when water in the ground freezes and forms ice lenses.

2

1 T 2 T 3 T 4 F 5 F

3



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

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

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

4

1 T 2 T 3 F 4 F

5

A wide B straight C L' stairs D return

6

Personal answers, for example:

I would choose 'L' stairs because they use up little space, look easy to climb, and you can build a cupboard under them.

7

Personal answers

## Unit 7 – pp. 27-28

1

A digging machines B concrete mixer C tower crane

2

- 1 A tower crane is used to build tall buildings. It works with a short arm carrying concrete blocks and a long arm carrying lifting gear.
- 2 An operator can control the crane either sitting in a cabin at the top of the tower just below the horizontal boom or by radio remote control from the ground.
- 3 Digging machines are used for digging trenches for subterranean utility lines, storm sewers, etc.
- 4 The rotary digging instruments use a rotating structure that is rotated along an elongated path.
- 5 A concrete mixer (or cement mixer) mixes cement aggregate (such as cement or gravel) and water to form concrete.
- 6 Portable concrete mixers are used for smaller volume work.

3

- 1 operator
- 2 bucket-style backhoe
- 3 sewer
- 4 elongated
- 5 portable

4

1 B 2 H 3 A 4 C 5 E 6 D 7 F 8 G 9 I

5

1 Managers, supervisors and workers should be taught site safety procedures, such as construction and maintenance

- of safety facilities, installation of safety signs, testing of lifting machinery, emergency and evacuation plans.
- 2 The materials, equipment and tools on the site should also meet some safety standards.
- 3 The main aim is to avoid accidents and ill health by eliminating potential dangers.
- 4 Every work platform must be provided with safe access and have enough strength to bear the load placed on it. It must be secured to a building to avoid separation from the supporting structure to which it is attached.
- 5 Scaffolds must be assembled with the vertical members plumb. Their bases must have bearing plates resting on a solid surface and strong enough to support their weight.
- 6 A scaffold must be grounded if it is situated near a high voltage source.

## Unit 8 – pp. 29-33

- 1
- 1 A plumbing system consists of pipes and fixtures and it carries out the distribution of tap water and the removal of waterborne waste in a building.
  - 2 Water systems of ancient times used pipes or channels made of clay, lead or stone.
  - 3 Today water supply systems use high pressure pumps and pipes made of non-toxic materials, such as copper, brass, steel, cast iron and plastic.

- 2
- 1 F 2 T 3 F 4 T 5 T

- 3
- A Radiant skirting board heaters
  - B Radiant ceiling or floor systems
  - C Electric heat pumps
  - D Portable space heaters
  - E Hydronic heating
  - F Central heating system

4

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

- 5
- Personal answers, for example:  
My house has got gas central heating, with pipes taking hot water to radiators, a thermostat to measure the temperature of the coldest room and an electric clock device to activate the system. There are many advantages: the radiators can be set for high or low heating and can be switched off individually, you can set the time when the heating comes on and goes off, you can warm one room more than another, and you get hot water at the same time as heating, depending on how you set the controls.  
The disadvantages are that if the electric power fails, or any other fault develops, there is no alternative method of heating the house or the water.

- 6
- A photovoltaic system
  - B thermal system

## 7

Solar energy is the electricity produced from the sun's rays and captured by means of solar panels, which are becoming increasingly (1) **common** 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) **sunlight**. Electricity is produced when sunlight hits them. This kind of technology is still quite expensive and its disadvantage nowadays is the problem of (3) **storing** energy.  
In the solar thermal system solar energy is used for water heating. The panels are positioned either on the (4) **roof** 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) **tank** 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) **pollution**, 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
- 1 f 2 a 3 h 4 b 5 g 6 d 7 e 8 c

- 9
- 1 Electricity can be produced by capturing the sun's energy by means of solar panels.
  - 2 Solar thermal panels contain cells whose semiconductors react with sunlight.
  - 3 Electricity is created when sunlight hits the solar panels.
  - 4 The two main disadvantages are: it is still quite expensive, storing energy is a problem.
  - 5 Solar energy is also used for water heating.
  - 6 When the thermal collectors in the panel are exposed to the sun, they heat the water (stored in a hot water cylinder).
  - 7 Some of the advantages are: it is not very expensive, it is renewable, it creates less environmental pollution, it reduces costs and maintenance, it saves resources.
  - 8 A conventional boiler can be used to make the water hotter, or to provide hot water when solar energy is not available.

- 10
- A Spot ventilation
  - B Natural ventilation
  - C Whole-house ventilation

- 11
- 1 Ventilation is important to reduce indoor moisture, odours and other pollutants.
  - 2 Excess moisture needs to be removed before high humidity levels lead to physical damage to the inside of the house.
  - 3 The disadvantage is that natural ventilation is uncontrollable.
  - 4 Spot ventilation means using localised fans in the rooms where contaminant substances are generated (for example kitchen extractor fans and bath fans).
  - 5 Whole-house ventilation is a system that works thanks

to fan and duct system to exhaust stale air and supply fresh air to the house.

12  8

**Interviewer** Why is ventilation important in our houses?

**Mr Young** Ventilation is important to get rid of pollution, water vapour and unwanted smells and to replace them with fresh air. But it is also important to control and direct it where we need it.

**Interviewer** What does the necessary ventilation depend on?

**Mr Young** Mainly on the number of people in a room and the quantity and type of pollution sources.

**Interviewer** Are permanent ventilators really necessary?

**Mr Young** A permanent ventilator should be a must if we have heating appliances which need air from inside a room, because toxic products from combustion can be very dangerous. Modern appliances usually have fittings which draw in and expel air, but in old houses this can be attained thanks to a purpose-built duct that brings air to the appliance.

**Interviewer** What can you tell us about heat exchangers?

**Mr Young** They are designed to recuperate the heat lost through controlled ventilation thanks to hollow tubes and fins which heat the incoming air.

**Interviewer** What can you do if you want to create a ventilation strategy?

**Mr Young** Well, first of all you need to understand which problems each room of your house has (e.g. too much humidity) and to choose the strategy which is more suitable for how you use your house. The most energy efficient solution is to have a heat exchanger with ducts to different parts of your home installed. Alternatively you can fit controllable trickle ventilators in every room, to allow cross ventilation. Mechanical extractor fans in kitchens and bathrooms can be another alternative. They are controlled by a moisture control switch. Or you can have mechanical or biological air cleaning equipment installed.

- 1 smells
- 2 sources
- 3 appliances
- 4 exchangers
- 5 ventilation
- 6 moisture

13

1 F 2 F 3 T 4 F 5 T

14

- 1 trend
- 2 device
- 3 reduce
- 4 help, make easier
- 5 pledge
- 6 promote, encourage
- 7 programme

## Unit 9 – pp. 34-37

1

Personal answer

2

1 T 2 T 3 F 4 F 5 F

3

Brick and stone. They should be biodegradable and recyclable; they should not be dangerous for our health and should contribute to a more sustainable environmental future.

4

1 B 2 C 3 A

5

- 1 The objective of new building is searching for environmentally-friendly solutions by finding different sources of energy production and paying more attention to the materials used.
- 2 The stages are: manufacturing, use and disposal.
- 3 Local materials are less expensive, their transport cost is lower and CO2 emissions are also limited.
- 4 Renewable and unlimited sources of energy and passive energy system are always considered.

6

- A solar water heating
- B double glazing
- C insulation
- D low-flow tap aerator

7

- 1 An efficient way to reduce the use of energy is having good insulation in walls, floors and ceilings and energy efficient windows with double glazing.
- 2 They can orient walls and windows in order to make the most of the use of natural light (decreasing the use of electric lighting when daylight is available) and they can place trees and sun shelters in effective positions to provide shade in summer.
- 3 It can be reduced through the use of solar water heating.
- 4 It can be attained through facilities that improve the collection, purification and reuse of water.
- 5 It can be improved during the design and construction processes by choosing construction materials and interior finish products with zero or low VOC emissions.
- 6 The control of moisture is important for the health of those living in a building.

8

1 T 2 T 3 F 4 F

9

Personal answer

10  9

The (1) **aim** of environmentally-friendly buildings is to decrease the (2) **quantity** of waste material. If a building is designed well, the amount of waste produced by the people living in it will be (3) **lower** thanks to on-site solutions such as compost bins. (4) **Moreover**, a building is usually demolished at the (5) **end** of its life and most of the waste is taken to landfills, but now, thanks to (6) **deconstruction**, some material is kept and used again, with (7) **two** advantages: recycling materials that are still usable (for example (8) **wood**) and reducing waste. Also wastewater from dishwashing or washing machines can be used again, for (9) **example** for irrigation and rainwater can be collected for a number of useful purposes. Converting waste and wastewater into fertiliser is a good (10) **idea** for cutting down costs: liquid fertiliser can be created collecting human and other (11) **biological** waste.

11

Personal answer

## Unit 10 – pp. 38-41

1

- 1 Bridges are built for providing passage over a gap or physical obstacles such as valleys, rivers and roads.
- 2 The first bridges were probably fallen tree trunks and bridges made of long ropes across rivers or valley. The first great bridge builders were the Ancient Romans.
- 3 The design of a bridge depends on its purpose, the kind of ground it is built on and the material used to build it.
- 4 Tower Bridge is an example of a double-decker bridge and one of the best symbols of London. It allows the roadway to be raised when large ships need to go through it.

2

- 1 The first roads 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.
- 2 The Ancient Romans used stone and gravel and included gutters for drainage.
- 3 The first stages are planning, designing and approval of the project. After deciding where to move gas, water, sewer, electricity and phone lines and compensating and relocating landowners, construction can start.

3  10

Schools have a very special importance in everyone's (1) **lives** and consequently architects should think carefully and sensitively when (2) **designing** them. During the 19th century the first to understand the economic importance of universal (3) **education** 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) **corridors**. 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) **light**, with multivalent spaces. More recently, schools have become buildings where the environment is more and more (6) **stimulating** and where solutions are found to meet practical demands, such as health, (7) **safety** 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) **green areas**.

4-5

1 c 2 e 3 a 4 b 5 d

6

- 1 Usually you can find both natural and man-made materials in parks: trees, grass, flowers and landscape features such as fountains, benches, picnic areas, statues, pathways and ponds.
- 2 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.
- 3 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.

- 4 It was opened in 1857 as an area to escape from the chaotic life of the city.
- 5 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.

7

- 1 Tunnels are long and narrow underground passages with an opening on each end. They are built for pedestrian or vehicular traffic and for canals.
- 2 Before building a tunnel it is important to examine the conditions and type of ground and groundwater.
- 3 The main techniques are: explosive if the rock is hard, whereas if the ground is softer, tunnel shields are pushed into the ground to dig out the earth.

8  11

The idea of building a tunnel under the English Channel to join Continental Europe and England was first suggested in the time of Napoleon. However, the 50.5 km long Channel Tunnel (also called Chunnel) did not open until 1994. Today it is considered one of the Seven Wonders of the Modern World. It is one of the longest tunnels in the world and the tunnel with the longest undersea portion. At its lowest point it is 75 metres deep. Its design and construction were carried out by ten construction companies and work started in 1988. It is only used for trains (some of which can carry cars). Today if you travel on High Speed 1 trains (at 300 km/h), the journey between London and Paris takes only two hours and 15 minutes.

- 1 1994
- 2 longest, undersea
- 3 trains.
- 4 two hours and 15 minutes.

9

Personal answer

## Unit 11 – pp. 42-47

1

1 b 2 c 3 a

2

- 1 It was probably built between 55 BC and 43 AD.
- 2 Bath is famous for its healthy mineral water, hot springs, Roman baths and Georgian buildings.
- 3 In 1987 Bath became a World Heritage Site and today it is a major centre for tourism.
- 4 Every year in May and June there is an important festival of classical music.
- 5 Roman Emperor Hadrian decided to build a wall across the northern border.
- 6 They built a series of small forts called 'milecastles'.

3

1 B 2 A 3 A 4 B 5 C

4

- 1 Norman architecture in England had defensive purpose.
- 2 They built strong castles made of stone and wood.
- 3 They chose strategic positions for their castles, so that they could defend themselves from the attacks of the natives.

4 These castles developed into manor halls and their defensive aim was gradually replaced by residential and entertainment functions.

5  12

In 1350 King Edward III demolished most of the existing castle and rebuilt it increasing the fortifications. In 1390 restoration work on St. George's Chapel began. After the Wars of the Roses, the role of the castle changed from bastion to royal palace.

Elizabeth I (who reigned 1558-1603) spent a lot of time at Windsor Castle because she considered it the safest place in her kingdom. It became one of her favourite locations and she made several transformations to the castle, using it as a royal court. After Charles I, it became a military headquarters and a prison. The following king, Charles II, restored much of the castle after the damage caused by the Civil War. However, after his death, it was left in a state of abandon. In 1804 the next king, Charles III, returned to use it as a royal residence. Queen Victoria made this castle her main royal residence and changed the surrounding parkland. During the second half of the 20th century, Windsor Castle became one of the most important tourist attractions in the UK. Today, Queen Elizabeth II uses it as a royal palace as well as her weekend home. It is used for state banquets and official entertaining.

1 c 2 e 3 a 4 d 5 b 6 f

6

- 1 The Renaissance style started in the middle of the 16th century.
- 2 It placed emphasis on symmetry, geometry and regularity.
- 3 Most of the cathedral is made of stone.
- 4 Visitors are fascinated by its great dimension and decorations.

7

The typical feature of the Georgian style is the simple but elegant 'Townhouse'. These tall, narrow buildings were often built in rows called 'terraces'.

8

- 1 Between the middle of the 18th and 19th centuries.
- 2 The new buildings were much more decorated than the older originals.
- 3 The Neoclassical style was influenced by ancient Greek and Roman architecture.
- 4 The main features are geometrical forms, straight lines and Greek columns.

9

- A Guggenheim Museum (NYC)
- B Ville Savoye
- C Jubilee Church
- D Pompidou Centre
- E Lloyd's building
- F The Gherkin
- G Guggenheim Museum (Bilbao)

10  13

One of the most influential American architects of the first half of the 20th century was (1) **Frank Lloyd Wright**. 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) **Le Corbusier** 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) **Richard Meier** 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) **Richard Rogers** 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) **Renzo Piano**. 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) **Norman Foster** 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) **Frank Gehry** 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

Personal answer

12

Personal answer