

# 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

1 C 2 D 3 A 4 D

5

- 1 Ecology is the science that studies how different organisms live together and how they interact with their physical environment.
- 2 Ecology also studies how the quantity and distribution of organisms are influenced and in turn influence their interactions with the environment.
- 3 In an environment there are factors such as climate, solar insulation, geology and other organisms that share its habitat.
- 4 By 'habitat' we mean the natural home or environment of an animal, plant or other organism.
- 5 The four most important aspects are shelter, water, food and space.
- 6 To protect themselves against predators and the weather.

6

1 gases, 2 surface, 3 rocks, 4 land, 5 ecosystems, 6 role, 7 balance, 8 changes, 9 sizes, 10 water

7

1 e 2 d 3 c 4 a 5 b

8  1

- Intvw.** Today we'd like to welcome Bob Harris, an expert ecologist who is going to talk to us about some of the ecosystems we can find on our planet. So, Bob, are all ecosystems the same size?
- Bob** Absolutely not! An ecosystem can be anything from a small puddle to a massive desert, and as my example suggests, they can be in water or on land.
- Intvw.** And I suppose each ecosystem has its own particular characteristics?
- Bob** Yes, of course. Let's take for example aquatic ecosystems. These can be very different according to their geographic position, for example Antarctica as opposed to a subtropical region or coastal regions rather than in the middle of the ocean. And of course aquatic ecosystems include both salt

and fresh water environments.

**Intvw.** Does that mean that species to be found in these ecosystems differ greatly according to their environment?

**Bob** Yes. For example, floating plants can be found in stillwater ecosystems where the water is calm, like lakes and lagoons. Instead rivers that consist of flowing freshwater have a higher content of oxygen than still waters, so there is much more biodiversity.

**Intvw.** And what about the sea? Is there any difference between what we can find along the coast for example as opposed to further out at sea?

**Bob** Well first of all, you have to remember that the water along coastlines isn't as deep and there is a lot more movement in these waters caused by the breaking of waves. Therefore, this area is usually populated with seaweed, barnacles, mollusks and crabs that prefer shallow water.

**Intvw.** And what about coral reefs?

**Bob** Well if you want variety, coral reefs are the best place. It's estimated that one quarter of marine species can be found in coral reefs, that are used for both food and shelter. Here you can find corals, colourful fish, sponges, sea urchins, sea anemones and clams, quite spectacular really.

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

9

Personal answer

## Unit 2 – pp. 8-13

1

- 1 Because, since the Industrial Revolution, the changes that have been brought about by humans on the environment have been so great that they have become a risk for the future of our planet.
- 2 Because we depend on it for many things like drinking, cooking, cleaning, to produce power, for agriculture and other economic activities.
- 3 It can become contaminated by human activities like industry, agriculture, transportation and construction.
- 4 Industries are no longer only in big cities but have also spread to smaller urban areas.
- 5 Architects have to consider that some areas are more at risk of disasters that can be triggered by the increase of building.
- 6 Hazard maps are constantly updated and restrictive building regulations are adopted for construction or reconstruction in seismic or other vulnerable areas, or construction may be forbidden by law if the risk is severe.

2

1 transformed 2 element 3 resources 4 contaminated 5 growth 6 disasters

**3**

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

**4**  **2**

'Anthropocene: The Human Epoch' is a documentary about the terrible effects humans have had on Earth. It highlights the harmful impact on the environment of human activities like farming, industrialisation, the excavation of minerals and the dumping of tons of rubbish. This impact is so strong that geologists refer to it as a new geological era – the Anthropocene era – because this effect has been created by man and not by nature like previous eras.

Parts of this documentary, that took three years to make, were shown at the United Nations Climate Action Summit in September 2019. The documentary was shot in different locations all over the world and the images are both stunning and shocking at the same time; a great way to catch your attention. One example is of an excavator which is trying to lift a massive piece of marble extracted from an Italian quarry. Another image takes us to Kenya where we see activists burning 10,000 elephant tusks. A narrator tells us some very alarming statistics as these images pass in front of us. They say for example, that by 2050, there will be more plastic than fish in our seas, oceans and rivers. We're also told that every year, 18.7 million acres of forest are cut down and one tenth of the world's wilderness has been lost in the last twenty years. Most experts believe that the Anthropocene era started just after 1945, but when it actually started isn't what is worrying them. Instead, they're alarmed about how fast its effects have grown. This is due to many factors such as a dramatic increase of people travelling around the world, the extraction of resources and farming on an industrial scale and urbanisation.

This documentary makes it clear that humans are responsible for all this damage. Therefore, our only hope for the future is that if we have been able to make such alterations to the Earth, then we just might have the know-how to be able to construct a more eco-friendly sustainable world.

1 f 2 d 3 a 4 g 5 c

**5**

Personal answer

**6**

Radioactive contamination, light pollution

**7**

Type of pollution	Examples
air pollution	carbon monoxide, 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

**8**

- The main source of air pollution in the world is motor vehicle emissions.
- In the USA, there are severe emissions controls whereas in the countries of the European Community the guidelines for this problem are not as strict.
- Other sources of pollution are chemical plants, coal-fired power stations, oil refineries, incinerators, metal production factories, plastics factories and other forms of heavy industry.
- They are called stationary pollution sources.

**9**  **3**

Reports show that 9 out of 10 people in the world breathe air with high levels of pollutants that cause the death of 7 million people every year. This air pollution is present outdoors but also indoors, where stoves and fuels in very poor areas produce deadly smoke. Indeed, over 90% of deaths related to air pollution are registered in low to middle-income countries, mainly in Asia and Africa, where people do not have clean cooking fuels and technologies in their homes. However, more countries are taking action to try and solve this problem and there is now an air quality database on ambient air pollution that includes more than 4,300 cities in 108 countries. This World Health Organization database gathers information on the concentration of fine particulate matter, including pollutants like sulfate, nitrates and black carbon that are the most dangerous for our health, and recommends the average annual values that countries should aim for. Unfortunately, many large cities around the world have air pollution levels five times higher than the recommended values. However, the fact that more and more cities are committed to recording air quality is a positive trend and some encouraging results have been reached. Many countries are now trying to reduce air pollution from particulate matter. Mexico City for example has decided to ban all private diesel cars by 2025. The World Health Organization stresses that countries need to work together to solve the problem of air pollution with sustainable transport, renewable energy production and better waste management and it supports countries that are trying to solve these problems.

1 million, 2 smoke, 3 database, 4 black, 5 five, 6 renewable

**10**

Personal answer

**11**

Personal answer

**12**

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

**13**  **4**

The English government has decided to launch a tree-planting scheme as part of their programme against global warming. This project aims at planting more than 130,000 trees in English towns and cities in the next two years. People will be able to apply for a grant through the Urban Tree Challenge Fund and this project will be managed by the Forestry Commission. Grants will be available for individuals who wish to take part in this project as well as local authorities,

charities and NGOs.

The grant will consist of a sum of money, which will pay for the planting of the trees and will also cover the cost of looking after them for the next three years in order to ensure that they grow well.

The Forestry Commission members are enthusiastic about the project as it will mean that trees can be planted much nearer to where people live and work, so where the benefits of trees are felt more.

Trees store carbon so they are very important for fighting against global warming, caused by the burning of fossil fuels that fill the air with carbon dioxide. Trees also bring many advantages to towns and cities, like absorbing noise, decreasing the risk of floods and creating shaded areas in summer. A street lined with trees is a way of keeping in contact with nature, so the presence of trees also makes us feel better.

The grant for planting a tree will be organised as a challenge fund, which means that the people or groups who apply for this money will have to invest the same amount personally. Grants will be given to those projects that will provide the greatest environmental and social benefits. Those interested will be able to consult a map to see if they can take part in the project whose aim is to plant as many trees as possible over the next 25 years.

1 A tree-planting scheme

2 Global warming

3 Two years

4 Forestry Commission members

5 Carbon

6 Nature

7 A challenge fund

8 A map

## 14

Personal answer

## 15 5

Research shows that the construction of offices, hotels and shops will increase all over the world in the next few years, and the good news is that most countries are planning on building structures according to high environmental standards. This trend is also becoming evident in the UK where analysts report that 37% of UK developers are now opting for green buildings. This option combines green design techniques and advanced technology that reduce energy consumption and have less impact on the environment.

Moreover, it costs less to run these buildings and working and living environments are more pleasant. Green buildings are also a good investment as the property value increases and people pay more to rent them. Here are some examples of eco-buildings in the UK.

Bloomberg HQ, a 10-storey facility in London, is considered the world's most sustainable office building. It was awarded the highest score of 98.5% for global sustainability standards by BREEAM – the Building Research Establishment Environmental Assessment Method. This exceptional green project achieved such a high score thanks to the use of both traditional and innovative sustainability solutions. These include a grey water collection system on the roof and vacuumdrainage toilets to reduce water usage. However, the most innovative energy-saving feature of this office block are the ceiling panels that combine heating,

cooling, lighting and acoustic functions. LED lights in these ceiling panels use 40% less energy than normal office lighting systems.

This new trend in sustainability is not only limited to office buildings. Waitrose, a leading supermarket chain in the UK, is the first store to receive BREEAM recognition for its efforts to run a sustainable business. Their store in London sends all unusable food waste to an anaerobic digestion plant to be converted into energy that is then reused. They also use low carbon lighting in their store and they capture cold air from the fridges and use it to cool the shop.

If the building industry continues to support sustainability, creating eco-friendly structures, then the UK Government might just manage to reach its goal of all buildings operating with no carbon emissions by 2050 to meet climate targets.

0 C 1 H 2 E 3 A 4 G 5 B

## Unit 3 – pp. 14-17

1

Personal answer

2

1 ecological, 2 harmony, 3 electromagnetic, 4 light, 5 flow, 6 greenhouses

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 CO<sub>2</sub> 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  6

The aim of green technology in construction is to make buildings more energy-efficient and sustainable. This objective involves all aspects of the project (1) **development** from the structure to choice of site, design, construction materials and the systems used to run and maintain the building. Here are some of the most popular sustainable technologies used in green construction nowadays.

First of all, sustainable resource sourcing is fundamental. This guarantees the use of construction materials that are (2) **recyclable** and can be recycled, and that are obtained from sustainable sources. Rammed earth brick, for example, is an ancient building technique that has recently become popular again. Biodegradable materials are used for foundations, walls and insulation. Green construction also uses sustainable indoor environment technologies that guarantee the health and safety of the people living in the building.

Sustainable construction technologies also aim to create buildings and houses with low-energy or zero-energy consumption. This starts with the choice of building materials like (3) **wood** rather than steel or concrete. It also involves the design of the building, like the positioning of windows and the building itself to maximise airflow and solar energy that provides heating and electricity. Electrochromic smart glass is another new technology that uses tiny electric signals to slightly change the windows to change the amount of solar radiation they reflect in order to keep the building cool inside. Zero-energy construction is achieved when the building is able to generate sufficient power to support its own energy needs. In most cases, (4) **wind** power technology is used to reach this goal. Water efficiency technologies include the re-use and application of efficient water supply systems like dual (5) **plumbing**, grey water re-use and the collection of (6) **rainwater**.

10

Personal answer

## Unit 4 – pp. 18-21

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  7

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>bugs</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>strength</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, 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</i>	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  8

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 5 –pp. 22-27

**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 Thermosoftening plastic can be heated, cooled and heated again to be reshaped, while thermosetting plastic can not be reshaped once it has hardened.
- 2 It's water resistant, durable and does not corrode.
- 3 It stands for Polyvinyl Chloride.
- 4 There are two types, rigid and non-rigid.
- 5 They are suitable for draining waste, natural gas distribution, rainwater and electrical and communications wiring.

**7**  9

**Intvw.** The plastic industry creates a huge quantity of carbon emissions every year: but your company has found a way to take pollution and turn it into plastic. What do you think of the climate change

debate?

**Mr Evans** You've got people on one side who say, 'if we put carbon legislation into practice, it's going to cost the economy,' and they're not wrong. On the other side, we have people who say this is a huge problem and we need to do something about it, and they're not wrong, either. The problem is they haven't been able to find anything that works for both sides.

**Intvw.** But you seem to have found that 'something'.

**Mr Evans** We've figured out how to make plastic out of destructive carbon emissions that would otherwise heat the atmosphere, rather than with fossil fuels such as oil. Most importantly, we've figured out a way to do it cheaply. It's something we've been working on for 11 years since I started the company with my friend Kenton Kimmel in my parents' garage.

We're not the first people to have the idea of turning greenhouse gas into plastic. The thing that was missing was that no one had figured out how to do it cost-effectively.

**Intvw.** How does it work?

**Mr Evans** Carbon emissions are captured from farms, landfills, and energy facilities and are fed into a 50-foot tall reactor at our plant. A bundle of enzymes strip out the carbon and oxygen and rearrange them into a substance they call 'air carbon'. The product is then melted down and cooled inside tubes and sliced into little plastic pellets that can be moulded into anything. I call it a disruptive technology that's going to change the world.

**Intvw.** Is your product on the market?

**Mr Evans** Yes, Newlight is selling its plastic to companies such as furniture maker KI who uses it to create chairs. There are also air carbon cell phone cases, soap dishes and plastic bags. Recently, a famous computer company announced their company will use our air carbon bags to wrap its computers.

**Intvw.** Do you think that the growth of your business will have an effect on the plastics industry?

**Mr Evans** What's exciting here is that, if you can capture carbon out of the air and do it on a large scale and over a long period of time, you not only get the product, but you also reduce the amount of greenhouse gases in the air, and that's something that companies and governments around the world are willing to pay for today.

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

**8**

1 nanotechnology, 2 pollution, 3 air, 4 durability, 5 react, 6 energy

**9**

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

**10**

Personal answer

**11**

Personal answer

**12**

2 1 F 2 T 3 T 4 T 5 F

**13**

1 ecological, 2 economic, 3 forests, 4 traditional, 5 guideline, 6 locally

**14**

1 They can rot if there's too much moisture and they're expensive to transport and store because of their size.  
2 Due to its elastic properties.  
3 Elements that can be recycled and demolition waste.  
4 Because there are no costs related to supply, transport, storage or disposal.

**15**

1 bales, 2 Bamboo, 3 Drainpipes, 4 Hardcore

## Unit 6 – pp. 28-31

**1**

- 1 They show landforms, mountains, deserts and lakes and explain differences in elevation.
- 2 They offer cultural information about countries like their borders and main cities and some physical characteristics like oceans, rivers and lakes.
- 3 They are one of the oldest types of maps in history; they show individual properties with details.
- 4 The most popular kind of topographical maps are Ordnance Survey maps.
- 5 Road maps are a type of navigational maps because they displays roads and transport links of an area.

**2**

- 1 b 2 d 3 e 4 a 5 c

3  10

Surveying is the scientific method of examining in detail a piece of land in order to gather information about its size, shape and (1) **position**. The word has its origin from late Middle English where it meant 'to examine closely'. Surveying is therefore very important for (2) **locating** property boundaries, construction layout and map-making as it reveals three important features of a piece of land by measuring distance, angles and elevation.

### EQUIPMENT

Special equipment is necessary to (3) **measure** each of these three different aspects of the land. First of all, surveyor's level is able to identify points in the land which are of the same height. There are now automatic digital levels on the market that allow the surveyor to record these (4) **measurements** in a quick, simple and accurate way both in the dark and during the day. For many years, surveyors used a focusing device called a theodolite to measure both vertical and horizontal angles. This device, an adjustable telescope mounted on a tripod, was particularly useful in the (5) **construction** of roads and tunnels. Then in 1970s, the original theodolite was replaced with the invention of the Total Station. This device is much more (6) **accurate** than the traditional theodolite. The Total Station consists of an electronic or digital theodolite, a microprocessor and an electronic distance measuring (EDM) device, providing the (7) **surveyor** with precise measurements. The data recorded by the Total Station can then easily be transferred and (8) **elaborated** on a PC. There is also a Robotic Total Station version on the market that allows you to operate the device from a distance using a remote control.

The GPS (Global Positioning System) Total Station provides (1) **information** about location, elevation and time anywhere in the world, through signals received from (2) **satellites** in space. Surveying instruments with GPS provide a 3D data, are fast and accurate, and can (3) **function** in any type of weather.

Laser scanners provide very accurate measurements in complicated environments so they are commonly used in industry. In architecture, they are useful for the interior (4) **design** of buildings, as the scanners provide a 3D model of the space available in a room or building.

Land surveying (5) **establishes** the boundaries of a piece of land for legal and ownership purposes.

Topographical surveying uses aerial photogrammetry and/or ground surveys to (6) **create** a map of the Earth's surface that includes natural and (7) **man-made** features of the site. As-built surveying documents any changes made during construction or on completion of a (8) **project** that do not respect the original design made at the planning stage.

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

3 Sometimes this material is needed to get prices from builders.

6 The latest form of software is 3D parametric solid modelling software.

**4**

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

**5**

- 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 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.

4 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).

5 The human-machine interface is usually via a computer mouse or a pen and a digitising or graphics tablet.

6 The advantages of CAD are lower product development costs and a greatly shortened design cycle.

## 6 11

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

## 7

1 an engineered program

2 three-dimensional

images

3 presentation, marketing

4 Real-time rendering

5 Building Information Modelling

6 construction

7 management

8 everyone involved

9 database

10 functionality

## 8

Personal answer

## Unit 7 – pp. 32-35

### 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.
- Shallow foundations are usually embedded a metre into the soil.
- 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 12

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

1 a 2 c 3 b 4 e 5 d

## 6

A wide, B straight, C L' stairs, D return

## 7

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.

## 8 13

We all probably frequently use staircases and don't even notice this miracle of architecture that has been part of our daily lives for (1) centuries. Indeed, they have existed from about 6000 BC and there are many spectacular staircases all over the world both outside and indoors. If you go to the jungle in Ecuador, you can admire the Canyon Staircase that is situated near a famous waterfall called *Pailón del Diablo* (in English, Devil's Cauldron) on the Pastaza River. This staircase made of (2) stone steps on the cliff lets you get really close to the force of the water as it tumbles down the cliff into a pool below and is a great tourist attraction. Spiral staircases have been around for centuries too. They are always a special (3) feature of a building and are still used in modern architecture today. One example is the spiral staircase inside the Garvan Institute of Medical Research in Australia. This amazing spiral staircase is the centrepiece of the building and was constructed in this way to save space. The design of this white, six-storey staircase has (4) glass sides and chrome railings that fit in perfectly with the modern décor of the building.

Nowadays, architects are experimenting more and more with staircase design, taking advantage of their (5) sculptural potential as they try to fight the trend of highspeed lifts. At the 2013 London Design Festival, one of the biggest attractions was 15 interlocking staircases designed by architects De Rijke Marsh Morgan (drMM). The (6) circular timber structure was erected in front of the Tate Modern

art gallery. Although this surreal staircase actually led nowhere, it served as an excellent (7) viewing platform overlooking the Tate Modern and the Thames.

9

1 covered, 2 glass, 3 smart, 4 properties, 5 four, 6 building

10

1 can warp, 2 fiberglass, 3 control ventilation, 4 safe rooms  
5 Sliding doors, 6 are used for (shops and)

## Unit 8 – pp. 36-37

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 9 – pp. 38-43

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

1 They are considered more efficient and comfortable.

2 In North America.

3 Electrical elements.

4 Radiant ceiling or floor systems.

5 By a boiler.

6 It converts the heat in the liquid in pipes into hot air to heat a home.

4

1 radiator, 2 boiler, 3 thermostat, 4 portable space heater

5

A photovoltaic system, B thermal system

6

14

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.

7

1 f 2 a 3 h 4 b 5 g 6 d 7 e 8 c

8

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.

9

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

10

- 1 Ventilation is important to reduce indoor moisture, odours and other pollutants.
- 2 The disadvantage is that natural ventilation is uncontrollable.
- 3 Spot ventilation means using localised fans in the rooms where contaminant substances are generated (for example kitchen extractor fans and bath fans).
- 4 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.

11 

15

- 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

12

Nowadays the demand for air conditioning is on the increase and projections for the future confirm this trend, with the biggest demand for AC units expected between 2030 and 2040. This expected growth is probably due to the fact that hot countries like India that have become more industrial and technological are now demanding air conditioning in the same way that countries like the US have been doing for years. Indeed the chart on the right clearly indicates that India is the country that is likely to have the biggest demand for AC units for the afore-mentioned reasons as economic growth means that many members of the population have more money to spend and wish to work and live in a comfortable environment. Instead, as said before, the US has been installing AC units for years so here there is likely to be little growth in demand. The increased energy demand for all these AC units could be a potentially massive problem for the world in general and will not help global warming to decrease. Therefore, manufacturers will have to find ways of producing AC units that cool more efficiently and use less energy.

13

- 1 T 2 F 3 T 4 F 5 F 6 T 7 F 8 T

- 2 Energy consumption can be reduced by increasing efficient energy use.  
 4 In passive solar building design, mechanical and electrical devices are avoided.  
 5 Even existing buildings can be adapted.  
 7 They had until 2020 to reduce primary energy consumption by 20%.

14

- 1 Personal answers, for example: decreasing and reducing consumption are the most easily available ways of conserving energy.  
 2 The purpose of energy conservation, apart from saving money, is to increase environmental quality, national and personal security and human comfort.  
 3 Passive solar building design 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.  
 4 Passive solar design makes use of window placement, glazing type, thermal insulation, thermal mass and shading.  
 5 If emissions decrease, this will help to reduce climate change.  
 6 To reduce primary energy consumption in the EU by 20%.  
 7 The addition of a new energy efficiency target for 2030 of at least 32.5%.

15

- 1 Domotics is a field that involves electronics and computer science.  
 2 Its aim is to create the automation of common tasks.  
 3 ‘Repeat multiple daily settings’ means that a thermostat for example can be programmed to come on and switch off again at various times during the day and this process can be programmed to be repeated day after day.  
 4 A home automation system is composed of sensors, a network and a control unit. The control unit is generally

linked to a device for external communication.

- 5 Yes, a device for external communication allows the owner to manage the control unit from his/ her telephone, smartphone or other devices linked to Internet.

16  16

'The Internet of Things' (also known as M2M or machine-to-machine) refers to an expanding network of interconnected internet-enabled devices. Driven by miniaturisation, the affordability of components such as cheap Bluetooth sensors and technologies such as Wi-Fi, it is now possible to connect devices in a way that would never have previously been thought possible. Consumers are beginning to realise that this technology can be used efficiently and effectively to solve everyday problems. The most popular uses are for security and savings. For example, consumers can be notified when a door is opened or there is movement in their house while they're away. They can be notified when there is moisture in the basement and they can programme the lights and heat to turn off when no one is present in the house, which can mean huge energy savings. There are numerous products on the market, but what they have in common is their ability to collect data from, and for their users. Therefore, it's not actually the 'Things' that are important but the data these devices provide. For example, a connected electric toothbrush can tell us how we brush our teeth, where we brush our teeth and where we need to improve. Before we only got this information once a year from our dentist when we went for a cleaning, but now we can get it in real time. This kind of information may not seem so important, but this is just the start. One man, Mike Grothaus, proposed to produce a set of kitchen scales that sends data about nutrition to your iPad. As soon as people heard about this 'new Thing', demand was so great, that the project received almost 30% of its funding in just one day. The Internet of Things is an even more important revolution than the smartphone because it connects everything together. Some people may raise questions about privacy. Maybe they would rather that not everybody knows about every single aspect of their life, but whatever the case, The Internet of Things is here to stay and multiple.

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

17

Personal answer

## Unit 10 – pp. 44-49

1

- 1 Information about building, civil and traffic engineering, urban and regional planning, local and national economies, history, demography, archaeology, law, politics and administration and their consequences.
- 2 It refers to the process by which cities grow as people move from rural areas to cities and towns.
- 3 The prospect of getting jobs in factories rather than having to work in agriculture.
- 4 Land previously used for agriculture was used to build houses and infrastructures for city dwellers.
- 5 London with 2 million inhabitants.
- 6 Statistics showed that more than 50% of the world population lived in cities.
- 7 Because it is expected that by 2045, 6 billion people will live in cities.
- 8 Only two, Moscow and London.

10

9 Two, Cairo in Egypt and Lagos in Nigeria.

10 Asia.

2

- 1 A conurbation is an extensive urbanised area, which may also include more than one city, with smaller towns in the area.
- 2 Cities that are near each other that eventually merge to make one big city.
- 3 The excessive expansion of cities in an uncontrolled way.
- 4 Replacing single-family residential areas with a mix of residential and social infrastructures that includes homes, shops and restaurants that are all easily accessible within a short distance.

3  17

With its 8 million inhabitants, London is the city with the (1) **highest** population in Europe. Nowadays, 'London' refers to the area called Greater London, which includes the central (2) **districts** of the City of London and the City of Westminster and another 31 (3) **metropolitan** boroughs that surround the industrial districts. The City of London is the (4) **financial** centre of the city and is of great strategic (5) **importance**, extending over an area of just 2.6 km<sup>2</sup>. The City of Westminster is situated (6) **west** of the City. Here you can find the main British (7) **institutions** like Parliament, the Government in Downing Street and the Ministries of Whitehall, as well as the Monarchy in Buckingham Palace. The High Court of Justice is also located in the City of Westminster at the Royal Courts of Justice. When we talk instead of the London metropolitan area, we refer to an urbanised area that, in addition to Greater London, also includes an 8-kilometre wide green (8) **belt** as well as the even more external (9) **strip** of the New Towns, which emerged after the second world war due to a (10) **demographic** boom.

4

Personal answer

5

Personal answer

6

- 1 The largest urban areas are characterised by the fastest rates of growth.
- 2 If metropolitan areas are too large, they have many problems and the government may decide to build new ones.
- 3 Because a large number of them can limit the probability of success for all.
- 4 When it has a strong manufacturing base or when it offers research facilities as well as higher education institutes.
- 5 Its retail and other service activities attract residents from nearby smaller urban areas.
- 6 The main consequence is a further increase in traffic and in air pollution.

7

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

8

1 D 2 B 3 G 4 A 5 C 6 H 7 F (E non usata)

9

Personal answer

Sample answer:

Large urban areas have many advantages and disadvantages.

First of all, one major advantage of a large urban area is that there is greater productivity leading to better employment opportunities and the availability of a large number of services and infrastructures for its citizens to make use of.

These include an efficient transport system which allows you to leave your car at home and so avoid problems of trying to find a parking place, as well as hospitals for example that can be easily reached in case of an emergency. There is also a wide variety of entertainment on offer in a city to satisfy all tastes. These range from cinemas to theatres, or museums and art galleries, as well as a huge number of restaurants where you can try food from all different parts of the world.

However, there are also some disadvantages to living in a large urban area. These include poor air quality due to car exhaust fumes, and the time people waste travelling back and forth to work in heavy traffic. Safety in cities may be a problem as the crime rate in urban areas is usually higher than rural ones.

#### Classi deboli

Per aiutare gli studenti nello svolgimento dell'esercizio 5, suggerirgli di far uso delle seguenti strutture durante la loro discussione:

*In my opinion.../I reckon...*

*I agree with you, but on the other hand.../ I see your point, but.../ Yes, but...*

*I agree, and in fact.../ Yes, and in fact...*

#### 10

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.

Planners typically do things such as: 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.

#### 11

18

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) **agricultural** 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 artist 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**.

#### 12

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

2 The earliest examples of planned cities in history were in modern-day Iraq and India.

3 During Middle Ages there was no trace of rational urban planning in Europe.

#### 13

1 City planners and various experts write a Master Plan to describe how the land should be organised, taking the existing facilities into account.

2 The 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.

#### 14

1 experts

4 proposals

2 examining

5 improvements

3 organised

6 limitation

## Unit 11 – pp. 50-53

### 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  19

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  20

In the past there was little architectural interest in building university residences because this type of building has always had low budgets and this usually meant low-quality architecture. However, by designing Westfield Campus of Queen Mary's College, Feilden Clegg Bradley Studios have proved that this is not always true. The project was not easy for a number of reasons, the most important of which is that the building is located in a disused area in London's East End near the railway and a canal. The requirements were to create comfort for the students, offer the possibility to use the residences as hotels during the holidays, and to reduce energy consumption and pollution emissions. All within a limited budget and time. This last requirement was attained by using a building envelope with 25% better insulation than the minimum legislative requirement.

Two linear buildings were designed which created the boundaries of the university campus. One of them had to act as an acoustic barrier against the noise of the railway, the other had to connect the nearby canal to the park. On the outside of the buildings copper was used, which not only is a sustainable material, but also provides durability and needs limited maintenance. Inside prefabricated elements were built using both in situ concrete within disposable formworks or tunnel technique.

1 residences, 2 disused, 3 hotels, 4 designed  
5 sustainable, needs

5-6

1 c 2 e 3 a 4 b 5 d

7

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.

8

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.

9  21

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.

10

Personal answer

## Unit 12 – pp. 54-63

1

1 thousands, 2 village, 3 tomb, 4 eight, 5 meeting  
6 megalithic

2

1 Nothing was recorded in writing.

2 It consisted of a group of huts made of animal bones and probably had space for a fire inside.

3 Structures made out of large pieces of stone that are put together without using mortar.

4 They were covered with earth and smaller stones to make a mound.

5 The houses in Skara Brae were made of layers of flat stones, stacked together without mortar. Stone was also used inside these houses for seats and beds.

6 Simple geometric forms, like circles.

7 Most believe that Stonehenge was a ceremonial place,

maybe an astronomical observatory to calculate lunar and solar eclipses and to study the sky, the stars, the moon and the seasons.

8 They are large man-made upright stones that come in different square-shaped sizes that are often narrower at the top.

3

1 forms, 2 architecture, 3 highest, 4 temples, 5 simplest  
6 decorated

4

1 style, 2 materials, 3 depending, 4 distribution, 5  
technological, 6 similar, 7 seating, 8 shape

5

Personal answer

6

1 b 2 c 3 a

7

- 1 It was built between 55 BC and 43 AD.
- 2 Its healthy mineral water, hot springs, Roman baths and Georgian buildings.
- 3 Bath became a World Heritage Site.
- 4 An important festival of classical music.
- 5 The Roman Emperor Hadrian
- 6 A series of forts.

8

1 B 2 A 3 A 4 B 5 C

9

- 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.

10

- 1 to the west of
- 2 monarch and the oldest and largest inhabited castle in the world
- 3 wood
- 4 the Round Tower

11

- 1 The Renaissance style started in England in the middle of the sixteenth century.
- 2 The Renaissance style was an original combination of the Tudor-Gothic and the classical styles.
- 3 Hampton Court Palace is situated 24 km west of London, beside the River Thames.
- 4 It is famous for its fine buildings, gardens and maze.

12 22

Saint Paul's Cathedral is located in London. The old Cathedral, also dedicated (1) to St Paul, was severely damaged by Cromwellian cavalry troops who used it as (2) barracks. In the 1660s Christopher Wren was enlisted to repair the cathedral, but it was (3) destroyed in the Great Fire of London (1666) before work could begin. Wren subsequently designed and oversaw the construction of the present cathedral, which was (4)

built mainly of Portland stone. Wren's design combined Neoclassical, Gothic, and Baroque elements. St Paul's famous dome, which has long dominated the London

(5) skyline, is composed of three shells: an outer dome, a concealed brick cone for structural support, and (6) an inner dome. At the base of the lantern (the (7) apex of the outer dome) is the famous Golden Gallery, which offers panoramas of London. Farther down, at a point just (8) below the brick cone, is the Stone Gallery, another popular viewing spot. The frescoes and grisaille of the inner dome are best admired from the Whispering Gallery (so called because a whisper from one side of the gallery can be (9) heard from the other side). There are some 300 monuments within the cathedral and many notable soldiers, artists, and intellectuals have been buried in the crypt, including Lord Nelson, the Duke of Wellington, and Wren himself, who was one of the first to be entombed there. Above his resting place is the (10) epitaph composed by his son, which may be translated 'Reader, if you seek a monument, look about you'.

13

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

14

- 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.

15

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

16 23

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).

## 17 24

During the 1930s, architects' designs were (1) influenced by new technological developments, such

as prefabricated construction. During the 1950s, modern architecture was considered anonymous and it began to receive (2) criticism for its disrespect of regional building traditions. As a result, the new generation of architects began looking for individual and regional forms of (3) expression, even if great importance was

still given to structure and materials. Postmodernism did not actually become a movement until the late 1970s. It combined new ideas with traditional forms, mixing and matching architectural (4) styles in innovative combinations. Two major architects of this period were Stirling and Rossi.

James Stirling (1926-1992) was a British architect who (5) designed several famous buildings and influenced the development of architecture especially in the UK, the USA and Germany. His best known design is the 1963 project for the Engineering Building at Leicester University. Other important buildings include the Social Sciences Centre in Berlin and the Performing Arts Centre for Cornell University. He believed that 'the (6) shape of a building should display the usage and way of life of its occupants'. Stirling was concerned with the (7) humanization of the environment and he wanted his buildings to be in harmony with common sense, tradition and the environment, whilst also showing concern for people.

Aldo Rossi (1931-1997) was a famous Italian architect who achieved international recognition in theory, drawing and architecture. In his earliest works, which were mostly theoretical, he was influenced by Italian (8) modernism, classicism and by the reflections of the painter De Chirico. In his designs he used the city as his central theme and believed that a city must be studied as something constructed over time, that remembers its past thanks to the monuments which give structure to it. In 1990 Rossi won the Pritzker Prize for architecture.

## 18

Personal answer

## 19 25

The Swiss architects Jacques Herzog and Pierre de Meuron have been finding inventive architectural solutions for a diverse (1) range of projects for over twenty years. One of their most famous commissions is the (2) conversion of London's Bankside electric power station into the Tate Modern, an architectural masterpiece. Another important project is the Allianz Arena Stadium in Munich, Germany, that was completed in 2005 and perfectly (3) combines building design and functionality. It has a light cover in ETFE cushions (ethylene tetrafluoroethylene) a plastic polymer related to Teflon, much lighter than glass, 100% recyclable, durable and highly (4) transparent. As is usual in the works of Herzog and de Meuron, much thought was given to the design of the exterior. A series of paths link the stadium to a green-covered parking area, creating the effect of a huge park that blends perfectly with the surrounding landscape. Another striking and awesome stadium they designed for the 2008 Olympic Games is the National Stadium in Beijing. Significantly, the Chinese themselves nicknamed the stadium 'Bird's Nest' for its shape and (5) undulating effect. More recently, in 2019, the partners designed the new Hilton Conrad Hotel in Washington D.C. They have been awarded several (6) prizes, including the Pritzker Architecture Prize in 2001 and the Mies Crown Hall Americas Prize in 2014.

Daniel Libeskind, a Polish-American architect, artist, professor and set designer, was born in 1946. His first major

(1) success was The Jewish Museum in Berlin, Germany (2001) but he has also worked in other (2) countries like Ireland where he designed the Grand Canal Theatre project in Dublin. Perhaps he is best known for (3) winning the competition to be the Master Plan architect for the

reconstruction of the World Trade Center site in New York formerly referred to as ‘Ground Zero’ after the September 11 terrorist attacks destroyed the previous World Trade Center in 2001. His Master **(4) Plan** takes into consideration the relationship between the site and the surrounding city. For Libeskind, it represents a **(5) spiritual** peak for the city and aims at restoring its hope and optimism.

Stefano Boeri is professor of Urban Design at the Polytechnic of Milan. He founded ‘Multiplicity’, an international network for the study of contemporary urban **(1) transformation**. He is founder of Boeri Studio and Stefano Boeri Architects, a Milan-based firm which operates in the field of contemporary architecture and **(2) urbanism** improving or recovering areas, especially in Europe. As part of a redevelopment project in Milan, the Studio Boeri was asked to design a luxury **(3) residential** complex. They planned two skyscrapers, one 85 m and the other 116 m high, built with traditional materials, but with **(4) balconies** acting as planters to hold trees, thus creating the first ‘Vertical Forest’. The Vertical Forest has over 900 trees and many shrubs and floral plants. The façade covered with **(5) glass** panels intensify the green of the towers. The project was praised worldwide, and won the Highrise Award in 2014. It has become a model for **(6) sustainable** residential buildings. The vegetation system helps produce humidity, absorbs CO<sub>2</sub> and dust particles, produces oxygen and creates a **(7) micro-climate** full of several species of insects and birds, providing fresh air and improving the quality of living for its occupants. The plants also protect the building from radiation and noise pollution. The Vertical Forest provides a system of irrigation that filters and **(8) reuses** the grey water produced by the building. In addition, a photovoltaic system on the roof provides energy to increase the building’s **(9) self-sufficiency**, while the vegetation integrates well with the public parks nearby. Since the Vertical Forest in Milan, the Studio Boeri has designed an experimental project for Cairo, Egypt: the Cairo Vertical Forest. Boeri and his colleagues are currently working on the urban project, named ‘The Polcevera Park and The Red Circle’ in Genoa which won the competition to **(10) rebuild** the area in Genoa destroyed after the Morandi Bridge disaster in 2018. Another project is the first Vertical Forest in Albania and the Master Plan for Tirana continues Boeri’s belief in ‘Urban Forestation’ to help fight climate change.

Zaha Hadid was an Iraqi-born British architect, the first woman to win the Pritzker prize (2004), a prestigious **(1) award** often called the Noble Prize of architecture. She also won The Stirling Prize in 2010 and 2011. In 2012, she received the **(2) title** of ‘Dame’ from Queen Elizabeth II for services to architecture, and in 2016, a month before her death, she became the **(3) first** woman to be awarded the Royal Gold Medal for the Royal Institute of British Architects. Her architecture was based on in-depth research and ambitious **(4) experimentation**, and she always paid special attention to the physical context and

landscapes of her projects. These characteristics are evident in the MAXXI, the first national museum for contemporary art and architecture that **(5) opened** in the outskirts of Rome in 2010. Its fragmented geometry and curved walls match with the neo-classical façade,

while the ambitious and dynamic design creates an interesting **(6) dialogue** with the classical heritage of the Flaminio neighbourhood. The MAXXI Museum is just one of Hadid’s masterpieces. Other major works include the Guangzhou Opera House in China and the Riverside Museum in Scotland. Several of her buildings were still under **(7) construction** at the time of her death, including Beijing Daxing International Airport and the Al Wakrah Stadium in Qatar, one of the venues for the 2022 FIFA World Cup. The terminal of Beijing Daxing International Airport, with its central hub and six curved spokes, looks like a **(8) starfish** when seen from above and indeed has been given this nickname by the Chinese media. It is not easy to put Hadid’s architectural style into one specific **(9) category**, and she herself claimed not to follow any one particular style or school. However, her many works have been described by others as belonging to Deconstructivism and Neo-Futurism. She accepted the use of technology software that became popular during her time, but she continued to **(10) draw** her buildings by hand and make models of the designs because she said she did not want to limit herself and her designs only to what the computer could do.

**20**

Personal answer

**21**

Personal answer