

# UNIT 1 ANSWERS

## CHAPTER 1

- 1 ► B      2 ► A      3 ► A      4 ► D
- 5 ► a Diagram should show each part of a plant cell and its function, e.g. cell wall (maintains shape of cell), cell membrane (controls entry and exit of substances), cytoplasm (where metabolism/reactions take place), vacuole (stores dissolved substances), nucleus (controls activities of cell), chloroplasts (photosynthesis), mitochondria (respiration).
- b An animal cell lacks a cell wall, a large permanent vacuole and chloroplasts.
- 6 ► Description, in words or diagrams, should include the following points:
- enzymes are biological catalysts
  - they speed up reactions in cells without being used up
  - each enzyme catalyses a different reaction
  - the production of enzymes is controlled by genes
  - enzymes are made of protein
  - the substrate attaches to the enzyme at the active site
  - the substrate fits into the active site like a key in a lock
  - this allows the products to be formed more easily
  - intracellular enzymes catalyse reactions inside cells
  - extracellular enzymes are secreted out of cells (e.g. digestive enzymes)
  - they are affected by changes in pH and temperature.
- 7 ► a About 75°C.
- b At 60°C the molecules of enzyme and substrate have more kinetic energy and move around more quickly. There are more frequent collisions between enzyme and substrate molecules, so more reactions are likely to take place.
- c The microorganism lives at high temperatures, so it needs 'heat-resistant' enzymes with a high optimum temperature.
- d It is denatured.
- 8 ► Diffusion is the net movement of particles (molecules or ions) from a high to low concentration. It does not need energy from respiration. Active transport uses energy from respiration to transport particles against a concentration gradient.
- 9 ► The function of the motor neurone is to send nerve impulses to muscles and glands. It has a long axon, which conducts these impulses. It has a cell body with many extensions called dendrons and dendrites, which link with other neurones at synapses. At the other end of the neurone, the axon branches and forms connections with muscle fibres, called neuromuscular junctions.
- The palisade cell's function is photosynthesis. Palisade cells are near the top surface of the leaf, where they are close to the sunlight. They have thin cell walls, so the light can easily reach the many chloroplasts that the cell contains.

- 10 ► a They carry out most of the reactions of respiration in the cell, providing it with energy.
- b Active transport. This uses the energy from the mitochondria.
- c Diffusion. The removal of glucose at A lowers the concentration inside the cell, so that the concentration at B is higher than inside the cell. Therefore glucose can diffuse down a concentration gradient.
- d Increases the surface area for greater absorption.

## CHAPTER 2

- 1 ► D      2 ► A      3 ► B      4 ► C
- 5 ► a i Fungi      ii Protoctists  
iii Plants      iv Bacteria
- b Like most protoctists, *Euglena* is a microscopic, single-celled organism. It has features of both plant and animal cells: like plants, it contains chloroplasts; like animals, it can move.
- 6 ► a Diagram should show a core of DNA or RNA surrounded by a protein coat. (It may also have an outer envelope or membrane derived from the host cell.)
- b A virus can be considered either as living or as a chemical. It does not have any of the normal characteristics of living things, except that it is able to reproduce.
- c Viruses can reproduce only inside a host cell, by taking over the cell's genetic machinery to make more virus particles. So viruses are all parasites.
- 7 ► a An animal that does not have a vertebral column (backbone).
- b Fine, thread-like filaments forming the feeding network of cells of a fungus.
- c A type of nutrition used by most fungi and some bacteria, where the organism feeds on dead organic material by digesting it using extracellular enzymes.

## END OF UNIT 1 QUESTIONS

- 1 ► a i nucleus, mitochondrion (both needed for 1)  
ii nucleus, chloroplast, mitochondrion (all needed for 1)  
iii nucleus, mitochondrion (both needed for 1).
- b The cells in a root have no chloroplasts because they don't receive any light and so can't carry out photosynthesis (1)
- c Nucleus controls the activities of the cell (1); chloroplast absorbs light energy for photosynthesis (1); mitochondrion carries out some reactions of respiration to release energy (1).
- 2 ► a The artery is an organ because it is made of several tissues (1); the capillary is made up of only one type of cell (1).
- b i Two from: Breaks down large insoluble molecules (1) into smaller soluble molecules (1) that can be absorbed (1)

- ii (1 mark for organ, 1 mark for function).

Three from:

- mouth: chews / breaks down food into smaller pieces / produces saliva;
- oesophagus (gullet): move food from mouth to stomach;
- stomach: produces digestive enzymes;
- pancreas: produces digestive enzymes;
- liver: makes bile;
- ileum (small intestine) produces digestive enzymes / absorbs products of digestion;
- colon (large intestine): absorbs excess water;
- rectum: stores waste (faeces).

- iii (1 mark for system, 2 marks for organs).

Two from:

- breathing system: trachea, lung, diaphragm;
- circulatory system: artery, vein, heart;
- musculoskeletal system: muscle, joint, (named) bone;
- nervous system: brain, spinal cord;
- reproductive system: testis, ovary, uterus, penis;
- excretory system: kidney, bladder.

- 3 ► a i 4g (1). Mass at start was 100g, decreased to 96g due to oxygen lost (1).

- ii Half this mass = 2g (1). This loss in mass occurs by (approximately) 0.5 minutes / 30 seconds (1).

- iii At the start there are a lot of enzyme and substrate molecules, so there are a lot of successful collisions (1). As the reaction proceeds, the number of substrate molecules decreases, so there are fewer successful collisions (1).

- b i There would be no difference / 4g formed (1); because the temperature affects only the reaction rate, not the end point (1).

- ii The time would be shorter (1) because the rate of reaction is speeded up by the increase in temperature (1).

- 4 ► a 1 mark for each correct row in the table.

Feature	Active transport	Osmosis	Diffusion
particles must have kinetic energy	X	✓	✓
requires energy from respiration	✓	X	X
particles move down a concentration gradient	X	✓	✓

- b i (As the temperature rises) ions gain kinetic energy (1), so they move faster (1).
- ii Above this temperature the cell membranes are being denatured (1) so are more permeable to ions (1).

- 5 ► a i So that each of the two cells produced (1) will have the correct number of chromosomes / correct amount of DNA after the division (1).

- ii The nucleus has divided into two (1).

- b i They increase the surface area for absorption (1).

- ii They (further) increase the surface area for absorption (1).

- iii As the glucose moves out of the cell, the concentration inside the cell decreases (1) and increases the concentration gradient for diffusion of glucose into the cell (1).

- 6 ► a i  $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$  (1 for each correct part).

- ii It is the same (1), because there are six molecules of each / same number of molecules / same number of moles (1), 1 mole of any gas has the same volume (1).

- iii Any sensible experimental error stated (1) with brief explanation (1).

- iv No oxygen would be used up (1), so distance moved would be less / bead would not move (1).

- 7 ► (1 mark for each correct row)

Feature	Type of organism		
	Plant	Fungus	Virus
they are all parasites	X	X	✓
they are made up of a mycelium of hyphae	X	✓	X
they can only reproduce inside living cells	X	X	✓
they feed by extracellular digestion by enzymes	X	✓	X
they store carbohydrates as starch	✓	X	X

- 8 ► (One mark for each correct underlined term)

Plants have cell walls made of cellulose. They store carbohydrate as the insoluble compound called starch or sometimes as the sugar sucrose. Plants make these substances as a result of the process called photosynthesis. Animals, on the other hand, store carbohydrate as the compound glycogen. Both animals' and plants' cells have nuclei, but the cells of bacteria lack a true nucleus, having their DNA in a circular chromosome. They sometimes also contain small rings of DNA called plasmids, which are used in genetic engineering. Bacteria and fungi break down organic matter in the soil. They are known as decomposers / saprotrophs. Some bacteria are pathogens, which means that they cause disease.

- 9 ► a Germinating seeds produce heat (1) from respiration (1).

- b To kill bacteria on the seeds (1)

- c To allow oxygen into the flask (1)

- d mass of seeds / number of seeds / age of seeds (1)

- 10 ► Any six for 6 marks, from:

- Use solution of ATP, compare with (control using) water (1)

- Same type of meat fibres / named type (1)
- Several replicates / number of replicates suggested, e.g. 10 (1)
- Measure length before treatment (1)
- Measure length after treatment / change in length / % change (1)
- Other controlled variables: temperature / volume of solutions / starting length (Max. 2)

## UNIT 2 ANSWERS

### CHAPTER 3

1 ► C      2 ► A      3 ► B      4 ► B

	Action during inhalation	Action during exhalation
external intercostal muscles	(contract)	relax
internal intercostal muscles	relax	contract
ribs	move up and out	(move down and in)
diaphragm	contracts and flattens	relaxes and becomes dome-shaped
volume of thorax	increases	decreases
pressure in thorax	decreases	increases
volume of air in lungs	increases	decreases

- 6 ► When we breathe in, the external intercostal muscles between our ribs contract, pulling the ribs up and out. The diaphragm muscles contract, flattening the diaphragm. This increases the volume in the chest cavity, lowering the pressure there, and causing air to enter from outside the body, through the nose or mouth. This is called ventilation. In the air sacs of the lungs, oxygen enters the blood. The blood then takes the oxygen around the body, where it is used by the cells. The blood returns to the lungs, where carbon dioxide leaves the blood and enters the air sacs. When we breathe out, the external intercostal muscles relax and the ribs move down and in. The diaphragm muscles relax, and the diaphragm returns to a dome shape. These changes decrease the volume of the chest cavity, increasing the pressure in the cavity, pushing the air out of the lungs.
- 7 ► a When the volume of the chest is increased by the movements of the ribs and diaphragm, the drop in pressure in the chest cavity draws air into the pleural cavity through the puncture in the chest wall, instead of through the mouth or nose into the lung.
- b Each lung is isolated from the other by being in a separate pleural cavity, so a pneumothorax on one side will not affect the opposite lung.
- c A tube is inserted through the chest wall into the pleural cavity on the side of the injured lung. This stops ventilation in that lung, while the other lung will be ventilated normally.
- 8 ► a The rings support the trachea so that it does not collapse during inhalation. The gap in the 'C' allows food to pass down the oesophagus, which runs next to the trachea, without catching on the rings.
- b The short distance allows easy diffusion of oxygen into the blood, and diffusion of carbon dioxide out of the blood.
- c The mucus traps bacteria and dirt particles. The cilia beat backwards and forwards to sweep these towards the mouth, preventing them entering the lungs.
- d Smoke contains carbon monoxide, which displaces oxygen from the haemoglobin of the red blood cells of the smoker.
- e The addictive drug in tobacco smoke is nicotine. Smokers who are trying to give up can use patches or gum to provide the nicotine they normally get from cigarettes, reducing the craving to smoke.
- f The large surface area is provided by the alveoli. It allows for efficient diffusion of oxygen into the large blood supply, and efficient removal of the waste product, carbon dioxide.
- 9 ► Bronchitis is a lung disease caused by irritation of the linings of the airways to the lungs, and may be made worse by bacteria infecting the bronchial system. Emphysema is a lung disease where the walls of the alveoli break down and then fuse together, reducing their surface area. (Both diseases may be caused by smoking.)
- 10 ► a Some points are:
- non-smokers have a low death rate from lung cancer at all ages
  - the death rate from lung cancer among smokers increases with age
  - the death rate increases with the number of cigarettes smoked per day.
  - (Numbers should be used from the graph to illustrate any of these points.)
- b For 55-year-olds smoking 25 a day: about 4.5 per 1000 men (or 45 per 10000 men).  
For 55-year-olds smoking 10 a day: about 1 per 1000 men.
- c Probably this investigation. The graph shows a direct relationship between number of cigarettes smoked and incidence of lung cancer, in one particular type of person (middle-aged male doctors): in other words, a more controlled group. In Table 3.2 the patients were matched for age, sex etc. but were from a more varied background. There could be other reasons for the correlation that had not been considered. However, they both show a strong link.
- 11 ► The leaflet should not be too complicated or have too much information so that it puts the reader off. It must have a clear message.