Cambridge Assessment International Education

Cambridge IGCSE™

1: Cells and cell processes – Topic questions Paper 3

The questions in this document have been compiled from a number of past papers, as indicated in the table below.

Use these questions to formatively assess your learners’ understanding of this topic.

Question	Year	Series	Paper number
1	2016	March	32
1	2016	June	32
6	2016	November	32

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1 The boxes on the left contain the names of characteristics of living organisms.
The boxes on the right contain the definitions of these characteristics.

Draw **one** straight line to link the characteristic with its correct definition.

An example has been done for you.

characteristic	**definition**
sensitivity	chemical reactions in cells that break down nutrient molecules and release energy
respiration	the ability to detect and respond to changes in the environment
nutrition	taking in of materials for energy, growth and development
excretion	an action by an organism causing a change of position or place
movement	removal from organisms of toxic materials and substances in excess of requirements
reproduction	a permanent increase in size
growth	the processes that make more of the same kind of organism

[5]

1 Fig. 1.1 shows four different reptiles.

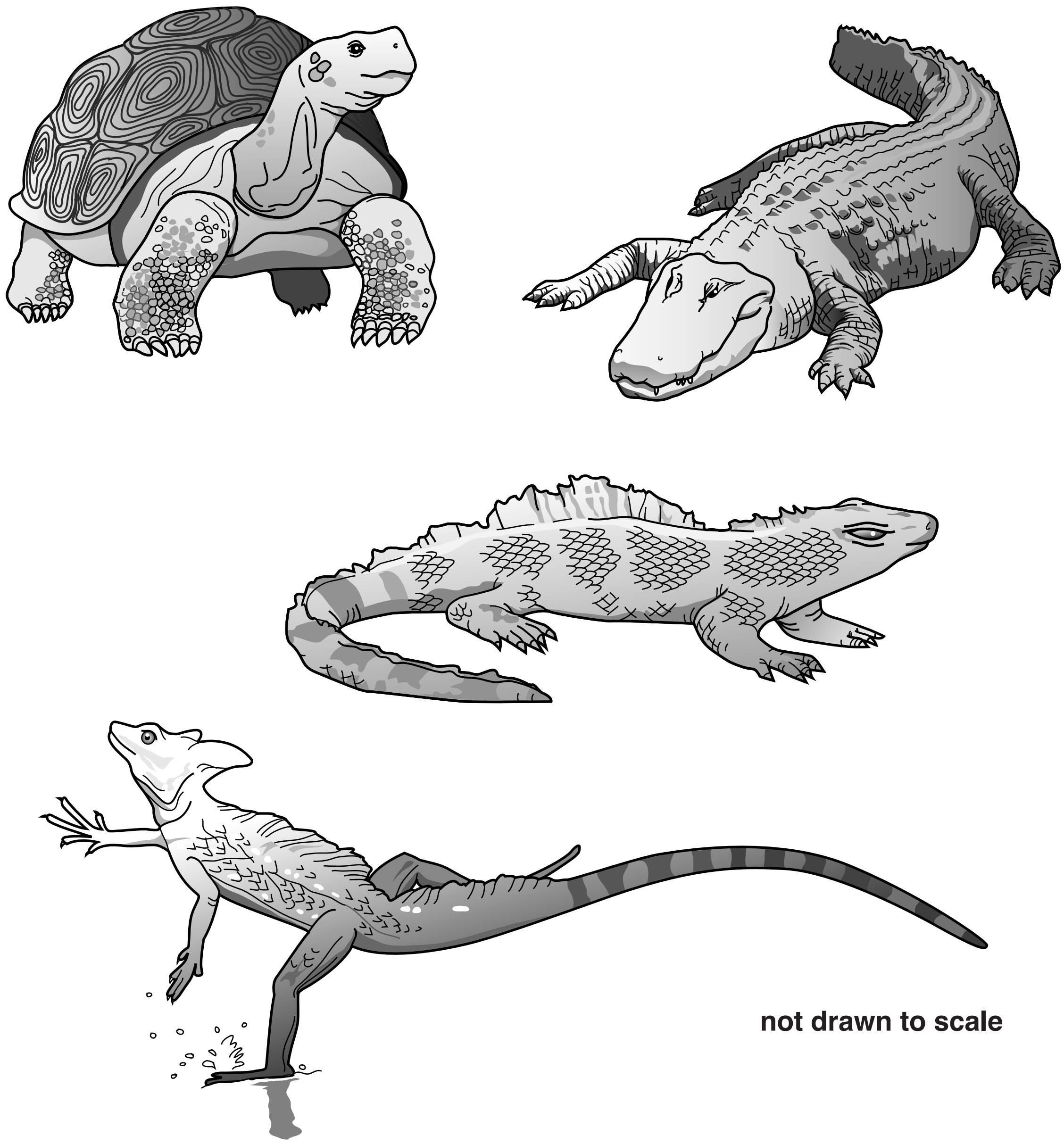


Fig. 1.1

(a) **(i)** Reptiles are vertebrates.

State **one** feature which all vertebrates have in common.

....

....[1]

(ii) State **two** features which can be used to identify the animals in Fig. 1.1 as reptiles.

1 ....

....

2 ....

....
[2]

(iii) Fig. 1.2 shows a snake.

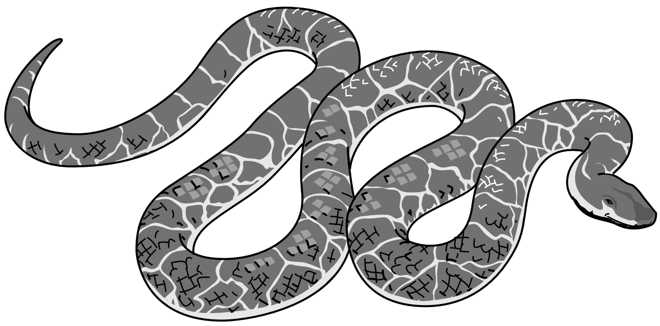


Fig. 1.2

Snakes are also reptiles. State **one** way, **visible** in Fig. 1.2, in which snakes are different from the reptiles shown in Fig. 1.1.

....

....[1]

Fig. 1.3 shows a newt, which looks similar to some reptiles, but belongs to a different vertebrate group.

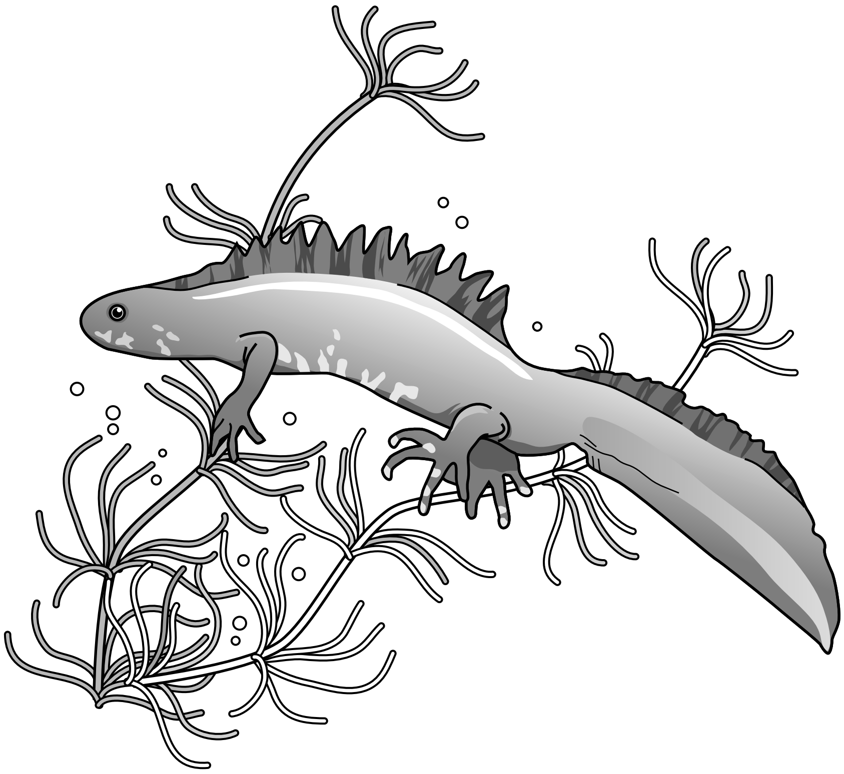


Fig. 1.3

(b) **(i)** State the vertebrate group to which the newt belongs.

Choose from this list and **circle** your answer.

amphibian **bird** **fish** **mammal**

[1]

(ii) State **two** features of this group which distinguish it from other vertebrate groups.

1 ....

....

2 ....

....

[2]

(c) In some species of reptile, the female keeps the fertilised eggs in her body until they are ready to hatch. Suggest **two** advantages of having this adaptive feature.

1 ....

....

2 ....

....
[2]

6 **(a)** Describe *osmosis.*

....

....

....

....

....

....[3]

(b) Fig. 6.1 shows a plant cell.

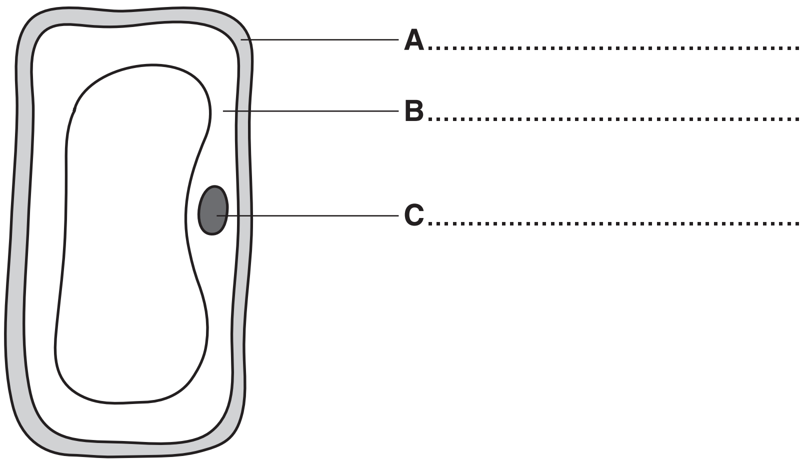


Fig. 6.1

(i) Name the structures labelled **A**, **B** and **C**.

Write your answers on Fig. 6.1. [3]

(ii) On Fig 6.1, draw a label line **D** to show the position of the vacuole. [1]

(c) Fig. 6.2 shows the same cell in pure water.
It is left there for 30 minutes.

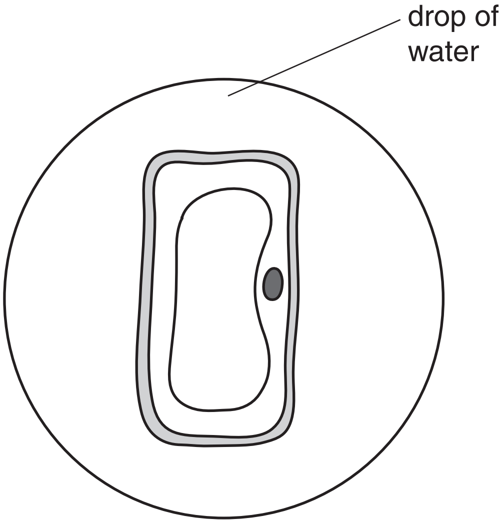


Fig. 6.2

Describe the changes that will occur in the cell during the 30 minutes it is in pure water.

....

....

....

....

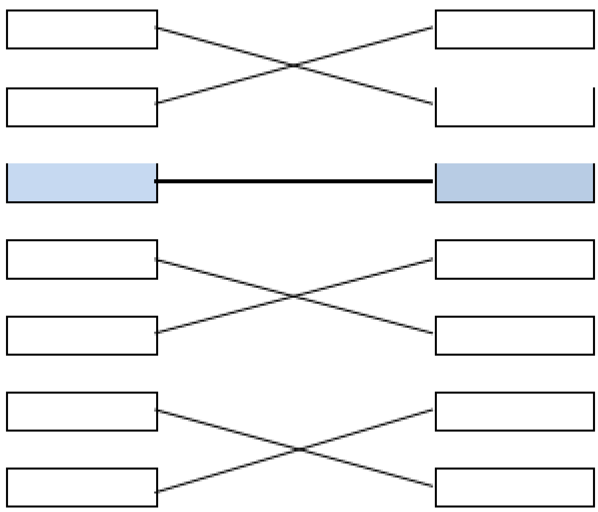
....

....[3]

[Total: 10]

Abbreviations used in the Mark Scheme:

;	separates marking points
/	alternatives
I	ignore
R	reject
A	accept (for answers correctly cued by the question, or guidance for examiners)
AW	alternative wording (where responses vary more than usual)
AVP	any valid point
ecf	credit a correct statement / calculation that follows a previous wrong response
ora	or reverse argument
( )	the word / phrase in brackets is not required, but sets the context
<u>underline</u>	actual word given must be used by candidate (grammatical variants excepted)
max	indicates the maximum number of marks that can be given

Question	Answer	Marks
1	 (1 mark per correct link; max 5)	[5]
		[Total: 5]

Question	Answer	Marks
1(a)(i)	ref. to vertebral column / backbone ; skull ;	[max. 2]
1 (a) (ii)	dry skin ; ref. to scales ; eggs with, dry shell / leathery shell ;	[max. 2]
1 (iii)	no limbs / legs ;	[1]
1 (b) (i)	<u>amphibian;</u>	[1]
1 (ii)	smooth skin / no scales ; gas exchange using skin ; spend part of life (cycle) in water and land / AW ; ref. to metamorphic life cycle / AW ;	[max. 2]
1 (c)	better survival of egg ; fewer eggs need to be produced ; less risk of predation ; maintains suitable temperature ; reduces risk of disease AW ; protected from external environment ;	[max. 2]
		[Total: 9]
6 (a)	movement of water; by diffusion /down a concentration gradient; through a partially permeable membrane;	[3]
6 (b) (i)	*A*: cell wall; *B*: cytoplasm; *C*: nucleus;	[3]
6 (b) (ii)	label line to end, on / in, central vacuole;	[1]
6 (c)	absorbs water/water moves or diffuses into cell /enters the cell; (cell) gets bigger; vacuole gets bigger; cell wall pushed out /AW; (cell) becomes turgid / turgor pressure increases; AVP;	[3]
		[Total: 10]

Cambridge Assessment International Education

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2: Animal nutrition – Topic questions

Paper 3

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Use these questions to formatively assess your learners' understanding of this topic.

Question	Year	Series	Paper number
3	2016	March	32
4	2016	June	33
7	2016	November	31

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3 **(a)** Define the term *enzyme*.

....

....

....

....

.... [2]

(b) **(i)** Fig. 3.1 shows a diagram of part of the human alimentary canal and associated organs.

Name the structures labelled **A**, **B**, **C** and **D**.

Write your answers on Fig. 3.1.

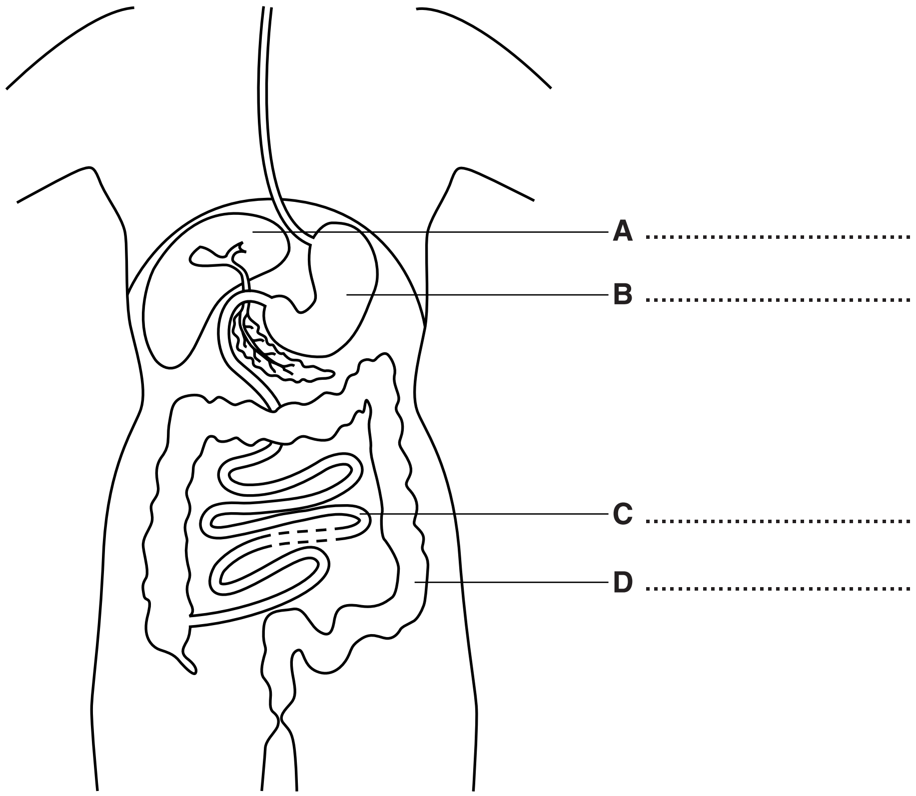

Fig. 3.1

[4]

(ii) Fig. 3.2 also shows a diagram of part of the human alimentary canal and associated organs.

On Fig. 3.2, draw label lines with letters to show:

E where hydrochloric acid is made

F where bile is made

G where amylase is made

H where egestion occurs.

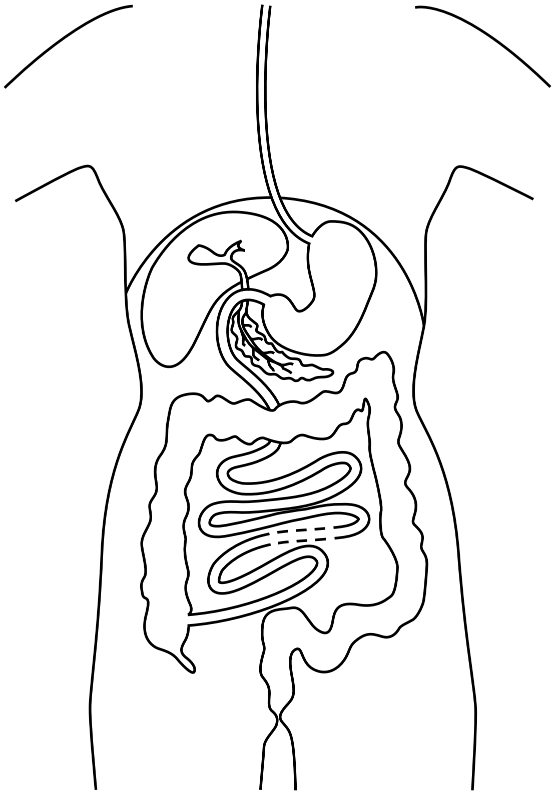

Fig. 3.2

[4]

(c) (i) State where digested food is absorbed.

....

.... [1]

(ii) Digestion of carbohydrate produces glucose.

Describe the absorption of glucose.

....

....

....

....

.... [2]

[Total: 13]

4 **(a)** State what is meant by the term *balanced diet*.

....

....

....

....

....[2]

(b) Fig. 4.1 shows a pie chart of a person's diet.

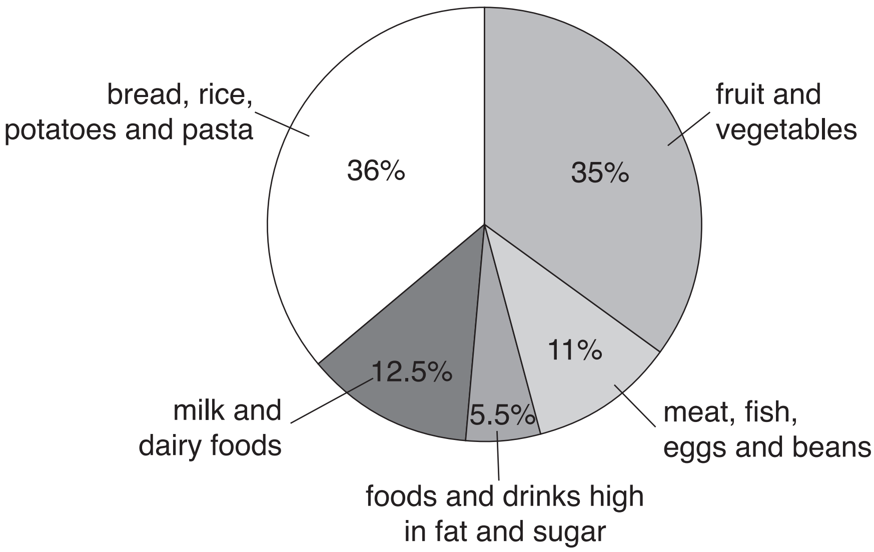

Fig. 4.1

(i) Bread, rice, potatoes and pasta form 36% of this diet.

Explain why these foods are important to the body.

....

....

....

....

....[2]

(ii) State the foods shown in Fig. 4.1 that are rich in protein **and** state why proteins are important to the body.

....

....

....

....

....[2]

(iii) Only 5.5% of this diet is made up of food and drinks that are high in fat and sugar.

Describe **one** harmful effect of eating too much fat.

....

....

....[1]

(iv) The diet in Fig. 4.1 would **not** be suitable for everyone's needs.

State **and** explain **two** factors that could affect a person's dietary needs.

....

....

....

....

....

....

....[4]

[Total: 11]

7 **(a)** Teeth are involved in mechanical digestion.

What is meant by the term *mechanical digestion*?

....

.... [2]

(b) Fig. 7.1 shows a section through a molar tooth.

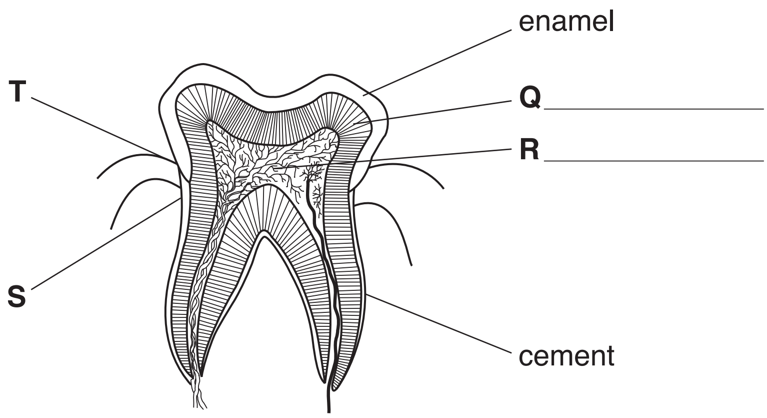

Fig. 7.1

(i) On Fig. 7.1, label parts **Q** and **R**. [2]

(ii) State **two** reasons why this tooth **cannot** be a canine tooth.

1 ....

....

2 ....

....

[2]

(iii) Gum disease causes the gums to shrink from position **T** to position **S**, as shown on Fig. 7.1.

Suggest why the tooth is more likely to decay when the gums are at position **S**.

....

....

.... [2]

(iv) State **two** ways of maintaining healthy teeth.

1 ....

....

2 ....

....

[2]

[Total: 10]

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Question	Answer	Marks
3 (a)	protein; that functions as a biological catalyst	[2]
3 (b) (i)	*A*: liver; *B*: stomach; *C*: small intestine/ ileum; *D*: large intestine/ colon;	[4]
3 (b) (ii)	*E*: ending in the stomach; *F*: ending on the liver; *G*: ending on the pancreas /wall of ileum; *H*: ending on the anus;	[4]
3 (c) (i)	ileum/ small intestine/ villi;	[1]
3 (c) (ii)	diffusion; (**A** absorption into stomach here) active transport; ref to glucose being small molecule/ soluble; through (thin) wall; into blood / plasma / blood capillary; villi; (villi) provide large surface area (per volume);	[max 2]
		[Total: 13]

Question	Answer	Marks
4 (a)	diet with all classes / groups of nutrients; in the correct proportions ; in the correct amounts ; ref. to energy ; idea of staying healthy ; (**A** list of at least 5 groups)	[max 2]
4 (b) (i)	(rich in) carbohydrates / starch; provide energy / joules / calories; for physical activity / body processes ;	[max 2]
4 (b) (ii)	meat/ fish/ eggs / beans / milk and dairy foods ; needed for growth/ repair/ to make enzymes / build muscles ;	[2]
4 (b) (iii)	obesity / overweight ; CHD/ heart disease/ high blood pressure ; diabetes ; liver disease/ gall stones ;	[max 1]
4 (b) (iv)	(One mark for factor and one mark for explanation; explanation **must** be linked to the factor.) age of person ; if they are growing or not; activity of person ; idea of more food (group) for energy / repair or build tissues ; obese/ anorexic ; might need to lose or gain weight ; gender (**A** sex); females generally require less than males ; pregnancy or lactating; more food need ; ref. to different metabolic rates ; needing more or less food ; medical conditions e.g. diabetes, allergies, illness ; need to avoid gluten/ sugars / fats / allergens / lactose OR need to eat certain food to alleviate a medical condition ; personal choice/ vegetarian/ vegan/religious / taste ; appropriate change in diet to suit choice diet ;	[max 4]
		[Total: 11]

Question	Answer	Marks
7 (a)	breakdown of food, into smaller pieces/to increase SA; (**R** ref. molecules) ref. to chewing / tearing /using teeth /masticating grinding; without chemical change to the food molecules; (**I** ref. to enzymes)	[2]
7 (b) (i)	(**Q**) dentine; (**R**) pulp (cavity); (**A** capillary / nerve)	[2]
7 (b) (ii)	has two cusps AW / has larger SA / is not pointed /canine only has one cusp / canine is pointed ; (**I** sharp(er)) has two roots / canine only has one root ;	[2]
7 (b) (iii)	cement is exposed /AW; cement is softer than enamel; cement decays, easily /quickly AW;	[2]
7 (b) (iv)	avoid eating sugary foods /eat less sugar; (**A** avoid, acidic / fizzy drinks) do not eat between meals /AW; brush / clean/wash, teeth regularly; use of, dental floss / interdental brushes; use fluoride, toothpaste / water; calcium rich diet; visit dentist;	[2]
		[Total: 10]

3: Plant nutrition and transport – Topic questions Paper 3

The questions in this document have been compiled from a number of past papers, as indicated in the table below.

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5	2016	June	31
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9	2016	November	32

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3 **(a)** Water enters plants through the root hairs and escapes to the air from the leaves.

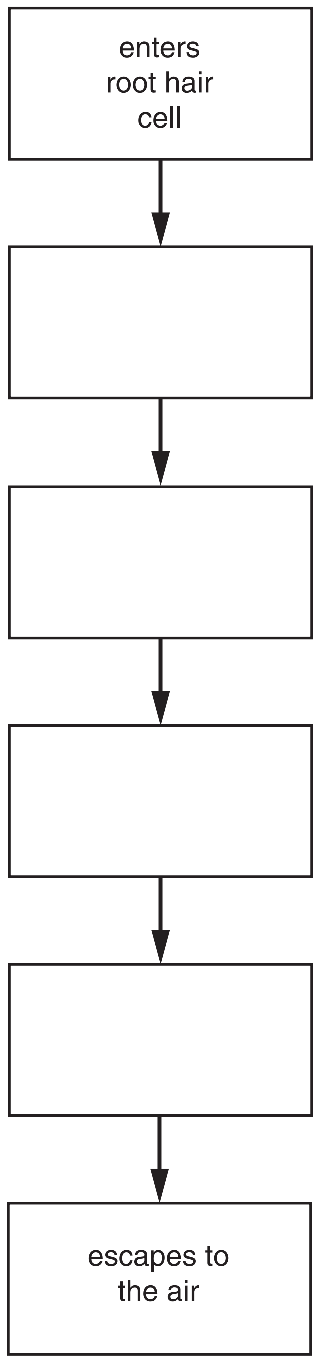
(i) Name the term that is used to describe the loss of water vapour from the leaves.

....[1]

(ii) Complete the flow chart by writing in the boxes the names of the parts through which water passes after it enters the root hair cells.

Choose words from the list.

mesophyll cells **cortex cells** **stomata** **xylem**



[3]

Fig. 3.1 shows a display of cut flowers in a shop.

At 6 am the flowers were placed in identical jars, **E**, **F**, **G** and **H**.

Each jar contained 500 cm^3 of water.

At 8 pm the jars all contained different volumes of water.

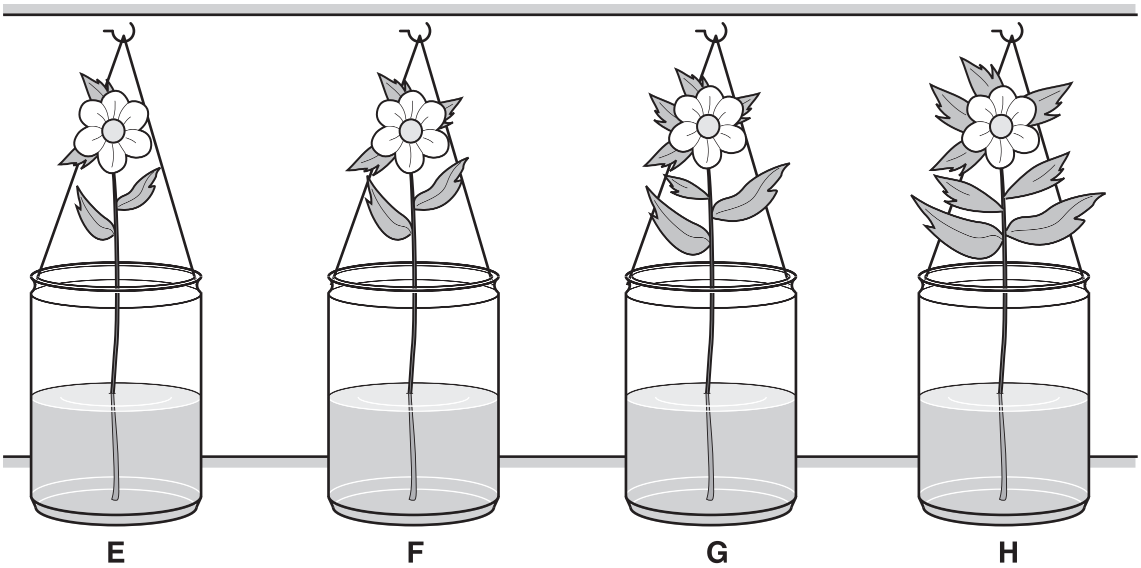


Fig. 3.1

(b) The volume of water remaining in jars **E**, **F**, **G** and **H** was measured at intervals between 6 am and 8 pm.

The results are shown in the graph in Fig. 3.2.

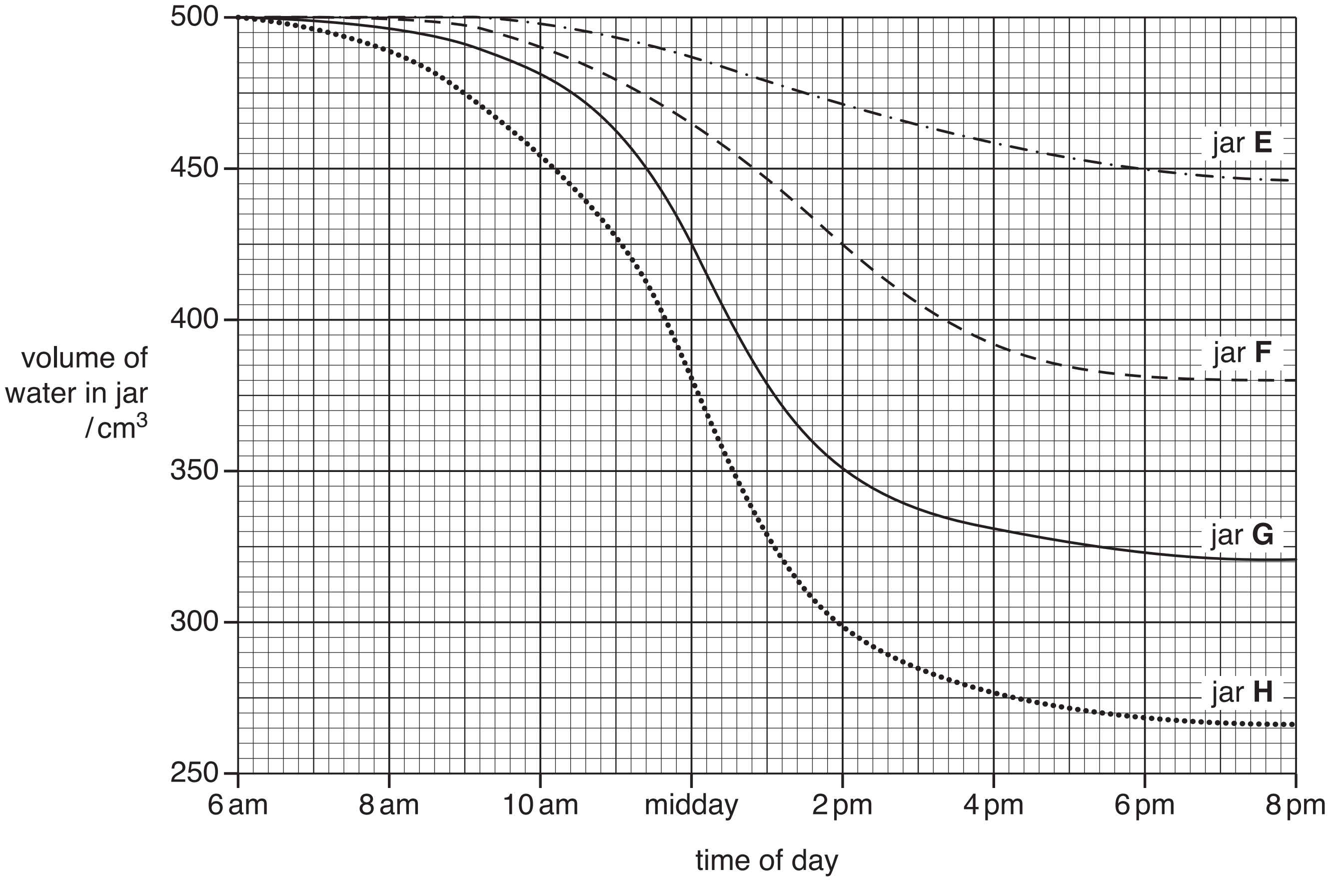


Fig. 3.2

(i) Using data from Fig. 3.2, describe the changes in the volume of water in jar **H**.

Suggest an explanation for these changes.

....

....

....

....

....

....

....

....

....[4]

(ii) Calculate the difference between the volume of water in jars **G** and **H** at midday. Show your working.

.... cm^3 [1]

(iii) Using **only** information shown in Fig. 3.1, suggest a reason for the difference in water loss from jars **G** and **H**.

....

....

....[1]

[Total: 10]

5 Fig. 5.1 shows some apparatus used to investigate transpiration.

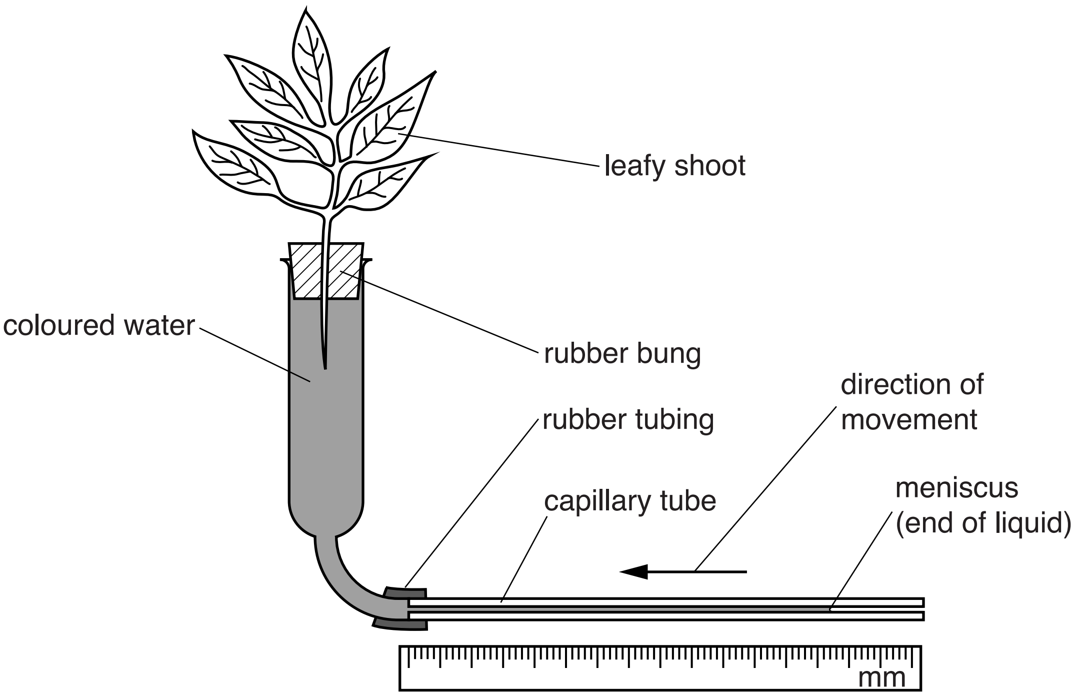


Fig. 5.1

The rate of transpiration can be calculated by measuring how far the meniscus moves in five minutes.

(a) Name the tissue that transports water from the roots to the leaves in a plant.

....[1]

(b) The investigation was carried out at five different temperatures.

All other conditions were kept constant.

Table 5.1 shows the results recorded using the apparatus shown in Fig. 5.1.

Table 5.1

temperature / °C	distance moved by meniscus in five minutes / mm
10	28
20	32
30	37
40	44
50	53

(i) State **one** conclusion that can be drawn from the results in Table 5.1 about the effect of temperature on the rate of transpiration.

....

....[1]

(ii) Suggest why the investigation was not continued at temperatures above 50 °C.

....

....

....

....[2]

(c) The investigation was repeated using the leafy shoot shown in Fig. 5.2.

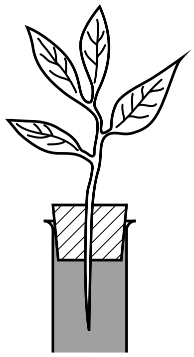


Fig. 5.2

(i) Predict how these results would be different to the results shown in Table 5.1.

....

....[1]

(ii) Give **two** reasons why the results would be different.

....

....

....

....[2]

(d) State **one** factor, other than temperature, that can affect the rate of transpiration.

....

....[1]

[Total: 8]

7 Fig. 7.1 shows a section through a leaf.

(a) Name the structures labelled **J** and **K**.

Write your answers on Fig. 7.1.

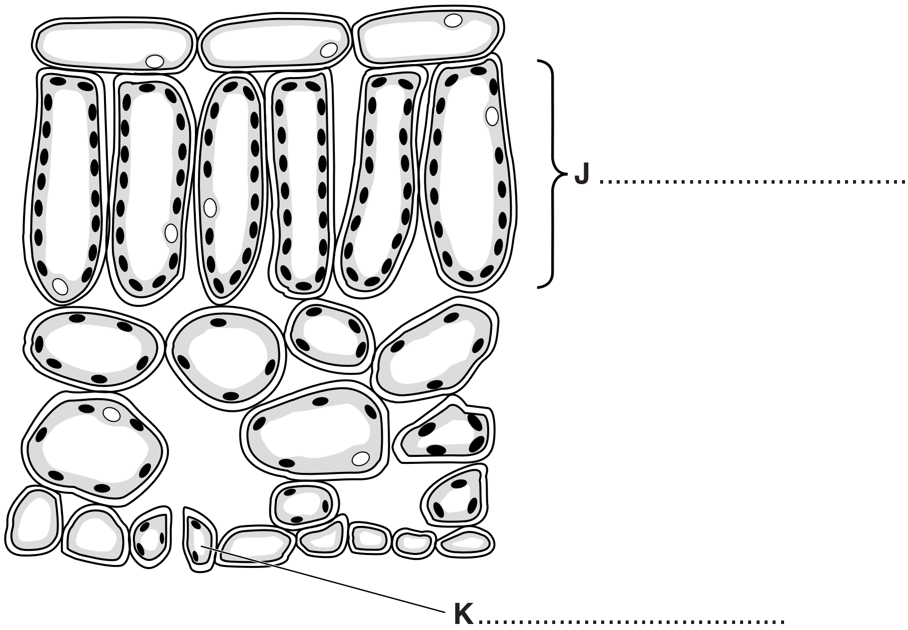


Fig. 7.1

[2]

(b) Leaves carry out photosynthesis.

Write the word equation for photosynthesis.

.... + ... $\xrightarrow[\text{chlorophyll}]{\text{light}}$ .... + ...

[2]

(c) Maize plants photosynthesise to produce the chemicals needed to form corn cobs.
Corn cobs are food for humans.

In an investigation, six similar fields of maize seedlings had different quantities of fertiliser added.
The mass of corn cobs produced by each field was calculated.

The results are shown in Fig. 7.2.

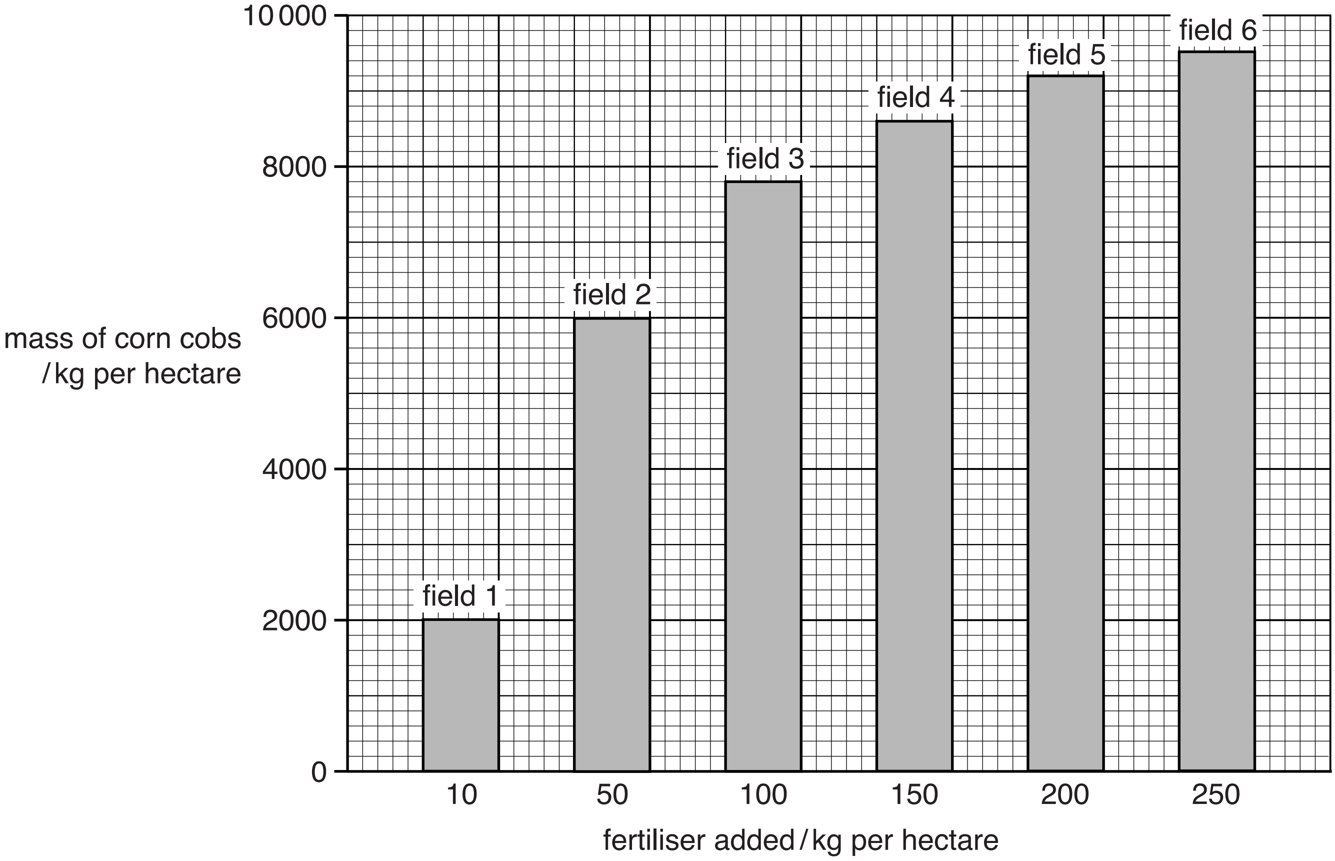


Fig. 7.2

(i) Describe the results of the investigation shown in Fig. 7.2.

....

....

....

.... [2]

(ii) State **two** factors, other than adding fertiliser, which can affect the rate of photosynthesis.

1 ....

2 ....

[2]

(d) (i) Explain how the use of herbicides improves the yields from crop plants such as maize.

....

....

....

....

.... [2]

(ii) Suggest how genetic engineering could reduce the use of insecticides on farms.

....

....

....

....

.... [2]

[Total: 12]

9 This question is about photosynthesis.

Complete the sentences using words from the list.

Each word may be used once, more than once or not at all.

chlorophyll	**chloroplast**	**epidermis**	**glucose**
glycogen	**membrane**	**palisade**	**starch**
stigma	**stomata**		

When plants carry out photosynthesis the chemical called .... traps light energy.

The energy is used to combine raw materials to make ....

This process mainly happens in the .... layer of the leaf.

The gas needed for photosynthesis enters the leaf through the ....

These are found in the .... of the leaf.

Leaves appear green because they contain the chemical called ....

[6]

[Total: 6]

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Question	Answer	Marks
3 (a)(i)	transpiration/ evaporation ;	[1]
3 (a) (ii)	(3 or 4 correct = 3, 2 correct = 2, 1 correct = 1) cortex cells; xylem; mesophyll cells; stomata;	[3]
3 (b)(i)	*description* decrease/AW ; plateau ; data quotation / usage ; *explanation* plant absorbs water ; (lost by) transpiration/ evaporation ; rate of transpiration/ evaporation varies ; reason as to why it varies ;	[max 4]
3 (b) (ii)	(425–380=) 45 (cm^3) ;	[1]
3 (b) (iii)	has bigger leaves ; more leaves ; larger surface area ;	[max 1]
		[Total: 10]

Question	Answer	Marks
5 (a)	xylem ;	[1]
5 (b)(i)	rate of transpiration increases as temperature rises / **ora** ; (**A** positive correlation) rate of increase becomes faster as temperature rises / **ora** ; (**I** efficiency) the higher the temperature the greater the distance moved by the meniscus **ora** ; (**R** incorrect casual relationship in an **ora**)	[max 1]
5 (b) (ii)	1 enzymes will be destroyed / cease to function ; (**A** enzymes denatured) 2 shoot / plant/ leaf / cells die / no transpiration ; 3 water loss greater than water intake ; (**A** wilting) 4 difficulty in achieving temperature (in lab) ;	[max 2]
5 (c)(i)	less transpiration / (meniscus) will not move as fast or as far / slower rate of movement / less water loss / less water uptake ; (**I** smaller / lower results)	[1]
5 (c) (ii)	1 smaller leaves ; 2 fewer leaves ; 3 less surface area (for transpiration) ; 4 fewer stomata (through which transpiration can occur) ;	[max 2]
5 (d)	humidity; (**A** air movement / light (intensity)/ carbon dioxide concentration)	[max 1]
		[Total: 8]
7 (a)	*J* palisade (mesophyll) cell/ layer; (**I** mesophyll unqualified) *K* guard cell; (**A** vacuole)	[2]
7 (b)	(either order for both pairs; **A** chemical symbols but must be correct; **I** energy on LHS; **R** energy on RHS) carbon dioxide and water; glucose and oxygen;	[2]
7 (c)(i)	crop yields increase as more fertiliser is added; at high levels the effect of the fertiliser makes little difference to yields / non-linear/AW; use of data;	[max 2]

Question	Answer	Marks
7 (c)(ii)	light intensity; concentration of carbon dioxide; temperature; (availability of) water; number of chloroplasts / amount of chlorophyll; AVP;	[max 2]
7 (d)(i)	kill weeds; (so) more resources / e.g. of, for maize / less competition; more photosynthesis; more energy available (for growth); more glucose / sucrose/ starch for cob production;	[max 2]
7 (d)(ii)	gene for tasting unpleasant to insects / to poison insects /AW; from another species; inserted into crop plants; into a chromosome; less chemical needed as plants resist insect attack;	[max 2]
		[Total: 12]
9	chlorophyll; glucose/ starch; palisade; stomata; epidermis; chlorophyll;	[6]
		[Total: 6]

4: Respiration and the human transport system – Topic questions Paper 3

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5	2016	November	32

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4 The body has defences against pathogens.

(a) **(i)** Define the term *pathogen*.

....

....

.... [1]

(ii) State **two** ways a pathogen can be transmitted.

1 ....

....

2 ....

....

[2]

(iii) The body can defend itself against pathogens.

Complete Table 4.1 by stating examples of the body's defences.

Table 4.1

defence	example
mechanical barrier	
chemical barrier	

[2]

(b) **(i)** Blood cells can also defend the body against pathogens.

Outline how they do this.

....

....

....

....

.... [3]

(ii) State **one** way in which modern medicine can help the body defend itself against pathogens.

....

.... [1]

[Total: 9]

5 Fig. 5.1 shows the risk of coronary heart disease by age and gender.

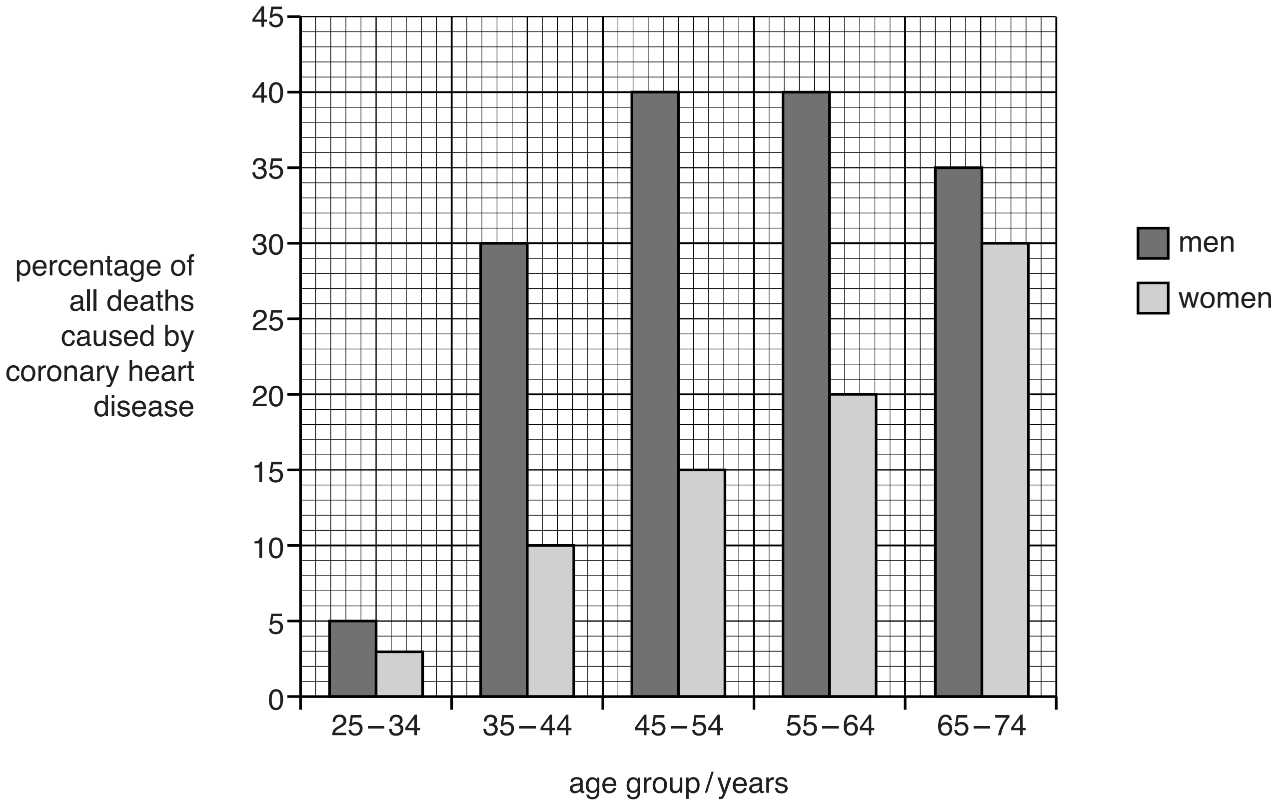

Fig. 5.1

(a) Use Fig. 5.1 to:

(i) state which age group has the lowest percentage of deaths caused by coronary heart disease

....[1]

(ii) describe what happens to the risk of coronary heart disease as a man gets older

....

....

....

....

....[2]

(iii) describe the difference in risk of coronary heart disease for a man and a woman between the ages of 55 and 64.

....

....

....

....

....[2]

(b) State **three** risk factors for coronary heart disease, **other than** age and gender.

1 ....

2 ....

3 ....
[3]

(c) Fig. 5.2 shows a diagram of the human heart and its associated blood vessels.

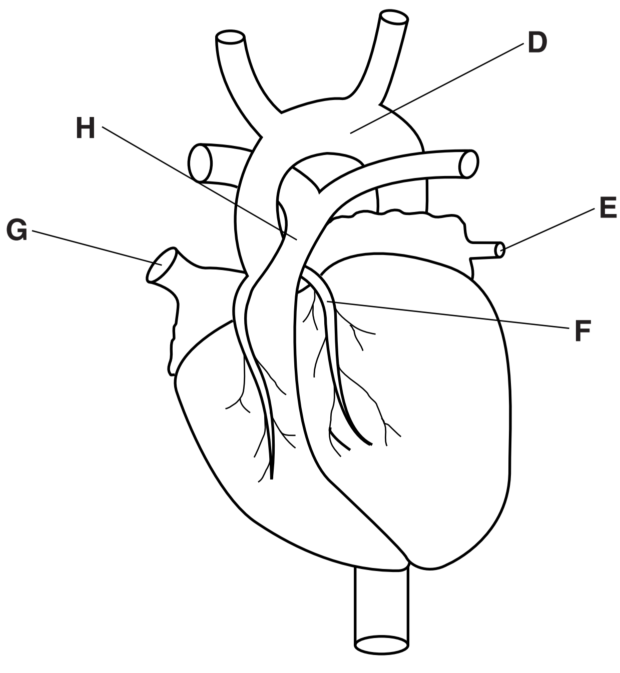

Fig. 5.2

On the diagram, **circle** the letter of the blood vessel which, when blocked, results in coronary heart disease. [1]

(d) The activity of the heart can be studied by monitoring the closing of the heart valves.

(i) Describe how this monitoring could be carried out.

....

....[1]

(ii) State the function of the heart valves.

....

....[1]

Fig. 5.3 shows heart activity (valves closing) over a period of ten seconds, for a person who is resting.

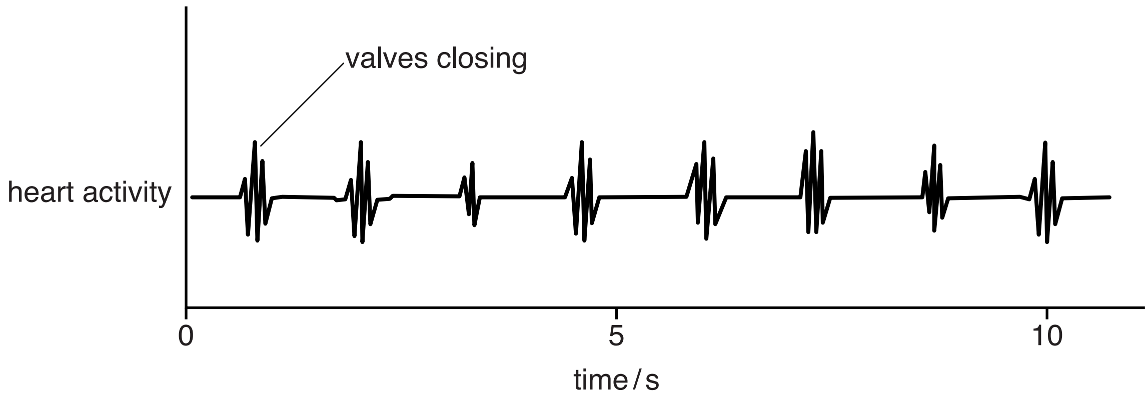

Fig. 5.3

(iii) State how many times the valves close in ten seconds.

....[1]

(iv) Calculate the heart rate, in **beats per minute**, of the person being monitored. Show your working.

.... beats per minute [2]

(v) Suggest how the heart activity would be different if the person started to exercise.

....

....

....[1]

[Total: 15]

5 **(a)** Fig. 5.1 shows the human breathing system.

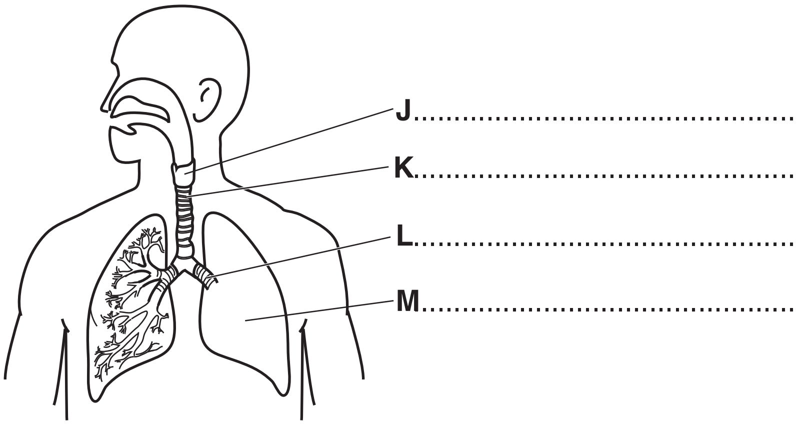

Fig. 5.1

Name the structures labelled **J**, **K**, **L** and **M**.

Write your answers on Fig. 5.1. [4]

(b) Fig. 5.2 shows four sections through groups of alveoli and their blood capillaries.

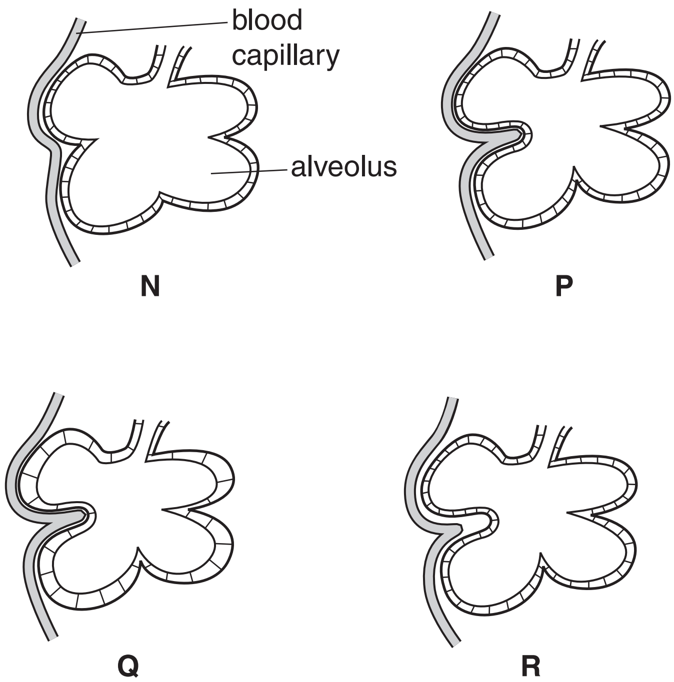

Fig. 5.2

State which diagram, **N**, **P**, **Q** or **R**, shows the most efficient gas exchange surface.

Give **one** reason for your answer.

most efficient gas exchange surface ....

reason ....

....

[2]

(c) **(i)** State the word equation for aerobic respiration in cells.

.... + ... → .... + ...

[2]

(ii) Respiration releases energy.

Outline **three** uses of this energy in the human body.

1 ....

....

2 ....

....

3 ....

....

[3]

[Total: 11]

Abbreviations used in the Mark Scheme:

;	separates marking points
/	alternatives
I	ignore
R	reject
A	accept (for answers correctly cued by the question, or guidance for examiners)
AW	alternative wording (where responses vary more than usual)
AVP	any valid point
ecf	credit a correct statement / calculation that follows a previous wrong response
ora	or reverse argument
( )	the word / phrase in brackets is not required, but sets the context
<u>underline</u>	actual word given must be used by candidate (grammatical variants excepted)
max	indicates the maximum number of marks that can be given

Question	Answer	Marks
4 (a) (i)	disease-causing organism;	[1]
4 a (ii)	(direct) contact / through blood / through (named) body fluids; (contaminated) surfaces /AW; (contaminated) food / water / AW; from, animals / (named) vector; through the air/AW;	[2]
4 a (iii)	*mechanical* skin/ hairs in nose; *chemical* mucus / stomach or hydrochloric acid / gastric juices;	[2]
4 (b) (i)	ref. to white blood cells; phagocytosis /engulfing /description of engulfing; ref. to production of antibodies / causing cells to clump / stick to cell surface AW;	[3]
4 (b) (ii)	vaccination /antibiotics /antifungals / antivirals /antitoxin / antiseptics /AVP;	[1]
		[Total: 9]

Question	Answer	Marks
5 (a) (i)	<u>25–34</u>	[1]
5 (a) (ii)	increases (with age) ; plateaus between 45–64 ; then falls (at/ after 65) ;	[max 2]
5 (a) (iii)	higher risk for men ; men twice as high as women / 40% for men and 20% for women / difference is 20% ;	[2]
5 (b)	(**R** age / gender) diet qualified ; (qualification must be a factor that leads to CHD; **A** obesity) stress ; smoking/ tobacco ; genetic predisposition ; AVP ;	[max 3]
5 (c)	**F** ;	[1]
5 (d) (i)	listening to (heart sounds) ;	[1]
5 (d) (ii)	prevents blood flowing backwards /AW ;	[1]
5 (d) (iii)	<u>8</u> (times) ;	[1]
5 (d) (iv)	$8 \times 6 =$ 48 ;	[2]
5 (d) (v)	*idea of* heart beats / pulse rate faster, more frequent / more peaks / peaks closer together;	[1]
		[Total: 15]

Question	Answer	Marks
5 (a)	*J* – larynx; *K* – trachea; *L* – bronchus; *M* – lung;	[4]
5 (b)	<u>**P**</u>; *idea of*: large(r) surface area (than N)/ alveolar wall is thin(ner)/ small diffusion distance / blood vessel closer to alveolar wall (than R or N)/ more rapid diffusion of gases / thin(ner) or smaller cells than Q;	[1] [1]
5 (c) (i)	oxygen ***and*** glucose (on LHS); water ***and*** carbon dioxide (on RHS);	[2]
5 (c) (ii)	*energy needed for*: 1 contraction of muscle fibres / body movement; 2 (examples of) chemicals reactions; 3 cell division / growth /repair; 4 passage of nerve impulses; 5 brain activity; 6 maintenance of constant body temperature; 7 reproduction / embryo development; 8 digestion; 9 excretion; 10 AVP;	[3]
		[Total: 11]

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5: Coordination, response & homeostasis – Topic questions Paper 3

The questions in this document have been compiled from a number of past papers, as indicated in the table below.

Use these questions to formatively assess your learners' understanding of this topic.

Question	Year	Series	Paper number
3	2016	June	31
8	2016	March	32
8	2016	November	31

The mark scheme for each question is provided at the end of the document.

You can find the complete question papers and the complete mark schemes (with additional notes where available) on the School Support Hub at www.cambridgeinternational.org/support

3 Fig. 3.1 shows a section through the skin.

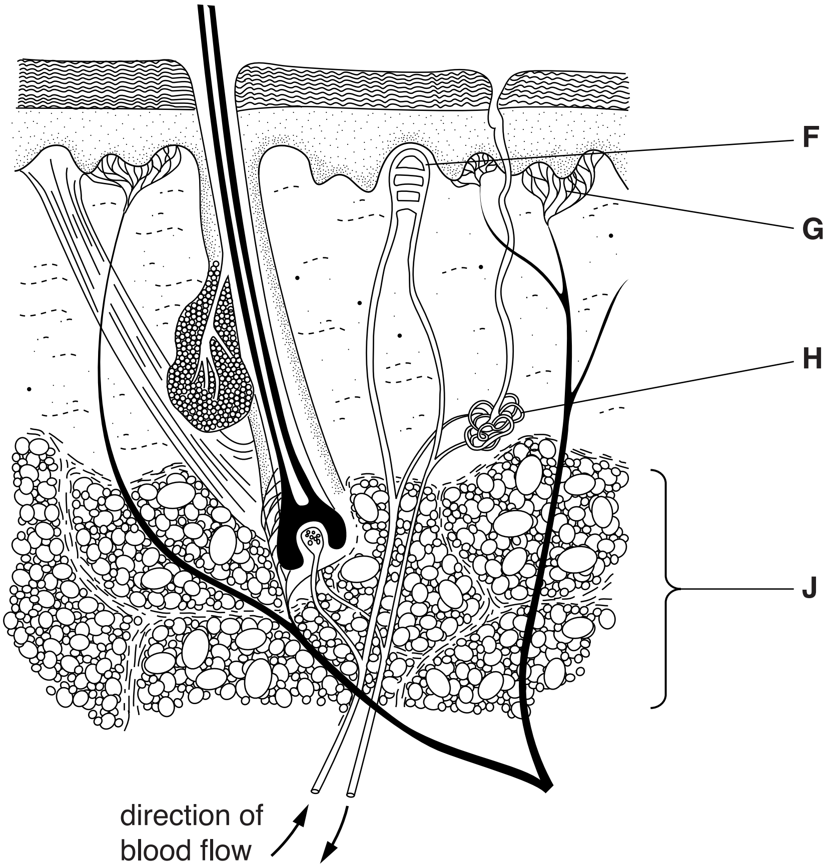


Fig. 3.1

(a) Name the structures labelled in Fig. 3.1 and outline a function in the skin for each one.

Write your answers in Table 3.1.

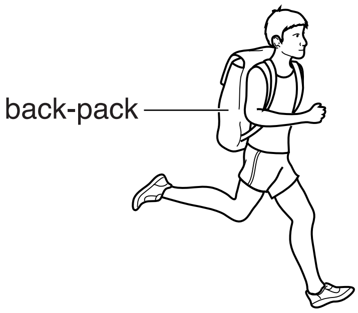
An example has been done for you.

Table 3.1

structure	name of structure	function in the skin
F		
G		
H	sweat gland	produces sweat for cooling the body
J		

[6]

(b) In an investigation the volume of sweat produced by a student was measured when running while carrying different masses in a back-pack.



The results are shown in Fig. 3.2.

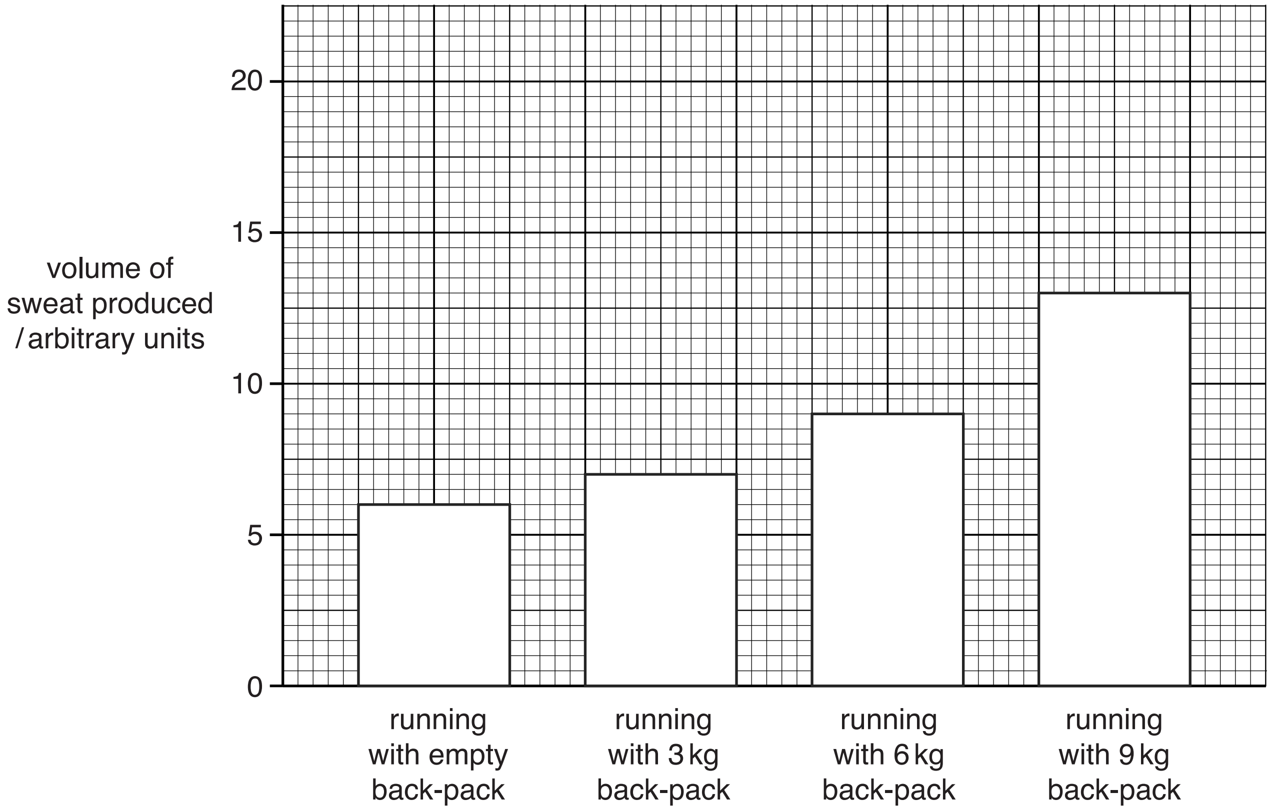


Fig. 3.2

(i) Use Fig. 3.2 to state:

the volume of sweat produced when running with an empty back-pack

.... arbitrary units

the volume of sweat produced when running with a 9 kg back-pack

.... arbitrary units

Use these two volumes to calculate the percentage increase in sweat production when running with a 9 kg back-pack.

Give your answer to the nearest whole number.

Show your working.

.... %
[3]

(ii) This investigation was carried out when the air temperature was 10 °C.

Predict the effect of carrying out the same investigation if the air temperature was 15 °C.

....

....[1]

(c) When the student was at rest the volume of sweat produced was 2 arbitrary units.

The volume increases during exercise as the body needs to keep cool.

Explain how this cooling takes place.

....

....

....

....

....

....[3]

[Total: 13]

8 **(a)** Name the **two** components that form the central nervous system (CNS).

1 ....

2 .... [2]

(b) Sense organs respond to specific stimuli.

Name **three** different stimuli that the sense organs in the human body can detect.

1 ....

2 ....

3 .... [3]

(c) A student picks up a very hot object and immediately drops it.

Describe what happens in this reflex action.

....

....

....

....

....

....

....

....

.... [4]

[Total: 9]

8 Fig. 8.1 shows the apparatus used for investigating the contents of cigarette smoke.

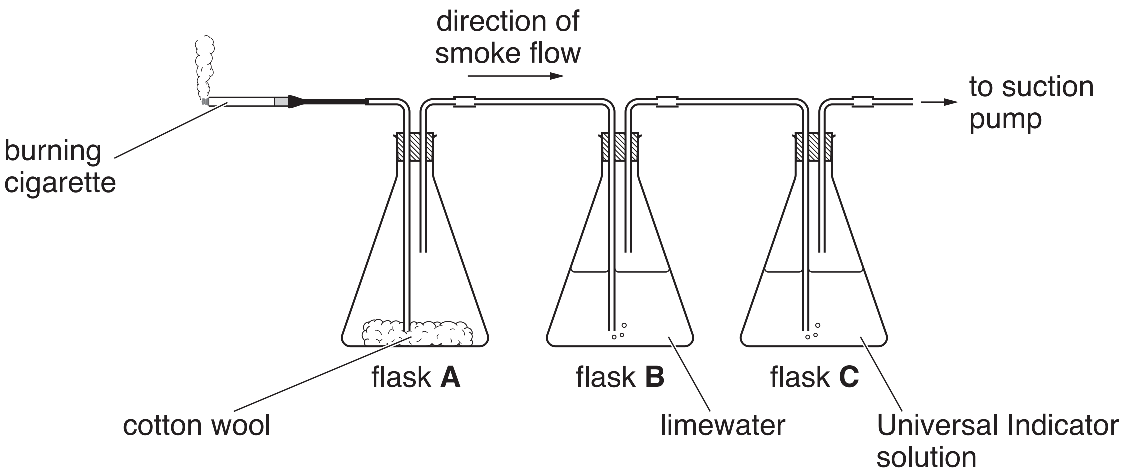


Fig. 8.1

The smoke from the burning cigarette is sucked through the apparatus.

Table 8.1 shows the results.

Table 8.1

flask	contents of flask	observations
A	cotton wool	stained yellow-brown with a sticky liquid
B	limewater	turned from colourless to milky
C	Universal Indicator solution	turned from green to orange-red

(a) **(i)** The chemical from the smoke that stained the cotton wool was tar.

State **two** effects tar has on the body.

1 ....

....

2 ....

....
[2]

(ii) State **one** conclusion that can be made from the limewater results.

....

....

.... [1]

(iii) State what the Universal Indicator results show about cigarette smoke.

....

.... [1]

(iv) Name **one** component of cigarette smoke, other than tar and carbon monoxide, **not** found in this investigation.

.... [1]

(b) The cigarette had a filter to collect harmful substances, but it did not work very well.

Suggest how the results in Table 8.1 show that the filter did not work very well.

.... [1]

(c) Explain why cigarette smoke makes the transport of oxygen by the blood less effective.

....

....

....

....

.... [2]

[Total: 8]

Abbreviations used in the Mark Scheme:

;	separates marking points
/	alternatives
I	ignore
R	reject
A	accept (for answers correctly cued by the question, or guidance for examiners)
AW	alternative wording (where responses vary more than usual)
AVP	any valid point
ecf	credit a correct statement / calculation that follows a previous wrong response
ora	or reverse argument
( )	the word / phrase in brackets is not required, but sets the context
underline	actual word given must be used by candidate (grammatical variants excepted)
max	indicates the maximum number of marks that can be given

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>3 (a)</td><td>
<table>
<tr><th>label</th><th>name</th><th>function</th></tr>
<tr><td>F</td><td>capillary ; (I vein / artery)</td><td>transports blood/ heat/ supplies oxygen glucose to cells /removes carbon dioxide;</td></tr>
<tr><td>G</td><td>receptors / sensory neurone ;</td><td>detect changes in external environment / stimulus / touch / pressure / temperature; (R detects temperature of the blood; I responds to)</td></tr>
<tr><td>H</td><td></td><td></td></tr>
<tr><td>J</td><td>adipose tissue/ fat / fatty tissue; (I fatty acids; I dermis)</td><td>insulation/prevention of heat loss / keeps body warm/ shock absorber/ energy store;</td></tr>
</table>
</td><td>[6]</td></tr>
<tr><td>3 (b) (i)</td><td>with no back-pack 6 (arbitrary units);
with 9kg back-pack 13 (arbitrary units);
117(%); (I 116.6%)</td><td>[3]</td></tr>
<tr><td>3 (b) (iii)</td><td>more/ increased volume of, sweat produced;</td><td>[1]</td></tr>
<tr><td>3 (c)</td><td>1 ref. to evaporation ; (I ref. to heat loss by conduction/ convection / radiation
2 (of) water/ sweat ;
3 (idea of) need for heat/ latent heat/ energy ; (I sweat absorbs heat unqualified)
4 (heat/ latent heat/ energy for evaporation) taken from / body/skin/ blood;
5 blood carries heat ;</td><td>[max 3]</td></tr>
<tr><td></td><td></td><td>[Total: 13]</td></tr>
</table>

Question	Answer	Marks
8 (a)	brain; spinal cord;	[2]
8 (b)	(**A** position of body in space/AW; **I** named sense organs) light; sound; chemicals; temperature (change); object touching skin; pressure against skin; damage to skin;	[max 3]
8 (c)	heat / stimulus detected by sensors /receptors, impulse (generated); passed along sensory neurone; across synapse (somewhere in account); impulse passed to motor neurone, via relay /AW neurone; impulse causes muscles to contract/respond;	[max 4]
		[Total: 9]

Question	Answer	Marks
8 (a)(i)	causes (lung) cancer/AW; causes bronchitis; increased mucus production / more goblet cells / cough; reduces gaseous exchange / coats the alveoli /narrows the lumen of the airways; stops cilia working /AW; stains teeth and fingers;	[2]
8 (a) (ii)	(cigarette smoke) contains carbon dioxide;	[1]
8 (a) (iii)	(cigarette smoke) is acidic /has a low pH;	[1]
8 (a) (iv)	nicotine; (**A** particulates)	[1]
8 (b)	(**A** many substances pass through the filter) yellow/ brown / sticky / stained, cotton wool or milky limewater or red Universal Indicator;	[1]
8 (c)	haemoglobin /red blood cells / erythrocytes, carry / transport, oxygen; carbon monoxide combines with haemoglobin; ref. to permanent bond; (carbon monoxide binding to haemoglobin) prevents O2 from binding to haemoglobin /AW;	[2]
		[Total: 8]

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6: Reproduction – Topic questions

Paper 3

The questions in this document have been compiled from a number of past papers, as indicated in the table below.

Use these questions to formatively assess your learners' understanding of this topic.

Question	Year	Series	Paper number
2	2014	June	22
3	2016	June	32
4	2014	November	22

The mark scheme for each question is provided at the end of the document.

You can find the complete question papers and the complete mark schemes (with additional notes where available) on the School Support Hub at www.cambridgeinternational.org/support

2 **(a)** Use words from the following list to complete the passage about plant reproduction.
You may use each word once, more than once or not at all.

asexual	**cotyledon**	**diploid**	**fertilisation**	**gamete**
haploid	**pollination**	**sexual**	**testa**	**zygote**

Living organisms must reproduce to replace organisms which die, and to supply more organisms to occupy new environments. Genetically identical offspring are produced from a single parent during the process of .... reproduction. During .... reproduction, a special cell called a .... is made by one parent and fuses with a .... from another parent. This process of fusion is called .... and may eventually lead to the development of a seed.

[3]

3 Flowers contain the male and female reproductive structures of a plant.

The female reproductive structure is the carpel.

The male reproductive structure is the stamen.

(a) Draw straight lines from the reproductive structures to show which parts of the flower are in each structure. You should draw only **five** lines.

reproductive structure	**part of flower**
	anther
	stigma
carpel	ovary
	petal
stamen	filament
	style
	sepal

[4]

(c) State **two** ways in which meiosis is different from mitosis.

1 ....

....

2 ....

....
[2]

4 **(a)** Fig. 4.1 shows a section through an insect-pollinated flower.

The structures in the flower are labelled by letters.

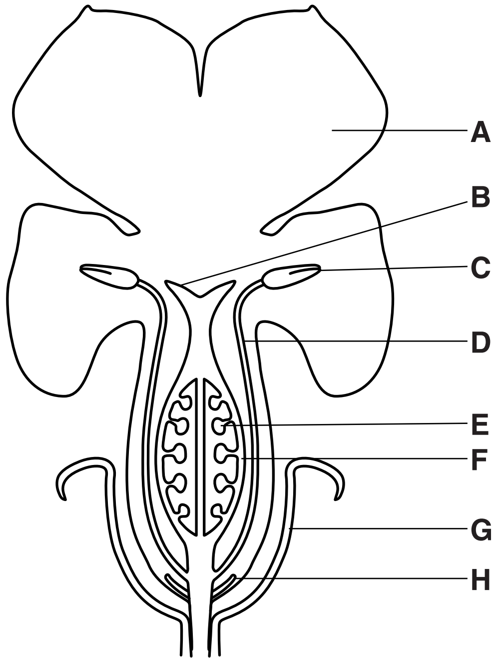

Fig. 4.1

Table 4.1 describes the functions of **four** of the flower parts.

Complete Table 4.1 by writing the letter that identifies the flower part that carries out each function.

Table 4.1

function of flower part	letter
forms the seed	
produces pollen	
protects the flower bud	
receives the pollen	

[4]

(b) Insect-pollinated flowers and wind-pollinated flowers are different in structure.

Complete Table 4.2 by:

- stating how the stamens and pollen of wind-pollinated flowers are different from those of insect-pollinated flowers
- giving a reason for each of the differences.

An example for the petal has been completed for you.

Table 4.2

flower part	difference	reason for the difference
petal	wind-pollinated flowers have small petals that are not brightly coloured	wind-pollinated flowers do not need to attract insects
stamen		
pollen		

[4]

[Total: 8]

Abbreviations used in the Mark Scheme:

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/	alternatives
I	ignore
R	reject
A	accept (for answers correctly cued by the question, or guidance for examiners)
AW	alternative wording (where responses vary more than usual)
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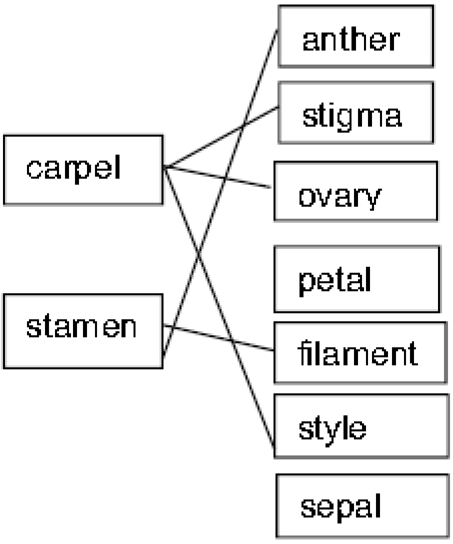
ecf	credit a correct statement / calculation that follows a previous wrong response
ora	or reverse argument
( )	the word / phrase in brackets is not required, but sets the context
<u>underline</u>	actual word given must be used by candidate (grammatical variants excepted)
max	indicates the maximum number of marks that can be given

Question	Answer	Marks
2 (a)	asexual + sexual (both correct for one mark) gamete + gamete (both correct for one mark) fertilisation	[3]
2 (b)	(potatoes have) tubers; idea of tubers growing into plant; photosynthesising; plant produces more tubers; mitosis;	[3]
		[Total: 6]

Question	Answer	Marks
3 (a)	 4 or 5 lines correct for 4 marks 3 lines correct for 3 marks 2 lines correct for 2 marks 1 lines correct for 1 mark	[4]
3 (b)	sperm swim through cervix / uterus ; ref. to sperm moving to / zygote passing through (after fertilisation), oviduct ; to egg (cell) / ovum ; ref. to enzymes in sperm (head) ; ref. to fertilisation / nuclei (of sperm and egg) fuse ; to form a zygote ; jelly coat changes (to prevent entry of more sperm) ; ref. to cell division / mitosis ; ref. to embryo is a ball of cells ; (embryo) implants into uterus wall ;	[max 4]
3 (c)	(takes place as) part of sexual reproduction ; (products) genetically different ; formation of, gametes / sex cells / eggs and sperm ; four (daughter) cells produced ; AVP ;	[max 2]
		[Total: 10]

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>4 (a)</td><td>
<table>
<tr><td>function of flower part</td><td>letter</td></tr>
<tr><td>forms the seed</td><td>E;</td></tr>
<tr><td>produces pollen</td><td>C;</td></tr>
<tr><td>protects the flower bud</td><td>G;</td></tr>
<tr><td>receives the pollen</td><td>B;</td></tr>
</table>
</td><td>[4]</td></tr>
<tr><td>4 (b)</td><td>
<table>
<tr><td>part</td><td>difference</td><td>reason for difference</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td>stamen</td><td>longer filaments or stamens / anthers larger / anthers loosely attached to filament / anthers or stamens hang outside other flower parts AW;</td><td>easily shaken by the wind (to release pollen) / exposed to the wind AW;</td></tr>
<tr><td>pollen</td><td>grains very small / light / smooth / large quantities;</td><td>easily transported by wind / increases chances of landing on stigma;</td></tr>
</table>
</td><td>[4]</td></tr>
<tr><td></td><td></td><td>[Total: 8]</td></tr>
</table>

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7: Human reproduction – Topic questions

Paper 3

The questions in this document have been compiled from a number of past papers, as indicated in the table below.

Use these questions to formatively assess your learners' understanding of this topic.

Question	Year	Series	Paper number
4	2016	March	32
4	2015	June	23
10	2016	June	33

The mark scheme for each question is provided at the end of the document.

You can find the complete question papers and the complete mark schemes (with additional notes where available) on the School Support Hub at www.cambridgeinternational.org/support

4 **(a)** This question is about sexual reproduction in humans.

Choose words from the list to complete the sentences below.

Words may be used once, more than once or not at all.

cervix	**egg cell**	**embryo**	**gamete**
ovary	**prostate gland**	**scrotum**	
testes	**uterus**	**vagina**	**zygote**

Sperm are produced in the .... of the male.

A sperm is produced by meiosis and is an example of a cell called a ....

During sexual intercourse sperm are released into the .... of the female.

At fertilisation a sperm fuses with the .... to form a .... which travels to the .... where it develops into an ....

[7]

(b) At the end of pregnancy a woman goes into labour and the baby is born.

Outline the stages involved in labour and birth.

....

....

....

....

....

....

....

....

.... [4]

[Total: 11]

4 **(c)** Fig. 4.2 shows the organs in the female reproductive system.

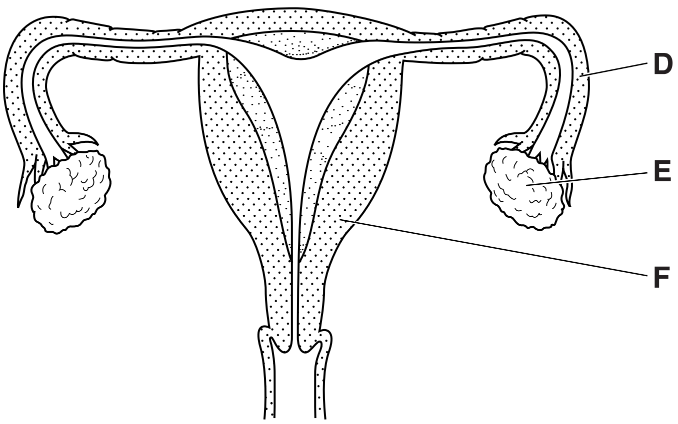

Fig. 4.2

(i) Identify the parts labelled **D**, **E** and **F**. Choose words from the list.

cervix **ovary** **oviduct** **uterus** **vagina**

D ....

E ....

F .... [3]

(ii) On Fig. 4.2 draw an **X** to show where sperm are released during sexual intercourse. [1]

4 **(d)** Fig. 4.3 shows a sperm cell. The tail can be moved from side to side.

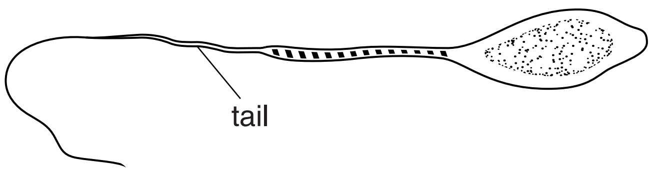

Fig. 4.3

Suggest why the tail is important for reproduction.

....

....

....

....

....[2]

10 Fig. 10.1 shows an early stage in the birth of a baby.

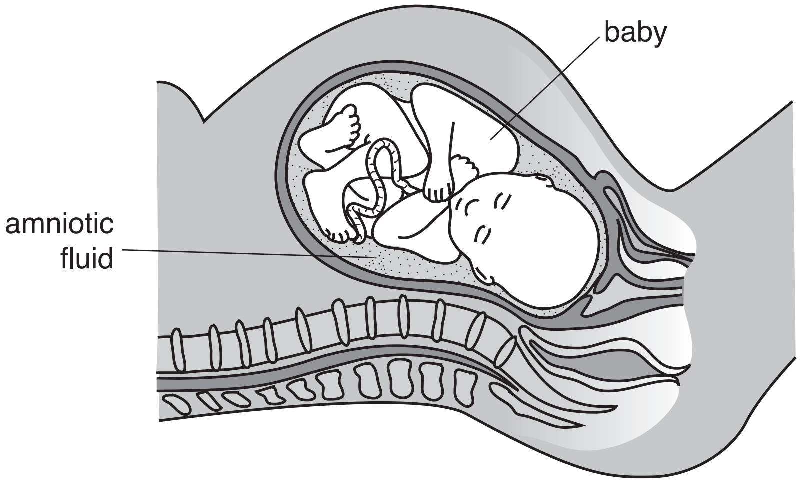

Fig. 10.1

(a) The unborn baby is surrounded by amniotic fluid.

Describe **one** function of this liquid.

....

....[1]

(b) The list describes six stages in the birth of a baby.

They are **not** in the correct order.

amniotic sac bursts	**baby passes down vagina**	**cervix dilates**
contractions begin	**placenta delivered**	**umbilical cord is cut**

Complete the boxes by writing the descriptions of the stages in the correct order.

Two of the stages have been completed for you.

contractions begin

↓

....

....

↓

....

....

↓

....

....

↓

umbilical cord is cut

↓

....

....

[3]

[Total: 4]

Abbreviations used in the Mark Scheme:

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/	alternatives
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R	reject
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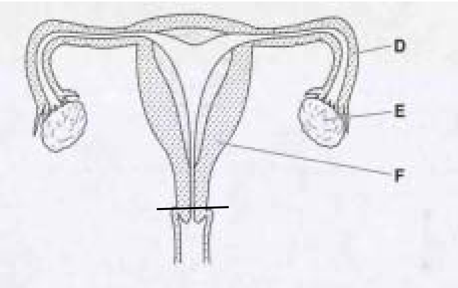
( )	the word / phrase in brackets is not required, but sets the context
<u>underline</u>	actual word given must be used by candidate (grammatical variants excepted)
max	indicates the maximum number of marks that can be given

Question	Answer	Marks
4 (a)	testes; gamete; vagina; egg cell; zygote; uterus; embryo;	[7]
4 (b)	release of amniotic fluid / amnion / amniotic sac, ruptures; cervix dilates; uterus muscles / walls contract; mother helps by contracting other muscles / pushing; baby pushed out through vagina; umbilical cord tied and cut; placenta / afterbirth passed out; AVP; (e.g. head normally delivered first)	[max 4]
		[Total: 11]

Question	Answer	Marks
10 (a)	cushions / protects (fetus) ; allows (fetus) to move ; supports (fetus) ;	[max 1]
10 (b)	box 2 and 3: cervix dilates / amniotic sac bursts (either order) ;; box 4: baby passes down vagina ; box 6: placenta delivered ;	[max 3]
		[Total: 4]
4 (c) (i)	D = oviduct ; E = ovary ; F = uterus ;	[3]
4 (c) (ii)	Centre of X must be in the cavity below the line on Fig.4.2 ;  Fig. 4.2	[1]
4 (d)	sperm can swim / move ; towards egg (and fertilise it) ;	[2]
		[Total: 6]

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8: Inheritance and evolution – Topic questions Paper 3

The questions in this document have been compiled from a number of past papers, as indicated in the table below.

Use these questions to formatively assess your learners' understanding of this topic.

Question	Year	Series	Paper number
2	2016	March	32
6	2016	March	32
6	2016	June	32

The mark scheme for each question is provided at the end of the document.

You can find the complete question papers and the complete mark schemes (with additional notes where available) on the School Support Hub at www.cambridgeinternational.org/support

2 Fig. 2.1 shows three mammals.

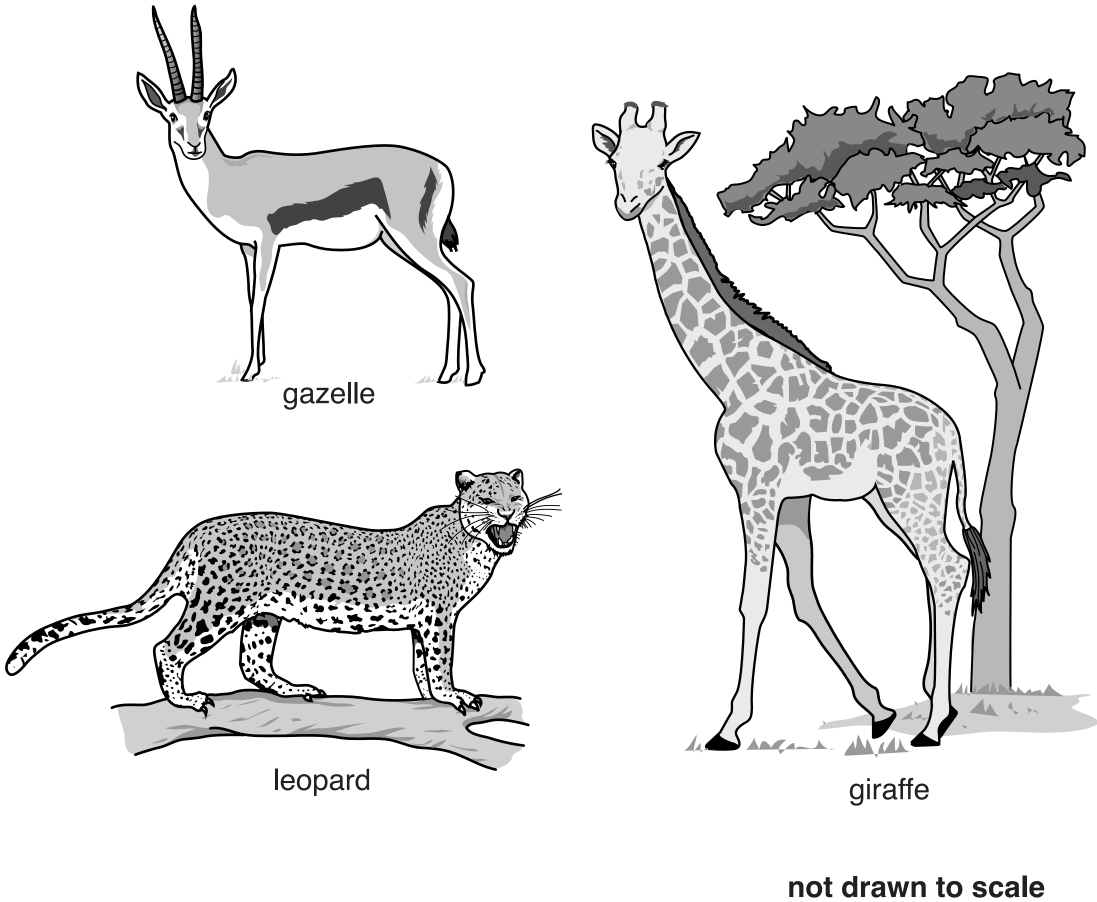

Fig. 2.1

For each mammal, choose **one** adaptive feature **visible** in Fig. 2.1 and outline how it helps the mammal to survive in its environment.

Choose a **different** feature for each mammal.

Write your answers in Table 2.1.

Table 2.1

name of mammal	adaptive feature	how feature helps the mammal to survive in its environment
gazelle		
giraffe		
leopard		

[6]

[Total: 6]

6 **(a)** **(i)** Define the term *chromosome*.

....

....

....

....

.... [2]

(ii) Fig. 6.1 shows a plant cell.

On Fig. 6.1, draw a line labelled **W** to show where chromosomes are found in this cell.

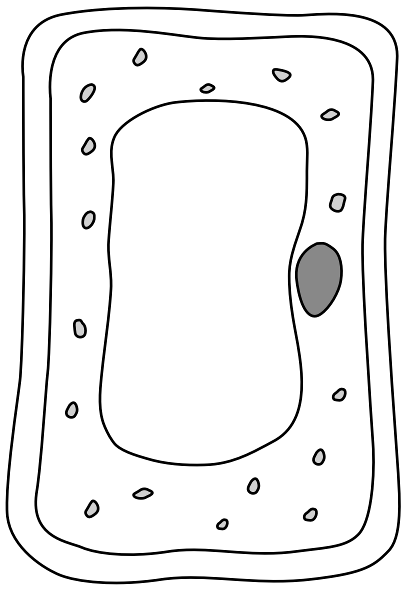

Fig. 6.1

[1]

(b) In mice the allele for black fur (**B**) is dominant to the allele for white fur (**b**).
A mouse with black fur was mated with a mouse with white fur.

The mouse with black fur had the genotype **Bb**.

Complete Fig. 6.2 to show how fur colour is inherited by the offspring of this mating.

parental phenotypes	black fur	×	white fur	
parental genotypes	....	×	....	
gametes	.... + ...	×	.... + ...	

Punnett Square

offspring genotypes	....	....	....	....
offspring phenotypes	....	....	....	....

ratio .... black : .... white

Fig. 6.2

[5]

(c) Sex inheritance in mice is the same as in humans.

State the sex chromosomes of a male mouse and a female mouse.

male mouse ....

female mouse ....

[2]

[Total: 10]

6 **(a)** Define the term *genetic engineering*.

....

....

....

....

....[2]

(b) **(i)** Outline why bacteria are useful in genetic engineering.

....

....

....

....

....[2]

(ii) Table 6.1 contains six statements about biological processes. Only **two** of these use genetic engineering. Identify these two processes. Place a tick in the box (✓) next to your choices.

Table 6.1

statement	uses genetic engineering
producing fruit juice using pectinase	
introducing genes into crop plants to provide additional vitamins	
selective breeding to produce organisms with desirable features	
placing a section of DNA into bacteria to produce human insulin	
using yeast to produce ethanol	
using a contraceptive implant as a method of birth control	

[2]

(c) Scientists have used genetic engineering to develop crop plants which are resistant to herbicides.

(i) Explain why farmers use herbicides.

....

....

....

....

....[2]

(ii) A field contains genetically modified crop plants which are resistant to herbicides. It also contains some weeds. The plants are sprayed with herbicides.

State how the herbicide affects:

the weeds

....

....

the crop plants.

....

....

[2]

[Total: 10]

Abbreviations used in the Mark Scheme:

;	separates marking points
/	alternatives
I	ignore
R	reject
A	accept (for answers correctly cued by the question, or guidance for examiners)
AW	alternative wording (where responses vary more than usual)
AVP	any valid point
ecf	credit a correct statement / calculation that follows a previous wrong response
ora	or reverse argument
( )	the word / phrase in brackets is not required, but sets the context
<u>underline</u>	actual word given must be used by candidate (grammatical variants excepted)
max	indicates the maximum number of marks that can be given

Question	Answer			Marks
2	(feature and reason must match for 2 marks; **A** AVP (visible) with associated reason; **A** possession of fur for one animal only; **A**			
	mammal	**feature**	**survival advantage**	
	gazelle	long legs; large ears; horns; eyes placed laterally; fur pattern;	escape predators; warning of danger; defence ; to detect predators; camouflage;	[max 2]
	giraffe	long legs; long neck; fur pattern; long eye-lashes; eyes placed laterally; large ears;	reaching food/ escaping predators; reaching food/ leaves; camouflage ; protection against dust/ insects / thorns; to detect predators ; warning of danger;	[max 2]
	leopard	fur pattern; long tail; large claws; long/pointed teeth; forward facing eyes; whiskers;	camouflage; balance; disable prey; disable/ eat prey; focus on prey; increased sensitivity;	[max 2]
	description/AW)			

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>6 (a) (i)</td><td>thread like structure/AW;
contains DNA;
carries genes / genetic information/ hereditary material;</td><td>[max 2]</td></tr>
<tr><td>6 (a) (ii)</td><td>line ending on the nucleus;</td><td>[1]</td></tr>
<tr><td>6 (b)</td><td>parental genotypes: Bb x bb;
gametes: B + b x b + b;
F_1 genotypes: Bb + bb + Bb + bb;
F_1 phenotypes: black + white + black + white;
ratio: 1 black : 1 white;</td><td>[5]</td></tr>
<tr><td>6 (c)</td><td>(I indeterminate letters)
(male) XY;
(female) XX;</td><td>[2]</td></tr>
<tr><td colspan="3" align="right">[Total: 10]</td></tr>
<tr><td>6 (a)</td><td>Change the genetic material (of an organism) ;
By removing / changing / inserting (individual) genes ;
From one organism / species to another ;</td><td>[max 2]</td></tr>
<tr><td>6 (b) (i)</td><td>rapid reproduction ;
can make complex molecules ;
cheaper to produce ;
ref. to no ethical issues ;</td><td>[max 2]</td></tr>
<tr><td>6 (b) (ii)</td><td>3 ticks deduct 1 mark
4, 5 or 6 ticks = 0 marks
<table>
<tr><th>statement</th><th>uses of genetic engineering?</th></tr>
<tr><td>producing fruit juice using pectinase</td><td></td></tr>
<tr><td>introducing genes into crop plants to provide additional vitamins</td><td>✓</td></tr>
<tr><td>selective breeding to produce organisms with desirable features</td><td></td></tr>
<tr><td>placing a section of DNA into bacteria to produce human insulin</td><td>✓</td></tr>
<tr><td>using yeast to produce ethanol</td><td></td></tr>
<tr><td>the use of contraceptive implants in birth control</td><td></td></tr>
</table></td><td>[2]</td></tr>
<tr><td>6 (c) (i)</td><td>to kill weeds;
to reduce competition, with weeds / for resources;
to increase crop yield;</td><td>[max 2]</td></tr>
<tr><td>6 (c) (ii)</td><td>(the weeds) kills them AW ;
(the crop plants) no effect/ does not kill them ;</td><td>[2]</td></tr>
<tr><td colspan="3" align="right">[Total: 10]</td></tr>
</table>

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10: Human influences on the environment – Topic questions Paper 3

The questions in this document have been compiled from a number of past papers, as indicated in the table below.

Use these questions to formatively assess your learners' understanding of this topic.

Question	Year	Series	Paper number
4	2016	November	32
5	2016	November	31
7	2016	June	32

The mark scheme for each question is provided at the end of the document.

You can find the complete question papers and the complete mark schemes (with additional notes where available) on the School Support Hub at www.cambridgeinternational.org/support

4 **(a)** **(i)** Define the term *sustainable resource.*

....

....

....

....[2]

(ii) State **one** example of a sustainable resource and **one** example of a resource that is not sustainable.

resource that is sustainable ....

....

resource that is not sustainable ....

....
[2]

(b) Outline how sewage is treated to make the water it contains safe for reuse.

....

....

....

....

....

....[3]

[Total: 7]

5 Fish called trout and other fish used to be caught commercially in the Great Lakes of Canada.

However, canals built between the lakes before 1900 allowed a predator fish, the lamprey, to enter the lakes.

The lamprey feeds on trout. It caused the fishing industry to collapse.

Fig. 5.1 shows fish catches over 65 years.

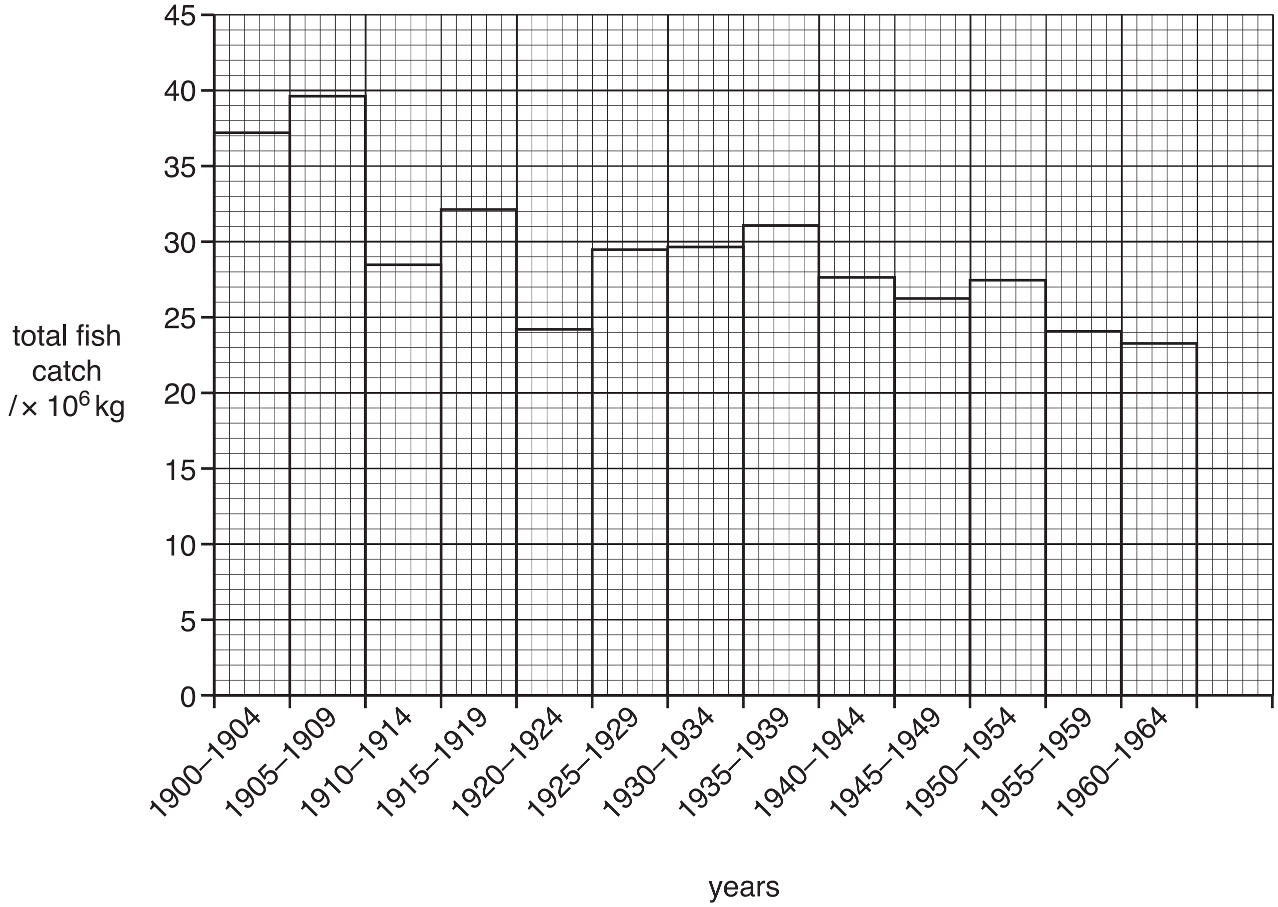

Fig. 5.1

(a) State in which five year period:

(i) the greatest mass of fish was caught .... [1]

(ii) the smallest mass of fish was caught .... [1]

(iii) Between 1900 and 1904, 37.4×10^6 kg of fish were caught.

Between 1960 and 1964, 23.4×10^6 kg of fish were caught.

Calculate the reduction in fish catches between 1900 and 1964.

Show your working.

.... [2]

(b) In 1944 barriers were placed in the canals to stop lampreys entering the lakes.

Suggest whether the barriers were effective.

Explain your answer.

....

....

.... [1]

(c) Studies have shown that human activities can affect trout numbers.

Suggest **three** human activities that could cause the trout numbers to drop.

1 ....

....

2 ....

....

3 ....

....

[3]

(d) Describe **two** methods of conserving endangered species.

1 ....

....

2 ....

....

[2]

[Total: 10]

7 Fig. 7.1 shows a newly planted oil palm plantation, with a rainforest in the background.

The land on which the oil palms are being grown has been cleared by removing part of the forest.

Fig. 7.1

(a) **(i)** State the term used to describe the removal of forests.

....[1]

(ii) Removing rainforests puts some species at risk of extinction.

List **three other** undesirable effects of removing rainforests.

1 ....

....

2 ....

....

3 ....

....
[3]

(b) The removal of rainforests has reduced the number of orangutans. Their numbers fell from 315 000 in 1900 to 50 000 in 2014.

(i) Calculate the percentage change in the number of orangutans between 1900 and 2014.

Show your working. Give your answer to the nearest whole number.

....%
[3]

(ii) Outline **two** ways of conserving the orangutan species.

1 ....

....

2 ....

....
[2]

(c) Crop plants such as oil palm plants are often grown as monocultures.

Describe **one** negative impact to the environment of growing plants as monocultures.

....

....

....[1]

[Total: 10]

Abbreviations used in the Mark Scheme:

;	separates marking points
/	alternatives
I	ignore
R	reject
A	accept (for answers correctly cued by the question, or guidance for examiners)
AW	alternative wording (where responses vary more than usual)
AVP	any valid point
ecf	credit a correct statement / calculation that follows a previous wrong response
ora	or reverse argument
( )	the word / phrase in brackets is not required, but sets the context
<u>underline</u>	actual word given must be used by candidate (grammatical variants excepted)
max	indicates the maximum number of marks that can be given

Question	Answer	Marks
4 (a) (i)	produced / replaced, as rapidly as it is removed; from the environment; so it does not run out;	[2]
4 (a) (ii)	*sustainable resource:* forests / wood / timber / fish stocks / biofuels; *non-sustainable resource:* fossil fuels / e.g. of fossil fuel / mineral reserves / ores AVP;	[2]
4 (b)	1 screening / filtering or removal of, solids / large objects; 2 settling or heavy objects / grit, sink to bottom; 3 microbes / bacteria, decompose organic matter in aerobic conditions; 4 aeration; 5 organic material removed by anaerobic microorganisms; 6 chlorine added / UV light / ozone / sterilisation / use of disinfectants / bactericides; 7 distillation;	[3]
		[Total: 7]

Question	Answer	Marks
5 (a) (i)	(most fish) 1905–1909	[1]
5 (a) (ii)	(least fish) 1960–1964	[1]
5 (a) (iii)	14.0 × 106 <u>kg</u> 37.4 – 23.4 = 14.0	[2]
5 (b)	*(no)* fish catches still dropped / little change in catches / AW;	[1]
5 (c)	pollution / contamination, of lakes / water / sea / rivers; specific example e.g. fertilisers / pesticides / oil / petrol / chemicals / sewage; fishing; lack of food; habitat, destruction / interference; other fish species / predator (birds or animals); disease / parasites; AVP; e.g. global warming / acid rain / eutrophication	[3]
5 (d)	captive breeding program; zoos / reserves / national parks; ban hunting / laws to protect; conserve / protect, habitat AW; remove predators / competitors; educate / awareness / research; idea of ecotourism;	[2]
		[Total: 10]
7 (a) (i)	deforestation	[1]
7 (a) (ii)	habitat destruction / AW ; disruption of food chain ; soil erosion / loss of soil / AW ; flooding ; increase in CO_2 in the atmosphere / less CO_2 absorbed / photosynthesis, by trees / ref. to global warming ;	[max 3]
7 (b) (i)	85% correct working $\frac{315000 \quad 50000}{315000} \times 100$ or $\frac{265000}{315000} \times 100$	[3]
7 (b)(ii)	monitoring species; protection of species; monitoring habitat; protection / replenishment, of habitat; ref. to food source; keeping in, zoos / reserves; captive breeding programme; education programme; ecotourism;	[max 2]
7 (c)	loss of biodiversity; less resistance to diseases / pests;	[max 1]
		[Total: 10]

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1: Cells and cell processes – Topic questions Paper 4

The questions in this document have been compiled from a number of past papers, as indicated in the table below.

Use these questions to formatively assess your learners' understanding of this topic.

Question	Year	Series	Paper number
1	2016	March	42
2	2016	November	43
4	2016	June	41

The mark scheme for each question is provided at the end of the document.

You can find the complete question papers and the complete mark schemes (with additional notes where available) on the School Support Hub at www.cambridgeinternational.org/support

1 A researcher used a light microscope to observe epithelial cells from a human cheek.

Fig. 1.1 is a photograph that the researcher made of these cells.

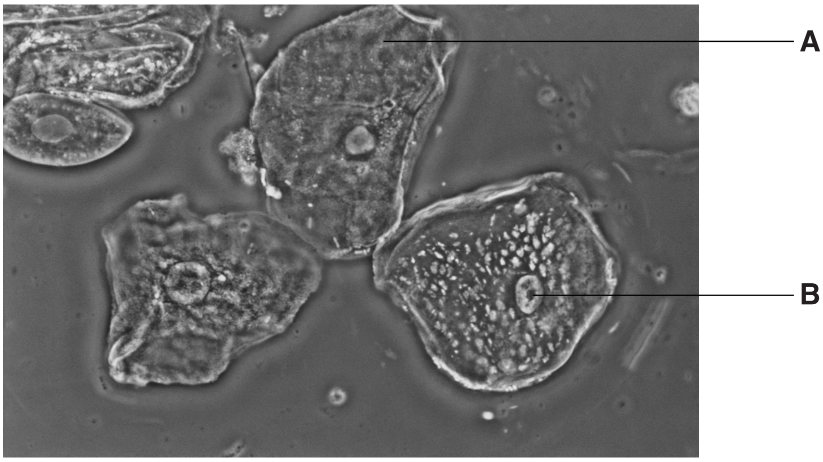

Fig. 1.1

(a) **(i)** Name the parts labelled **A** and **B**.

A ....

B ....
[2]

(ii) The cells in Fig. 1.1 each have a cell membrane.

State **one** of the functions of a cell membrane.

....

....[1]

(iii) State how the shape of the cells shown in Fig. 1.1 differs from the shape of a palisade mesophyll cell in a leaf.

....

....

....[1]

(b) Fig. 1.2 shows an electron micrograph of a mitochondrion.

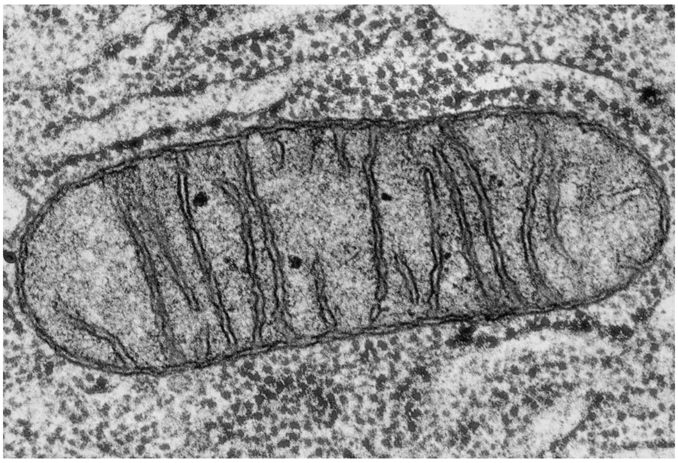

Fig. 1.2

Mitochondria have two membranes, an inner membrane and an outer membrane. The inner membrane is folded and used in respiration.

Suggest why the inner membrane of mitochondria is folded.

....

....

....[1]

(c) Table 1.1 shows different specialised cells and the average number of mitochondria each cell contains.

Table 1.1

specialised cell type	average number of mitochondria
liver cell	1000–2000
red blood cell	0
sperm cell	25–75
heart muscle cell	1500

Explain the differences between the average numbers of mitochondria in the cells shown in Table 1.1.

....

....

....

....

....

....

....

....

....[4]

[Total: 9]

2 Pectinase is an enzyme used in the production of fruit juice.

(a) Describe in detail how enzymes function, using pectinase as an example.

....

....

....

....

....

....

....

....

....

....

....

....

....[6]

(b) An experiment to test the effect of the size of apple pieces on the activity of pectinase was performed by a group of students. Some of their apparatus is shown in Fig. 2.1.

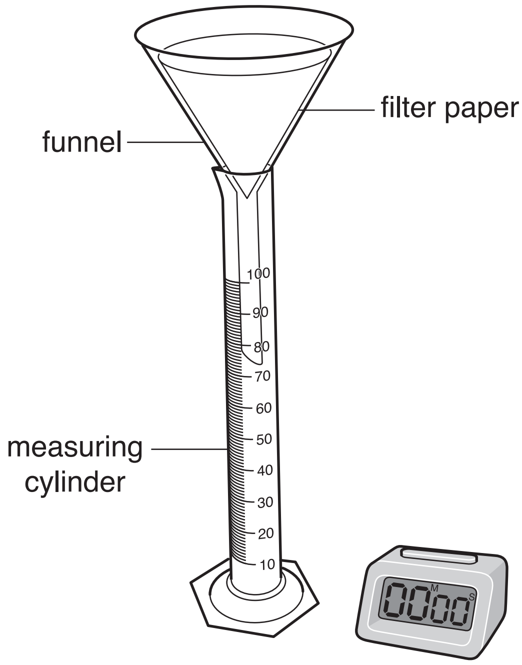

Fig. 2.1

Describe how the students should use the measuring cylinder to obtain **accurate** measurements of volume.

....

....

....

....

....[2]

(c) The students added 1.5 cm^3 of pectinase solution to pieces of apple in a beaker. They then poured the mixture into the funnel.

They found that it took 10 minutes to collect 19 cm^3 of juice.

(i) Calculate the rate of the enzyme reaction.

Show your working.

Write your answer to the nearest whole number.

.... cm^3 per min [2]

(ii) The students performed four experiments using different ways to prepare the apples.

The same total mass and type of apple was used each time.

A 0.5 cm^3 apple cubes

B 1.0 cm^3 apple cubes

C whole peeled small apples

D whole unpeeled small apples

Predict **and** explain which experiment (**A**, **B**, **C** or **D**) would result in the fastest rate of reaction.

....

....

....

....

....[2]

[Total: 12]

4 *Rhabdostyla* is a single-celled organism that has no cell wall and no chlorophyll.

(a) Gases are exchanged across the cell membrane of *Rhabdostyla*.

Name:

the gas produced by *Rhabdostyla* ....

the process that produces the gas ....

the method of removal of the gas ....

[3]

Rhabdostyla lives in freshwater habitats, such as ponds, lakes and rivers.

Freshwater has a very low concentration of solutes.

Rhabdostyla has a contractile vacuole that fills with water and empties at intervals as shown in Fig. 4.1. The contractile vacuole removes excess water.

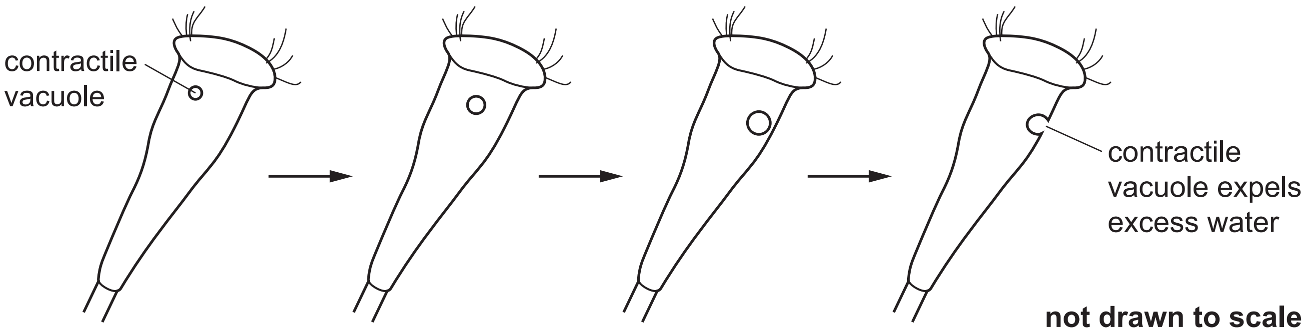

Fig. 4.1

(b) Explain, using the term **water potential**, why *Rhabdostyla* needs to remove excess water.

....

....

....

....

....

....

.... [3]

In an investigation, individual *Rhabdostyla* were placed into different concentrations of sea water. The rate of water excreted by the contractile vacuole of each organism was determined. The results are shown in Fig. 4.2.

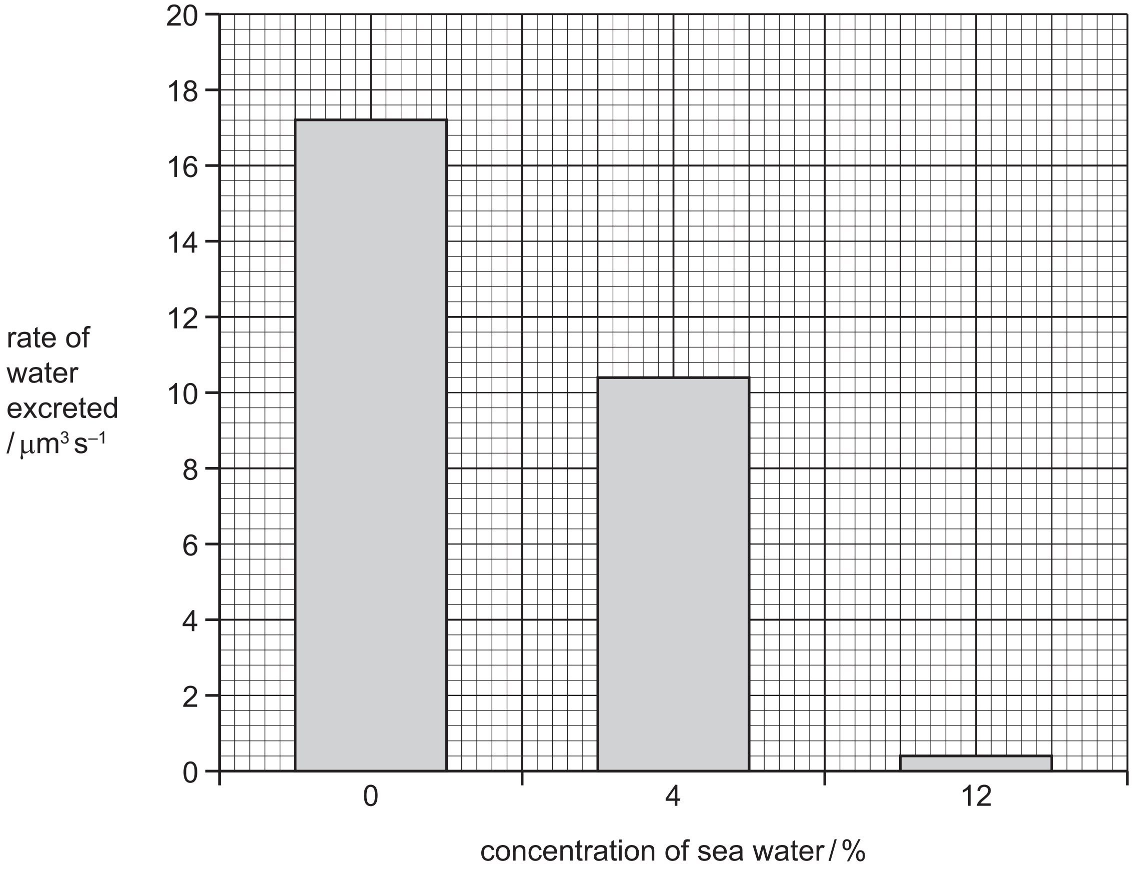

Fig. 4.2

(c) Explain the results shown in Fig. 4.2.

....

....

....

....

....

....

.... [3]

(d) Single-celled organisms with cell walls do not have contractile vacuoles. Suggest why.

....

....

....

....

....

....

.... [3]

[Total: 12]

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/	alternatives
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R	reject
A	accept (for answers correctly cued by the question, or guidance for examiners)
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( )	the word / phrase in brackets is not required, but sets the context
<u>underline</u>	actual word given must be used by candidate (grammatical variants excepted)
max	indicates the maximum number of marks that can be given

Question	Answer	Marks
1 (a) (i)	**A** cytoplasm **B** nucleus	[2]
1 (a) (ii)	forms a barrier between the cell and its surroundings ; keeps contents of cell inside ; allows / controls / (movement of) substances, into / out, of the cell / across membrane ;	[max 1]
1 (a) (iii)	irregular shape / rounded shape / not columnar / not cylindrical / not rectangular / no specific shape ;	[1]
1 (b)	large surface area ; more surface for respiration ; allows, increased / faster / efficient, respiration ;	[max 1]
1 (c)	1 mitochondria are site of aerobic respiration / production of (most of the) ATP ; 2 liver cell / heart cell, is very active / use lots of energy / respire more; 3 e.g. function of liver cell or heart cell ; 4 sperm cells, are active / swim / beating flagella ; 5 sperm cells have few mitochondria, as they are small ; 6 red blood cells, full of haemoglobin / more space for oxygen / AW ; 7 red blood cells, use less energy / do not actively move ;	[max 4]
		[Total: 9]

Question	Answer	Marks
2(a)	1 enzymes are proteins; 2 enzymes can be reused / are unchanged in a reaction; 3 enzymes are specific; 4 (enzymes are) catalyst / speeds up reaction; 5 lowers (activation) energy needed for the reaction; 6 successful collisions; 7 enzyme-substrate complex / ESC; 8 active site; 9 (enzyme and substrate) complementary shape / AW; 10 ref. to optimum, temperature / pH; 11 too much heat results in denatured enzymes; 12 too little kinetic energy / heat, less (successful) reactions; 13 incorrect pH results in denatured enzymes; 14 (substrate) is pectin / cell wall; 15 results / product, is clear juice; 16 mass / cheaper / more (volume) / yield, juice production;	[6]
2 (b)	read at eye level / avoid error of parallax; read bottom of meniscus; place measuring cylinder on a level / flat, surface; remove funnel / ensure all drops have fallen to the bottom;	[2]
2 (c) (i)	19 ÷ 10 **or** 17.5 ÷10; 2 (cm^3 per min);	[2]
2 (c) (ii)	**A** / 0.5 (cm^3 cubes); large(st) surface area (to volume);	[1]
		[Total: 12]
4 (a)	carbon dioxide / CO_2 ; (aerobic) respiration ; (simple) diffusion ;	[3]
4 (b)	water enters by osmosis ; down a water potential gradient / high(er) to low(er) water potential ; through partially permeable membrane ; needs to remove water to prevent bursting ;	[max 3]
4 (c)	as concentration of sea water increases the removal of water decreases ; as concentration of sea water increases the water potential gradient decreases ; therefore less water enters at higher concentrations of sea water ; less excess water ;	[max 3]
4 (d)	cell walls, inelastic / do not stretch / rigid / inflexible / keep shape of cell ; cells, are turgid / have high turgor pressure ; resist any increase in, volume / pressure ; these cells do not absorb excess water ; the cells will not burst ;	[max 3]
		[Total: 12]

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2: Animal nutrition – Topic questions

Paper 4

The questions in this document have been compiled from a number of past papers, as indicated in the table below.

Use these questions to formatively assess your learners' understanding of this topic.

Question	Year	Series	Paper number
1	2016	November	42
3	2016	November	43
6	2016	June	43

The mark scheme for each question is provided at the end of the document.

You can find the complete question papers and the complete mark schemes (with additional notes where available) on the School Support Hub at www.cambridgeinternational.org/support

1 Milk is sometimes referred to as a 'complete food' because it contains all the nutrients that a young mammal requires.

(a) Table 1.1 shows three nutrients that are contained in milk.

Complete the table by stating **one** role of each nutrient in the body of a young mammal.

Table 1.1

nutrient	role in the body
protein	
lactose (milk sugar)	
calcium	

[3]

(b) Protein digestion begins in the stomach of the human alimentary canal and is completed in the small intestine.

Describe in detail how enzymes function to digest protein in the alimentary canal.

....

....

....

....

....

....

....

....

....

....

....

....

....

.... [6]

(c) Some people are unable to digest lactose (milk sugar) and have a condition known as lactose intolerance.

Fig. 1.1 shows what happens in the intestine of a person who is lactose intolerant if they eat food containing a lot of lactose.

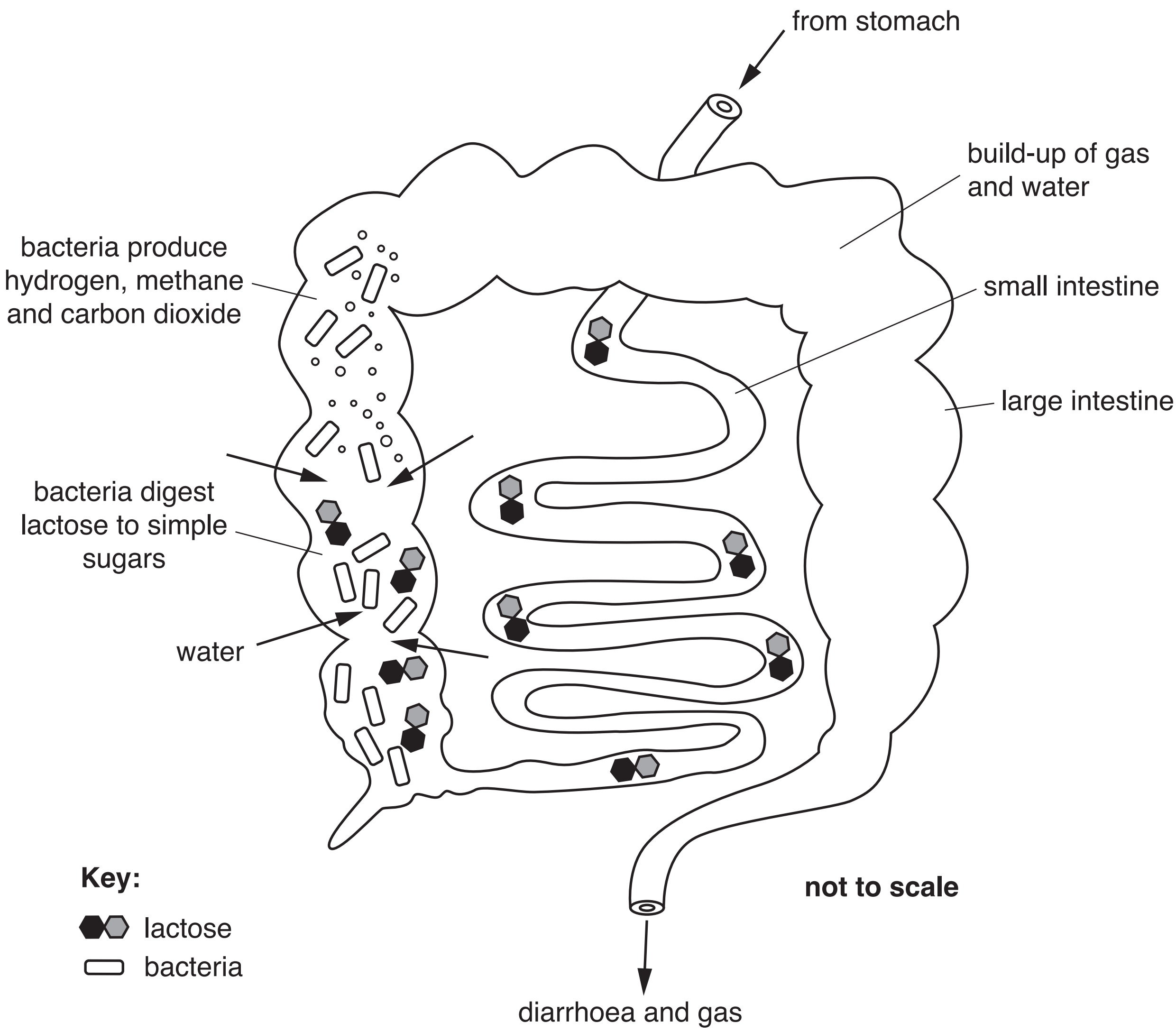

Fig. 1.1

(i) Explain why lactose is not absorbed by the small intestine.

....

....

....

....

.... [2]

(ii) Suggest the dangers to health of severe diarrhoea if it is not treated for a long time.

....

....

....

....

....

.... [3]

(d) Hydrogen gas is produced by the bacteria that digest lactose in the large intestine. The gas is absorbed into the blood and excreted through the lungs. Lactose intolerance can be monitored by measuring the hydrogen gas content of the air a person breathes out.

People taking part in an investigation into lactose intolerance consumed the following milk products on different days:

A. untreated milk
B. milk treated with lactase immediately before drinking
C. milk treated with lactase three days before drinking
D. yoghurt made by bacteria that digested the lactose in the milk

The hydrogen gas content of the air breathed out was measured every hour for five hours following the ingestion of each milk product.

The mean results are shown in Fig. 1.2.

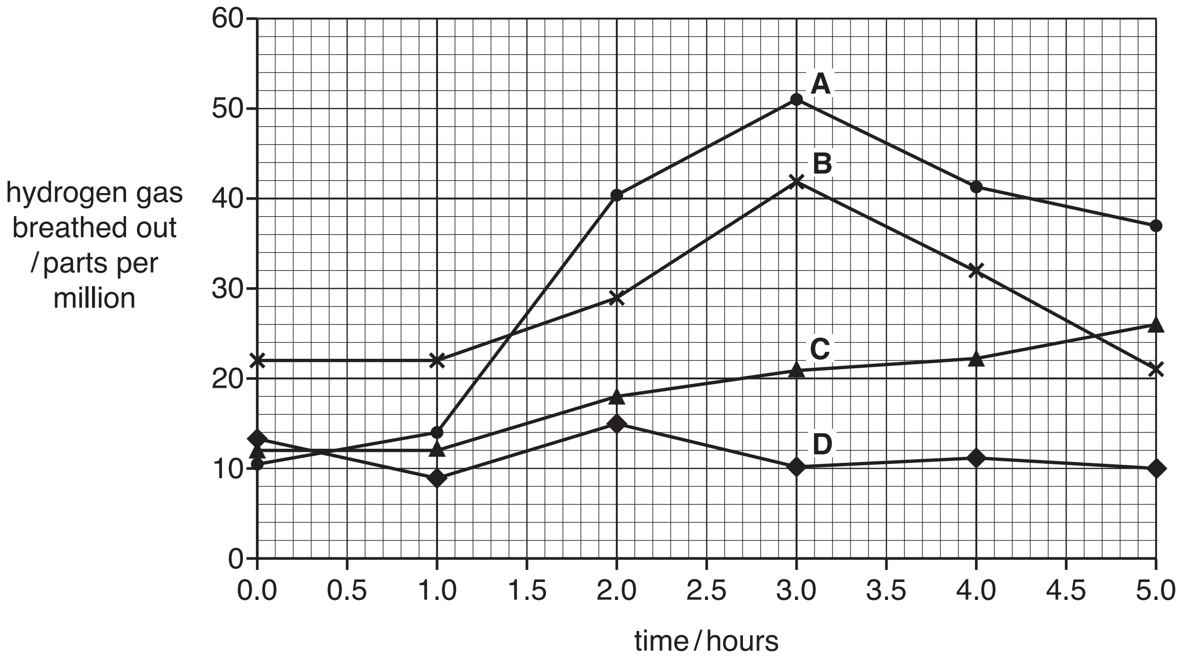

Fig. 1.2

(i) Explain why untreated milk was included in the investigation.

....

....

....

.... [2]

(ii) Suggest why lactase might be added to milk.

....

....

....

.... [2]

(iii) Use the results in Fig. 1.2 to explain why yoghurt is the best milk product for people with lactose intolerance.

....

....

....

....

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....

.... [3]

[Total: 21]

3 The length of the small intestine was measured in four types of mammal.

The results are shown in Table 3.1.

Table 3.1

mammal	length of small intestine / cm	length of small intestine relative to body mass / cm per g
insect-eating bat	19	2.30
domestic cat	104	0.05
rat	98	0.34
human	552	0.01

(a) Use the information in Table 3.1 to compare the length of the small intestine of the four mammals.

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....[3]

(b) Fig. 3.1 is a diagram showing a short length of the small intestine of a mammal.

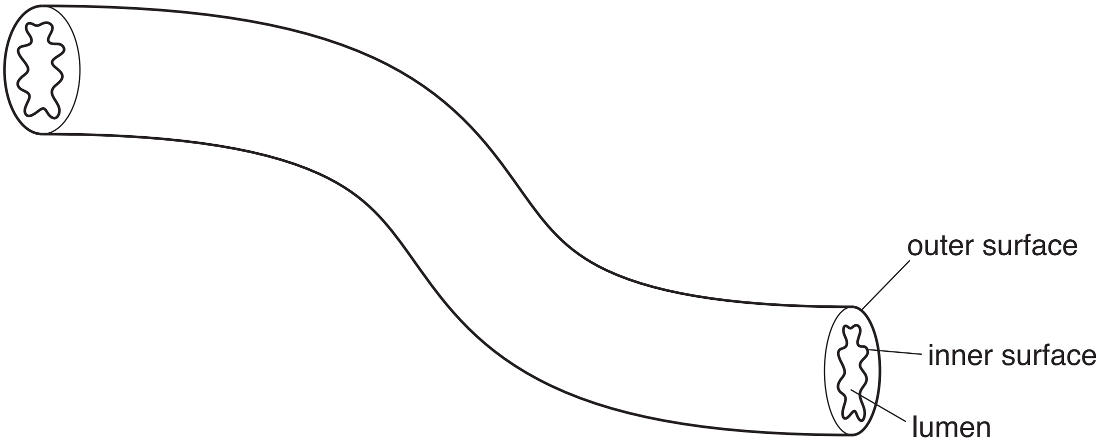

Fig. 3.1

A function of the small intestine is absorption.

Describe how a molecule of glucose passes from the lumen of the small intestine into the blood.

....

....

....

....

....

....

....[3]

(c) Measurements were taken of the inner and outer surface area of two parts of the small intestine for the four mammals in Table 3.1. The results are shown in Table 3.2.

Table 3.2

mammal	ratio of inner surface area to outer surface area	
	duodenum	ileum
insect-eating bat	283:1	54:1
domestic cat	15:1	12:1
rat	6:1	4:1
human	7:1	3:1

(i) Suggest which mammal has the most villi per centimetre of small intestine.

....[1]

(ii) The duodenum is more effective than the ileum at absorption. Use the information in Table 3.2 to explain why.

....

....

....

....

....[3]

(d) Bile is released into the small intestine from the gall bladder.

Outline the roles of bile.

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....

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....[4]

[Total: 14]

6 Fig. 6.1 shows the alimentary canals of two mammals, an insect-eating bat, which is a carnivore, and a rabbit, which is a herbivore.

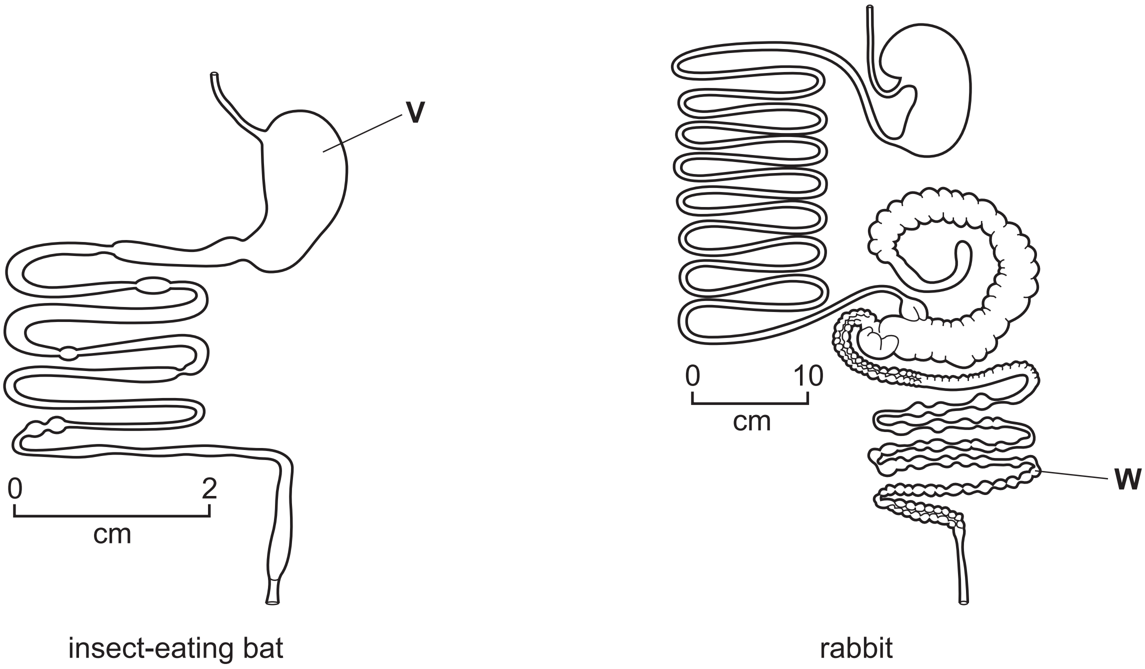

Fig. 6.1

(a) Name the organs labelled **V** and **W**.

V ....

W ....

[2]

(b) Explain the role of mechanical digestion.

....

....

....

....

....

....

.... [3]

Scientists investigated digestion in different species of mammal. The mammals that they studied ranged in size from an elephant shrew, *Elephantulus edwardii*, with a mass of 50 g to an ox, *Bos taurus*, with a mass of 220 kg.

The scientists added indigestible particles to the animals' food and timed how long the particles stayed in the digestive system.

The results for 24 different mammal species are shown in Fig. 6.2.

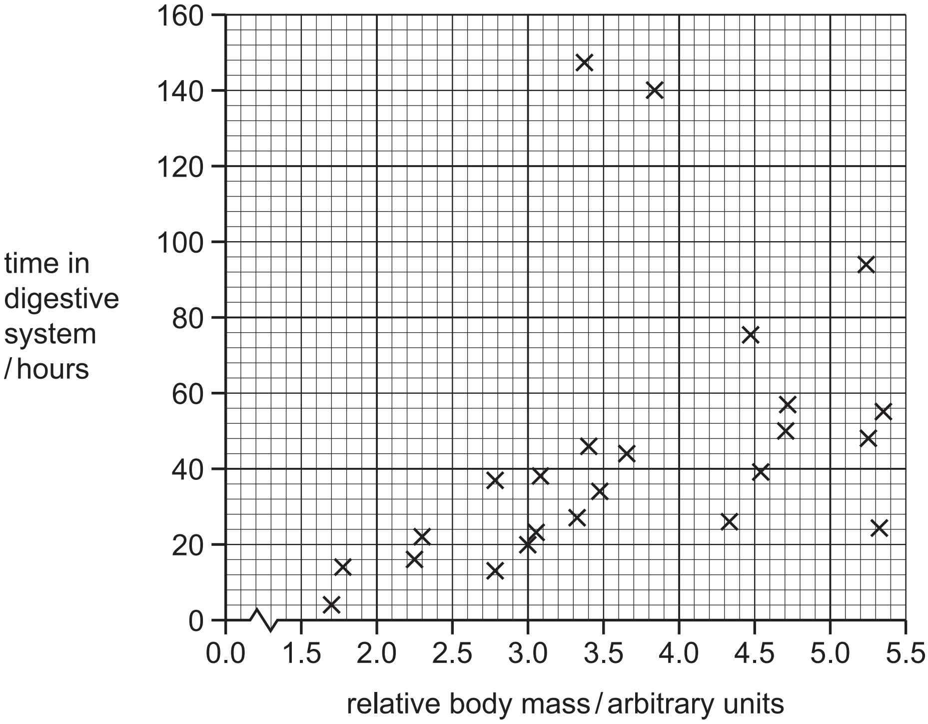

Fig. 6.2

(c) The scientists concluded that food stays longer in the digestive systems of larger mammals compared with smaller mammals.

Discuss the evidence from Fig. 6.2 for **and** against the statement that food stays longer in the digestive systems of larger mammals.

....

....

....

....

....

....

....

....

.... [4]

[Total: 9]

Abbreviations used in the Mark Scheme:

;	separates marking points
/	alternatives
I	ignore
R	reject
A	accept (for answers correctly cued by the question, or guidance for examiners)
AW	alternative wording (where responses vary more than usual)
AVP	any valid point
ecf	credit a correct statement / calculation that follows a previous wrong response
ora	or reverse argument
( )	the word / phrase in brackets is not required, but sets the context
<u>underline</u>	actual word given must be used by candidate (grammatical variants excepted)
max	indicates the maximum number of marks that can be given

Question	Answer	Marks
1 (a)	*protein to max 1* for growth / making new cells / repair / replacement (of tissues) / making (named) tissue; provides amino acids (for making protein); *lactose* (provides) energy / (glucose for) respiration; *calcium to max 1* (strengthening) bones / teeth; needed for vitamin D to function; blood clotting; for muscle contraction; for nerve impulse conduction;	[3]

Question	Answer	Marks
1 (b)	1 enzymes are, biological / protein, catalysts / speed up reactions; 2 ref to specificity; 3 active site; 4 substrate / protein, fits into / AW, enzyme / active site; 5 ref to, complementary shape of molecules; 6 enzyme-substrate complex / ESC; 7 enzymes, lower energy needed for reaction; 8 enzymes are, unchanged (at end of reaction) / reused; 9 (enzymes) carry out, chemical digestion / hydrolysis / catabolic reactions; 10 break down, large / insoluble, molecules into, small(er) / soluble, molecules; 11 protein broken down to,polypeptides / peptides / amino acids; 12 pepsin, active in stomach; 13 trypsin, active in, small intestine / duodenum / ileum; *ref. to conditions in alimentary canal* 14 low pH / pH 1–3 / (hydrochloric) acid, in stomach; 15 high pH / alkaline / neutral / non-acidic / pH 7–9, in, small intestine / duodenum / ileum; 16 ref. to denaturation; 17 temperature is 37 °C; 18 ref. to successful collisions;	[6]
1 (c) (i)	no enzyme to, digest / break down, lactose; lactose (molecule) is (too) large / complex; cannot pass through, (cell) membrane(s); no carrier protein for it ;	[2]
1 (c) (ii)	1 dehydration / loss of water; 2 loss of, (named) salt(s) / ions / minerals / vitamins; 3 decrease in, volume of blood / blood pressure; 4 increase in blood concentration / decrease in water potential; 5 any effect on cells **;** 6 AVP; e.g. less efficient reactions / slower metabolism / kidney failure / ref to effect on brain cells / coma / death	[3]
1 (d) (i)	control; for comparison (with different treatments) / to see if there is any difference between effects of treated milk and untreated milk;	[2]
1 (d) (ii)	(lactase) digests / breaks down, lactose; molecules, are small enough to be absorbed / do not pass straight through, small intestine / AW; reduces chance of diarrhoea / means lactose intolerant people can consume milk / AW;	[2]
1 (d) (iii)	(concentration / amount of) hydrogen is the lowest / least; **ora** concentration / amount, of hydrogen, shows small, fluctuations / changes / AW; (concentration / amount) not higher than 15 (±1) ppm / between 9 – 15 (±1) ppm; comparative data quote between D and A, B or C;	[3]
		[Total: 21]

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>3 (a)</td><td>human / largest mammal, has the longest / bat has the shortest (small intestine);
(small intestine of) rat and cat are very similar in length;
comparative data, quote / calculation with units at least once;
negative correlation between length and length relative to body mass;</td><td>[3]</td></tr>
<tr><td>3 (b)</td><td>movement into / out of / through, (epithelial) cells / villi;
into, capillaries;
across cell membranes;
by active transport;
through protein carriers;
against a concentration gradient;
using energy;</td><td>[3]</td></tr>
<tr><td>3 (c) (i)</td><td>(insect-eating) bat</td><td>[1]</td></tr>
<tr><td>3 (c) (ii)</td><td>ratios are higher in the duodenum;
higher (inner) surface area (than ileum);
data comparison (for any one animal);
more villi;
more microvilli;</td><td>[3]</td></tr>
<tr><td>3 (d)</td><td>emulsification;
increased surface area of fat (globules);
faster, digestion / break down (of fat by enzymes);
by lipase / to fatty acids and glycerol;
neutralises (stomach) acid / chyme;
provides alkaline medium for, pancreatic enzymes / lipase;
denatures, pepsin / stomach, enzymes;
AVP;</td><td>[4]</td></tr>
<tr><td colspan="3">[Total: 14]</td></tr>
<tr><td>6 (a)</td><td>V stomach ;
W large intestine / colon / rectum ;</td><td>[2]</td></tr>
<tr><td>6 (b)</td><td>breaks up food into small(er) pieces ;
without chemical change ;
by teeth / muscles ;
to mix (with digestive juice) ;
increases surface area ;
for enzyme action ;
speeds up chemical digestion ;
easier to swallow ;</td><td>[3]</td></tr>
<tr><td>6 (c)</td><td>for:
positive correlation / as (relative) body mass increases, time in digestive system increases ;
any two or more figures from the graph ;
against: max 3 from
two / one / few / some (species), are outliers / anomalies ;
any figure(s) from the graph ;
(description of) some mammals do not fit the, pattern / trend ;
any example from the graph ;
only information about 26 species of mammal / small sample size ;
idea about unknown validity ;</td><td>[max 4]</td></tr>
<tr><td colspan="3">[Total: 9]</td></tr>
</table>

Cambridge Assessment International Education

Cambridge IGCSE™

3: Plant nutrition and transport – Topic questions Paper 4

The questions in this document have been compiled from a number of past papers, as indicated in the table below.

Use these questions to formatively assess your learners' understanding of this topic.

Question	Year	Series	Paper number
4	2016	June	43
6	2016	June	41
6	2016	November	43

The mark scheme for each question is provided at the end of the document.

You can find the complete question papers and the complete mark schemes (with additional notes where available) on the School Support Hub at www.cambridgeinternational.org/support

(c) Mammals have a transport system for carbon dioxide. Plants absorb carbon dioxide from their surroundings to use in photosynthesis.

Explain how a molecule of carbon dioxide from the atmosphere reaches the site of photosynthesis in a leaf.

....

....

....

....

....

....

....

....

.... [4]

[Total: 17]

6 **(a)** State the balanced chemical equation for photosynthesis.

.... $\xrightarrow[\text{chlorophyll}]{\text{light}}$ ....

[2]

A student investigated the effect of different wavelengths of light on the rate of photosynthesis of the water plant, *Cabomba*.

The student used the apparatus shown in Fig. 6.1.

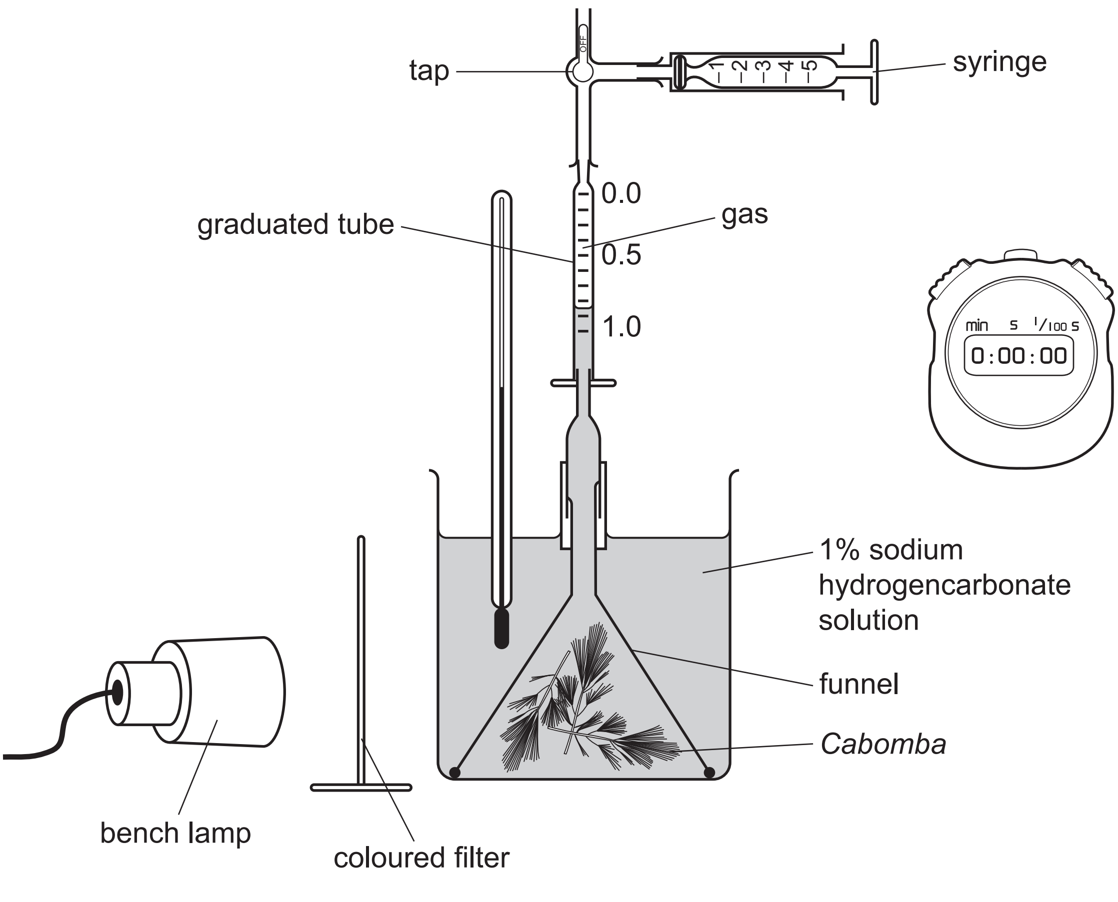

Fig. 6.1

(b) The student collected the gas produced by the plant for five minutes. The results are shown in Table 6.1.

Table 6.1

colour of filter	wavelength of light / nm	volume of gas collected / cm^3
violet	400	0.80
blue	475	0.80
green	550	0.20
yellow	600	0.40
red	675	0.90

Describe the effect of wavelength of light on the rate of photosynthesis as shown in the student's results in Table 6.1.

You will gain credit if you use data from the table.

....

....

....

....

....

....

.... [3]

(c) State how the student would calculate the rates of photosynthesis from the results in Table 6.1.

....

.... [1]

(d) State why the student:

(i) kept the lamp at the same distance during the investigation,

....

....

.... [1]

(ii) used sodium hydrogencarbonate solution.

....

....

.... [1]

(e) State **three** uses in a plant of the carbohydrate produced in photosynthesis.

1...

2...

3...

[3]

[Total: 11]

6 **(a)** Name **one** feature of dicotyledonous leaves that distinguishes them from monocotyledonous leaves.

....[1]

(b) Explain why a leaf is an organ.

....

....[1]

(c) Photosynthesis occurs in leaves.

State the balanced chemical equation for photosynthesis.

....[3]

(d) Fig. 6.1 is an image of a section through a dicotyledonous leaf from a scanning electron microscope.

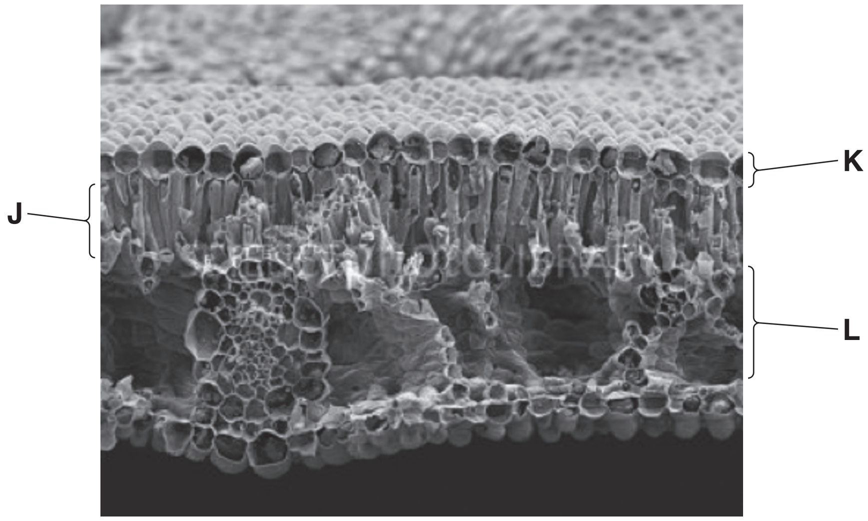

Fig. 6.1

Identify the layers labelled in Fig. 6.1 and explain how their adaptations allow photosynthesis to occur in the leaf.

(i) layer **J** ....

adaptation for photosynthesis ....

.... [2]

(ii) layer **K** ....

adaptation for photosynthesis ....

.... [2]

(iii) layer **L** ....

adaptation for photosynthesis ....

.... [2]

(e) Plants need nitrate ions for growth.

Explain why.

....

....

....

....

....

....

....[3]

[Total: 14]

Abbreviations used in the Mark Scheme:

;	separates marking points
/	alternatives
I	ignore
R	reject
A	accept (for answers correctly cued by the question, or guidance for examiners)
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<u>underline</u>	actual word given must be used by candidate (grammatical variants excepted)
max	indicates the maximum number of marks that can be given

Question	Answer	Marks
4 (c)	diffusion ; down concentration gradient ; (diffuses) through stoma / stomata ; (through) (intercellular) air space / (between) spongy mesophyll ; into / reached, palisade, mesophyll / cell ; chloroplast ; AVP ; e.g. dissolve / diffuse, through cell wall / cell membrane / cytoplasm	[4]
		[Total: 4]

Question	Answer	Marks
6 (a)	$6CO_2 + 6H_2O$ _ $C_6H_{12}O_6 + 6O_2$;;	[2]
6 (b)	as wavelength increases, rate (of photosynthesis) decreases and increases ; high rates in, blue and violet and red / 400–475 nm and 675 nm ; low(est) rate in, green and yellow / 550–600 nm ; either maximum rate = 0.9 cm_3, at 675 nm / red or minimum rate = 0.2 cm_3, at 550 nm / green ;	[max 3]
6 (c)	divide the volumes by, five (minutes) / time ;	[1]
6 (d) (i)	to keep the light intensity the same ;	[1]
6 (d) (ii)	to provide carbon dioxide / so carbon dioxide is not a limiting factor / so the only limiting factor is wavelength ;	[1]
6 (e)	for, respiration / energy ; converted to sucrose ; used to make, nectar / fruits ; used to make, cellulose / lignin ; used in cell walls ; used to make, starch / oils / fats ; storage ; used to make, amino acids ; used to make, chlorophyll ;	[max 3]
		[Total: 11]
6 (a)	(branching) veins; **ora** shape / broad (leaves); **ora**	[1]
6 (b)	it is (made of a group of) tissues working together to perform specific function(s);	[1]
6 (c)	$6CO_2 + 6H_2O$ (LHS); $C_6H_{12}O_6 + 6O_2$ (RHS); energy / light / chlorophyll;	[3]
6 (d) (i)	palisade (mesophyll / tissue / cells / parenchyma); tightly packed / contain many chloroplast / stacked upright;	[2]
6 (d) (ii)	(upper) epidermis / epidermal cells; transparent / allows light to pass through / thin;	[2]
6 (d) (iii)	spongy, mesophyll / tissue / cells / parenchyma / layer; air spaces / loosely packed / gas exchange / diffusion of gases;	[2]
6 (e)	nitrates are useable source of nitrogen; needed to make amino acids; (amino acids) to make proteins; protein / DNA, needed for growth; to make DNA / RNA / nucleotides / bases; other suitable named use of organic nitrogenous compounds found in plants;	[3]
		[Total: 14]

Cambridge Assessment International Education

Cambridge IGCSE™

4: Respiration and the human transport system – Topic questions Paper 4

The questions in this document have been compiled from a number of past papers, as indicated in the table below.

Use these questions to formatively assess your learners' understanding of this topic.

Question	Year	Series	Paper number
1	2016	June	41
1	2016	June	43
5	2016	November	42

The mark scheme for each question is provided at the end of the document.

You can find the complete question papers and the complete mark schemes (with additional notes where available) on the School Support Hub at www.cambridgeinternational.org/support

1 **(a)** Fig. 1.1 shows the human heart and the main blood vessels. The functions of the parts of the heart and some of the blood vessels are given in Table 1.1.

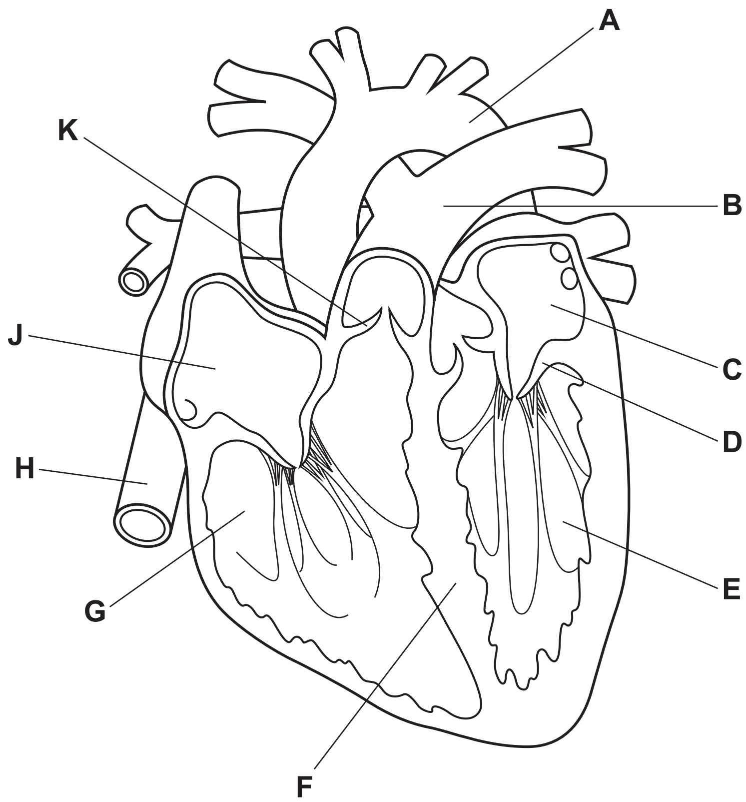

Fig. 1.1

Complete Table 1.1.

One row has been done for you.

Table 1.1

function	letter on Fig. 1.1	name
structure that separates oxygenated and deoxygenated blood		
structure that prevents backflow of blood from ventricle to atrium		
blood vessel that carries oxygenated blood	**A**	aorta
blood vessel that carries deoxygenated blood		
structure that prevents backflow of blood from pulmonary artery to right ventricle		
chamber of the heart that contains oxygenated blood		
chamber of the heart that contains deoxygenated blood		

[6]

(b) A group of students used a heart monitor to record the pulse rate of an athlete during a 5000 metre race. The recordings started just before the race began and ended just after it had finished, as shown in Fig. 1.2.

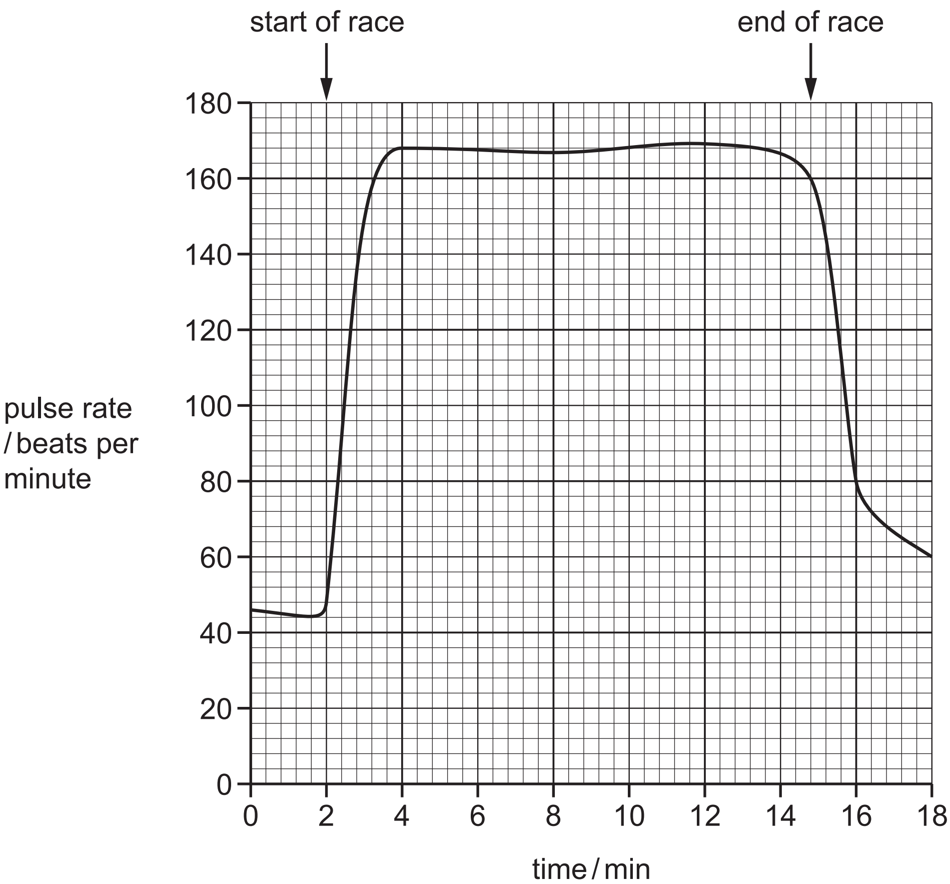

Fig. 1.2

(i) Use data from Fig. 1.2 to describe the effect of exercise on the pulse rate of the athlete.

....

....

....

....

....

....

.... [3]

(ii) Explain the change in pulse rate between 2 minutes and 3 minutes after the recordings started.

....

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....

....

.... [4]

[Total: 13]

1 **(a)** Fig. 1.1 shows the human gas exchange system. The functions of the parts of the gas exchange system are given in Table 1.1.

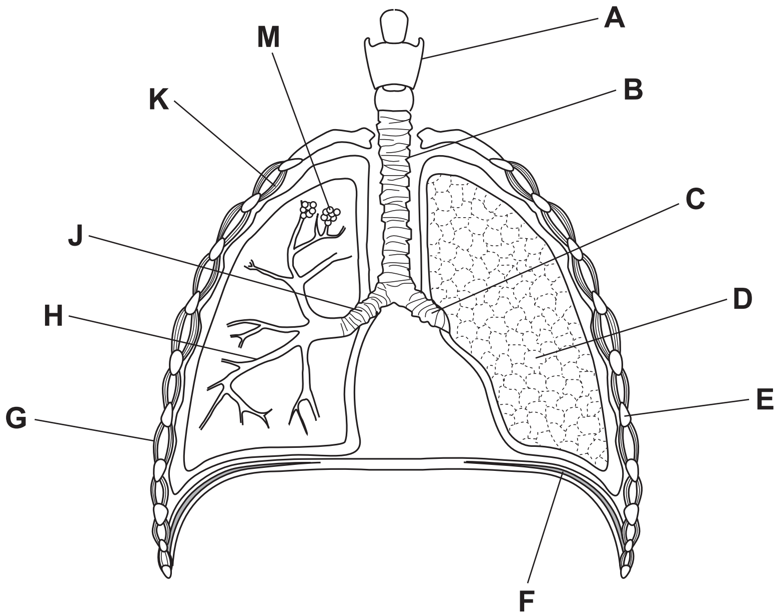

Fig. 1.1

Complete Table 1.1. One row has been done for you.

Table 1.1

function	letter on Fig. 1.1	name
structure that makes sounds	**A**	larynx
bone that provides protection for the lungs		
airway that allows passage of air only into the right lung		
airway that allows passage of air into both lungs		
contracts to increase volume of thorax		
muscle that contracts to lower the ribcage		
site of gas exchange		

[6]

(b) The gas exchange system contains cartilage.

Describe the function of cartilage in the gas exchange system.

....

....

....

....

.... [2]

(c) Soon after starting physical activity the concentration of carbon dioxide in the blood increases.

(i) Name the process inside cells that produces carbon dioxide.

....

.... [1]

(ii) State the effect on breathing of an increase in carbon dioxide concentration in the blood.

....

....

.... [1]

(iii) Explain how this effect on breathing is coordinated.

....

....

....

....

....

....

.... [3]

[Total: 13]

5 The numbers of different cells in a blood sample were counted. The results are shown in Table 5.1.

Table 5.1

cell type	number / per mm^3	percentage
red blood cells	4820000	94.91
lymphocytes	1900	0.04
phagocytes	6000	0.12
platelets	250000	
total	5077900	100.00

(a) Complete the table by calculating the percentage of platelets. Write your answer in Table 5.1 to two decimal places. [1]

(b) State the role of platelets in the blood **and** describe the process they are involved in.

....

....

....

....

....

.... [4]

(c) Lymphocytes are white blood cells that are produced in bone marrow. Lymphocytes travel in the blood from bone marrow to lymph nodes throughout the body.

If a pathogen infects the body, some of these lymphocytes are activated.

State the role of lymphocytes in defence against pathogens.

.... [1]

(d) During a second infection of the same pathogen the response by lymphocytes is much faster. Explain how this happens.

....

....

....

....

....

.... [2]

(e) HIV invades specific lymphocytes that coordinate immune responses.

Fig. 5.1 shows the change in numbers of these lymphocytes following an HIV infection that has not been treated.

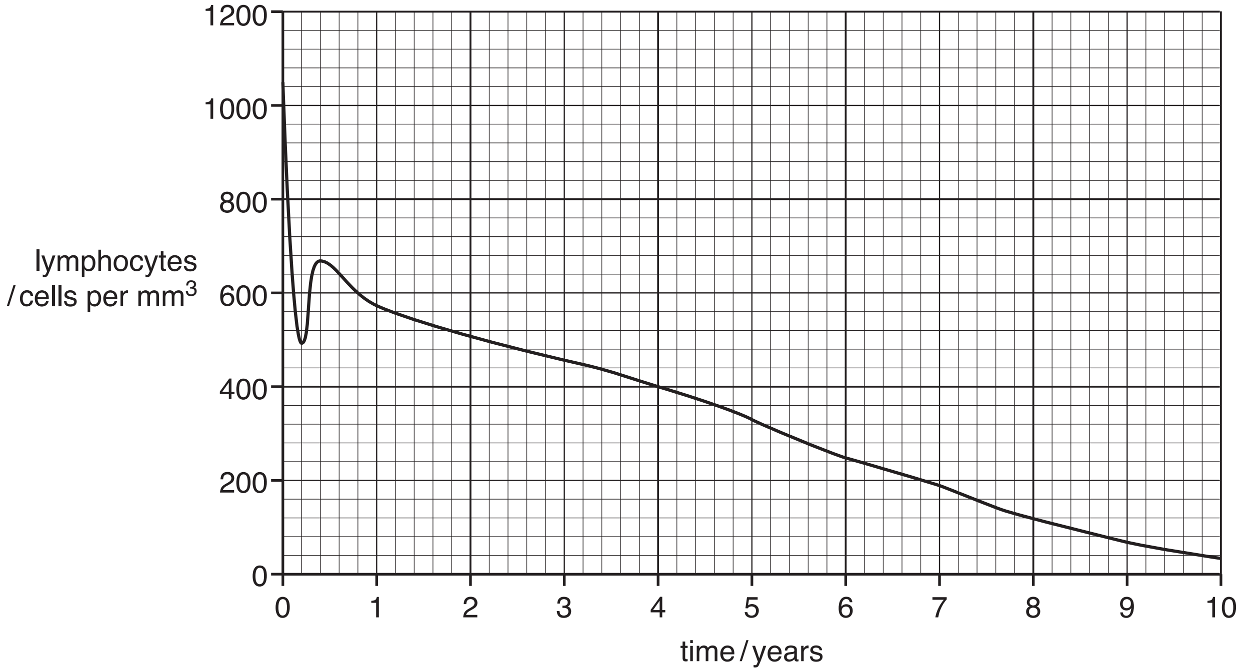

Fig. 5.1

(i) Describe the changes in lymphocyte numbers following HIV infection.

....

....

....

....

....

.... [3]

(ii) Describe the effects on the body of an untreated HIV infection as shown in Fig. 5.1.

....

....

....

....

....

.... [3]

[Total: 14]

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>1 (a)</td><td>
<table>
<tr><th>function</th><th>letter on Fig. 1.1</th><th>name</th></tr>
<tr><td>structure that separates oxygenated and deoxygenated blood</td><td>F</td><td>septum ;</td></tr>
<tr><td>structure that prevents backflow of blood from ventricle to atrium</td><td>D</td><td>bicuspid / mitral / atrioventricular, <u>valve</u> ;</td></tr>
<tr><td>blood vessel that carries oxygenated blood</td><td>A</td><td>aorta</td></tr>
<tr><td>blood vessel that carries deoxygenated blood</td><td>B

H</td><td>pulmonary artery

vena cava ;</td></tr>
<tr><td>structure that prevents backflow of blood from pulmonary artery to right ventricle</td><td>K</td><td>semilunar <u>valve</u> ;</td></tr>
<tr><td>chamber of the heart that contains oxygenated blood</td><td>C
E</td><td>left atrium
left ventricle ;</td></tr>
<tr><td>chamber of the heart that pumps deoxygenated blood</td><td>J
G</td><td>right atrium
right ventricle ;</td></tr>
</table>
</td><td>[6]</td></tr>
<tr><td>1 (b) (i)</td><td>pulse rate increases and remains constant ;
immediate / sudden / steep / rapid / AW, increase in pulse rate ;
increases from 44–48 bpm to 164–170 bpm ;
maximum / 164–170 bpm, at, 4 min(utes) / 2 min(utes) after race starts ;</td><td>[max 3]</td></tr>
</table>

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>1 (b) (ii)</td><td>adrenaline stimulates increase in, heart / pulse, rate ;
increase in blood, carbon dioxide (concentration) / acidity, detected ;
nerves stimulate heart to beat faster ;
ref to muscle contraction / AW ;
muscles require more energy / muscles are doing more work ;
(rate of aerobic) respiration increases ;
increase demand for, oxygen / glucose ;
ref to removal of, carbon dioxide / lactic acid / heat ;
more, blood / carbon dioxide, to lungs (per unit time) ;
more, blood / oxygen / glucose, to muscles ;
AVP ; e.g. ref to ATP / vasodilation in muscles</td><td>[max 4]</td></tr>
<tr><td colspan="3">[Total: 13]</td></tr>
<tr><td>1 (a)</td><td><table>
<tr><th>function</th><th>letter</th><th>name</th></tr>
<tr><td>structure that makes sounds</td><td>A</td><td>larynx</td></tr>
<tr><td>bone that provides protection for the lungs</td><td>E</td><td>rib ;</td></tr>
<tr><td>airway that allows passage of air only into the right lung</td><td>J</td><td>bronchus ;</td></tr>
<tr><td>airway that allows passage of air into both lungs</td><td>B</td><td>trachea ;</td></tr>
<tr><td>contracts to increase the volume of the thorax</td><td>F/G</td><td>(F) diaphragm / (G) external intercostal muscle ;</td></tr>
<tr><td>muscle that contracts to lower the ribcage</td><td>K</td><td>internal intercostal muscles ;</td></tr>
<tr><td>site of gas exchange</td><td>M</td><td>alveoli ;</td></tr>
</table></td><td>[6]</td></tr>
<tr><td>1 (b)</td><td>keeps, airways / trachea / bronchi, open ;
allows (free flow of) air into (the lungs) ;
allows flexibility / can breathe even when, bent / swallowing / AW ;
AVP ;</td><td>[max 2]</td></tr>
<tr><td>1 (c) (i)</td><td>(aerobic) respiration</td><td>[1]</td></tr>
<tr><td>1 (c) (ii)</td><td>rate (of breathing) increases</td><td>[1]</td></tr>
<tr><td>1 (c) (iii)</td><td>stimulus (is CO_2) ; A acidic / pH, of blood decreases ;
(CO_2 / pH) detected by the brain ;
by a receptor ;
ref to (named) neurone in context ;
brain sends impulses to, (intercostal) muscles / diaphragm / effectors ;
(intercostal) muscles / diaphragm / effectors, contract more (frequently) ;
negative feedback / homeostasis ;
reflex / automatic / involuntary ;</td><td>[max 3]</td></tr>
<tr><td colspan="3">[Total: 13]</td></tr>
</table>

Question	Answer	Marks
5 (a)	4.92 / 4.93;	[1]
5 (b)	(platelets) promote / involved in, clotting; fibrinogen changes to fibrin; soluble to insoluble; fibrin forms a mesh; traps blood cells; prevents loss of blood / stops bleeding; prevents entry of pathogens; AVP;	[4]
5 (c)	secrete / produce / release, antibodies;	[1]
5 (d)	active immunity; ref to memory, cells / lymphocytes; memory cells produced in first infection;	[2]
5 (e) (i)	decrease, steep / in short period of time / in two months / AW, to 500 cells per mm^3**;** increase to 650 – 670 cells per mm^3; gradual / AW, decrease until 10 years; to 40 cells per mm^3 at 10 years;	[3]
5 (e) (ii)	no / reduced, (active) immune response; reduced production of antibodies; vulnerable to, infections / (opportunistic) disease / TB / cancers / pneumonia / AW; AIDS; weight loss / death / reduce life span;	[3]
		[Total: 14]

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5: Coordination, response and homeostasis – Topic questions Paper 4

The questions in this document have been compiled from a number of past papers, as indicated in the table below.

Use these questions to formatively assess your learners' understanding of this topic.

Question	Year	Series	Paper number
2	2016	June	41
4	2016	November	43
6	2016	June	42

The mark scheme for each question is provided at the end of the document.

You can find the complete question papers and the complete mark schemes (with additional notes where available) on the School Support Hub at www.cambridgeinternational.org/support

2 The nervous system coordinates the responses of animals to changes in their environment.

(a) Fig. 2.1 shows the arrangement of the nervous system in a mammal.

Complete Fig. 2.1 by writing the names of the missing parts of the mammalian nervous system in the boxes.

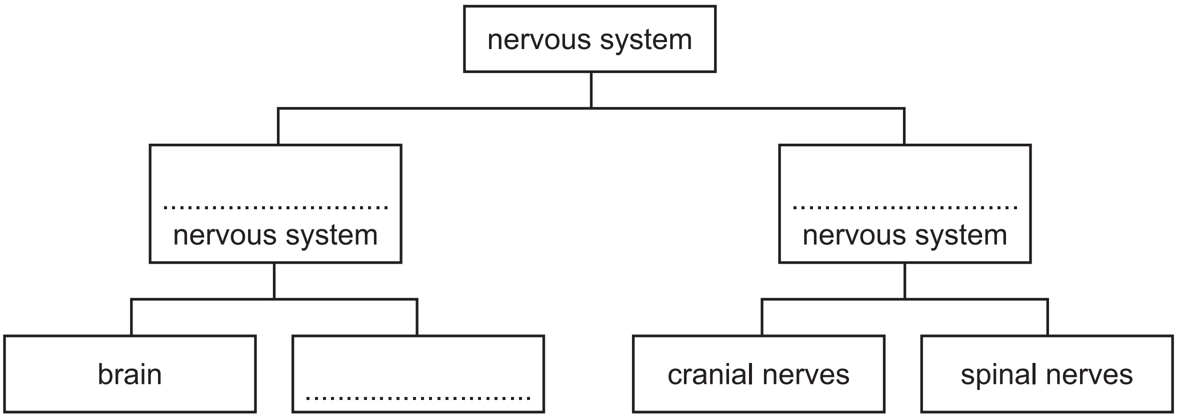

Fig. 2.1

[3]

(b) Fig. 2.2 is a flow chart that shows how an involuntary action is controlled.

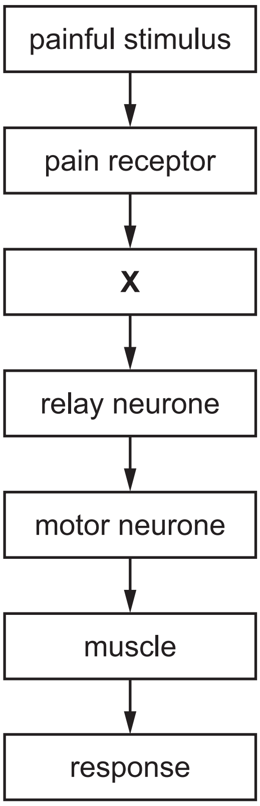

Fig. 2.2

(i) State the structure found at **X**.

.... [1]

(ii) State the type of involuntary action shown by the flow chart.

.... [1]

(iii) State **two** ways in which a voluntary action differs from an involuntary action.

1 ....

....

2 ....

....

[2]

(c) Fig. 2.3 shows three pots of seedlings that have been kept in different conditions.

pot **P** pot **Q** pot **R**

Fig. 2.3

(i) State the conditions in which pots **P** and **Q** were kept.

P ....

Q..

[1]

(ii) State the name of the growth response shown by the seedlings in pot **R**.

.... [2]

(iii) Explain the advantage to the seedlings of this growth response.

....

....

....

....

.... [2]

(iv) Auxins control the growth responses of seedlings.

Explain how auxins control the growth response of the seedlings in pot **R**.

....

....

....

....

....

....

....

....

.... [4]

[Total: 16]

4 Tobacco smoke is made up of over 7000 chemicals.

Nicotine is a component of tobacco smoke.

(a) Explain why nicotine is a drug.

....

....

....

....

....[2]

(b) Describe the effect on the gas exchange system of the following components of tobacco smoke:

carbon monoxide ....

....

....

....

tar ....

....

....

....

[4]

(c) A study compared the percentages of men and women aged between 35 and 54 years who smoked cigarettes. The annual death rate caused by lung cancer was also recorded.

The results are shown in the two graphs in Fig. 4.1.

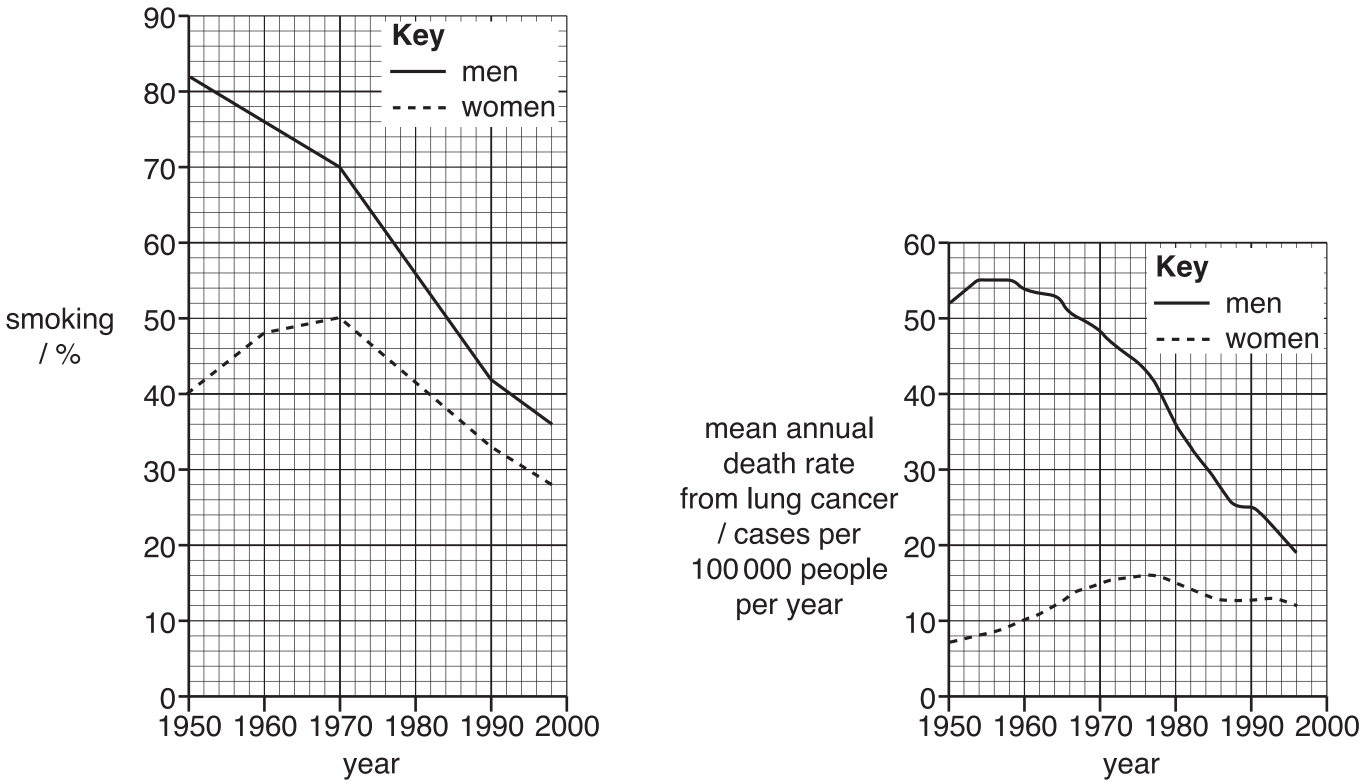

Fig. 4.1

(i) Use the data shown in Fig. 4.1 to compare the percentages of men and women who smoked cigarettes between **1950** and **1998**.

....

....

....

....

....

....

....

....

....[4]

(ii) Use the information from **both** graphs in Fig. 4.1 to discuss the link between smoking and lung cancer.

....

....

....

....

....

....

....

....

....[4]

(d) Explain why it is recommended that pregnant women do not smoke.

....

....

....

....

....[3]

[Total: 17]

6 Fig. 6.1 shows the changes in glucose concentration of the blood.

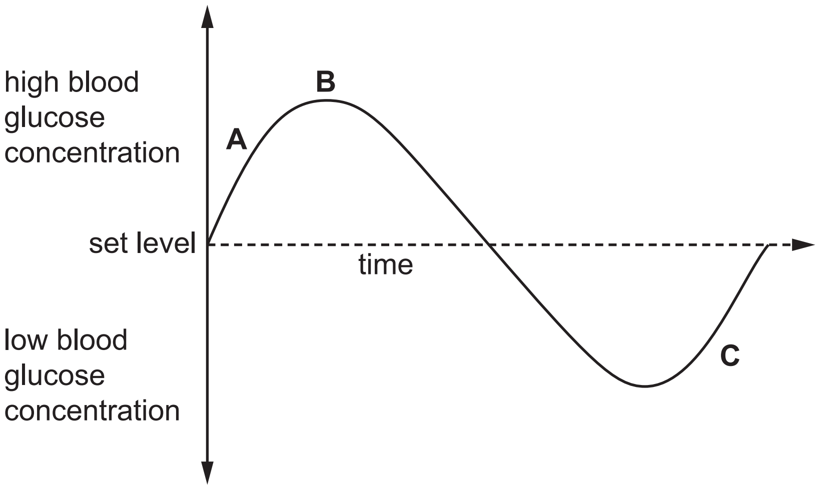

Fig. 6.1

(a) Name the process that maintains blood glucose concentration within set limits.

.... [1]

(b) **(i)** Name the hormone that would be secreted in response to the increasing blood glucose concentration at **A** in Fig. 6.1.

.... [1]

(ii) Name an organ that is responsible for the decrease in blood glucose concentration after **B** in Fig. 6.1.

.... [1]

(iii) Name the compound that is converted to glucose at **C** in Fig. 6.1.

.... [1]

(c) Describe the symptoms **and** treatment of Type 1 diabetes.

....

....

....

....

....

....

....

....

....

....

.... [5]

[Total: 9]

Abbreviations used in the Mark Scheme:

;	separates marking points
/	alternatives
I	ignore
R	reject
A	accept (for answers correctly cued by the question, or guidance for examiners)
AW	alternative wording (where responses vary more than usual)
AVP	any valid point
ecf	credit a correct statement / calculation that follows a previous wrong response
ora	or reverse argument
( )	the word / phrase in brackets is not required, but sets the context
underline	actual word given must be used by candidate (grammatical variants excepted)
max	indicates the maximum number of marks that can be given

Question	Answer	Marks
2 (a)	central (nervous system) ; peripheral (nervous system) ; spinal cord ;	[3]
2 (b) (i)	sensory neurone ;	[1]
2 (b) (ii)	simple reflex / reflex ;	[1]
2 (b) (iii)	slower / takes more time ; needs thought / uses (higher centres of) the brain / conscious control ; learnt / not inherited / not innate / needs training / AW ; not automatic ; response is not always the same to the stimulus ;	[max 2]
2 (c) (i)	either pot P – (uniform) light AND pot Q – no light / dark / covered (up) ; or pot P – (uniform) with / plus, magnesium AND pot Q – no magnesium;	[1]
2 (c) (ii)	positive ; (photo)tropism / (photo)tropic ;	[2]
2 (c) (iii)	idea that leaves / seedlings / plants / chloroplasts, get more light ; more (light) energy, absorbed / trapped / AW ; more photosynthesis ; more, growth / biomass / glucose / starch / AW ;	[max 2]

Question	Answer	Marks
2 (c) (iv)	(auxins) made / produced, in (shoot), tip / apex ; pass / move / diffuse / spread (down the stem) ; auxins collect in the side, in the dark / away from light ; greater (cell) elongation on side in the dark ; AVP ; e.g. absorption of water (by osmosis) / stretching of cell walls / phototropin(s) / plants detect or sense light / ref to turgor pressure	[max 4]
		[Total: 16]
4 (a)	(nicotine is) a (chemical) substance taken into the body; that modifies / affects / influences, (chemical reactions in) the body; addictive / can cause withdrawal symptoms (when stopped) / AW	[2]
4 (b)	*carbon monoxide:* binds to haemoglobin (permanently); Accept carboxyhaemoglobin reduced oxygen (transport); *tar (max 3):* carcinogenic / causes lung cancer; sticks to / blocks / damages, alveoli / cilia; produce more mucus; making prone to (named) respiratory infections; reduced, diffusion / gas exchange;	[4]
4 (c) (i)	1 more men smoked (between 1950–1998 than women); ORA 2 both decrease overall / between 1950 and 1998; 3 (overall) drop in men is more (than in women); ORA Ignore data 4 (1950)–1970: men decreasing and women increasing; 5 1970 onwards : both genders decreasing; 6 larger difference in numbers / %, before 1970s / earlier OR smaller difference in numbers / %, after 1970s / later; AW 7 maximum (implied) for women was 50% and 82% for men; 8 comparative data quote between men and women with units stated once;	[4]
4 (c) (ii)	number of deaths by (lung) cancer shows similar trend as percentage smokers; (correlation) in both men and women / AW; lag in the death rate trend (compared with smokers) / AW; relevant data quote from both graphs; trend more obvious in men / death rate in women is increasing overall; impossible to show conclusive link; (because) cannot control experimental conditions / other lifestyle factors; AVP;	[4]
4 (d)	toxins / AW, in smoke can cross the placenta; increased risk, of miscarriage / still birth / premature birth / low birth weight / deformities; reduces oxygen available to the foetus / foetal brain damage; increased risk, of reduced lung, function / infection, in foetus / infants; babies more likely to become addicted / have withdrawal symptoms; AVP;	[max 3]
		[Total: 17]

Question	Answer	Marks
6 (a)	homeostasis / negative feedback ;	[1]
6 (b) (i)	insulin	[1]
6 (b) (ii)	liver / muscle / pancreas	[1]
6 (b) (iii)	glycogen	[1]
6 (c)	Symptoms: fatigue / AW ; thirst / AW ; increased urination / glucose in urine / fruity breath / ketosis / flushed face; weight loss / nausea / vomiting / abdominal pain / hunger ; blurred vision / glaucoma ; behavioural changes / confusion / faint / unconscious / coma(tose) / dizzy / rapid breathing / deep breathing ; slow (wound) healing / poor circulation ; Treatment: insulin ; by injection / insulin pump ; regular blood glucose tests ; regular meals / controlled diet ;	[max 5]
		[Total: 9]

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6: Reproduction – Topic questions Paper 4

The questions in this document have been compiled from a number of past papers, as indicated in the table below.

Use these questions to formatively assess your learners' understanding of this topic.

Question	Year	Series	Paper number
1	2015	November	31
3	2016	June	42
5	2015	November	31

The mark scheme for each question is provided at the end of the document.

You can find the complete question papers and the complete mark schemes (with additional notes where available) on the School Support Hub at www.cambridgeinternational.org/support

1 **(c)** Zookeepers report that isolated female Komodo dragons, *Varanus komodoensis*, have produced offspring asexually. This is very unusual in vertebrates.

(i) State **two** disadvantages of asexual reproduction.

....

....

....

....

....[2]

(ii) State **two** disadvantages of sexual reproduction.

....

....

....

....

....[2]

(d) Sexual reproduction requires meiosis to occur.

(i) Define the term *meiosis*.

....

....

....[2]

(ii) Explain the significance of meiosis to the survival of endangered species of lizards.

....

....

....

....

....[3]

[Total: 16]

3 **(b)** Meiosis is necessary for sexual reproduction of carnation plants.

Define the term *meiosis*.

....

....

....

....

.... [2]

5 Fig. 5.1 is a diagram showing the events from pollination to fertilisation in a species of flowering plant.

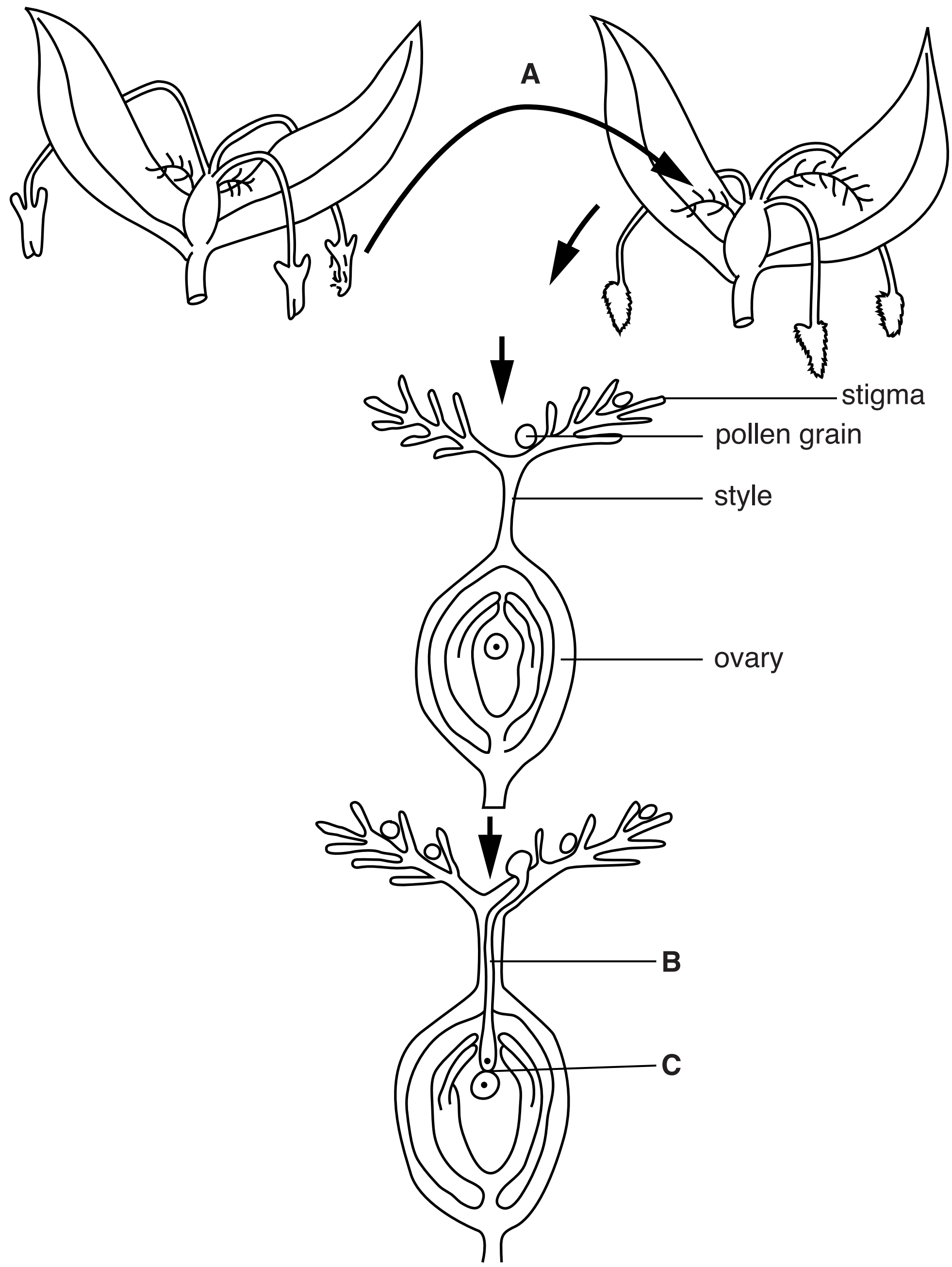

Fig. 5.1

(a) Name the likely method of pollination for the flowers shown at **A** in Fig. 5.1. Give an explanation for your choice.

method of pollination ....

explanation ....

....

....

[3]

(b) In Fig. 5.1 pollen is transferred from one plant to another.

State the name for this type of pollination.

....[1]

(c) Name structure **B** shown in Fig. 5.1 and state its function.

....

....

....[2]

(d) Fertilisation occurs at **C** as shown in Fig. 5.1.

Describe what happens at fertilisation in flowering plants.

....

....

....

....

....[2]

(e) Seed formation occurs after fertilisation. Seeds are formed inside the fruits and then dispersed.

(i) Name the part of the flower that develops into the seed.

....[1]

(ii) Name the part of the flower that develops into the fruit.

....[1]

(iii) State an advantage of seed dispersal.

....

....[1]

(f) Seed germination occurs when conditions are suitable.

Explain the role of enzymes in seed germination.

....

....

....

....

....[2]

[Total: 13]

Abbreviations used in the Mark Scheme:

;	separates marking points
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( )	the word / phrase in brackets is not required, but sets the context
<u>underline</u>	actual word given must be used by candidate (grammatical variants excepted)
max	indicates the maximum number of marks that can be given

Question	Answer	Marks
1 (c) (i)	reduced genetic diversity ; identical offspring ; negative traits passed on ; more competition for local resources ; less chance of survival in a varying environment ; one disease could wipe out total population ; AVP ; e.g. less chance of evolving	[max 2]
1 (c) (ii)	offspring may not be as well adapted to environment ; slower process / takes longer (than asexual reproduction) ; requires partner / two parents ; less energy efficient / requires more energy / many eggs is wasteful ; AVP ;	[max 2]
1 (d) (i)	reduction division / chromosome number is halved / one set of chromosomes ; diploid to haploid ; for production of gametes ; daughter cells are not genetically identical / genetically different ;	[2]

Question	Answer	Marks
1 (d) (ii)	for adaption to, new / changed environment ; causes (genetic) variation ; competition for survival ; best suited reproduce ; allows natural selection ; allows evolution ; AVP ;	[max 3]
		[Total: 9]
3 (b)	1 reduction / nuclear, division ; 2 chromosome number is halved ; 3 (diploid to) haploid ; 4 results in genetically different, cells / gametes / AW ;	[max 2]
		[Total: 2]
5 (a)	method of pollination: wind ; explanation to max 2: Feathery / AW, stigma ; long, filament ; large, anthers / stamens ; anthers / stamens, hang outside flower ; anthers loosely attached (to filament) ; light pollen ; no petals ;	[max 3]
5 (b)	cross (pollination)	[1]
5 (c)	pollen tube ; delivers male gamete / pollen nucleus / male nucleus to ovule ; AW	[2]
5 (d)	idea that tip of pollen tube opens / AW ; gametes / sex cells / ova and pollen nuclei, fuse / join / combine ; formation of zygote ; diploid ;	[max 2]
5 (e) (i)	ovule	[1]
5 (e) (ii)	ovary (wall)	[1]
5 (e) (iii)	colonise new areas ; reduce (intraspecific) competition ; reduce inbreeding ; ora	[max 1]
5 (f)	stored food / food reserves (in seed) broken down ; named enzyme plus substrate ; product plus use ; enzymes required in process of respiration ;	[max 2]
		[Total: 13]

7: Human reproduction – Topic questions Paper 4

The questions in this document have been compiled from a number of past papers, as indicated in the table below.

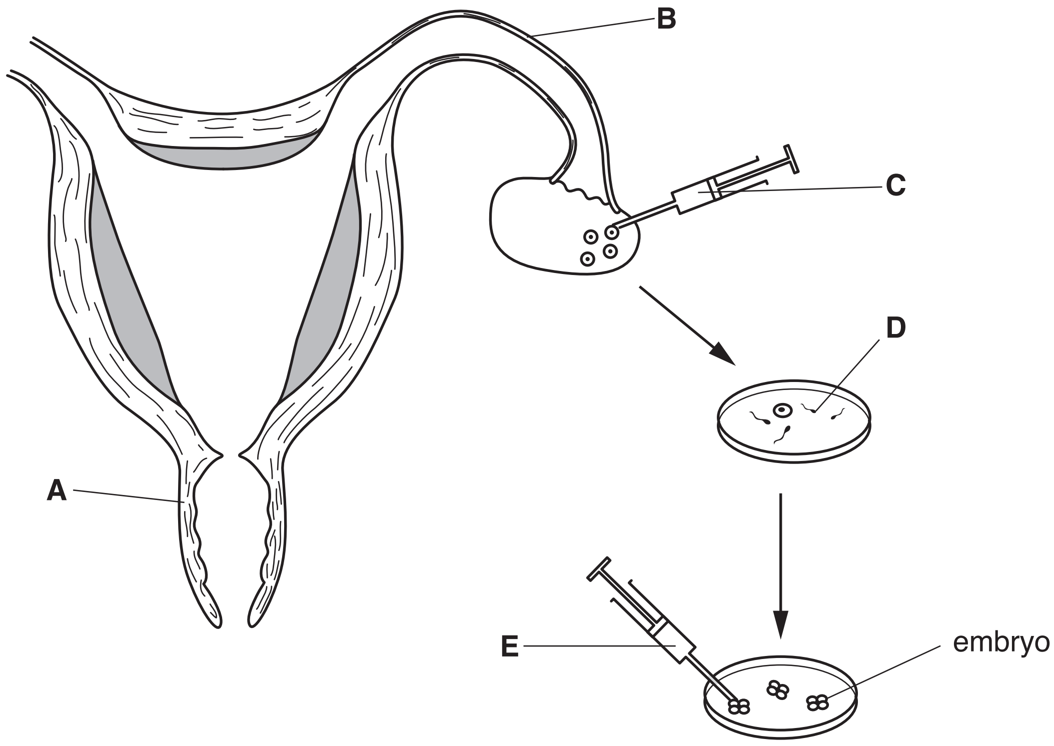
Use these questions to formatively assess your learners' understanding of this topic.

Question	Year	Series	Paper number
1	2016	November	43
5	2016	June	42

The mark scheme for each question is provided at the end of the document.

You can find the complete question papers and the complete mark schemes (with additional notes where available) on the School Support Hub at www.cambridgeinternational.org/support

1 An *in vitro* fertilisation (IVF) procedure is outlined in Fig. 1.1.



not drawn to scale

Fig. 1.1

(a) (i) Name structures **A**, **B** and **D**.

A ....

B ....

D ....
[3]

(ii) State the purpose of syringe **C**.

....

....[1]

(b) (i) Name a hormone that would be injected to stimulate egg cell development.

....[1]

(ii) State when, during the menstrual cycle, this hormone should be injected.

....[1]

(iii) Draw an **X** on Fig. 1.1 at the position where the embryos should be placed.
[1]

(c) Discuss the social implications of IVF.

....

....

....

....

....

....

....

....

....[4]

[Total: 11]

5 Hormones are secreted by glands or made artificially by drug companies.

(a) (i) Name the gland that secretes testosterone.

.... [1]

(iii) Describe the role of progesterone in the menstrual cycle.

....

....

.... [1]

(iv) Synthetic progesterone is found in oral contraceptives.

Name **one** other hormone often found in oral contraceptives.

.... [1]

Abbreviations used in the Mark Scheme:

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AW	alternative wording (where responses vary more than usual)
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underline	actual word given must be used by candidate (grammatical variants excepted)
max	indicates the maximum number of marks that can be given

Question	Answer	Marks
1 (a) (i)	**A**: vagina; **B**: oviduct / Fallopian tube; **D**: sperm / male gamete;	[3]
1 (a) (ii)	to remove, egg cells / ova / female gametes;	[1]
1 (b) (i)	follicle stimulating hormone / FSH; luteinizing hormone / LH;	[1]
1 (b) (ii)	start of new cycle / days 1–10 / during menstruation / AW;	[1]
1 (b) (iii)	**X** positioned anywhere in uterus (wall / lining);	[1]
1 (c)	1 allows infertile couples / single parents / same sex couples (to have children); 2 religious / legal / moral / ethical, concerns about IVF; 3 may not treat infertility successfully; 4 expense of fertility treatment; 5 may lead to multiple births; 6 *idea of* genetic screening before implanting is possible; 7 storage of, eggs / embryos, is possible (during chemotherapy); 8 qualification of an religious / ethical / legal / moral, issue; 9 has allowed stem cell research on embryos; 10 AVP	[4]
		[Total: 11]

Question	Answer	Marks
5 (a) (i)	testes	[1]
5 (a) (ii)	increases, muscle mass / strength / power ; improved recovery of muscle damage / promotes protein synthesis ; increase, competitive drive / aggression / AW ; increases bone, density / mass ;	[max 1]
5 (a) (iii)	maintains, uterine lining / endometrium ; inhibits, FSH / LH (release) ;	[max 1]
5 (a) (iv)	oestrogen	[1]
		[Total: 4]

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8: Inheritance and evolution – Topic questions Paper 4

The questions in this document have been compiled from a number of past papers, as indicated in the table below.

Use these questions to formatively assess your learners' understanding of this topic.

Question	Year	Series	Paper number
3	2016	March	42
3	2016	June	41
3	2016	June	43

The mark scheme for each question is provided at the end of the document.

You can find the complete question papers and the complete mark schemes (with additional notes where available) on the School Support Hub at www.cambridgeinternational.org/support

3 Yeast is used in bread-making. It respires anaerobically, producing carbon dioxide.

(a) Write the balanced chemical equation for anaerobic respiration of yeast in bread-making.

....[2]

A baker wants to increase the rate of carbon dioxide production in the bread-making process.
The baker trialled different concentrations of glucose solution in the bread dough.
Fig. 3.1 shows the results.

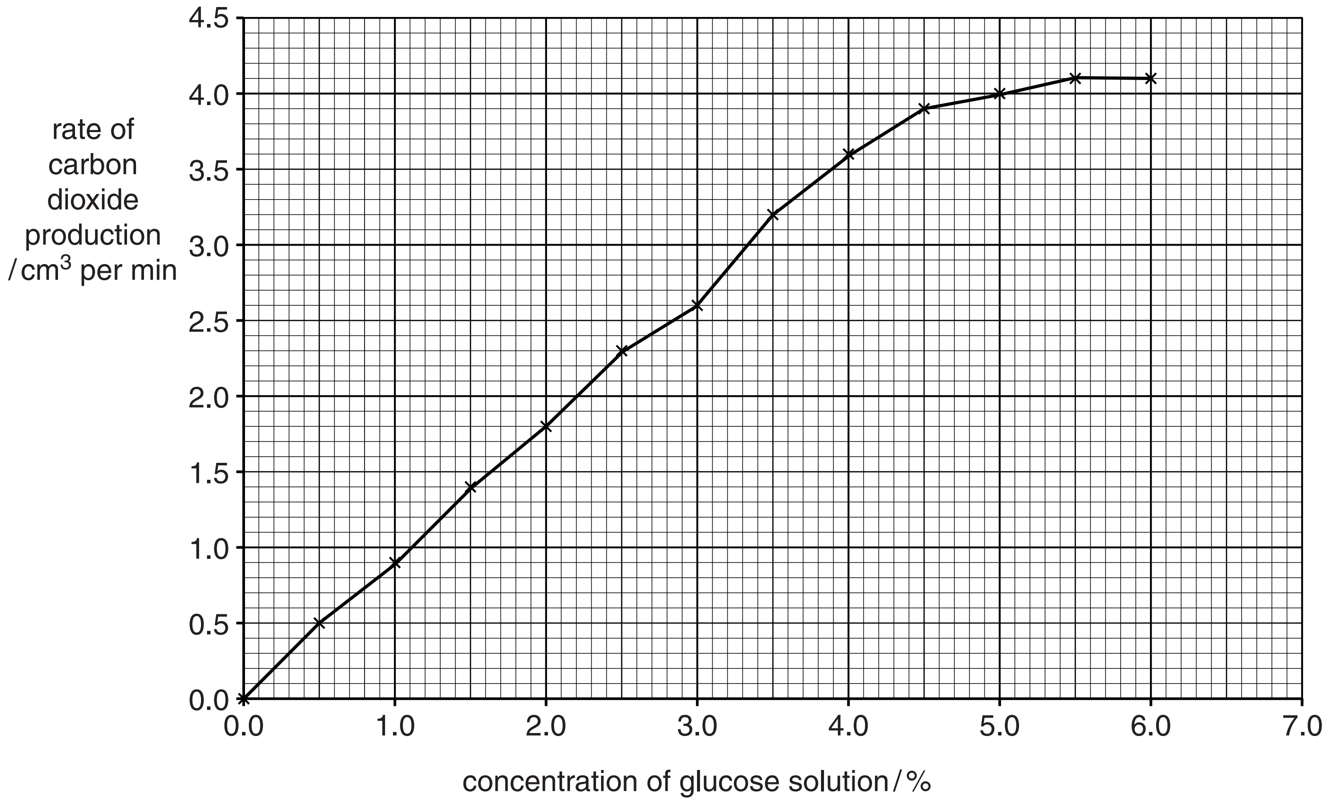

Fig. 3.1

(b) (i) Predict the rate of carbon dioxide production if the concentration of the glucose solution was 7.0%.

.... cm^3 per min [1]

(ii) The baker carried out the trials at 30 °C.
The trials were repeated at 20 °C.
Draw a line on Fig. 3.1 to show the rate of carbon dioxide production at 20 °C. [2]

(iii) The baker carried out another trial at 80 °C. No carbon dioxide was released.

State why no carbon dioxide was produced.

....[1]

(c) Name **one** other industrial process that uses yeast.

....[1]

(d) During the production of penicillin, large fermenters are used. Fig. 3.2 shows a fermenter.

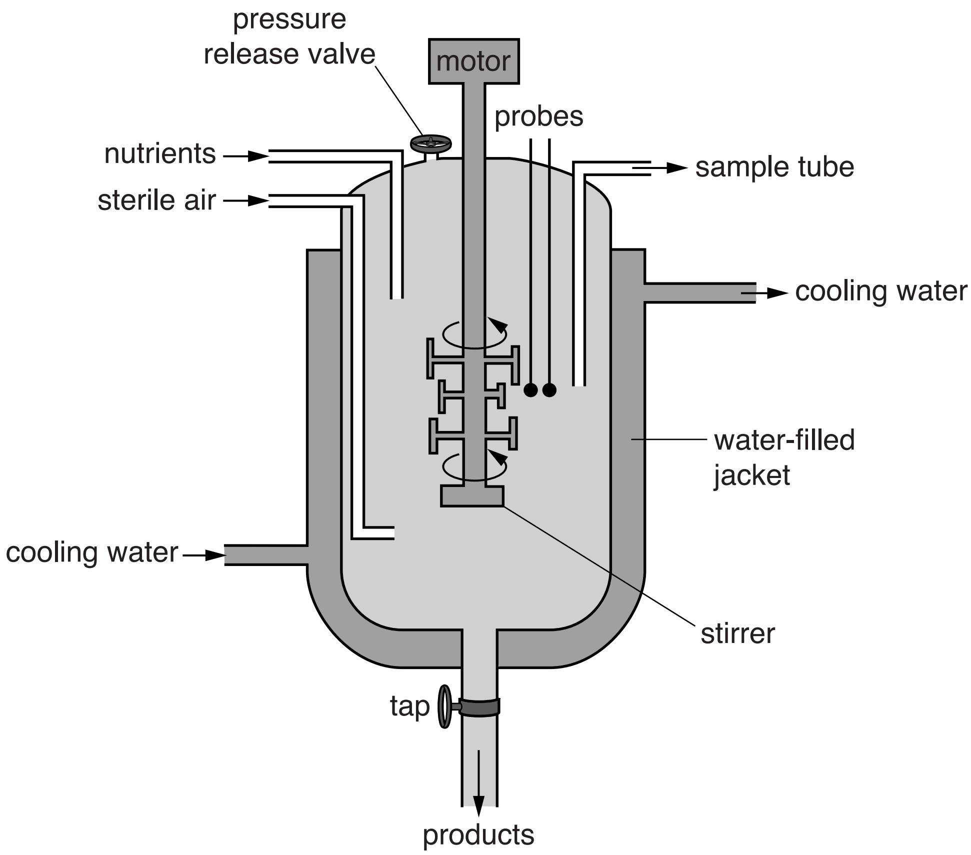

Fig. 3.2

(i) Explain the functions of the following parts of the fermenter:

stirrer ....

....

water-filled jacket ....

....

probes ....

....
[3]

(ii) The air and nutrients that are added to the fermenter are sterile.

State why they must be sterile.

....

....

....[1]

[Total: 11]

3 Catalase is an enzyme that breaks down hydrogen peroxide inside cells. Red blood cells contain catalase.

Some dogs have an inherited condition in which catalase is not produced. This condition is known as acatalasia and it is caused by a mutation in the gene for catalase.

(a) Define the terms *gene* and *gene mutation*.

gene..

....

gene mutation...

....

[2]

(b) A geneticist was asked to investigate the inheritance of acatalasia in dogs.

The normal allele is represented by **B** and the mutant allele is represented by **b**.

The geneticist made the diagram in Fig. 3.1 to show the inheritance of acatalasia in a family of dogs. The shaded symbols indicate the dogs with acatalasia.

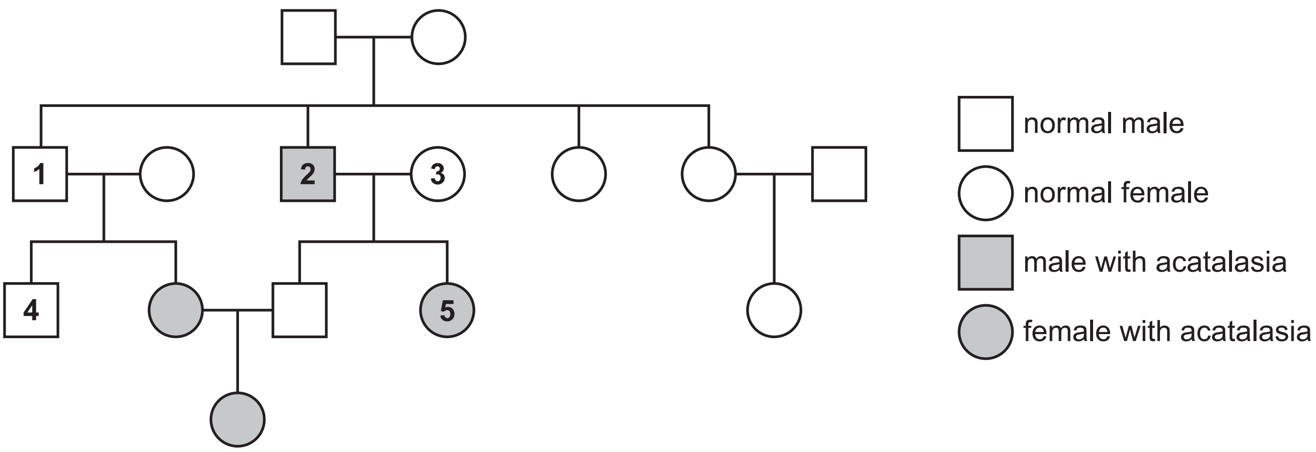

Fig. 3.1

(i) State the genotypes of the dogs identified as **1**, **2** and **3** in Fig. 3.1.

1 ....

2 ....

3 .... [3]

(ii) The geneticist crossed dog **4** with dog **5**. Approximately half of the offspring had acatalasia and half the offspring did not have acatalasia.

Complete the genetic diagram to show how this is possible.

	dog **4**		dog **5**
parental phenotypes	normal		has acatalasia
parental genotypes	....		....
gametes	.........., ...	+	....

Punnett square

offspring genotypes...

offspring phenotypes.. [3]

(iii) State the name given to the type of cross that you have completed in **(b)(ii)**.

.... [1]

[Total: 9]

3 **(a)** Sex in cats is determined in the same way as in humans.

Complete the diagram below to show how sex is determined in cats.

male cat × female cat

female cat (XX)

	gametes	X	X
male cat (.........)	......		
	......		

offspring ratio .... [3]

(b) A scientist investigated the inheritance of fur colour in cats.

The gene for coat colour is located on the X chromosome. The gene has two alleles:

- **B** black
- **b** orange.

The X chromosome with the allele for black is represented by $\mathbf{X^B}$.
The X chromosome with the allele for orange is $\mathbf{X^b}$.

A female cat can be a mixture of these colours, described as calico.

Fig. 3.1 shows the inheritance of this condition in a family of cats.

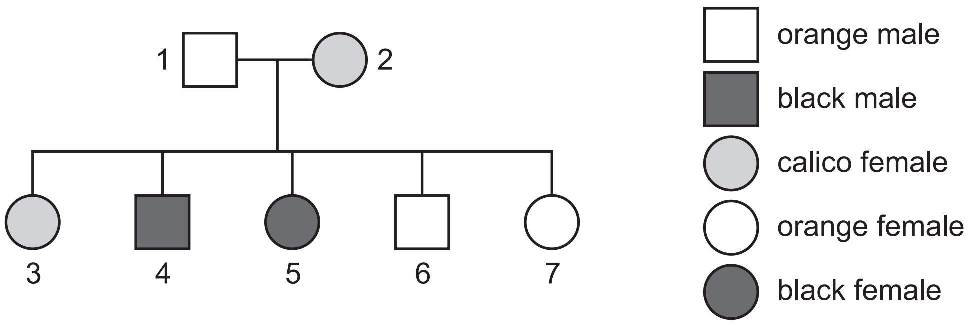

Fig. 3.1

(i) State the genotypes of cats 1, 4, and 5 in Fig. 3.1.

cat 1 ....

cat 4 ....

cat 5 .... [3]

(ii) Coat colour in cats is an example of discontinuous variation.

Explain why coat colour is an example of discontinuous variation.

....

....

....

....

....

....

.... [3]

[Total: 9]

Abbreviations used in the Mark Scheme:

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<u>underline</u>	actual word given must be used by candidate (grammatical variants excepted)
max	indicates the maximum number of marks that can be given

Question	Answer	Marks
3 (a)	$C_6H_{12}O_6 \rightarrow 2C_2H_5OH + 2CO_2$;;	[2]
3 (b) (i)	4.1 (cm^3 per min) ;	[1]
3 (b) (ii)	a single line below the original curve on the graph and following the same shape ; line starts at origin ;	[2]
3 (b) (iii)	enzymes denatured / yeast died ;	[max 1]
3 (c)	(named) alcohol production ; producing biofuels / ethanol ; production of yeast extract ; GM yeast ;	[max 1]
3 (d) (i)	stirrer keeps microorganism suspended / prevent it from sinking ; enables microorganisms to always have access to nutrients ; maintain even temperature ; to create uniform / even / homogenous mixture ; to form pellets of fungus / avoid mat formation ; water-filled jacket reduces heat energy / temperature ; maintains, a constant / suitable / optimum, temperature ; probes monitor / detect / measure, temperature / pH / gas concentration / pressure / nutrients ;	[4]

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>3 (d) (ii)</td><td>prevent contamination ;</td><td>[1]</td></tr>
<tr><td colspan="3" align="right">[Total: 11]</td></tr>
<tr><td>3 (a)</td><td>gene a length of DNA that codes for a protein ;
gene mutation a change in base sequence of DNA ;</td><td>[2]</td></tr>
<tr><td>3 (b) (i)</td><td>1 Bb ;
2 bb ;
3 Bb ;</td><td>[3]</td></tr>
<tr><td>3 (b) (ii)</td><td>
<table>
<tr><td></td><td></td><td colspan="2">male gametes</td></tr>
<tr><td></td><td></td><td>B</td><td>b</td></tr>
<tr><td rowspan="2">female gametes</td><td>b</td><td>Bb</td><td>bb</td></tr>
<tr><td>(b)</td><td>(Bb)</td><td>(bb)</td></tr>
</table>
offspring genotypes Bb and bb ;
A heterozygous and homozygous recessive
offspring phenotypes normal / carrier and acatalasia ;</td><td>[3]</td></tr>
<tr><td>5 (b) (iii)</td><td>test (cross)</td><td>[1]</td></tr>
<tr><td colspan="3" align="right">[Total: 9]</td></tr>
<tr><td>3 (a)</td><td>
<table>
<tr><th>gametes</th><th>X</th><th>X</th></tr>
<tr><td>X</td><td>XX</td><td>XX</td></tr>
<tr><td>Y ;</td><td>XY</td><td>XY ;</td></tr>
</table>
offspring ratio = 1:1 / 50:50 / 50% male, 50% female / 2:2 ;</td><td>[3]</td></tr>
<tr><td>3 (b) (i)</td><td>cat 1 X^bY ;
cat 4 X^BY ;
cat 5 X^BX^B;</td><td>[3]</td></tr>
<tr><td>3 (b) (ii)</td><td>distinct, phenotypes / coat colours / categories ;
no (continuous) range of colour / AW ;
controlled by genes ;
not affected by the, environment / AW / named example ;</td><td>[3]</td></tr>
<tr><td colspan="3" align="right">[Total: 9]</td></tr>
</table>

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9: Organisms and environment – Topic questions Paper 4

The questions in this document have been compiled from a number of past papers, as indicated in the table below.

Use these questions to formatively assess your learners' understanding of this topic.

Question	Year	Series	Paper number
6	2015	June	33
6	2014	June	32

The mark scheme for each question is provided at the end of the document.

You can find the complete question papers and the complete mark schemes (with additional notes where available) on the School Support Hub at www.cambridgeinternational.org/support

6 Some integrated farming systems involve making best use of all available resources without the use of large inputs of energy in the form of fossil fuels.

A study looked at what happened to the light energy that was the major energy input to farms in the Zhujiang delta in China. The farms are based on a dyke-pond system as shown in Fig. 6.1.

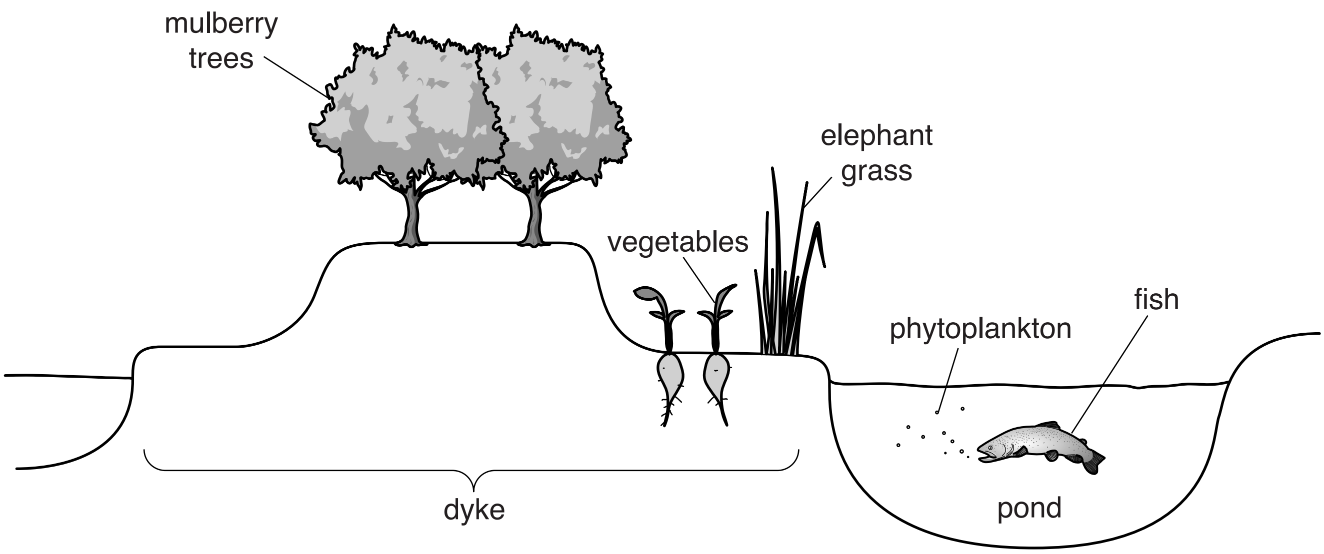

Fig. 6.1

Elephant grass, vegetables and mulberry trees are grown on the dykes in between the ponds. The elephant grass is grown and then cut to feed the fish. Vegetables and fish are used for human consumption. Silkworms feed on the mulberry trees. Phytoplankton are the main producers in the pond and are eaten by the fish.

(a) **(i)** Explain the meaning of the term *producer*.

....

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....[2]

(ii) Use the information provided in the passage on page 18 and in Fig. 6.1 to **complete** a food web for the farm. Some of the producers have been drawn for you.

mulberry trees

vegetables

phytoplankton in the pond

[5]

(b) In the study the researchers discovered that the vegetables absorbed 1560 MJ m^{-2} per year of light energy. The energy which was transferred from the vegetables to humans was 3 MJ m^{-2} per year.

Explain what happens to the energy that is absorbed by the vegetables but is not transferred to humans.

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....[3]

(d) A student found the following information about the feeding relationships between some organisms in a soil habitat.

Dead organic matter, such as leaves, provides food for bacteria and soil fungi.

Earthworms eat dead leaves.

Many millipedes feed on dead plant matter and also on soil fungi.

Nematodes feed on bacteria and are eaten by springtails.

Centipedes are predators that feed on earthworms, millipedes and springtails.

(i) Draw a food web to show the feeding relationships described above.

[4]

(ii) Describe the roles of the soil organisms in the **carbon** cycle.

....

....

....

....

.... [2]

[Total: 17]

Abbreviations used in the Mark Scheme:

;	separates marking points
/	alternatives
I	ignore
R	reject
A	accept (for answers correctly cued by the question, or guidance for examiners)
AW	alternative wording (where responses vary more than usual)
AVP	any valid point
ecf	credit a correct statement / calculation that follows a previous wrong response
ora	or reverse argument
( )	the word / phrase in brackets is not required, but sets the context
<u>underline</u>	actual word given must be used by candidate (grammatical variants excepted)
max	indicates the maximum number of marks that can be given

Question	Answer	Marks
6 (a) (i)	autotrophic (organism) ; organism that makes its own organic nutrients / food ; (usually) using energy from the Sun / by photosynthesis ;	[2]
6 (a) (ii)	1 all arrows point from food to feeder ; 2 elephant grass added (at the producer level) ; 3 phytoplankton and elephant grass arrows go to fish ; 4 mulberry trees arrow goes to silkworms ; 5 vegetables and fish arrows go to humans ;	[5]
6 (b)	1 not all of the plants are edible / some not digested ; 2 faeces / egestion ; 3 eaten by, pests / AW ; 4 dead leaves / AW, to decomposers ; 5 plants lose energy as a result of respiration ; AVP ; e.g. some energy not used for growth	[max 3]
		[Total: 10]

Question	Answer	Marks
6 (d) (i)	1 all arrows point from food to feeder ; 2 millipedes eat dead leaves and fungi ; 3 food chain : bacteria _ nematodes _ springtails _ centipedes ; 4 centipedes eat millipedes, springtails and earthworms ;	[4]
6 (d) (ii)	1 ref to, respiration / decomposition ; 2 release carbon dioxide ; 3 carbon dioxide is taken in by, plants / photosynthesis ;	[max 2]
		[Total: 6]

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10: Human influences on the environment – Topic questions Paper 4

The questions in this document have been compiled from a number of past papers, as indicated in the table below.

Use these questions to formatively assess your learners' understanding of this topic.

Question	Year	Series	Paper number
4	2016	March	42
4	2016	June	41
6	2016	November	42

The mark scheme for each question is provided at the end of the document.

You can find the complete question papers and the complete mark schemes (with additional notes where available) on the School Support Hub at www.cambridgeinternational.org/support

4 **(a)** Increasing human population is linked to a change in carbon dioxide concentration in the atmosphere. Fig. 4.1 shows the carbon dioxide concentration between 1958 and 2010 measured at Mauna Loa, Hawaii.

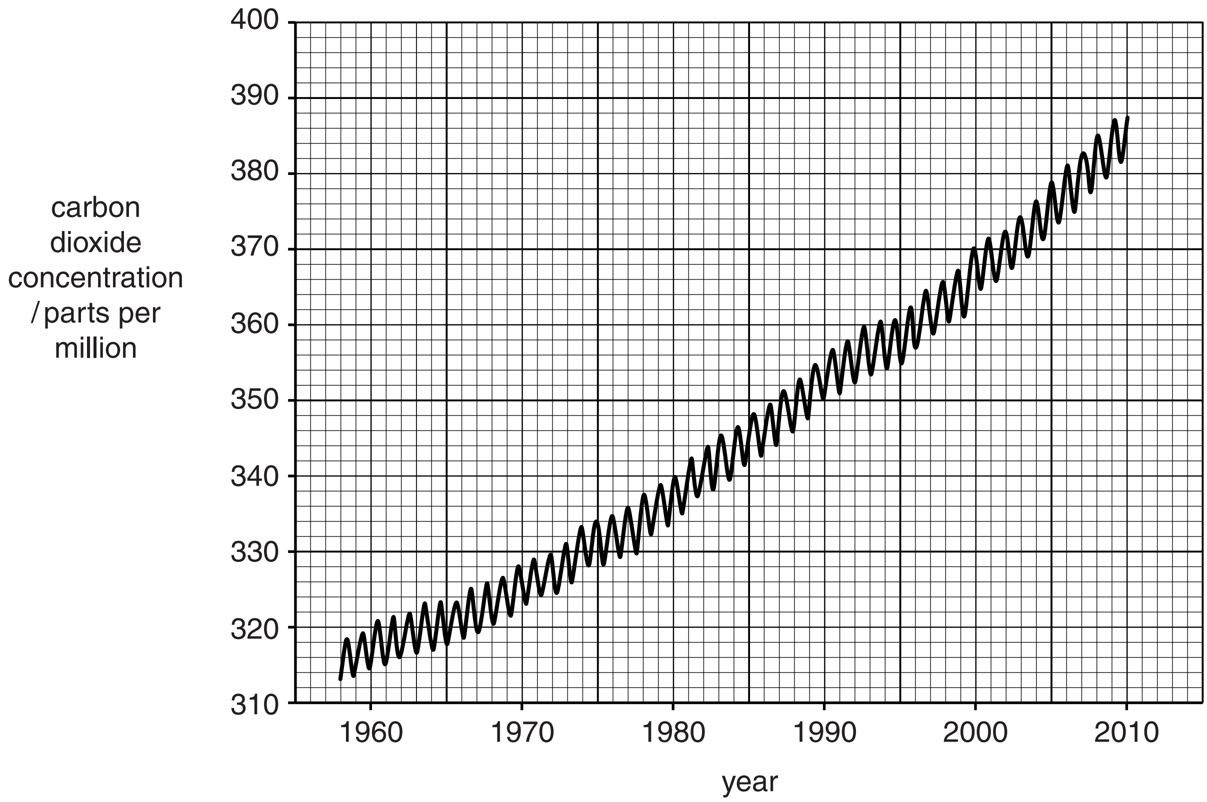

Fig. 4.1

Describe how the carbon dioxide concentration has changed between 1958 and 2010.
You will gain credit for using data from Fig. 4.1.

....

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....[3]

(b) **(i)** Carbon dioxide is a greenhouse gas.
Name **one other** greenhouse gas.

....[1]

(ii) Explain how carbon dioxide enhances the greenhouse effect.

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....[3]

(c) Mineral ions are needed for plant growth.

Complete Table 4.1 to show the function and effect of the lack of some mineral ions on plants.

One has been done for you.

Table 4.1

mineral ion	function in plants	effect of lack of mineral ion on plants
nitrate		
magnesium		
phosphate	used for making DNA	poor root growth

[4]

(d) Fertilisers can cause pollution to aquatic systems. Overuse of fertilisers may cause eutrophication. Lake Udai Sagar in India is an example of an aquatic system that shows high levels of eutrophication.

Explain what happens in aquatic environments, such as Lake Udai Sagar, when eutrophication occurs.

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....[6]

[Total: 17]

5 A researcher investigated the population growth of fish for fish farming. The researcher stocked a farmer's lake with a small number of these fish and recorded the number of fish over the next five years. The researcher's results showed that the population of fish had increased exponentially.

(a) **(i)** Use the axes to show the **exponential growth** in the population of fish.

Label the axes and draw a suitable curve.

[3]

(ii) Explain why the population of fish increased exponentially.

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.... [4]

Fig. 5.1 shows the total mass of wild fish caught worldwide between 1950 and 2012 and the mass of farmed fish produced worldwide over the same period.

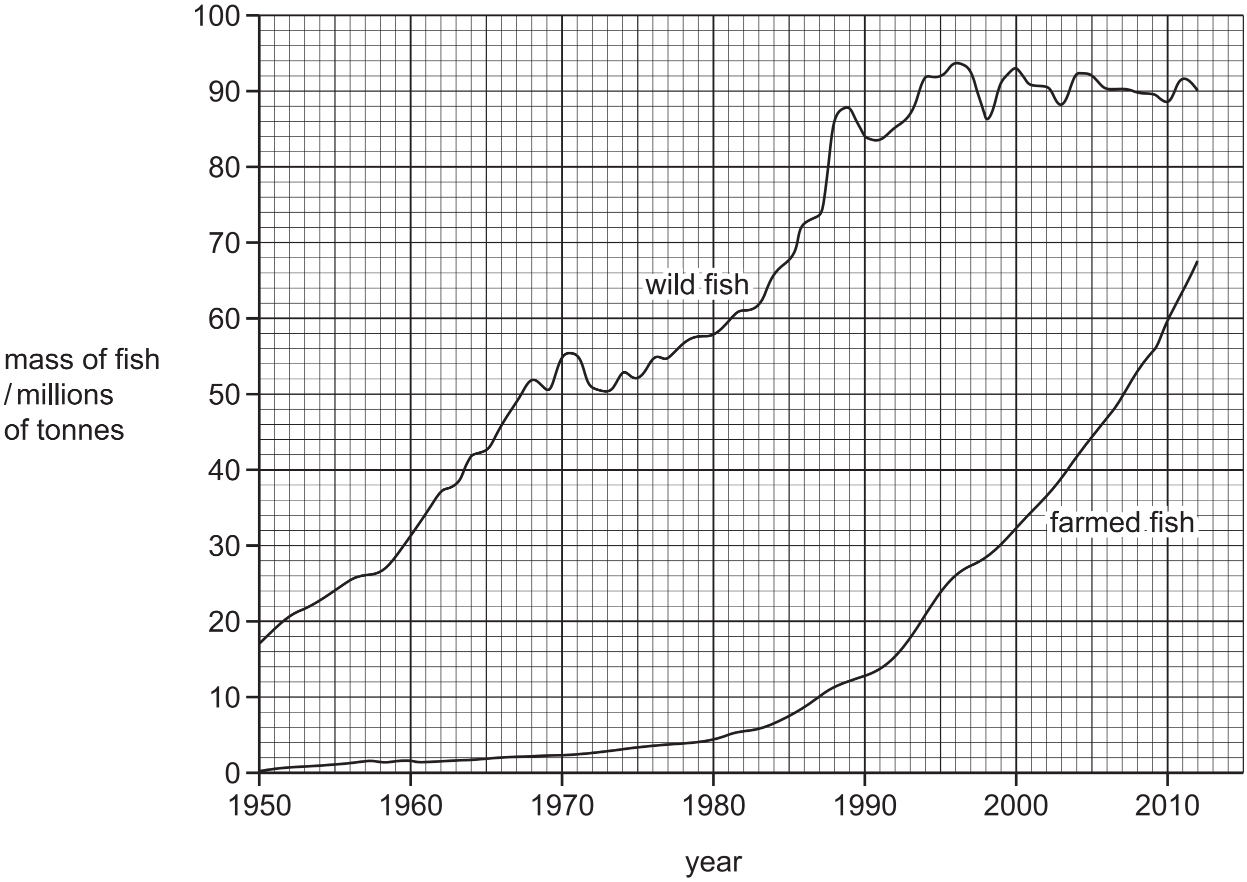

Fig. 5.1

(b) Describe the changes in the mass of **wild fish** caught between 1950 and 2012.

You will gain credit if you use data from Fig. 5.1.

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.... [3]

(c) It is predicted that wild fish stocks will decrease and become depleted because of overfishing.

Suggest ways in which governments can try to maintain the stocks of wild fish.

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.... [6]

(d) Like fish stocks, forests can be a sustainable resource.

Discuss what is meant by the term *sustainable resource*, using forests as an example.

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.... [3]

[Total: 19]

6 Wetlands are internationally important ecosystems. The spoon-billed sandpiper, *Calidris pygmaea*, is an endangered species.

Fig. 6.1 shows a spoon-billed sandpiper feeding in a wetland ecosystem. The wetland is a stopover on the bird's long migration from north-east Russia to south-east Asia.

The smaller photograph is a close-up of the bird's legs to show that it has been ringed.

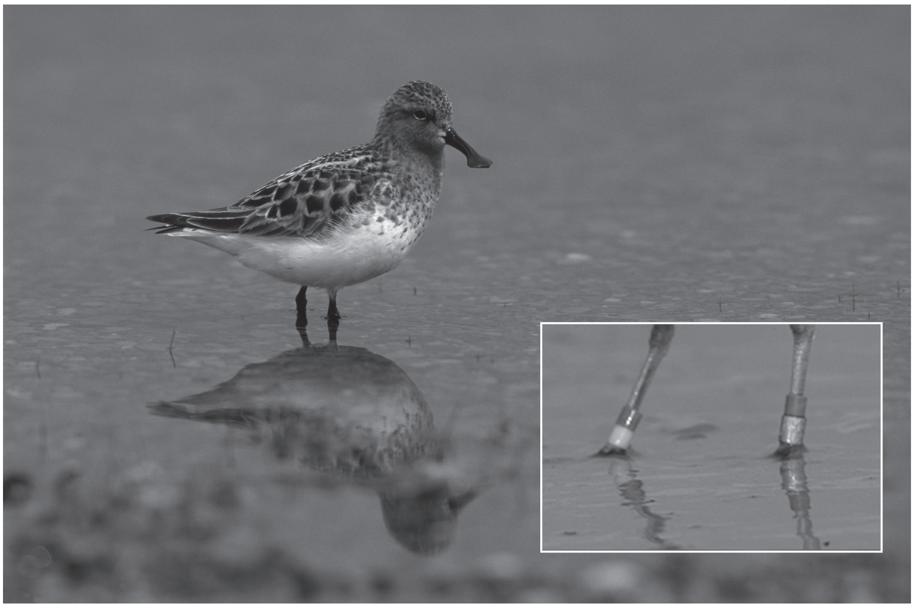

Fig. 6.1

Spoon-billed sandpipers stop to feed at the Rudong mudflats near Shanghai, China.

Putting one or more rings on a bird's leg is a common way to identify individual birds. Spoon-billed sandpipers ringed in Russia have been seen at the Rudong mudflats.

(a) Suggest why scientists put leg rings on birds, such as the spoon-billed sandpiper.

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.... [2]

(b) Explain why it is important to conserve ecosystems, such as wetlands.

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.... [5]

[Total: 7]

Abbreviations used in the Mark Scheme:

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max	indicates the maximum number of marks that can be given

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>4 (a)</td><td>1 overall carbon dioxide concentration increases ;
2 at a steady rate ;
3 there are minor fluctuations in carbon dioxide concentration ;
4 the fluctuations occur, regularly / yearly / seasonally ;
5 use of comparative figures with year and concentration with units ;</td><td>[max 3]</td></tr>
<tr><td>4 (b) (i)</td><td>methane</td><td>[1]</td></tr>
<tr><td>4 (b) (ii)</td><td>1 radiation / light from the Sun hits, Earth / atmosphere ;
2 (named) short-wave radiation passes through carbon dioxide layer ;
3 re-radiated / reflected, from the ground as long-wave radiation / infrared / heat energy ;
4 long-wave radiation / infrared / heat energy, trapped / prevented from escaping from atmosphere by carbon dioxide ;</td><td>[max 3]</td></tr>
<tr><td>4 (c)</td><td><table>
<tr><th>mineral ion</th><th>function in plants</th><th>effect of ion deficiency on plants</th></tr>
<tr><td>nitrate</td><td>make amino acids / proteins / DNA / RNA / enzymes / chlorophyll ;</td><td>poor growth / lower leaves die early ;</td></tr>
<tr><td>magnesium</td><td>used to make chlorophyll / pigments ;</td><td>yellow leaves / chlorosis ;</td></tr>
<tr><td>phosphate</td><td>used for making DNA</td><td>poor root growth</td></tr>
</table></td><td>[4]</td></tr>
</table>

Question	Answer	Marks
4 (d)	1 fertiliser / nutrients, leached into / enter, rivers / streams / lakes ; 2 causing algal bloom / algae growth ; 3 algae block sunlight from entering water ; 4 so rooted plants unable to photosynthesise ; 5 so plants die ; 6 bacteria, decompose / feed, on dead plants ; 7 so bacterial population increase ; 8 bacteria respire aerobically ; 9 bacteria use up the oxygen in the water ; 10 organisms / fish / creatures, die / suffocate / migrate, due to lack of oxygen ;	[max 6]
		[Total: 17]
4 (a)	carbon dioxide / CO_2 ; (aerobic) respiration ; (simple) diffusion ;	[3]
4 (b)	water enters by osmosis ; down a water potential gradient / high(er) to low(er) water potential ; through partially permeable membrane ; needs to remove water to prevent bursting ;	[max 3]
4 (c)	as concentration of sea water increases the removal of water decreases ; as concentration of sea water increases the water potential gradient decreases ; therefore less water enters at higher concentrations of sea water ; less excess water ;	[max 3]
4 (d)	cell walls, inelastic / do not stretch / rigid / inflexible / keep shape of cell ; cells, are turgid / have high turgor pressure ; resist any increase in, volume / pressure ; these cells do not absorb excess water ; the cells will not burst ;	[max 3]
		[Total: 12]

Question	Answer	Marks
6 (a)	1 ringing allows monitoring of, species / population; 2 to check on (population) numbers; 3 find out about life span; 4 to find out where they go (during migration) / to track their position; 5 find out how far birds travel; 6 to find out when they migrate; 7 allows checks on, health of birds / survival rates; 8 breeding success; 9 do not harm the birds / do not make them obvious to predators; 10 AVP; e.g. information from ringing is used in conservation	[2]
6 (b)	1. to prevent extinction; 2. maintain biodiversity; 3. provide feeding grounds for animals / ref. to disruption of food, chains / web; 4. provide, breeding grounds / places for breeding; 5. provide, habitats / shelter; 6. vulnerable to the effects of, development / drainage / AW; 7. ref to flooding / natural disasters; 8. ref to nitrogen cycle; 9. ref to maintenance of water cycle; 10. ref to carbon cycle; e.g. greenhouse gas / carbon storage / carbon sink 11. waste disposal; 12. provide, resources / food / fuel / drugs / raw materials; 13. idea of areas for, recreation / (eco)tourism / education; 14. ethical reasons / aesthetic reasons / AW; 15. AVP; e.g. soil erosion	[5]
		[Total: 7]

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1: Cells and cell processes – Topic questions Paper 5

The questions in this document have been compiled from a number of past papers, as indicated in the table below.

Use these questions to formatively assess your learners' understanding of this topic.

Question	Year	Series	Paper number
1	2016	March	52
1	2016	November	53
2	2016	June	51

The mark scheme for each question is provided at the end of the document.

You can find the complete question papers and the complete mark schemes (with additional notes where available) on the School Support Hub at www.cambridgeinternational.org/support

1 You are going to investigate the effect of temperature on the activity of amylase.

Amylase is an enzyme that catalyses the break down of starch.

Starch changes the colour of iodine solution from orange-brown to blue-black.

You will measure the time taken for the iodine solution to stay orange-brown at two different temperatures.

Amylase can irritate the skin and damage the eyes. Use the eye protection and gloves provided.

Read through steps 1 to 11 **before** starting the experiment.

Step 1 Label a test-tube **W**, add $3\,cm^3$ of starch solution and place it into the beaker of warm water.

Step 2 Label a test-tube **C**, add $3\,cm^3$ of starch solution and place it into the beaker of iced water.

Step 3 Place one dropping pipette into each of test-tubes **W** and **C**.

Step 4 Use the marker pen to draw a line which divides the white spotting tile into two equal halves. Label one half **W** and the other half **C**.

Step 5 Put one drop of iodine solution into each of the wells of the spotting tile.

Step 6 Transfer one drop of the liquid in test-tube **W** to the first well in the half of the spotting tile labelled **W**. Observe any colour change.

Step 7 Transfer one drop of the liquid in test-tube **C** to the first well in the half of the spotting tile labelled **C**. Observe any colour change.

(a) State any colour changes observed in steps 6 and 7.

....

....[1]

Read through steps 8 to 11 and prepare a results table in part **1(b)**. **Do not start step 8 until you have drawn your results table.**

Step 8 Add 20 drops of amylase solution to each of test-tubes **W** and **C**, and stir gently.

Step 9 Start the timer.

Step 10 **Immediately**, transfer one drop of liquid from test-tube **W** to the second well in the half of the spotting tile labelled **W**. Return the remaining liquid in the pipette to test-tube **W** and then place the dropping pipette back into test-tube **W**. **Immediately**, transfer one drop of liquid from test-tube **C** to the second well in the half of the spotting tile labelled **C**. Return the remaining liquid in the pipette to test-tube **C** and then place the dropping pipette back into test-tube **C**.

Observe any colour changes and record your results in the table you prepared in part **1(b)**.

Step 11 Repeat step 10 after 2, 4, 6 and 8 minutes, using different wells in the spotting tile in each case. Record your observations in the table you prepared in part **1(b)**.

(b) Prepare a table to record your observations in the space below.

[6]

(c) Suggest reasons for using separate dropping pipettes for test-tubes **W** and **C**.

....

....

....[1]

(d) Explain your results for test-tube **W**.

....

....

....

....

....

....[3]

(e) Another student carried out the same investigation as you and they concluded:

"The higher the temperature, the greater the activity of amylase."

Do you agree with this conclusion?

Give a reason for your answer.

....

....

....[1]

(f) State **two** sources of error in the method used in your investigation.

Suggest how to improve the method to minimise these sources of error.

error 1 ....

....

improvement 1 ....

....

....

error 2 ....

....

improvement 2 ....

....

....

[4]

(g) Some students stated:

"The activity of amylase is greatest at 40 °C."

Describe an investigation to test whether this statement is correct.

The investigation should be similar to that described in steps 1–11.

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....[6]

(h) Amylase breaks starch down into reducing sugars.

Outline how the students could show that reducing sugars are present in a solution.

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....

....

....[2]

[Total: 24]

Read through all the questions on the paper carefully before starting work.

1 Catalase is an enzyme found in plant and animal cells. It catalyses the breakdown of hydrogen peroxide to form water and oxygen.

$$\text{hydrogen peroxide} \xrightarrow{\text{catalase}} \text{water + oxygen}$$
$$2H_2O_2 \rightarrow 2H_2O + O_2$$

You are going to investigate the effect of surface area on the breakdown of hydrogen peroxide by catalase.

You will use potato as a source of catalase. You will vary the surface area of the potato and measure the volume of oxygen produced by the break down of the hydrogen peroxide.

Read all instructions but DO NOT CARRY THEM OUT until you have drawn a table for your results in the space provided in 1(a).

You should use the gloves and eye protection provided while you are carrying out the practical work.

Step 1 Lay the six potato sticks next to each other on the white tile.

Cut each potato stick to exactly 4 cm in length.

Step 2 Take two of the potato sticks and cut each one into eight equal pieces as shown in Fig. 1.1.

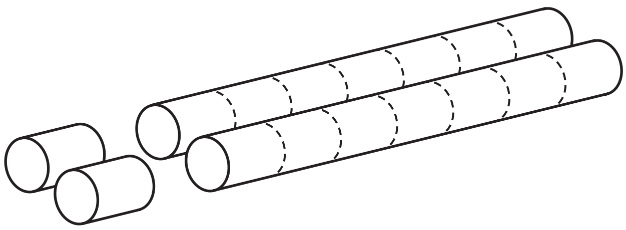

Fig. 1.1

Step 3 Repeat step 2 with two more potato sticks. Leave the last two potato sticks whole.

Step 4 Submerge the 25 cm^3 measuring cylinder in the tub of water and allow it to fill with water. Turn the measuring cylinder upside down keeping the open end under the water in the tub as shown in Fig. 1.2.

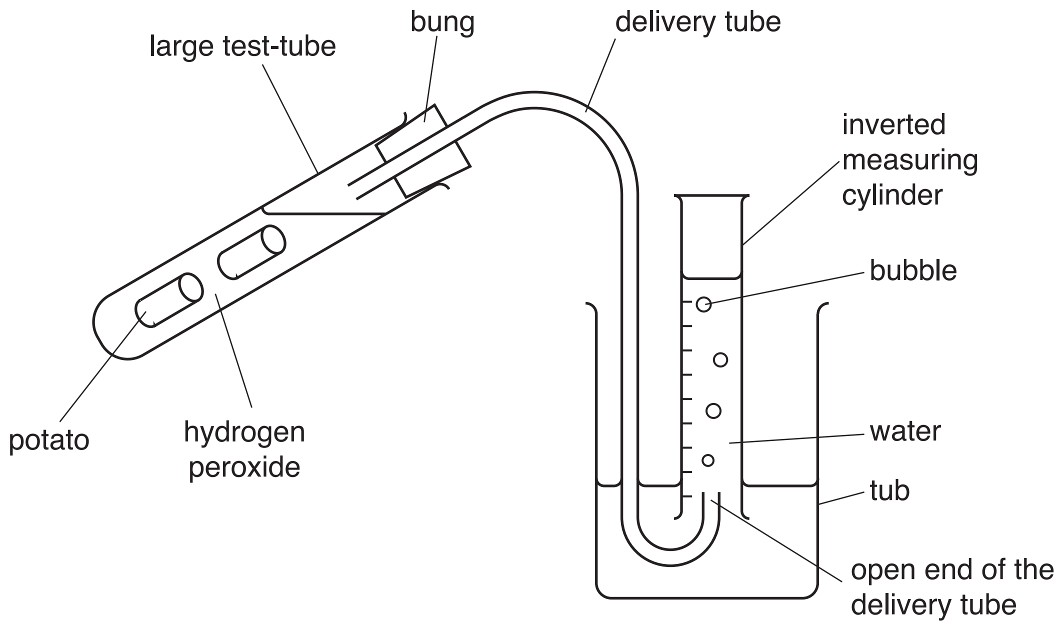

Fig. 1.2

You are going to carry out a practice experiment using two of the potato sticks that have been cut into 8 (a total of 16 pieces). Record the results of this experiment in the space provided in **1(c)**.

Step 5 Place the open end of the delivery tube into the inverted measuring cylinder in the tub of water.

Step 6 Use the syringe to add 20 cm^3 of hydrogen peroxide to the large test-tube.

Step 7 Add the 16 pieces of potato that you cut in Step 2 to the large test-tube and immediately place the bung, attached to the other end of the delivery tube, into the large test-tube.

Step 8 Start the timer and carefully shake the large test-tube briefly every 30 seconds for three minutes.

Step 9 Record the volume of oxygen gas collected in the measuring cylinder for your practice experiment in **1(c)**.

Step 10 Remove the bung and pour the used hydrogen peroxide solution and potato into the beaker labelled **waste**.

Step 11 Rinse the large test-tube with the washing water provided.

Use the results of your practice experiment to choose the most appropriate size of measuring cylinder to use to measure the volume of oxygen gas produced in three minutes. Record your choice in **1(c)**.

Step 12 Repeat Steps 4 to 8 using the 16 pieces of potato that you cut in Step 3 and your chosen measuring cylinder. Record in your table in **1(a)**, the volume of oxygen gas collected in the measuring cylinder after three minutes.

Step 13 Repeat Steps 4 to 8 using the remaining two whole potato sticks in Step 7 and your chosen measuring cylinder. Record the volume of oxygen gas collected in the measuring cylinder after three minutes in your table in **1(a)**.

(a) Prepare a table to record your results.

[4]

(b) **(i)** Calculate the rate of oxygen gas production for each of the values in your table. Give your answer in cm^3 per minute to one decimal place.

Show your working.

whole potato stick .... cm^3 per minute

cut potato stick .... cm^3 per minute
[2]

(ii) Describe the effect on the surface area of the potato of cutting the potato stick into eight pieces.

....

....[1]

(iii) Describe **and** explain, using your results, the effect of surface area on the volume of oxygen gas produced.

....

....

....

....

....

....[3]

(c) Complete the following:

Practice volume of oxygen produced ....

Size of the measuring cylinder used for Steps 12 and 13 ....

Explain why you chose that size.

Explanation ....

....

....[1]

(d) State **two** variables that were kept constant in this investigation.

1 ....

2 ....

[2]

(e) Identify **two** sources of error in this method and suggest an improvement for each error.

error ....

....

improvement ....

....

....

error ....

....

improvement ....

....

....

[4]

(f) Hydrogen peroxide breaks down slowly without catalase enzyme being present.

Describe a suitable control for this investigation.

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....[2]

(g) Another student wanted to investigate the amount of catalase present in different food plants.

Describe a method that the student could use to carry out this investigation.

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....[5]

(h) Table 1.1 shows the volume of oxygen produced when the student carried out the experiment for three different food plants.

Table 1.1

food plant	volume of oxygen produced / cm^3
A	9.2
B	0.8
C	6.7

Plot a graph of the data from Table 1.1 on the grid.

[4]

(i) Describe how the student could test food prepared from these plants for the presence of reducing sugars.

....

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....[3]

[Total: 31]

2 Fig. 2.1 is a photograph of a cross-section of a vascular bundle in a leaf.

Line **AB** shows the length of the vascular bundle.

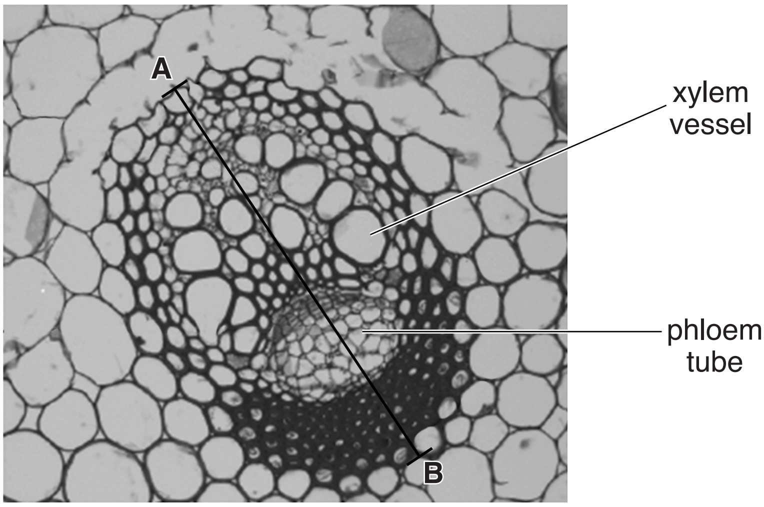

Fig. 2.1

(a) (i) Make a large drawing to show the different regions of the vascular bundle shown in Fig. 2.1.

Do **not** draw any individual cells.

Identify and label on your drawing the position of the xylem vessel as shown in Fig. 2.1.

[5]

(ii) Measure the length of line **AB** as shown on Fig. 2.1. **Include the unit.**

Length of **AB** ....

Mark on your drawing a line in the same position as **AB**.

Measure the line you have drawn.

Length of line on drawing ....

$$\text{magnification} = \frac{\text{length of line on drawing}}{\text{length of } \mathbf{AB}}$$

Calculate the magnification of your drawing using the information above and your answers.

Show your working.

magnification ....
[3]

(iii) State **one** way **visible** in Fig. 2.1 in which the xylem vessel is different from the phloem tube.

....

....

....[1]

(b) The walls of xylem vessels are supported by a chemical called lignin, which can be stained by a red dye. This makes the xylem vessel walls easily seen when using a microscope.

Use this information to plan how you could find the position of the vascular bundles in a stem.

....

....

....

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....

....

....[4]

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Question	Answer	Marks
1 (a)	change to blue-black	[1]
1 (b)	1 one table with ruled lines for at least 6 rows and 3 columns ; 2 a column / row, with header: time / min ; 3 two, columns / rows headings as, colour / observation, W / C ; 4 correct completion of information into table ; 5 W – start is blue-black, gradual change through dark brown to orange-brown ; 6 C – start is blue-black, remains blue-black for longer than W, may turn brown towards the end ;	[6]
1 (c)	idea of minimising contamination ; to measure simultaneously ;	[max 1]
1 (d)	(blue-black shows) starch present at, 0 min / start ; (dark brown shows) some starch present at 2 min ; (orange-brown shows) no starch present, after 2 min / from 4 min ;	[3]
1 (e)	yes : C stayed blue-black for longer / slower colour change ora ; OR no : there is not a large enough range of temperatures ;	[max 1]

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>1 (f)</td><td>any two errors with two matching improvements:
<table>
<tr><th>Source of error</th><th>Improvement</th></tr>
<tr><td>experiment was done only once ;</td><td>repeat entire experiment (at least 3 times in total) to calculate an average;</td></tr>
<tr><td>shaking, can cause spillage / inconsistent mixing ;</td><td>(magnetic) stirrer / glass rod bung / flask to swirl;</td></tr>
<tr><td>drops / dropping pipettes, are imprecise / volume of amylase may not be the same ;</td><td>use syringe / burette / graduated pipette / measuring cylinder ; Accept method without equipment</td></tr>
<tr><td>(long) intervals between testing / AW ; A reaction finishes between points</td><td>test, more often / every minute / 30 seconds;</td></tr>
<tr><td>colour changes are subjective ; A endpoint hard to judge</td><td>colour chart / standards / control with no starch / colorimeter ;</td></tr>
<tr><td>trying to do, W and C simultaneously ;</td><td>do W and C separately / second person to do second tube ;</td></tr>
<tr><td>(water) temperature changes ;</td><td>insulate beakers / use (thermostatically controlled) water bath ;</td></tr>
<tr><td>AVP ; e.g. contents in pipette might contaminate spotting tests</td><td>AVP ; e.g. use clean pipettes each time</td></tr>
</table></td><td>[max 4]</td></tr>
<tr><td>1 (g)</td><td>1 test at 40 °C ;
2 test at least one temperature below 40 °C and one above ;
3 use of water bath (to maintain different temperatures) / AW ;
4&5 named controlled variables ;;
6 measure time taken until iodine becomes orange brown / no longer changes colour ;
7 by repeated sampling at interval of less than 2 mins ;
8 repeat entire experiment / replicates ;
9 relevant stated safety procedure ;</td><td>[max 6]</td></tr>
<tr><td>1 (f)</td><td>Benedict’s solution turns (brick) red ;
with heat ;</td><td>[2]</td></tr>
<tr><td></td><td></td><td>[Total: 24]</td></tr>
</table>

Question	Answer	Marks
1 (a)	table with two / three columns and two / three rows and result recorded in each cell of the table; headings for dependant variable volume of oxygen / gas produced with unit in the header only (cm^3); headings for the independent variable; correct trend in values (cut potato higher than uncut);	[4]
1 (b) (i)	calculates rate by dividing by 3; two correct answers to 1 d.p.;	[2]
1 (b) (ii)	increased / AW	[1]
1 (b) (iii)	*description* greater oxygen production with cut potato / larger surface area; use of data; *explanation* a greater surface area / more catalase, in contact with the hydrogen peroxide / substrate;	[3]
1 (c)	*either* (25 cm^3) the volume of gas produced was greater than 10 cm^3 / the 10 cm^3 measuring cylinder did not hold all of the gas produced; *or* (10 cm^3) the 10 cm^3 measuring cylinder could be read with greater accuracy / precision;	[1]
1 (d)	total length / diameter / width / volume of potato cylinder; concentration / volume of hydrogen peroxide; time;	[2]
1 (e)	*error* – loss of gas while connecting the bung; *improvement* – idea of closed system / three-way tap / doing quickly; *error* – pieces sticking together reduces surface area; *improvement* – shake continuously; *error* – (inconsistent) shaking; *improvement* – sensible suggestion for regular shaking; *error* – potato not measured so not cut into equal sized pieces; *improvement* – measure 5 mm slices; *error* – dilution of peroxide due to washing; *improvement* – use a new large test tube each time; *error* -sticks not from same potato / same variety of potato / different mass / density; *improvement* – use sticks from the same potato / variety of potato / age of potato / measure mass; *error* – temperature fluctuation; *improvement* – water bath; *error* – only one trial ; *improvement* – repeat at least 2 more time ; AVP;	[4]

Question	Answer	Marks
1 (f)	keep (all) variables the same / AW; substitute plant material for inert material e.g. glass beads / leave out potato; idea of collecting gas produced solely by decomposition and subtracting this value/ AW;	[2]
1 (g)	1 use the same size (surface area) of plant; 2 carry out experiment at the same temperature / pH; 3 other variable from previous method; 4 measure volume of oxygen produced; 5 plans to repeat experiment; 6 calculate the mean; 7 comparison of volumes for different food plants; 8 reference to relevant safety feature;	[5]
1 (h)	**A**(xes) – labelled with units, y-axis even scale; **S**(ize) – occupies at least half the grid; **P**(lot) – all bars plotted accurately ± ½ square; **B**(ars) – ruled lines, have an equal gap between each component and are equal width;	[4]
1 (i)	add Benedict's solution; heat; red / brown / green / yellow precipitate indicates reducing sugars present;	[3]
		[Total: 31]
2 (a) (i)	Outlines – all lines single, clear and unbroken ; Size – occupies at least half of the space provided ; Detail – oval shape + phloem + 1 other area ; two other areas shown ; Label – line to correct area on drawing to show position of xylem (vessel) and line labelled "xylem"	[5]
2 (a) (ii)	measurement of AB = 58 mm; line on their drawing and length measured with correct unit ; correct magnification calculation;	[3]
2 (a) (iii)	(xylem) walls thick(er) / large (er) / wide(er); (xylem vessels) round(er) ; (xylem) has large(r) cross section area / big(ger) ;	[max 1]
2 (b)	1 use of any suitable plant material; 2 put stem / material chosen in (red) dye / add dye to cut (stem) surface; 3 time for absorption of dye; 4 cut (sections) of stem or material chosen; 5 (red stained xylem) will indicate position of vascular bundle	[max 4]
		[Total: 13]

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2: Animal nutrition – Topic questions

Paper 5

The questions in this document have been compiled from a number of past papers, as indicated in the table below.

Use these questions to formatively assess your learners' understanding of this topic.

Question	Year	Series	Paper number
1	2016	June	52

The mark scheme for each question is provided at the end of the document.

You can find the complete question papers and the complete mark schemes (with additional notes where available) on the School Support Hub at www.cambridgeinternational.org/support

Read through all the questions on this paper carefully before starting work.

1 You are going to test the composition of three liquid food supplements: **P**, **Q** and **R**.

Use the eye protection provided.

Read through steps 1 to 5 before starting the experiment.

(a) You will test the three food supplements, **P**, **Q** and **R**, for vitamin C.

Only **two** of the food supplements contain a high amount of vitamin C.

When iodine solution is mixed with starch a blue-black colour is observed. Vitamin C stops the blue-black colour from forming.

Step 1 Label a test-tube **P** and add $3\,cm^3$ of food supplement **P** to the test-tube.

Step 2 Add $1\,cm^3$ of starch solution to test-tube **P**.

Step 3 Add iodine solution to test-tube **P**, one drop at a time. Count the drops as you add them. Gently shake the test-tube from side to side after adding each drop. Stop adding drops when a blue-black colour remains **or** when you have added 20 drops of iodine solution.

Step 4 Record the number of drops added in Table 1.2.

Step 5 Repeat steps **1** to **4** with food supplements **Q** and **R**.

Table 1.1 shows how the number of drops of iodine solution added relates to the vitamin C content of the food supplement.

Table 1.1

number of drops of iodine solution added	vitamin C content
1	none
2–3	low
4 or more	high

(i) Use your results and the information in Table 1.1 to complete Table 1.2.

Table 1.2

food supplement	number of drops of iodine solution added	vitamin C content
P		
Q		
R		

[2]

(ii) There is a source of error in step **3** of the method for the vitamin C test.

Identify this source of error **and** suggest why it is a source of error in the experiment.

....

....

....

.... [2]

(b) **(i)** You will now test the food supplements, **P**, **Q** and **R**, to find their reducing sugar content.

A positive result for the test for reducing sugar is a colour change from blue.

The quicker the colour changes, the higher the concentration of reducing sugar.

Read through steps 6 to 11 before starting the experiment.

Step 6 Label a test-tube **P2** and add 3 cm^3 of food supplement **P** to the test-tube.

Step 7 Add 3 cm^3 of the reducing sugar test solution to test-tube **P2**.

Step 8 Repeat steps 6 and 7 with food supplements **Q** and **R**.

Step 9 Raise your hand to request a beaker of hot water.

Step 10 Place test-tubes **P2**, **Q2** and **R2** into the beaker of hot water, and **immediately** start the timer.

Step 11 Observe the test-tubes and in Table 1.3 record the time as soon as the colour changes from blue.

If there is no colour change after 180 seconds (3 minutes), stop timing and record 'more than 180' as the result for that test-tube.

Table 1.3

test-tube	time for colour change / s

[3]

(ii) Name the solution used to test for reducing sugars.

.... [1]

(c) State **one** source of error in the method used for the reducing sugar test.

Suggest how to improve the method to minimise this source of error.

error

....

....

....

improvement

....

....

....
[2]

(d) Some students carried out the test for protein on food supplements **P**, **Q** and **R**.

(i) State the chemical test you would use to show that protein is present.

.... [1]

(ii) Food supplements **P** and **R** contain protein. Food supplement **Q** does not contain protein.

Complete Table 1.4 to show the results from the students' tests for protein.

Table 1.4

food supplement	colour at start	colour at end
P		
Q		
R		

[2]

(e) Table 1.5 shows the protein content of five foods.

Table 1.5

food	protein content of food / g per 100 g
maize	3.2
rice	7.1
potato	2.0
yam	1.5
sorghum	11.3

(i) Plot a graph of the data shown in Table 1.5.

[4]

(ii) It is recommended that a six-year-old child eats 20 g of protein per day.

Calculate the mass of sorghum a six-year-old child must eat each day to obtain 20 g of protein.

Show your working.

Give your answer to the nearest whole number.

.... g

[2]

[Total: 19]

Abbreviations used in the Mark Scheme:

;	separates marking points
/	alternatives
I	ignore
R	reject
A	accept (for answers correctly cued by the question, or guidance for examiners)
AW	alternative wording (where responses vary more than usual)
AVP	any valid point
ecf	credit a correct statement / calculation that follows a previous wrong response
ora	or reverse argument
( )	the word / phrase in brackets is not required, but sets the context
underline	actual word given must be used by candidate (grammatical variants excepted)
max	indicates the maximum number of marks that can be given

Question	Answer	Marks
1 (a) (i)	larger number of drops for P & R than Q ; P and R both have vitamin C and Q has none ;	[2]
1 (a) (ii)	using drops of / a dropper for iodine solution ; each drop will be a different volume / amount ; OR drops dribble down side of test-tube ; not all reaches liquid in bottom ;	[2]
1 (b) (i)	all cells completed ; time to colour change in R less than P ; OR two positive results of very similar time ; more than 180 recorded for Q ;	[3]
1 (b) (ii)	Benedict's (solution / reagent) ;	[1]
1 (c)	*Source of error* / *Improvement*: idea of difficult to be sure of colour change ; / white or black background / compare with standard / compare with a control ; cannot add all tubes to hot water simultaneously/cannot monitor colour change in three tubes simultaneously ; / do tubes separately ;	[max 2]

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>1 (d) (i)</td><td>Biuret</td><td>[1]</td></tr>
<tr><td>1 (d) (ii)</td><td><table><tr><th>food supplement</th><th>colour at start</th><th>colour at end</th></tr><tr><td>P</td><td>blue</td><td>lilac</td></tr><tr><td>Q</td><td>blue</td><td>blue ;</td></tr><tr><td>R</td><td>blue</td><td>lilac ;</td></tr></table>rows P and R correct – 1 mark
row Q correct – 1 mark</td><td>[2]</td></tr>
<tr><td>1 (e) (i)</td><td>A – axes labels with units ;
S – even scale and plots to fill at least ½ of grid both directions ;
P – plots accurate to ± ½ square ;
B – bars of equal width, not touching and with equal space between them ;</td><td>[4]</td></tr>
<tr><td>1 (e) (ii)</td><td>177;
(20 ÷ 11.3) × 100</td><td>[2]</td></tr>
<tr><td></td><td></td><td>[Total: 19]</td></tr>
</table>

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3: Plant nutrition and transport – Topic questions Paper 5

The questions in this document have been compiled from a number of past papers, as indicated in the table below.

Use these questions to formatively assess your learners' understanding of this topic.

Question	Year	Series	Paper number
2	2016	June	52

The mark scheme for each question is provided at the end of the document.

You can find the complete question papers and the complete mark schemes (with additional notes where available) on the School Support Hub at www.cambridgeinternational.org/support

2 Fig. 2.1 shows the apparatus used to measure the rate of water loss from the leaves of a plant.

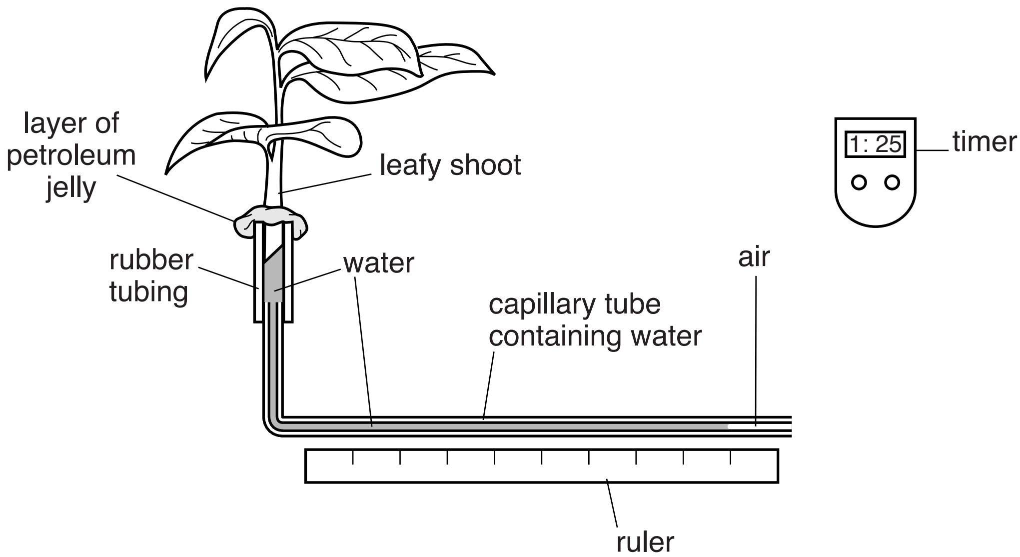

Fig. 2.1

(a) Suggest how a student might use the apparatus shown in Fig. 2.1 to calculate the **rate** of water loss from the leaves of a leafy shoot.

....

....

....

....

.... [2]

The student used the apparatus shown in Fig. 2.1 to compare the rates of water loss from leaves in still and moving air.

(b) Suggest **one** piece of apparatus that the student could use to vary the air movement.

.... [1]

(c) State **two** variables that the student should keep constant in this investigation.

1 ....

....

2 ....

....

[2]

Petroleum jelly is greasy and waterproof.

(d) Suggest the purpose of the petroleum jelly on the apparatus shown in Fig. 2.1.

....

.... [1]

The student's results are shown in Fig. 2.2.

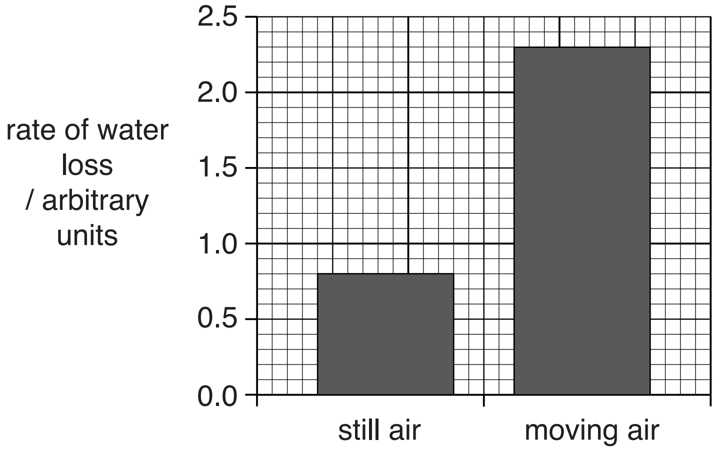

Fig. 2.2

(e) The rate of water loss is greater in moving air than still air.

Use Fig. 2.2 to calculate how many times greater the rate of water loss is in moving air than still air.

Show your working.

Give your answer to one decimal place.

....

[2]

(f) Another student thinks that the apparatus in Fig. 2.1 does not measure water **loss** from the leaves.

Suggest why this student is correct.

....

....

.... [1]

(g) Fig. 2.3 shows some laboratory apparatus.

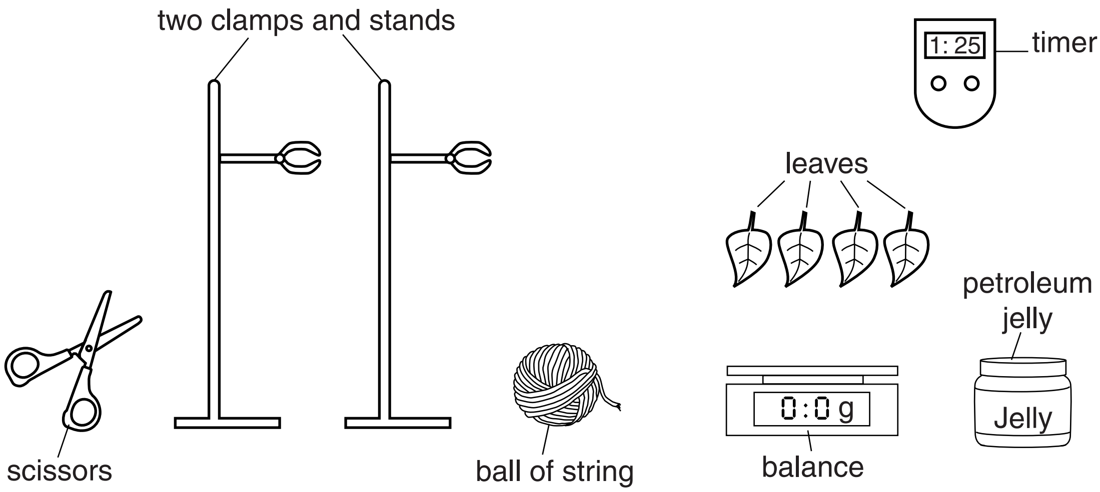

Fig. 2.3

Petroleum jelly is greasy and waterproof.

Describe, with the aid of a labelled diagram, how you could set up the apparatus shown in Fig. 2.3 to find out whether the upper or the lower surface of the leaves loses more water by evaporation.

....

....

....

....

....

....

....

....

.... [6]

(h) Fig. 2.4 shows a section of a stem as seen under a light microscope.

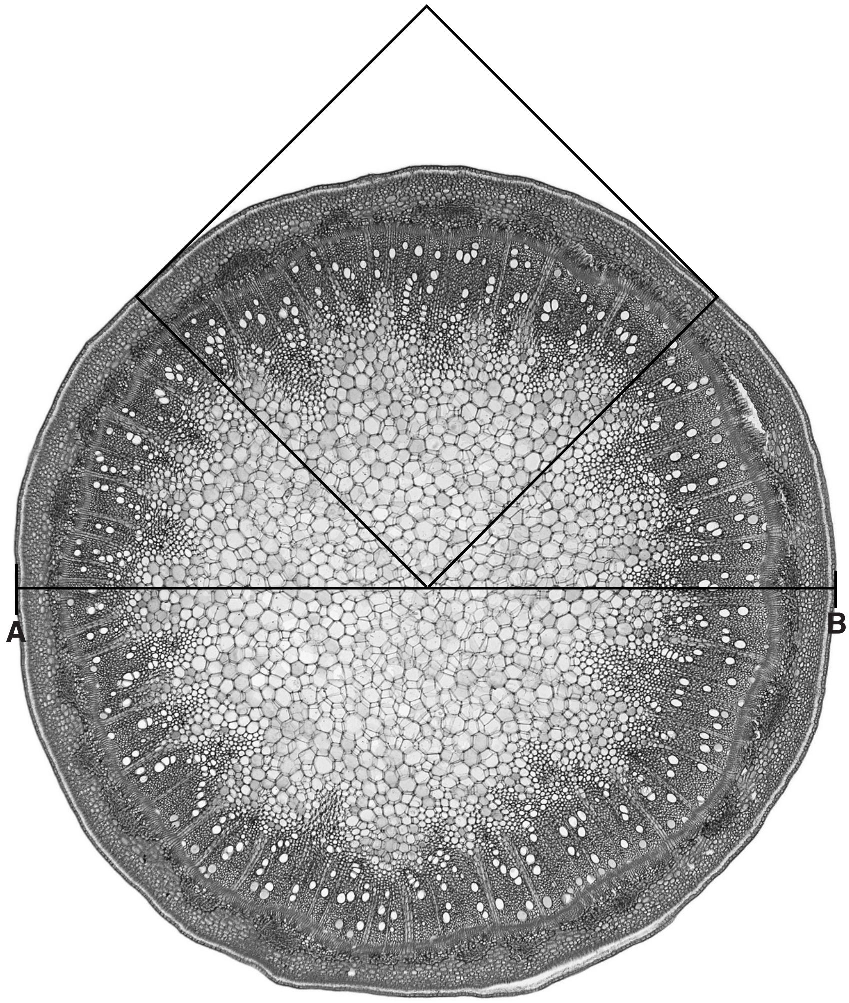

Fig. 2.4

Make a large drawing of the section of the stem contained in the square on Fig. 2.4 to show the different structures and layers.

Do not draw any individual cells.

[4]

(i) **(i)** The diameter of the stem in Fig. 2.4 is shown by the line **AB**.

Measure the length of **AB** on Fig. 2.4.

measured length of line **AB** .... mm [1]

(ii) The actual diameter of the stem is 7.5 mm.

The magnification of Fig. 2.4 can be calculated using the following equation:

$$\text{magnification} = \frac{\text{length of } \mathbf{AB}}{\text{actual diameter of stem}}$$

Calculate the magnification of Fig. 2.4 using the information above and your answer to **(i)**.

Show your working.

Give your answer to the nearest whole number.

magnification .... [1]

[Total: 21]

Abbreviations used in the Mark Scheme:

;	separates marking points
/	alternatives
I	ignore
R	reject
A	accept (for answers correctly cued by the question, or guidance for examiners)
AW	alternative wording (where responses vary more than usual)
AVP	any valid point
ecf	credit a correct statement / calculation that follows a previous wrong response
ora	or reverse argument
( )	the word / phrase in brackets is not required, but sets the context
underline	actual word given must be used by candidate (grammatical variants excepted)
max	indicates the maximum number of marks that can be given

Question	Answer	Marks
2 (a)	measure distance moved by air / water / meniscus ; for a set period of time;	[max 2]
2 (b)	fan / hairdryer	[1]
2 (c)	any 2 from: leaf area / size ; type/species of plant / use same leaves ; light (intensity) ; temperature ; diameter of capillary tubing ; no additional air movement, e.g. windows open ; humidity ;	[max 2]
2 (d)	to prevent water leakage / AW ; to stop air getting in ;	[max 1]
2 (e)	correct reading from the graph (2.3 and 0.8) ; 2.3 / 0.8 = 2.9 ;	[2]
2 (f)	idea that it actually measures water uptake (not loss);	[1]

Question	Answer	Marks
2 (g)	drawing showing apparatus set up ; description of the treatments ; any 4 of: 1 use of a control with a correct example, 2 weigh (mass of) leaves at beginning with petroleum jelly applied; 3 weigh leaf at end ; 4 for a set period of time ; 5 describe a controlled variable / named environmental factor being kept constant ; 6 repeat experiment / described e.g. two leaves with same treatment ;	[max 6]
2 (h) (i)	O – all lines single, clear and unbroken with no shading ; S - drawing occupies at least half the space ; D1 – no cells and only the sector drawn ; D2 – detail ;	[4]
2 (h) (ii)	108 ± 1 mm ;	[1]
2 (h) (iii)	(x)14 ; A 15 if (ii) 109 mm ecf for incorrect measurement in (h) (ii) R if units included with the magnification	[1]
		[Total: 21]

4: Respiration and the human transport system – Topic questions Paper 5

The questions in this document have been compiled from a number of past papers, as indicated in the table below.

Use these questions to formatively assess your learners’ understanding of this topic.

Question	Year	Series	Paper number
2	2016	November	52

The mark scheme for each question is provided at the end of the document.

You can find the complete question papers and the complete mark schemes (with additional notes where available) on the School Support Hub at www.cambridgeinternational.org/support

2 **(a)** A group of students investigated the effect of two different exercises on the heart rate of ten male and ten female students.

Before the first exercise, the pulse rate at rest was measured and the group then jumped on the same spot for two minutes without moving their arms. Every two seconds an investigator shouted 'jump'.

After two minutes the pulse rate was measured and the students were allowed ten minutes to rest.

Before the second exercise, the pulse rate at rest was measured again and the group was asked to do a different exercise.

The students jumped on the same spot for two minutes lifting their arms above their head as they jumped up and dropping their arms as they came down. Every two seconds an investigator shouted 'jump'.

Table 2.1 shows the results of this investigation.

Table 2.1

activity	average pulse rate / beats per minute		
	male students	female students	all students
resting	68	74	71
after jumping	96	92	
after jumping and moving arms	128	140	

(i) Complete Table 2.1 by writing in the average pulse rate for all students after both forms of exercise.

[2]

(ii) Describe **two** variables in this investigation that have been controlled.

1 ....

....

2 ....

....

[2]

(iii) Explain why the students had to rest before carrying out the second exercise.

....

....[1]

(iv) State **one** variable that cannot be controlled during the exercise and describe the effect of this variable on the results of the investigation.

variable ....

effect on results ....

....

....

[2]

(b) **(i)** Plot a bar chart of the data in Table 2.1, for both the male and the female students, on the grid.

[4]

(ii) State **one** similarity and **one** difference the effect of exercise has on males and females.

similarity ....

....

....

difference ....

....

....

[2]

(c) Fig. 2.1 shows a photomicrograph of a cross section of an artery from a mammal.

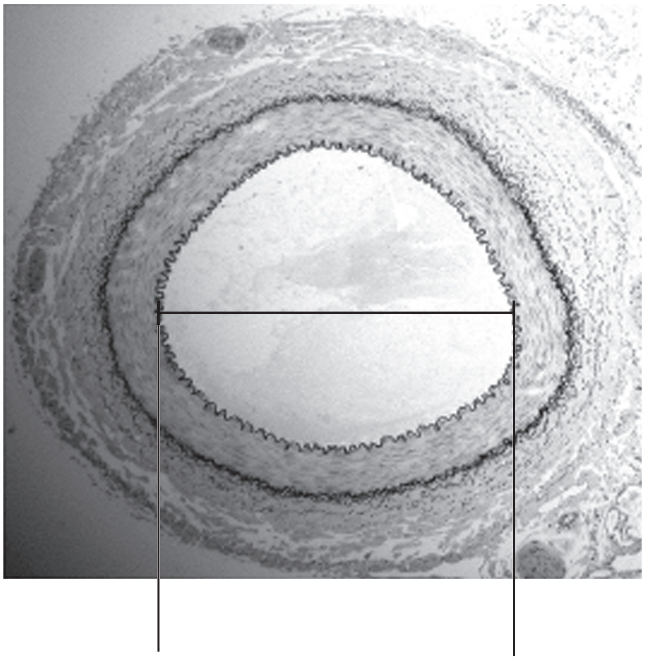

Fig. 2.1

(i) Make a large diagram of this cross section to show the layers forming the wall of the artery.

[3]

(ii) Measure the diameter of the lumen of the artery between points **X** and **Y** on Fig. 2.1. **Include the unit**.

Diameter of the lumen on Fig. 2.1 ....

Draw a line in the same position on your drawing and measure the diameter of the lumen on your drawing.

Diameter of the lumen on your drawing ....

$$\text{magnification} = \frac{\text{diameter of the lumen on your drawing}}{\text{diameter of the lumen on Fig. 2.1}}$$

Calculate the magnification of your drawing using the equation given and your answers.

Show your working.

magnification ....
[3]

[Total: 19]

Abbreviations used in the Mark Scheme:

;	separates marking points
/	alternatives
I	ignore
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AW	alternative wording (where responses vary more than usual)
AVP	any valid point
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<u>underline</u>	actual word given must be used by candidate (grammatical variants excepted)
max	indicates the maximum number of marks that can be given

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>2 (a) (i)</td><td>94;
134;</td><td>[2]</td></tr>
<tr><td>2 (a) (ii)</td><td>same time / 2 minutes for whole exercise;
same time / 10 minutes for rest between exercises;
same rate / every 2 sec for each jump;
equal numbers of male and female students;
idea of same students in each exercise;</td><td>[2]</td></tr>
<tr><td>2 (a) (iii)</td><td>to allow pulse rate to recover / return to normal / resting (before doing another exercise);
so the effect of the two exercises can be compared;</td><td>[1]</td></tr>
<tr><td>2 (a) (iv)</td><td><table><tr><th>variable</th><th>effect on results</th></tr><tr><td>idea of effort put into exercise;</td><td>more effort would make pulse rate increase more;</td></tr><tr><td>idea of fitness;</td><td>pulse would increase less for fitter students;</td></tr></table></td><td>[2]</td></tr>
<tr><td>2 (b) (i)</td><td>correct reading from the graph (2.3 and 0.8) ;
2.3 / 0.8 = 2.9 ;</td><td>[2]</td></tr>
</table>

Question	Answer	Marks
2 (b) (ii)	*any 1 of:* (s) exercise increases heart / pulse rate; (s) idea that the more intense the exercise the more increase in heart / pulse rate; *any 1 from* (d) jumping without moving arms shows greater increase in males than females; (d) jumping and moving arms shows greater increase in females than males;	[2]
2 (c) (i)	*drawing of cross section of artery* **O**(utline) – single clear lines and without shading; **S**(ize) – occupies at least half of the space provided; **D** (detail) to show at least 2 layers and wavy lining;	[3]
2 (c) (ii)	diameter of lumen = 47 (±1) mm; diameter of drawing = **X** ± 1 mm; correct magnification;	[3]
		[Total: 19]

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5: Coordination, responses and homeostasis – Topic questions **Paper 5**

The questions in this document have been compiled from a number of past papers, as indicated in the table below.

Use these questions to formatively assess your learners' understanding of this topic.

Question	Year	Series	Paper number
1	2016	June	53
1	2016	November	51

The mark scheme for each question is provided at the end of the document.

You can find the complete question papers and the complete mark schemes (with additional notes where available) on the School Support Hub at www.cambridgeinternational.org/support

Read through all of the questions in this paper carefully before starting work.

1 Fig. 1.1 shows an elephant, *Loxodonta africana*. They have large ears which help them to control their body temperature.

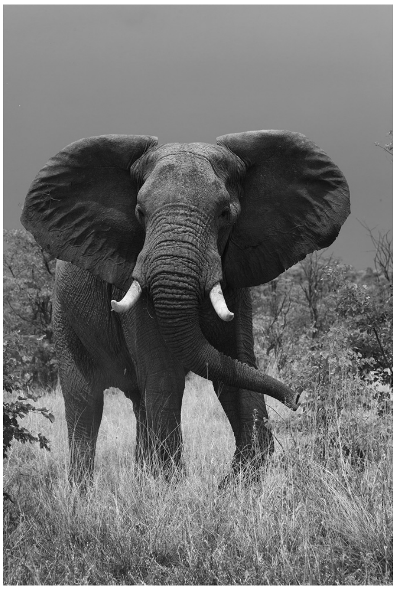

Fig. 1.1

When the elephant is too hot, more blood is pumped into the blood vessels in the elephant's ears. Increasing blood flow to the surface of the skin helps the elephant to cool down.

You are going to set up a model of what happens in the elephant's ears as shown in Fig. 1.2.

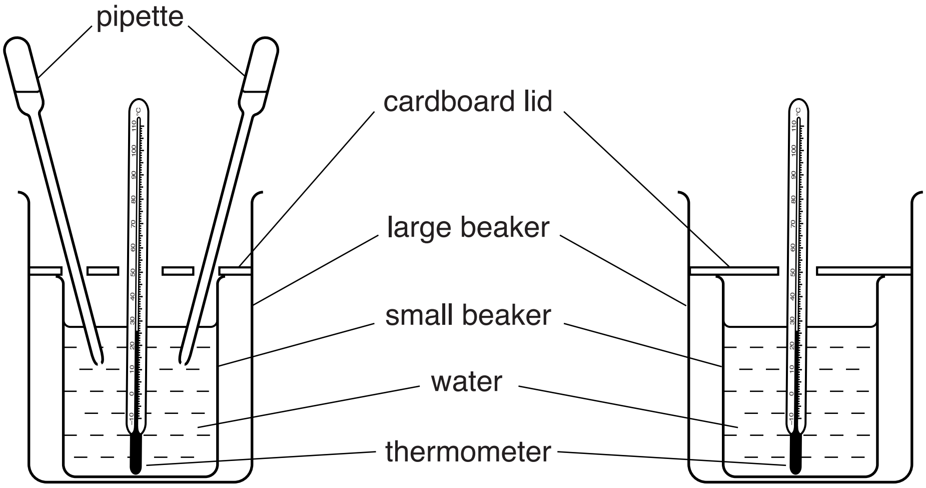

Fig. 1.2

You will place hot water into two small beakers and stand each one in a larger beaker. One of the small beakers will have 'ears' and the other will not.

The 'ears' will be represented by two plastic dropping pipettes. You will squeeze and release the pipette ears throughout the experiment so that water continuously moves out of and into the pipettes.

You will measure and record the starting temperature of the hot water in both small beakers and then record the temperature of the water every minute for a total of eight minutes.

(a) Before you start the practical work, prepare a table to record your observations in the space below.

[6]

(b) Suggest **one** safety precaution that you will take during this experiment.

....

....

....[1]

Step 1 Place one small beaker into each of the large beakers.

Step 2 Cut two circles from the piece of cardboard. The circles should fit inside the large beakers and completely cover the top of the small beakers.

Step 3 Make a small hole in each circle of cardboard for a thermometer to pass through and make two additional holes in **one** of the circles of cardboard for the pipette ears to pass through.

Step 4 Carefully insert the thermometers and pipette ears through the holes in the circles of cardboard as shown in Fig. 1.2.

Step 5 Raise your hand for hot water. The hot water will be poured into both of the small beakers.

Step 6 **Immediately** and carefully place the circles of cardboard on top of the small beakers. Measure and record the starting temperature of the water in both beakers.

Step 7 Start the timer.

Step 8 Begin to squeeze and release the pipette ears so that they empty and fill with hot water. Continue doing this throughout the experiment.

Step 9 Measure the temperature of the water in each small beaker every minute for a total of eight minutes.

Step 10 Record your observations in the table in part **(a)**.

(c) **(i)** A student repeated this experiment and calculated the change in temperature of the water each minute for eight minutes in both small beakers.

The change in temperature in the small beaker with pipette ears was 18 °C.

The change in temperature in the small beaker without pipette ears was 11 °C.

Explain why it is important to calculate the change in temperature in each beaker.

....

....

....

....

....[2]

(ii) Use the information in part **(c)(i)** to calculate the **rate** of temperature change in the small beaker with pipette ears for the student's experiment.

Show your working.

Give your answer to two significant figures.

rate of temperature change ....°C per min
[2]

(d) **(i)** Suggest and explain **two** sources of error in your experiment.

1 ....

....

....

....

2 ....

....

....

....
[4]

(ii) Suggest an improvement that will reduce one of the sources of error identified in **(d)(i)**.

....

....[1]

(e) Fig. 1.3 shows a different species of elephant, *Elephas maximus*, to the one shown in Fig. 1.1.

Fig. 1.3

(i) State **one** visible difference between the ears of the elephant in Fig. 1.3 and those of the elephant shown in Fig. 1.1.

....

....[1]

(ii) Based on this difference and the results of the student's experiment in part **(c)(i)**, what can you conclude about the environmental conditions that the elephant shown in Fig. 1.3 lives in compared to the elephant in Fig. 1.1?

....

....

....[1]

[Total: 18]

Read through all the questions on this paper carefully before starting work.

1 Some animals have a body temperature that is higher than the temperature of the environment.

As a result these animals lose heat to the environment, causing their body temperature to fall.

You are going to investigate the effect of the volume of the body on the loss of heat to the environment.

The volume of the body of an animal and its temperature can be represented by hot water.

Complete question **1(a)** before starting the investigation.

Step 1 Label two beakers, one beaker **A** and another beaker **B**.

Step 2 Draw a line on beaker **A**, 6 cm up from the bottom of the beaker.

Step 3 Raise your hand when you are ready for hot water to be added to the container labelled **hot water**.

Step 4 Add hot water to beaker **A** up to the 6 cm mark.

Step 5 Place the thermometer in the water in beaker **A** and start the timer.
Immediately measure the temperature of the water and record it in your results table.
Leave the thermometer in the water throughout the investigation.

Step 6 After 1 minute, measure the temperature of the water in beaker **A** and record it in your results table.

Step 7 Repeat step 6 after 2, 3, 4 and 5 minutes and record these results.

Step 8 Raise your hand to get the container labelled **hot water** refilled with hot water.

Step 9 Draw a line on beaker **B**, 3 cm up from the bottom of the beaker.

Step 10 Add hot water to beaker **B** up to the 3 cm mark.

Step 11 Repeat steps 5 to 7 for beaker **B**.

(a) Prepare a table to record your results in the space below.

[6]

(b) **(i)** The rate of heat loss is the fall in temperature per minute.

Calculate the rate of heat loss between 0 and 5 minutes for both beakers.
Include the units.

Show your working.

beaker **A**

....

beaker **B**

....
[4]

(ii) Using your results, suggest a relationship between the volume of the body and heat loss.

....

....

....

....[2]

(c) (i) State **two** variables in this investigation that have been controlled.

1 ....

2 ....
[2]

(ii) Suggest why the thermometer must be left in the water throughout the investigation.

....

....[1]

(iii) There is a possible source of error in step 2 and step 9 of this investigation.

Identify the source of error and describe how to modify steps 2 and 9 to improve this investigation.

....

....

....

....[2]

(d) Some students were asked to test the hypothesis:

The colder the surroundings, the faster a small mammal's temperature will drop.

Describe how the students could modify the investigation you have carried out to test this hypothesis.

Do **not** carry out this experiment.

....

....

....

....

....

....

....

....

....

....

....

....

....[6]

(e) Humans sweat when they get too hot.

The effect of the temperature of the room on the average rate of sweating was investigated.

The results are shown in Table 1.1.

Table 1.1

temperature of room / °C	average rate of sweating / cm^3 per hour
13	10
22	40
30	320
36	740
40	1180

(i) Plot a graph, using the data in Table 1.1, on the grid.

[4]

(ii) Describe the effect of the temperature of the room on the average rate of sweating.

....

....

....

....[2]

[Total: 29]

Abbreviations used in the Mark Scheme:

;	separates marking points
/	alternatives
I	ignore
R	reject
A	accept (for answers correctly cued by the question, or guidance for examiners)
AW	alternative wording (where responses vary more than usual)
AVP	any valid point
ecf	credit a correct statement / calculation that follows a previous wrong response
ora	or reverse argument
( )	the word / phrase in brackets is not required, but sets the context
<u>underline</u>	actual word given must be used by candidate (grammatical variants excepted)
max	indicates the maximum number of marks that can be given

Question	Answer	Marks
1 (a)	one table drawn with rows and (3) columns ; appropriate column headings with units (°C and min) ; table shows starting temperatures ; correct completion of the table ; temperature in both beakers decreases with time ; faster rate of temperature decrease in the beaker with 'ears' ;	[6]
1 (b)	wear goggles / gloves / method to reduce spillages / stand up when working ;	[1]
1 (c) (i)	may have different starting temperatures ; enables results to be compared / AW ; allows calculation of rate ;	[2]
1 (c) (ii)	2.3 ; working 18 ÷ 8	[2]
1 (d) (i)	suggest do not fit snugly on the beaker / holes made in the cardboard/more holes in the lid with the ears ; water volume not measured ; squeeze rate not consistent / defined ; difficult to measure both times simultaneously ; explain heat may be lost through gaps / more holes so greater heat loss ; different volumes cool at different rates ;	[4]

Question	Answer	Marks
1 (d) (ii)	improve insulation of beaker ; start temperatures the same ; measure volume of water in beakers ; squeezing regularly / force of squeezing ; stir water ; use digital thermometer ; tape holes ; sequential experiments ;	[1]
1 (e) (i)	smaller ears	[1]
1 (e) (ii)	cooler temperature	[1]
		[Total: 18]
1 (a)	one table drawn with lines ; column / row headings (time and temperature); appropriate units (°C and minutes) in the header only; temperatures recorded for beaker **A** ; temperatures recorded for beaker **B** ; appropriate trend;	[6]
1 (b) (i)	temperature fall correct for beaker **A** and **B** (with units) ; divide both temperature differences by 5 (minutes) ; correct answer obtained; correct units (°C / min) ;	[4]
1 (b) (ii)	the greater the volume of the body, the smaller the rate of heart loss / ref to speed (e.g. slower) / **ora;** rate of heat loss in **A** is less than beaker **B** / **ora** ; appropriate data quote comparing **A** and **B**; the greater the volume of the body, the greater the (total) heat loss / **ora**;	[2]
1 (c) (i)	*any 2 from:* temperature of environment; size / volume of beaker; starting temperature of water; time intervals / 1 minute to record temperature ; total time / 5 minutes for investigation;	[2]
1 (c) (ii)	*idea* of time taken for the thermometer to reach the water temperature is longer;	[1]
1 (c) (iii)	*error:* drawing the line accurately / judging the water level against the line / measuring height (rather than volume); *improvement:* measure the volumes of water / AW ;	[2]

Question	Answer	Marks
1 (d)	*any 6 from:* 1 identical containers / containers of equal volume / containers of equal size; 2 same volume of water in each container; 3 same starting temperature for the water; 4 idea of placing (containers) in 2 or more different temperatures; 5 detail of method to keep external temperature constant, e.g. use of water-bath or a fridge and explanation; 6 measure temperature in each container for the same time / measure temperature in each container at set intervals; 7 repeat and calculate an average / mean; 8 calculate / compare rate of heat loss (for each temperature);	[6]
1 (e) (i)	**A**(xes) – labelled with units; **S**(cale) – even scale and plots to fill half or more of the printed grid ; **P(**lot) – all points plotted accurately ± ½ square ; **L**(ine) – line joining all the points ± ½ square ;	[4]
1 (e) (ii)	as temperature increases (rate of) sweating increases / **ora**; idea of increasing rate of increase as temperature rises / not a linear relationship / not directly proportional;	[2]
		[Total: 29]

Cambridge Assessment International Education

Cambridge IGCSE™

1: Cells and cell processes – Topic questions Paper 6

The questions in this document have been compiled from a number of past papers, as indicated in the table below.

Use these questions to formatively assess your learners' understanding of this topic.

Question	Year	Series	Paper number
1	2016	March	62
1	2016	November	63
2	2016	June	61

The mark scheme for each question is provided at the end of the document.

You can find the complete question papers and the complete mark schemes (with additional notes where available) on the School Support Hub at www.cambridgeinternational.org/support

1 Some students investigated the effect of temperature on the activity of amylase.

Amylase is an enzyme that catalyses the break down of starch.

Starch changes the colour of iodine solution from orange-brown to blue-black.

Step 1 The students added 2 cm^3 of starch solution to a test-tube, labelled it **W**, and placed it into a beaker of warm water.

Step 2 They added 2 cm^3 of starch solution to a second test-tube, labelled it **C**, and placed it into a beaker of iced water.

Step 3 The students placed one dropping pipette into each of test-tubes **W** and **C**.

Step 4 They waited five minutes before continuing.

Step 5 The students added 10 drops of amylase solution to each of test-tubes **W** and **C** and shook both test-tubes gently.

Step 6 They started a timer.

Step 7 The students immediately tested the liquids in test-tubes **W** and **C** for starch using iodine solution.

Step 8 The students repeated step 7 after 2, 4, 6 and 8 minutes.

(a) Iodine solution can affect the activity of amylase.

The students tested the liquids in test-tubes **W** and **C** using iodine solution without affecting the activity of the amylase.

Describe how the students did this.

....

....

....

....

....[2]

The students observed that the liquid from test-tube **W** turned the iodine solution blue-black after 0 minutes, dark brown after 2 minutes, and it remained orange-brown after 4, 6 and 8 minutes.

The liquid from test-tube **C** turned the iodine solution blue-black after 0, 2 and 4 minutes and dark brown after 6 and 8 minutes.

(b) Prepare a table to record these observations in the space below.

[4]

(c) Suggest reasons for:

(i) waiting for five minutes at step 4

....

....

....[1]

(ii) using separate dropping pipettes for test-tubes **W** and **C**.

....

....

....[1]

(d) Explain the observations for test-tube **W**.

....

....

....

....

....

....

....[3]

(e) The students concluded:

"The higher the temperature, the greater the activity of amylase."

Do you agree with this conclusion?

Give a reason for your answer.

....

....

....[1]

(f) There is a source of error in step 5 of the method.

(i) Identify this source of error.

....

....

....[1]

(ii) Suggest apparatus that could be used to minimise this source of error.

....[1]

(g) State **one** other source of error in the method used in this investigation.

Suggest how to improve the method to minimise this source of error.

error ....

....

....

improvement ....

....

....

.... [2]

(h) Some students stated:

"The activity of amylase is greatest at 40 °C."

Describe an investigation to test whether this statement is correct.

The investigation should be similar to that described in steps 1–8.

....

....

....

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....[6]

(i) Amylase breaks starch down into reducing sugars.

Outline how the students could show that reducing sugars are present in a solution.

....

....

....

....

....[2]

[Total: 24]

1 Catalase is an enzyme found in plant and animal cells. It catalyses the breakdown of hydrogen peroxide to form water and oxygen.

$$\text{hydrogen peroxide} \xrightarrow{\text{catalase}} \text{water + oxygen}$$
$$2H_2O_2 \rightarrow 2H_2O + O_2$$

Students investigated the effect of surface area on the breakdown of hydrogen peroxide by catalase.

They used potato as a source of catalase. They varied the surface area of the potato and measured the volume of oxygen gas produced by the break down of the hydrogen peroxide.

Step 1 Three potato sticks, of the same diameter, were placed next to each other on a white tile.

Each potato stick was cut to exactly 4 cm in length.

Step 2 One of the potato sticks was cut into eight equal pieces as shown in Fig. 1.1.

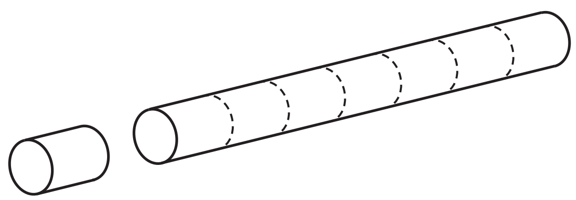

Fig. 1.1

Step 3 Step 2 was repeated with another potato stick. The last potato stick was left whole.

Step 4 A 25 cm^3 measuring cylinder was submerged in a tub of water and allowed to fill with water. The measuring cylinder was turned upside down keeping the open end under the water in the tub as shown in Fig. 1.2.

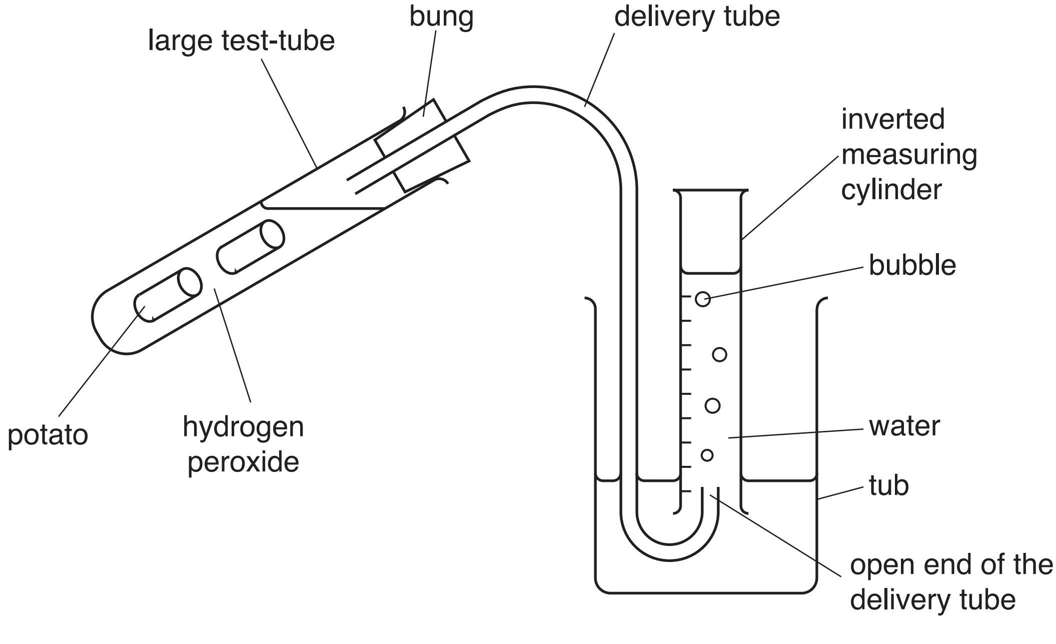

Fig. 1.2

A practice experiment was carried out using one of the potato sticks that had been cut into eight pieces.

Step 5 The open end of the delivery tube was placed into the inverted measuring cylinder in the tub of water.

Step 6 A syringe was used to add 20 cm^3 of hydrogen peroxide to a large test-tube.

Step 7 All eight pieces of potato were added to the large test-tube and the delivery tube bung was immediately placed into the large test-tube.

Step 8 A timer was started and the large test-tube was shaken every 30 seconds for three minutes.

Step 9 The volume of oxygen gas collected in the measuring cylinder for the practice experiment was recorded as 2.5 cm^3.

Step 10 The contents of the large test-tube were discarded. The large test-tube was rinsed with distilled water before being reused.

Step 11 Steps 4 to 8 were repeated with the remaining whole potato stick. The volume of oxygen gas collected is shown in Fig. 1.3.

Step 12 Steps 4 to 8 were repeated using the remaining potato stick that had been cut into eight pieces. The volume of oxygen gas collected is shown in Fig. 1.3.

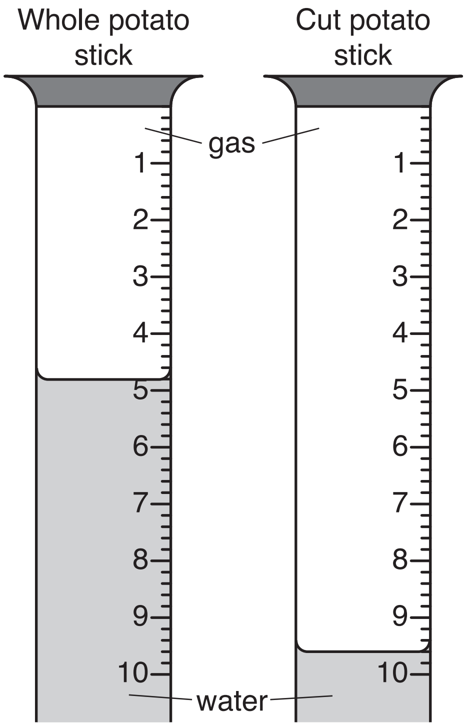

Fig. 1.3

Step 13 Read the volume of oxygen gas collected in the two measuring cylinders shown in Fig. 1.3 and record the results in your table in **1(a)**.

(a) Prepare a table to record the results shown in Fig. 1.3. Complete the table by entering the results.

[4]

(b) **(i)** The students measured the volume of oxygen gas produced in three minutes. Calculate the rate of oxygen gas production for each of the values in your table. Give your answer in cm^3 per minute.

Show your working.

whole potato stick .... cm^3 per minute

cut potato stick .... cm^3 per minute

[2]

(ii) Describe the effect on the surface area of the potato of cutting the potato stick into eight pieces.

....

....[1]

(iii) Describe **and** explain, using the results from **(b)(i)**, the effect of surface area on the volume of oxygen gas produced.

....

....

....

....

....

....[3]

(c) The student used a 25 cm^3 measuring cylinder to collect the gas in their practice experiment. The practice volume of oxygen gas recorded was 2.5 cm^3. Suggest why the student then chose to use a 10 cm^3 measuring cylinder for the rest of their investigation.

....

....

....[1]

(d) State **two** variables that were kept constant in this investigation.

1 ....

2 ....
[2]

(e) Identify **two** sources of error in this method and suggest an improvement for each error.

error ....

....

improvement ....

....

....

error ....

....

improvement ....

....

....
[4]

(f) Hydrogen peroxide breaks down slowly without catalase enzyme being present.

Describe a suitable control for this investigation.

....

....

....

....

....[2]

(g) Another student wanted to investigate the amount of catalase present in different food plants.

Describe a method the student could use to carry out this investigation.

....

....

....

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....

....

....[5]

(h) Table 1.1 shows the volume of oxygen produced when the student carried out the experiment for three different food plants.

Table 1.1

food plant	volume of oxygen produced / cm^3
A	9.2
B	0.8
C	6.7

Plot a graph of the data from Table 1.1 on the grid.

[4]

(i) Describe how the student could test food prepared from these plants for the presence of reducing sugars.

....

....

....

....[3]

[Total: 31]

2 Fig. 2.1 is a photograph of a cross-section of a vascular bundle in a leaf.

Line **AB** shows the length of the vascular bundle.

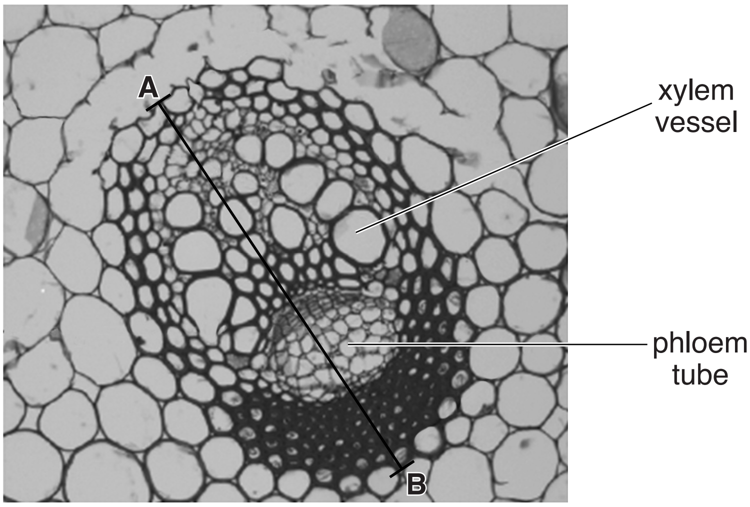

Fig. 2.1

(a) (i) Make a large drawing to show the different regions of the vascular bundle shown in Fig. 2.1.
Do **not** draw any individual cells.
Identify and label on your drawing the position of the xylem vessel as shown in Fig. 2.1.

[5]

(ii) Measure the length of line **AB** as shown on Fig. 2.1. **Include the unit.**

Length of **AB** ....

Mark on your drawing a line in the same position as **AB**.

Measure the line you have drawn.

Length of line on drawing ....

$$\text{magnification} = \frac{\text{length of line on drawing}}{\text{length of } \mathbf{AB}}$$

Calculate the magnification of your drawing using the information above and your answers.

Show your working.

magnification ....

[3]

(iii) State **one** way **visible** in Fig. 2.1 in which the xylem vessel is different from the phloem tube.

....

....

....[1]

(b) The walls of xylem vessels are supported by a chemical called lignin, which can be stained by a red dye. This makes the xylem vessel walls easily seen when using a microscope.

Use this information to plan how you could find the position of the vascular bundles in a stem.

....

....

....

....

....

....

....[4]

[Total: 13]

Abbreviations used in the Mark Scheme:

;	separates marking points
/	alternatives
I	ignore
R	reject
A	accept (for answers correctly cued by the question, or guidance for examiners)
AW	alternative wording (where responses vary more than usual)
AVP	any valid point
ecf	credit a correct statement / calculation that follows a previous wrong response
ora	or reverse argument
( )	the word / phrase in brackets is not required, but sets the context
<u>underline</u>	actual word given must be used by candidate (grammatical variants excepted)
max	indicates the maximum number of marks that can be given

Question	Answer	Marks
1 (a)	idea of withdrawing a sample to test ; aspect of appropriate method described ;	[2]
1 (b)	1 one table with ruled lines for at least 6 rows and 3 columns ; 2 a column / row, with header: time / min ; 3 two, columns / rows headings as, colour / observation, W / C ; 4 correct completion of information into table ;	[4]
1 (c) (i)	idea of equilibration ;	[1]
1 (c) (ii)	idea of minimising contamination ; idea of allowing simultaneous measurement ;	[max 1]
1 (d)	(blue-black shows) starch present at, 0 min / start ; (dark brown shows) some starch present at 2 min ; (orange-brown shows) no starch present, after 2 min / from 4 min ;	[3]

Question	Answer	Marks
1 (e)	yes : C stayed blue-black for longer / slower colour change ; ORA OR no : there is not a large enough range of temperatures ;	[max 1]
1 (f) (i)	drop / dropping pipettes, are imprecise / volume of amylase may vary ; shaking can, cause spillage / inconsistent mixing ;	[max 1]
1 (f) (ii)	appropriate apparatus to measure precise volume ; e.g. syringe / burette / graduated pipette / measuring cylinder ; appropriate apparatus to stir carefully / consistently; e.g. (magnetic) stirrer / glass rod / bung / test-tube shaker ;	[max 1]
1 (g)	(see table below)	[max 2]
1 (h)	1 test at 40 °C ; 2 test at least one temperature below 40 °C and one above ; 3 use of water-bath (to maintain different temperatures) / AW ; 4&5 named controlled variables ;; 6 measure time taken until iodine becomes orange brown / no longer changes colour ; 7 by repeated sampling at interval of less than 2 mins ; 8 repeat entire experiment / replicates ; 9 relevant stated safety procedure ;	[max 6]
1 (i)	Benedict's solution turns (brick) red ; with heat ;	[2]
		[Total: 24]

1 (g):

Source of error	*Improvement*
experiment was done only once ;	repeat entire experiment (at least 3 times in total) to calculate an average ;
shaking, can cause spillage/ inconsistent mixing ;	(magnetic) stirrer/ glass rod bung/flask to swirl;
drops/ dropping pipettes, are imprecise/ volume of amylase may not be the same ;	use syringe/ burette/ graduated pipette/measuring cylinder ;
(long) intervals between testing/AW ; **A** reaction finishes between points	test, more often/ every minute/30 seconds;
colour changes are subjective ; **A** endpoint hard to judge	colour chart/ standards/ control with no starch/ colorimeter ;
trying to do, **W** and **C** simultaneously ;	do **W** and **C** separately/ second person to do second tube ;
(water) temperature changes ;	insulate beakers/use (thermostatically controlled) water-bath ;
AVP ; e.g. contents in pipette might contaminate spotting tests	AVP ; e.g. use clean pipettes each time

Question	Answer	Marks
1 (a)	table with two / three columns and two / three rows and result recorded in each cell of the table; headings for dependant variable volume of oxygen / gas produced with unit in the header only (cm^3); headings for the independent variable; correct values transferred from Fig. 1.3; i.e. 9.6 and 4.8 $\pm$ 0.1 cm^3	[4]
1 (b) (i)	1.6; 3.2;	[2]
1 (b) (ii)	increased / AW	[1]
1 (b) (iii)	*description* greater oxygen production with cut potato / larger surface area; use of data; *explanation* a greater surface area / more catalase, in contact with the hydrogen peroxide / substrate;	[3]
1 (c)	the 10 cm^3 measuring cylinder could be read with greater accuracy / precision / AW;	[1]
1 (d)	total length / diameter / width / volume of potato cylinder; concentration / volume of hydrogen peroxide; time; shaking every 30 seconds / at regular intervals;	[2]
1 (e)	*error* – loss of gas while connecting the bung; *improvement* – idea of closed system / three-way tap / doing quickly; *error* – pieces sticking together reduces surface area; *improvement* – shake continuously; *error* – (inconsistent) shaking; *improvement* – sensible suggestion for regular shaking; *error* – potato not measured so not cut into equal sized pieces; *improvement* – measure 5 mm slices; *error* – dilution of peroxide due to washing; *improvement* – use a new large test tube each time; *error* -sticks not from same potato / same variety of potato / different mass / density; *improvement* – use sticks from the same potato / variety of potato / age of potato / measure mass; *error* – temperature fluctuation; *improvement* – water bath; *error* – only one trial ; *improvement* – repeat at least 2 more time ; AVP e.g. pH, contamination of tubes	[4]

Question	Answer	Marks
1 (f)	keep (all) variables the same / AW; substitute plant material for inert material e.g. glass beads / leave out potato; idea of collecting gas produced solely by decomposition and subtracting this value/ AW;	[2]
1 (g)	1 use the same size (surface area) of plant; 2 carry out experiment at the same temperature / pH; 3 other variable from previous method; 4 measure volume of oxygen produced; 5 plans to repeat experiment; 6 calculate the mean; 7 comparison of volumes for different food plants; 8 reference to relevant safety feature;	[5]
1 (h)	**A**(xes) – labelled with units, y-axis even scale; **S**(ize) – occupies at least half the grid; **P**(lot) – all bars plotted accurately ± ½ square; **B**(ars) – ruled lines, have an equal gap between each component and are equal width;	[4]
1 (i)	add Benedict's solution; heat; red / brown / green / yellow precipitate indicates reducing sugars present;	[3]
		[Total: 31]
2 (a) (i)	Outlines – all lines single, clear and unbroken ; Size – occupies at least half of the space provided ; Detail – oval shape + phloem + 1 other area ; two other areas shown ; Label – line to correct area on drawing to show position of xylem (vessel) and line labelled "xylem"	[5]
2 (a) (ii)	measurement of AB = 58 mm; line on their drawing and length measured with correct unit ; correct magnification calculation;	[3]
2 (a) (iii)	(xylem) walls thick(er) / large (er) / wide(er); (xylem vessels) round(er) ; (xylem) has large(r) cross section area / big(ger) ;	[max 1]
2 (b)	1 use of any suitable plant material; 2 put stem / material chosen in (red) dye / add dye to cut (stem) surface; 3 time for absorption of dye; 4 cut (sections) of stem or material chosen; 5 (red stained xylem) will indicate position of vascular bundle	[max 4]
		[Total: 13]

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2: Animal nutrition – Topic questions

Paper 6

The questions in this document have been compiled from a number of past papers, as indicated in the table below.

Use these questions to formatively assess your learners' understanding of this topic.

Question	Year	Series	Paper number
1	2016	June	62

The mark scheme for each question is provided at the end of the document.

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1 Some students test the composition of three liquid food supplements.

(a) **(i)** State the chemical test the students would use to show that protein is present in a liquid sample of a food supplement.

....[1]

The students carried out this test for protein on liquid samples of food supplements **P**, **Q** and **R**.

Food supplements **P** and **R** contained protein.

(ii) Complete Table 1.1 to show the results from the students' tests for protein.

Table 1.1

food supplement	colour at start	colour at end
P		
Q		
R		

[2]

The students carried out a test for vitamin C on liquid samples of food supplements **P**, **Q** and **R**.

When iodine solution is mixed with starch, a blue-black colour is observed. Vitamin C stops this blue-black colour from forming.

Step 1 The students labelled a test-tube **P** and added $3\,cm^3$ of food supplement **P** to the test-tube.

Step 2 They added $1\,cm^3$ of starch solution to test-tube **P**.

Step 3 The students added iodine solution to the test-tube, one drop at a time. They counted the drops as they added them. They shook the test-tube gently after adding each drop and stopped adding drops when a blue-black colour remained.

A blue-black colour remained in **P** after **12** drops of iodine solution had been added.

Step 4 They repeated steps **1** to **3** with food supplements **Q** and **R**.

A blue-black colour remained in **Q** after **1** drop of iodine solution had been added.

A blue-black colour remained in **R** after **5** drops of iodine solution had been added.

Table 1.2 shows how the number of drops of iodine solution added relates to the vitamin C content of the food supplement.

Table 1.2

number of drops of iodine solution added	vitamin C content
1	none
2–3	low
4 or more	high

(b) Use the results of the students' experiments and the information in Table 1.2 to complete Table 1.3.

Table 1.3

food supplement	number of drops of iodine solution added	vitamin C content
P		
Q		
R		

[2]

The students carried out a test for reducing sugar on liquid samples of food supplements **P**, **Q** and **R**.

(c) **(i)** Name the solution used for the reducing sugar test.

....[1]

(ii) Give **one** safety precaution that should be used when carrying out this test.

....[1]

A positive result for the test for reducing sugar is the appearance of a brick-red colour.

The quicker the brick-red colour appears, the higher the concentration of reducing sugar.

Step 5 The students labelled a test-tube **P2** and added a sample of food supplement **P** to the test-tube.

Step 6 They added 2 cm^3 of the test solution to test-tube **P2**.

Step 7 The students repeated steps **5** and **6** with food supplements **Q** and **R**.

Step 8 They placed test-tubes **P2**, **Q2** and **R2** into hot water, and started a timer.

Step 9 The students observed the test-tubes carefully and noted the time when the brick-red colour appeared in each test-tube.

If there was no colour change after 180 seconds (3 minutes), the students recorded 'more than 180' as the result for that test-tube.

A brick-red colour appeared in test-tube **R2** after 25 seconds and in test-tube **P2** after 1 minute and 15 seconds.

No brick-red colour appeared in test-tube **Q2**.

(d) Complete Table 1.4 to show the students' results for the reducing sugar test.

Table 1.4

test-tube	time for brick-red colour to appear / s

[2]

(e) There is a source of error in step **5** of the method for the reducing sugar test.

(i) Identify this source of error.

....

....

....[1]

(ii) Suggest apparatus that could be used to minimise this source of error.

....[1]

(f) State **one** other source of error in the method used for the reducing sugar test.

Suggest how to improve the method to minimise this source of error.

error

....

....

improvement

....

....

....

[2]

(g) Table 1.5 shows the protein content of five foods.

Table 1.5

food	protein content of food / g per 100 g
maize	3.2
rice	7.1
potato	2.0
yam	1.5
sorghum	11.3

(i) Plot a graph of the data shown in Table 1.5.

[4]

(ii) It is recommended that a six-year-old child eats 20 g of protein per day.

Calculate the mass of sorghum a six-year-old child must eat each day to obtain 20 g of protein.

Show your working.

Give your answer to the nearest whole number.

.... g

[2]

[Total: 19]

Abbreviations used in the Mark Scheme:

;	separates marking points
/	alternatives
I	ignore
R	reject
A	accept (for answers correctly cued by the question, or guidance for examiners)
AW	alternative wording (where responses vary more than usual)
AVP	any valid point
ecf	credit a correct statement / calculation that follows a previous wrong response
ora	or reverse argument
( )	the word / phrase in brackets is not required, but sets the context
<u>underline</u>	actual word given must be used by candidate (grammatical variants excepted)
max	indicates the maximum number of marks that can be given

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>1 (a) (i)</td><td>Biuret</td><td>[1]</td></tr>
<tr><td>1 (a) (ii)</td><td>
<table>
<tr><td>food supplement</td><td>colour at start</td><td>colour at end</td></tr>
<tr><td>P</td><td>blue</td><td>lilac</td></tr>
<tr><td>Q</td><td>blue</td><td>blue ;</td></tr>
<tr><td>R</td><td>blue</td><td>lilac ;</td></tr>
</table>
rows P and R correct – 1 mark
row Q correct – 1 mark</td><td>[1]</td></tr>
<tr><td>1 (b)</td><td>
<table>
<tr><td>food supplement</td><td>number of drops of iodine solution added</td><td>vitamin C content</td></tr>
<tr><td>P</td><td>12</td><td>high</td></tr>
<tr><td>Q</td><td>1</td><td>none</td></tr>
<tr><td>R</td><td>5 ;</td><td>high ;</td></tr>
</table>
mark each column</td><td>[2]</td></tr>
<tr><td>1 (c) (i)</td><td>Benedict's (solution / reagent) ;</td><td>[1]</td></tr>
</table>

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>1 (c) (ii)</td><td>idea of eye protection / safety when using heat qualified ;</td><td>[1]</td></tr>
<tr><td>1 (d)</td><td>
<table>
<tr><th>test-tube</th><th>time for brick red colour to appear / s</th></tr>
<tr><td>P2</td><td>75;</td></tr>
<tr><td>Q2</td><td>more than 180</td></tr>
<tr><td>R2</td><td>25;</td></tr>
</table>
P2 = 1mark
both Q2 and R2 = 1mark</td><td>[2]</td></tr>
<tr><td>1 (e) (i)</td><td>volume of food supplement may not be the same ;</td><td>[1]</td></tr>
<tr><td>1 (e) (ii)</td><td>syringe / burette / graduated pipette / measuring cylinder / balance / scales ;</td><td>[1]</td></tr>
<tr><td>1 (e) (ii)</td><td>
<table>
<tr><th>Source of error</th><th>Improvement</th></tr>
<tr><td>idea of difficult to be sure of end point / difficult to see when the colour changes ;</td><td>white or black background / compare with standard / control / use a colorimeter;</td></tr>
<tr><td>cannot add tubes to hot water / monitor colour change, in three tubes simultaneously ;</td><td>do tubes separately / other people to do other tubes ;</td></tr>
</table></td><td>[max 2]</td></tr>
<tr><td>1 (g) (i)</td><td>A – axes labels with units ;
S – even scale and plots to fill at least ½ of grid both directions ;
P – plots accurate to ± ½ square ;
B – bars of equal width, not touching and with equal space between them ;</td><td>[4]</td></tr>
<tr><td>1 (g) (ii)</td><td>177 ;
(20 ÷ 11.3) × 100</td><td>[2]</td></tr>
<tr><td></td><td></td><td>[Total: 19]</td></tr>
</table>

Cambridge Assessment International Education

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3: Plant nutrition and transport – Topic questions Paper 6

The questions in this document have been compiled from a number of past papers, as indicated in the table below.

Use these questions to formatively assess your learners' understanding of this topic.

Question	Year	Series	Paper number
2	2016	June	62

The mark scheme for each question is provided at the end of the document.

You can find the complete question papers and the complete mark schemes (with additional notes where available) on the School Support Hub at www.cambridgeinternational.org/support

2 Fig. 2.1 shows the apparatus used to measure the rate of water loss from the leaves of a plant.

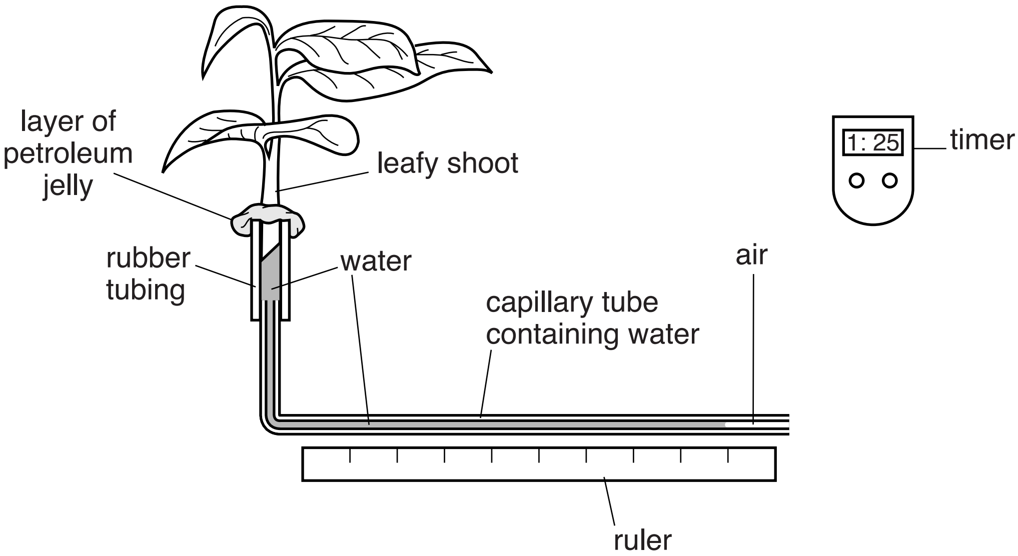

Fig. 2.1

(a) Suggest how a student might use the apparatus shown in Fig. 2.1 to calculate the **rate** of water loss from the leaves of a leafy shoot.

....

....

....

....

....[2]

The student used the apparatus shown in Fig. 2.1 to compare the rates of water loss from leaves in still and moving air.

(b) Suggest **one** piece of apparatus that the student could use to vary the air movement.

....[1]

(c) State **two** variables that the students should keep constant in this investigation.

1 ....

....

2 ....

....
[2]

Petroleum jelly is greasy and waterproof.

(d) Suggest the purpose of the petroleum jelly on the apparatus shown in Fig. 2.1.

....[1]

The student's results are shown in Fig. 2.2.

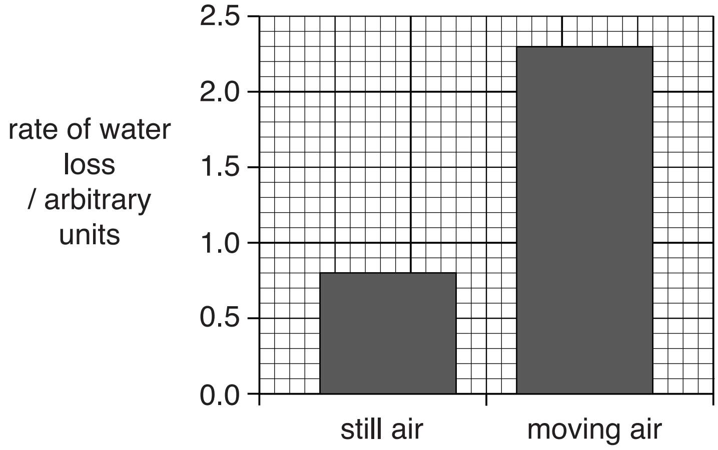

Fig. 2.2

(e) The rate of water loss is greater in moving air than still air.

Use Fig. 2.2 to calculate how many times greater the rate of water loss is in moving air.

Show your working.

Give your answer to the nearest whole number.

....

[2]

(f) Another student thinks that the apparatus in Fig. 2.1 does not measure water **loss** from the leaves.

Suggest why this student is correct.

....

....

....[1]

(g) Fig. 2.3 shows some laboratory apparatus.

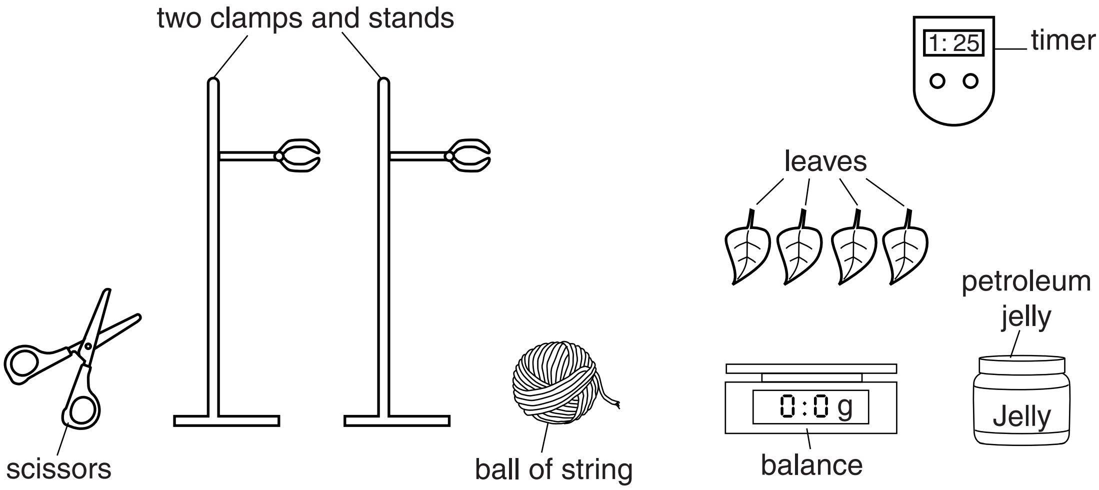

Fig. 2.3

Petroleum jelly is greasy and waterproof.

Describe, with the aid of a labelled diagram, how you could set up the apparatus shown in Fig. 2.3 to find out whether the upper or the lower surface of the leaves loses more water by evaporation.

....

....

....

....

....

....

....

....

....[6]

(h) Fig. 2.4 shows a section of a stem as seen under a light microscope.

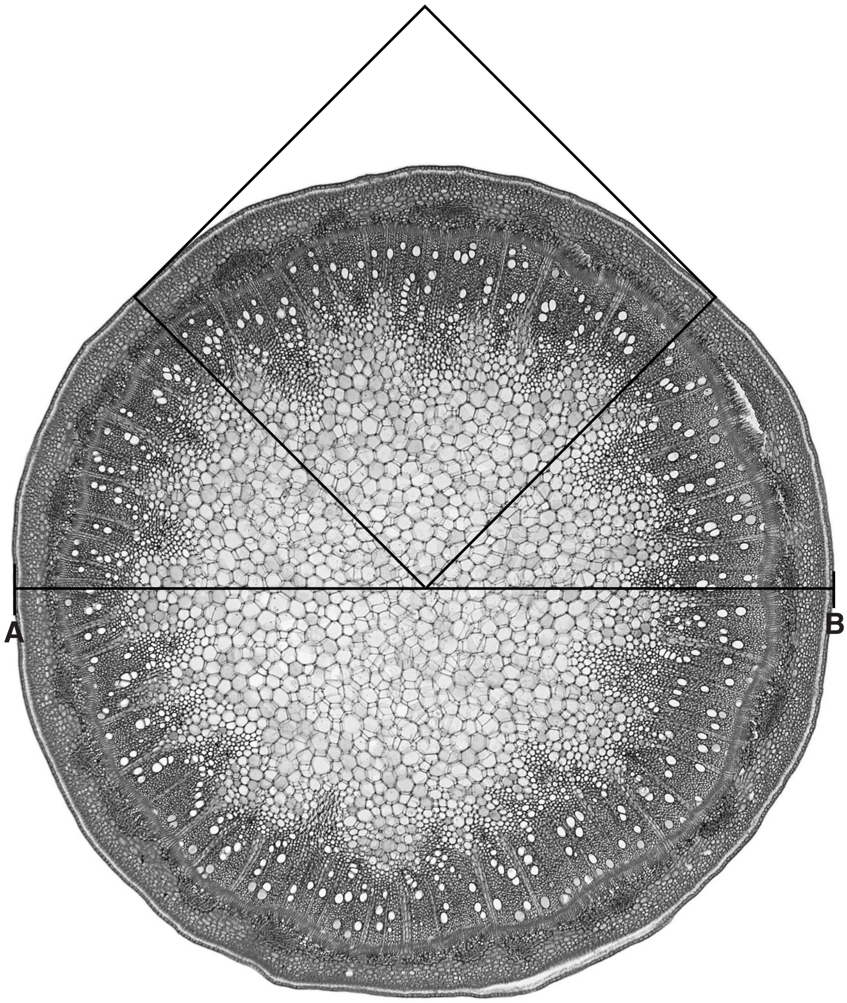

Fig. 2.4

Make a large drawing of the section of the stem contained in the square on Fig. 2.4 to show the different structures and layers.

Do not draw any individual cells.

[4]

(i) **(i)** The diameter of the stem in Fig. 2.4 is shown by the line **AB**.

Measure the length of **AB** on Fig. 2.4.

measured length of line **AB** .... mm [1]

(ii) The actual diameter of the stem is 7.5 mm.

The magnification of Fig. 2.4 can be calculated using the following equation:

$$\text{magnification} = \frac{\text{length of } \mathbf{AB}}{\text{actual diameter of stem}}$$

Calculate the magnification of Fig. 2.4 using the information above and your answer to **(i)**.

Show your working.

Give your answer to the nearest whole number.

magnification .... [1]

[Total: 21]

Abbreviations used in the Mark Scheme:

;	separates marking points
/	alternatives
I	ignore
R	reject
A	accept (for answers correctly cued by the question, or guidance for examiners)
AW	alternative wording (where responses vary more than usual)
AVP	any valid point
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underline	actual word given must be used by candidate (grammatical variants excepted)
max	indicates the maximum number of marks that can be given

Question	Answer	Marks
2 (a)	measure distance moved by air / water / meniscus ; for a set period of time;	[max 2]
2 (b)	fan / hairdryer	[1]
2 (c)	any 2 from: leaf area / size ; type/species of plant / use same leaves ; light (intensity) ; temperature ; diameter of capillary tubing ; no additional air movement, e.g. windows open ; humidity ;	[max 2]
2 (d)	to prevent water leakage / AW ; to stop air getting in ;	[max 1]
2 (e)	correct reading from the graph (2.3 and 0.8) ; 2.3 / 0.8 = 2.9 ;	[2]
2 (f)	idea that it actually measures water uptake (not loss);	[1]

Question	Answer	Marks
2 (g)	drawing showing apparatus set up ; description of the treatments ; any 4 of: 1 use of a control with a correct example, 2 weigh (mass of) leaves at beginning with petroleum jelly applied; 3 weigh leaf at end ; 4 for a set period of time ; 5 describe a controlled variable / named environmental factor being kept constant ; 6 repeat experiment / described e.g. two leaves with same treatment ;	[max 6]
2 (h) (i)	O – all lines single, clear and unbroken with no shading ; S - drawing occupies at least half the space ; D1 – no cells and only the sector drawn ; D2 – detail ;	[4]
2 (h) (ii)	108 ± 1 mm ;	[1]
2 (h) (iii)	(x)14 ; A 15 if (ii) 109 mm ecf for incorrect measurement in (h) (ii) R if units included with the magnification	[1]
		[Total: 21]

4: Respiration and the human transport system – Topic questions Paper 6

The questions in this document have been compiled from a number of past papers, as indicated in the table below.

Use these questions to formatively assess your learners' understanding of this topic.

Question	Year	Series	Paper number
2	2016	November	62

The mark scheme for each question is provided at the end of the document.

You can find the complete question papers and the complete mark schemes (with additional notes where available) on the School Support Hub at www.cambridgeinternational.org/support

2 **(a)** A group of students investigated the effect of two different exercises on the heart rate of ten male and ten female students.

Before the first exercise, the pulse rate at rest was measured and the group then jumped on the same spot for two minutes without moving their arms. Every two seconds an investigator shouted jump.

After two minutes the pulse rate was measured and the students were allowed ten minutes to rest.

Before the second exercise, the pulse rate at rest was measured again and the group was asked to do a different exercise.

The students jumped on the same spot for two minutes lifting their arms above their head as they jumped up and dropping their arms as they came down. Every two seconds an investigator shouted 'jump'.

Table 2.1 shows the results of this investigation.

Table 2.1

activity	average pulse rate / beats per minute		
	male students	female students	all students
resting	68	74	71
after jumping	96	92	
after jumping and moving arms	128	140	

(i) Complete Table 2.1 by writing in the average pulse rate for all students after both forms of exercise. [2]

(ii) Describe **two** variables in this investigation that have been controlled.

1 ....

....

2 ....

....
[2]

(iii) Explain why the students had to rest before carrying out the second exercise.

....

....[1]

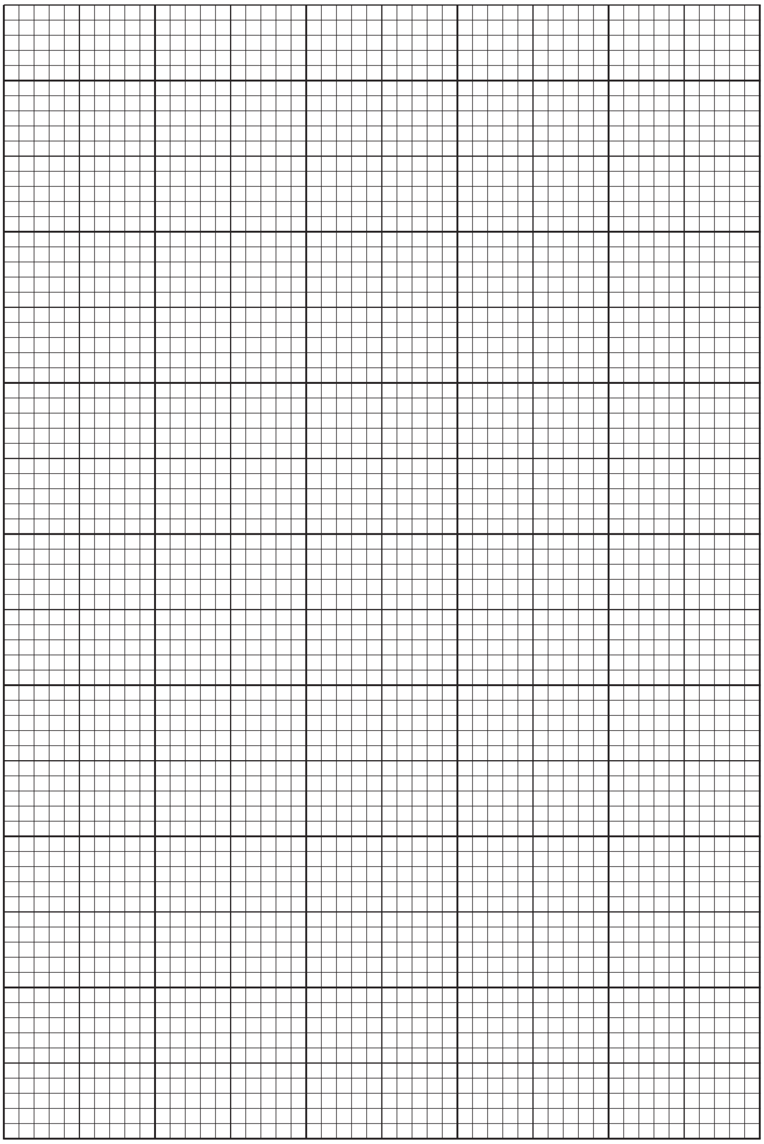
(iv) State **one** variable that cannot be controlled during the exercise and describe the effect on the results of the investigation.

variable ....

effect on results ....

....
[2]

(b) **(i)** Plot a bar chart of the data in Table 2.1, for both the male students and the female students, on the grid.



[4]

(ii) State **one** similarity and **one** difference the effect of exercise has on males and females.

similarity ....

....

....

difference ....

....

....

[2]

(c) Fig. 2.1 shows a photomicrograph of a cross section of an artery from a mammal.

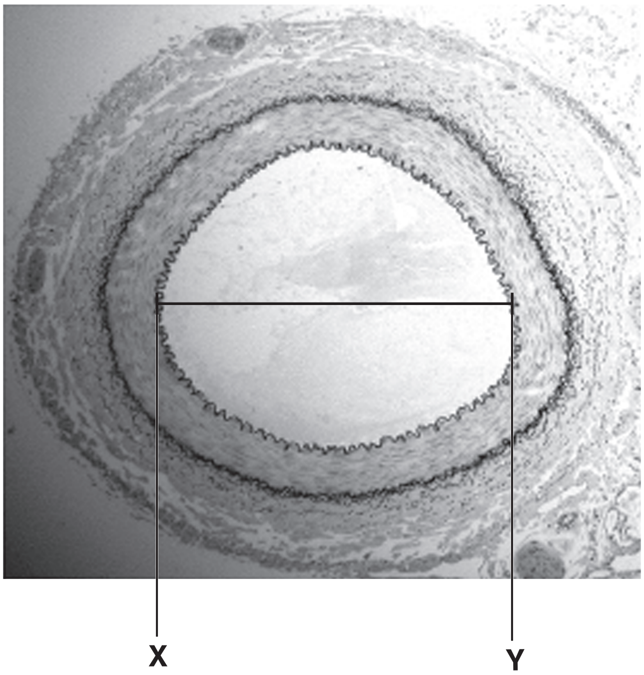


Fig. 2.1

(i) Make a large diagram of this cross section to show the layers forming the wall of the artery.

[3]

(ii) Measure the diameter of the lumen of the artery between points **X** and **Y** on Fig. 2.1.

Include the unit.

Diameter of the lumen on Fig. 2.1 ....

Draw a line in the same position on your drawing and measure the diameter of the lumen on your drawing.

Diameter of the lumen on your drawing ....

$$\text{magnification} = \frac{\text{diameter of the lumen on your drawing}}{\text{diameter of the lumen on Fig. 2.1}}$$

Calculate the magnification of your drawing using the equation given and your answers.

Show your working.

magnification ....
[3]

[Total: 19]

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<u>underline</u>	actual word given must be used by candidate (grammatical variants excepted)
max	indicates the maximum number of marks that can be given

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>2 (a) (i)</td><td>94;
134;</td><td>[2]</td></tr>
<tr><td>2 (a) (ii)</td><td>same time / 2 minutes for whole exercise;
same time / 10 minutes for rest between exercises;
same rate / every 2 sec for each jump;
equal numbers of male and female students;
idea of same students in each exercise;</td><td>[2]</td></tr>
<tr><td>2 (a) (iii)</td><td>to allow pulse rate to recover / return to normal / resting (before doing another exercise);
so the effect of the two exercises can be compared;</td><td>[1]</td></tr>
<tr><td>2 (a) (iv)</td><td><table><tr><th>variable</th><th>effect on results</th></tr><tr><td>idea of effort put into exercise;</td><td>more effort would make pulse rate increase more;</td></tr><tr><td>idea of fitness;</td><td>pulse would increase less for fitter students;</td></tr></table></td><td>[2]</td></tr>
<tr><td>2 (b) (i)</td><td>A(xes) – labelled with units on y axis;
S(cale) – suitable even linear scale and plots to fill more than half of the printed grid;
P(lot) – all points plotted accurately ±½ square;
B(ars) – have a gap between each component;</td><td>[4]</td></tr>
</table>

Question	Answer	Marks
2 (b) (ii)	*similarity* any 1 from: exercise increases (average) pulse rate; (idea of) more intense the exercise the more increase in (average) pulse rate; *difference* jumping produces greater increase in males than females; jumping and moving arms produces greater increase in females than males;	[2]
2 (c) (i)	*drawing of cross section of artery* **O**(utline) – single clear lines and without shading; **S**(ize) – occupies at least half of the space provided; **D** (detail) to show at least 2 layers and wavy lining;	[3]

2 (c) (ii)	diameter of lumen = 47 ($\pm$1) mm;
	diameter of drawing = **X** $\pm$ 1 mm;
	correct magnification;
		[3]

		[Total: 19]

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5: Coordination, response and homeostasis – Topic questions Paper 6

The questions in this document have been compiled from a number of past papers, as indicated in the table below.

Use these questions to formatively assess your learners' understanding of this topic.

Question	Year	Series	Paper number
1	2016	June	63
1	2016	November	61

The mark scheme for each question is provided at the end of the document.

You can find the complete question papers and the complete mark schemes (with additional notes where available) on the School Support Hub at www.cambridgeinternational.org/support

1 Fig. 1.1 shows an elephant, *Loxodonta africana*. They have large ears which help them to control their body temperature.

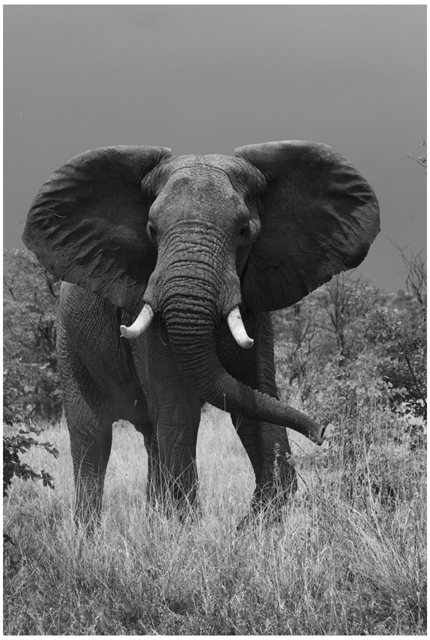

Fig. 1.1

When the elephant is too hot, more blood is pumped into the blood vessels in the elephant's ears. Increasing blood flow to the surface of the skin helps the elephant to cool down.

A student set up a model of what happens in the elephant's ears, as shown in Fig. 1.2.

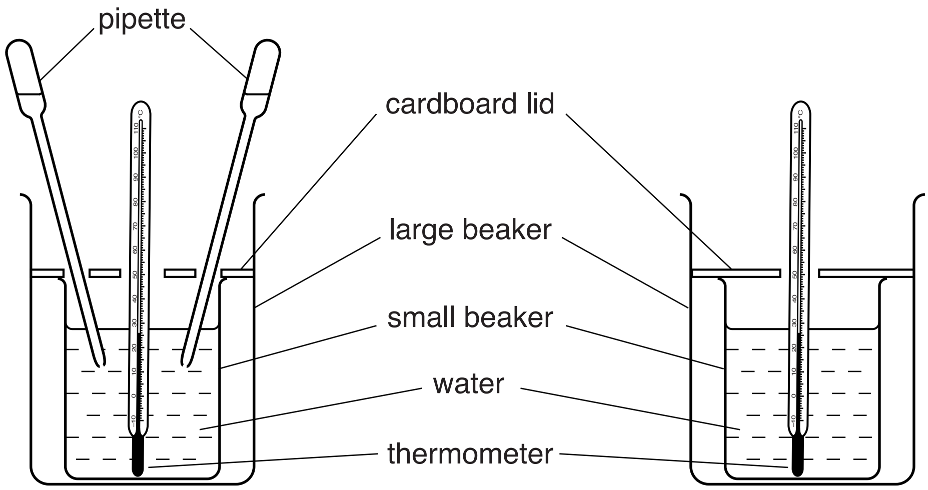

Fig. 1.2

They placed hot water into two small beakers and stood each one in a larger beaker. One of the small beakers had 'ears' and the other did not.

The 'ears' were represented by two plastic dropping pipettes. The student squeezed and released the pipette ears throughout the experiment so that water continuously moved out of and into the pipettes.

The student placed a cardboard lid on top of each small beaker. They made holes in the cardboard lids so that a thermometer and the pipettes could pass through them.

(a) The student recorded the starting temperature of the water in both small beakers.

The thermometer readings are shown in Fig. 1.3.

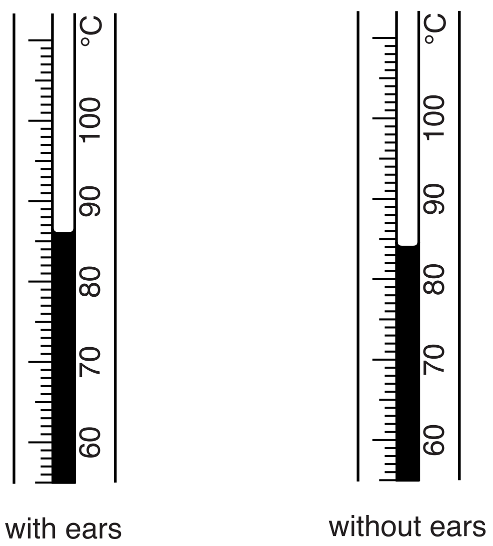

Fig. 1.3

Read the starting temperatures of the two thermometers shown in Fig. 1.3 and record the temperatures below.

with ears .... without ears .... [2]

(b) The student measured and recorded the temperature of the hot water in both beakers every minute for a total of eight minutes.

The student obtained the results shown in Fig. 1.4.

With ears (pipettes) the temperature went down to 84 after a minute, then 80, 78, 76, 74, 72, 71 and finished at 70°C after 8 minutes.

Without the ears the other beaker of water dropped every minute to 83, 82, 81, 79, 78, 77, 76 and finished at 75.

Fig. 1.4

Prepare a table to record the observations shown in Fig. 1.4 **and** the starting temperatures from Fig. 1.3.

Complete the table by entering all of the results.

[4]

(c) Suggest **one** safety precaution that should be taken during this experiment.

....

....

....[1]

(d) **(i)** A student repeated this experiment and calculated the change in temperature of the water each minute for eight minutes in both small beakers.

The change in temperature in the small beaker with pipette ears was 18 °C.

The change in temperature in the small beaker without pipette ears was 11 °C.

Explain why it is important to calculate the change in temperature in each beaker.

....

....

....

....

....[2]

(ii) Use the information in part **(d)(i)** to calculate the **rate** of temperature change in the small beaker with pipette ears for the student's experiment.

Show your working.

Give your answer to two significant figures.

rate of temperature change ....°C per min
[2]

(e) **(i)** Suggest why the student used cardboard lids on top of each of the small beakers.

....

....

....[1]

(ii) Suggest and explain **one** source of error in the method as a result of using the cardboard lids.

....

....

....[2]

(iii) Suggest **two** improvements which could be made to the method, other than changing the cardboard lids.

1 ....

....

....

2 ....

....

....
[2]

(f) Fig. 1.5 shows a different species of elephant, *Elephas maximus*, to the one shown in Fig. 1.1.

Fig. 1.5

(i) State **one** visible difference between the ears of the elephant in Fig. 1.5 and those of the elephant shown in Fig. 1.1.

....[1]

..

(ii) Based on this difference and the results of the student's experiment in part **(d)(i)**, what can you conclude about the environmental conditions that the elephant shown in Fig. 1.5 lives in compared to the elephant in Fig. 1.1?

....

....

....[1]

[Total: 18]

1 Some animals have a body temperature that is higher than the temperature of the environment.

As a result these animals lose heat to the environment, causing their body temperature to fall.

An investigation was carried out to find the effect of the volume of the body on the loss of heat to the environment.

The volume of the body of an animal and its temperature can be represented by hot water.

Step 1 Two 250 cm^3 beakers were labelled **A** and **B**.

Step 2 A line was drawn on beaker **A**, 6 cm up from the bottom of the beaker.
A line was drawn on beaker **B**, 3 cm up from the bottom of the beaker.

Step 3 Hot water was added to both beakers up to these marks.

Step 4 A thermometer was placed in the water in each beaker and a timer started.
The temperature of the water was measured immediately in both beakers and recorded in a results table.
The thermometers were left in the water throughout the investigation.

Step 5 The temperature of the water in both beakers was measured and recorded every minute for five minutes.

Fig. 1.1 on page 3 shows the results of this investigation

(a) Prepare a table in the space provided to record these results. Use Fig. 1.1 to complete this table.

[5]

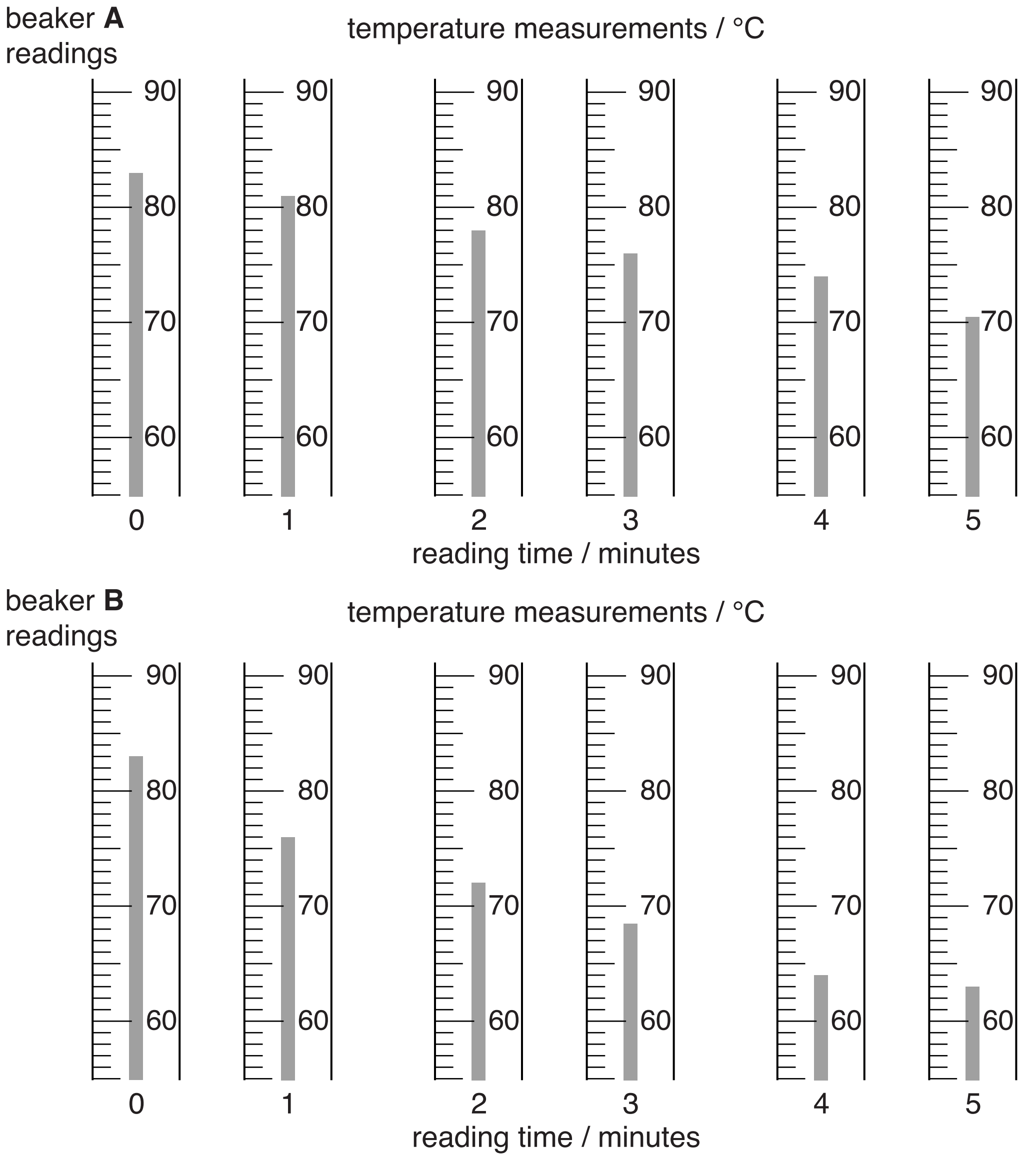

Fig. 1.1

(b) **(i)** The rate of heat loss is the fall in temperature per minute.

Calculate the rate of heat loss between 0 and 5 minutes for both beakers.
Include the units.

Show your working.

beaker **A**

....

beaker **B**

....

[4]

(ii) Using your results, suggest a relationship between the volume of the body and heat loss.

....

....

....

....[2]

(c) (i) State **two** variables in this investigation that have been controlled.

1 ....

2 ....
[2]

(ii) Suggest why the thermometer must be left in the water throughout the investigation.

....

....[1]

(iii) There is a possible source of error in step 2 of the investigation.

Identify this source of error and describe how to modify step 2 to improve the investigation.

....

....

....

....[2]

(iv) Suggest **one** safety precaution students should take while carrying out this investigation.

....

....[1]

(d) Some students were asked to test the hypothesis:

The colder the surroundings, the faster a small mammal's temperature will drop.

Describe how the students could modify the investigation described in steps 1–5 to test this hypothesis.

....

....

....

....

....

....

....

....

....

....

....

....

....[6]

(e) Humans sweat when they get too hot.

The effect of the temperature of the room on the average rate of sweating was investigated.

The results are shown in Table 1.1.

Table 1.1

temperature of the room / °C	average rate of sweating / cm^3 per hour
13	10
22	40
30	320
36	740
40	1180

(i) Plot a graph, using the data in Table 1.1, on the grid.

[4]

(ii) Describe the effect of the temperature of the room on the average rate of sweating.

....

....

....

....[2]

[Total: 29]

Abbreviations used in the Mark Scheme:

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/	alternatives
I	ignore
R	reject
A	accept (for answers correctly cued by the question, or guidance for examiners)
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Question	Answer	Marks
1 (a)	86 and 84 ; °C ;	[2]
1 (b)	one table drawn with rows and (3) columns ; appropriate column headings with units (°C and min) ; table shows starting temperatures ; correct completion of the table ;	[4]
1 (c)	wear goggles / gloves / method to reduce spillages / stand up when working ;	[1]
1 (d) (i)	may have different starting temperatures ; enables results to be compared / AW ; allows calculation of rate ;	[2]

Question	Answer	Marks
1 (d) (ii)	2.3 ; working 18 ÷ 8	[2]
1 (e) (i)	to reduce heat loss from beaker (other than via the pipettes) ;	[1]
1 (e) (ii)	suggest do not fit snugly on the beaker / holes made in the cardboard / more holes in the lid with the ears ; explain heat may be lost through gaps / more holes so greater heat loss ;	[2]
1 (e) (iii)	improve insulation of beaker ; start temperatures the same ; measure volume of water in beakers ; squeezing regularly / force of squeezing ; stir water ; use digital thermometer ; tape holes ; sequential experiments ;	[max 2]
1 (f) (i)	smaller ears	[1]
1 (f) (ii)	cooler temperature	[1]
		[Total: 18]
1 (a)	one table drawn with lines ; column / row headings (time and temperature); appropriate units (°C and minutes) in the header only; temperatures recorded for beaker **A** ; temperatures recorded for beaker **B** ;	[5]
1 (b) (i)	temperature differences: Beaker **A** = 12.5 °C, Beaker **B** = 20 °C; divide both temperature differences by 5 (minutes); **A** = 2.5, **B** = 4; correct units (°C / min);	[4]
1 (b) (ii)	the greater the volume of the body, the smaller the rate of heart loss / ref to speed (e.g. slower) / **ora;** rate of heat loss in **A** is less than beaker **B** / **ora** ; appropriate data quote comparing **A** and **B**; the greater the volume of the body, the greater the (total) heat loss / **ora**;	[2]
1 (c) (i)	*any 2 from:* temperature of environment; size / volume of beaker; starting temperature of water; time intervals / 1 minute to record temperature ; total time / 5 minutes for investigation;	[2]
1 (c) (ii)	*idea* of time taken for the thermometer to reach the water temperature is longer;	[1]
1 (c) (iii)	*error:* drawing the line accurately / judging the water level against the line / measuring height (rather than volume); *improvement:* measure the volumes of water / AW ;	[2]

Question	Answer	Marks
1 (d)	*any 6 from:* 1 identical containers / containers of equal volume / containers of equal size; 2 same volume of water in each container; 3 same starting temperature for the water; 4 idea of placing (containers) in 2 or more different temperatures; 5 detail of method to keep external temperature constant, e.g. use of water-bath or a fridge and explanation; 6 measure temperature in each container for the same time / measure temperature in each container at set intervals; 7 repeat and calculate an average / mean; 8 calculate / compare rate of heat loss (for each temperature);	[6]
1 (e) (i)	**A**(xes) – labelled with units; **S**(cale) – even scale and plots to fill half or more of the printed grid ; **P(**lot) – all points plotted accurately ± ½ square ; **L**(ine) – line joining all the points ± ½ square ;	[4]
1 (e) (ii)	as temperature increases (rate of) sweating increases / **ora**; idea of increasing rate of increase as temperature rises / not a linear relationship / not directly proportional;	[2]
		[Total: 29]