

GCSE Separate Science

AQA

2024 Predicted Paper

Paper 1: Higher Tier

Biology



Scan me for
walkthrough



Name:.....

Date:.....

1 hour 45 minutes allowed

You may use a calculator

Rough Grade Boundaries

These do not guarantee you
the same mark in the exam.

9 - 70%

8 - 60%

7 - 50%

6 - 45%

5 - 35%

4 - 30%

3 - 25%

Question	Possible Marks	Marks Gained
1	9	
2	10	
3	11	
4	15	
5	10	
6	15	
7	15	
8	8	
9	7	
Total	100	





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01 Red blood cells are highly specialised cells.

a) Describe what a specialised cell is.

[1 mark]

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b) Give one feature of a red blood cell and explain how it helps it to carry out its function.

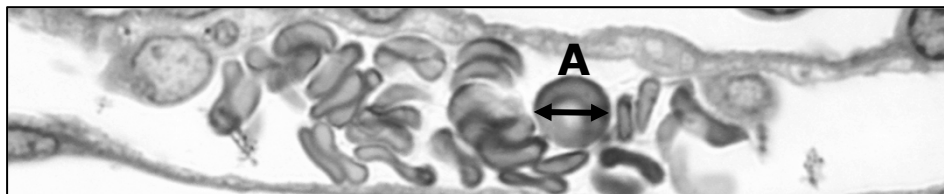
[2 marks]

Feature:.....

Explanation:.....

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The figure below shows some red blood cells in a capillary, taken using a microscope.



c) The actual diameter of the red blood cell marked A is $8\mu\text{m}$. Calculate the magnification of the image.

[2 marks]

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d) The red blood cells are inside a capillary where substances are exchanged between neighbouring cells and the blood in the capillary.

i) Name **two** substances that travel from respiring cells into the blood.

[2 marks]

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ii) Glucose is a substance that moves from the blood to cells.
Explain how glucose moves from the blood into muscle cells.

[2 marks]

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02 The top layer of your skin cells constantly shed as new cells from below grow and replace them.

a) Describe the process that produces new skin cells.

[4 marks]

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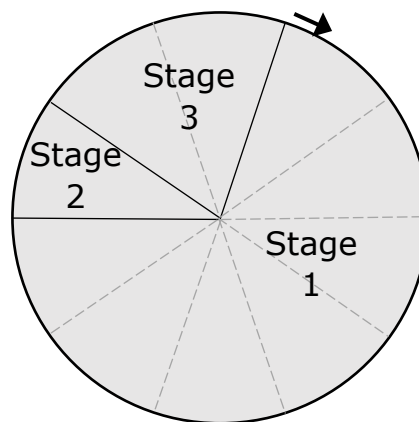
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The chart shows the stages of the cell cycle that skin cells go through.



A skin cell cycle typically takes 48 hours in total.

b) Describe one change that occurs in the cell during **Stage 1** of the cycle.

[1 mark]

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- c)** Calculate the length of time a skin cell spends in **Stage 2** of the cycle.

Give your answer correct to 2 significant figures.

[3 marks]

Time in Stage 2 = minutes

- d)** Sometimes problems with the cell cycle can lead to cancer.

- i)** Define cancer.

[1 mark]

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- ii)** State a risk factor for developing skin cancer.

[1 mark]

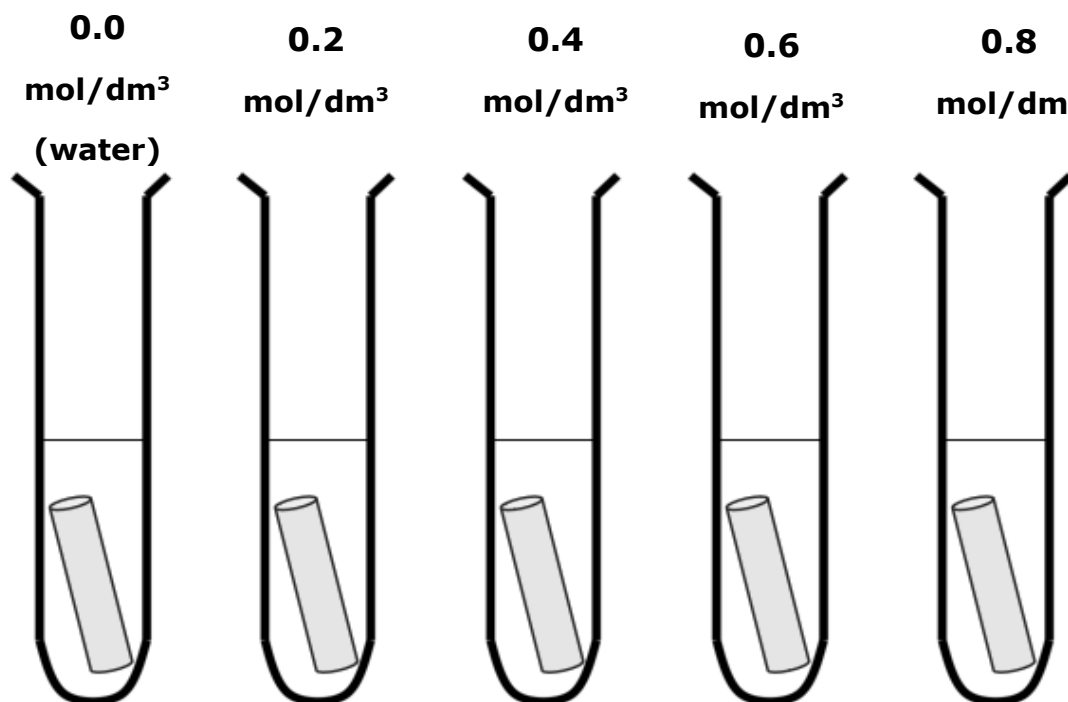
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- 03** A student wanted to investigate how different concentrations of salt solution affected the mass of parsnip tissue.

They set up the experiment as shown in the diagram below, with each parsnip cylinder in a different concentration of salt solution.



- a)** The student used a scalpel to cut the parsnip cylinders.
Give one safety precaution that the student should have taken when using the scalpel.

[1 mark]

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- b)** State **two** variables that need to be controlled in this investigation.

[2 marks]

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- c) The mass of each parsnip cylinder was recorded before it was placed in the salt solution.

When the chips were removed from the salt solution, the student blotted each cylinder before weighing it again.

Explain why.

[1 mark]

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The student recorded the masses in a results table shown below.

Solution concentration (mol / dm³)	0.0	0.2	0.4	0.6	0.8
Initial Mass (g)	10.0	10.6	10.0	10.1	10.4
Final Mass (g)	13.0	12.2	9.0	7.9	7.3
Change in Mass (%)	+30.0	.....	-10.0	.....	-29.8

- d) Calculate the percentage change in mass for the cylinders in 0.2 **and** 0.6 mol / dm³.

[2 marks]

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- e)** Explain the percentage change in the parsnip cylinder in the 0.8 mol / dm^3 solution.

[3 marks]

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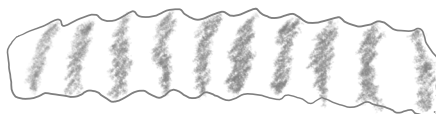
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- f)** The student repeated the experiment but used a crinkle cutter to cut the chips instead.
A crinkle cut chip can be seen in the image below.



Explain why these chips showed greater changes in mass than the cylinders.

[2 marks]

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04 Communicable diseases can be caused by viruses.

a) Describe what is meant by the term 'communicable disease'.

[1 mark]

b) Describe how the human body prevents the entry of pathogens that cause disease.

[6 marks]

This image shows a full page of white paper with horizontal dashed lines, typical of primary school writing paper. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.



HIV is a virus that can result in the condition known as AIDS if left untreated.

- c)** Name the type of drugs that can be used to treat HIV infections to prevent AIDS developing.

[1 mark]

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- d)** Patients diagnosed with AIDS usually die from a different type of infection, such as bacterial infections.
Explain why.

[2 marks]

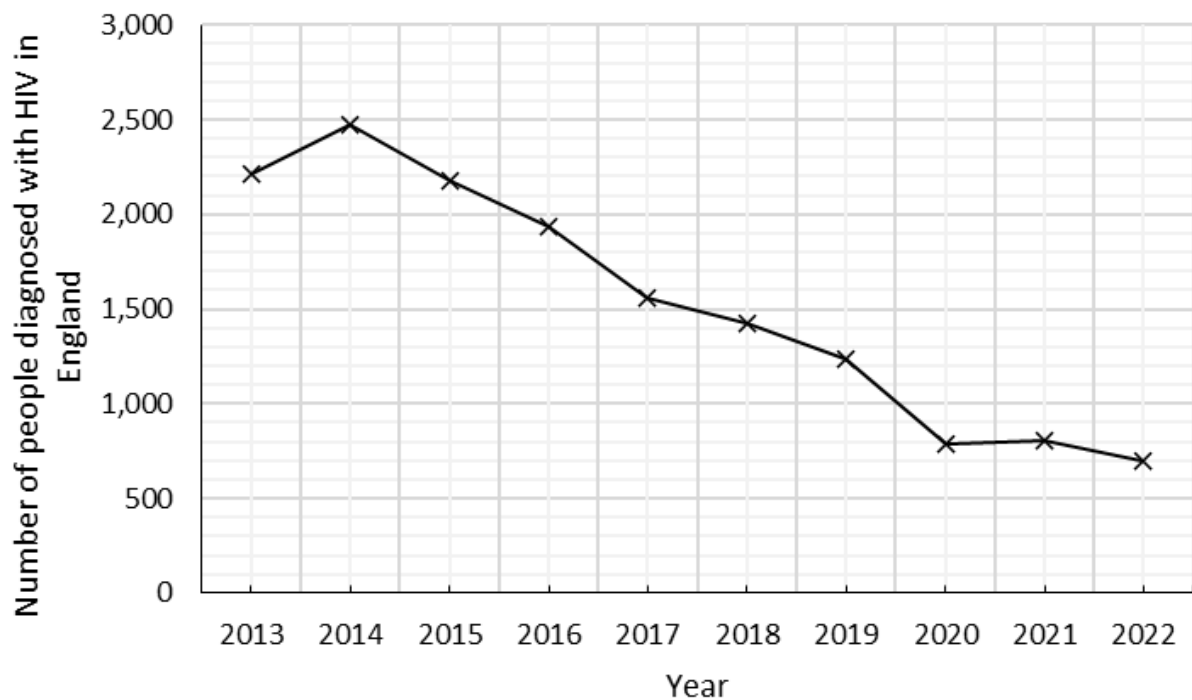
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- e) The graph shows the number of new HIV diagnoses each year in England since 2013.



- i) Describe the pattern the graph shows.

[3 marks]

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- ii) Suggest **two** reasons that could explain the change in the number of people diagnosed with HIV since 2014.

[2 marks]

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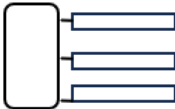
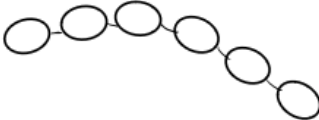


05 A group of students investigated the digestion of fats in milk by the enzyme lipase.

a) Identify which of the following diagrams best represents a fat molecule.

Tick **one** box only.

[1 mark]

b) State where in the body the enzyme lipase usually works to carry out fat digestion.

[1 mark]

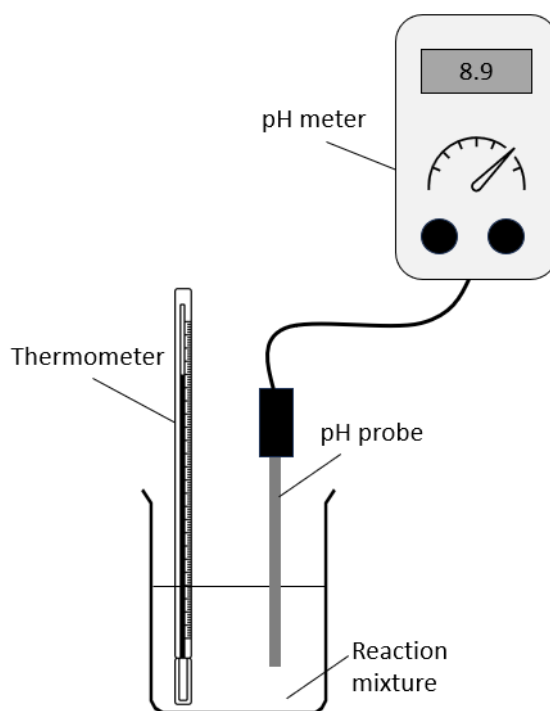
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The students set up their equipment as shown in the diagram.

- A small beaker containing milk at 10°C was set up
- Lipase solution was added to the beaker to form the reaction mixture
- The students measured the pH of the reaction mixture using a pH probe attached to a pH meter.
- The pH was measured again after 30 minutes.
- They repeated the experiment at the following temperatures: 20, 30, 40, 50 and 60 °C



c) Give the independent and dependent variable in this experiment:

[2 marks]

Independent:.....

Dependent:.....

d) Name the piece of equipment the students could have used to keep the beakers of reaction mixture at the correct temperature for 30 minutes.

[1 mark]

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The students' results are shown in the table below:

Temperature (°C)	pH of the mixture at the start	pH of the mixture after 30 minutes
10	6.8	5.2
20	6.8	4.4
30	6.8	3.6
40	6.8	2.8
50	6.8	6.5
60	6.8	6.8

- e) Explain why the pH decreased when the lipase solution was added to the milk.

[1 mark]

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- f) Using information from the table:

- i) Explain the effect of temperature on the activity of the lipase enzyme from 10-40°C.

[2 marks]

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- ii) Explain the results when the temperature was increased above 40°C.

[2 marks]

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- 06** The image shows the structure of a transport tissue, X, from the stem of a plant.

It shows the spiral structures that form the walls of the cells that make up the transport tissue.



Tissue X transports water and mineral ions up the plant.

- a)** Describe what a tissue is.

[1 mark]

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- b)** Identify the transport tissue, X.
Tick **one** box only.

[1 mark]

Xylem	<input type="checkbox"/>
Epidermis	<input type="checkbox"/>
Phloem	<input type="checkbox"/>



- c)** Describe **two** features of the structure of the vessels in tissue X.
[2 marks]

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- d)** Give the scientific term for the movement of water from the roots to the leaves of a plant.
[1 mark]

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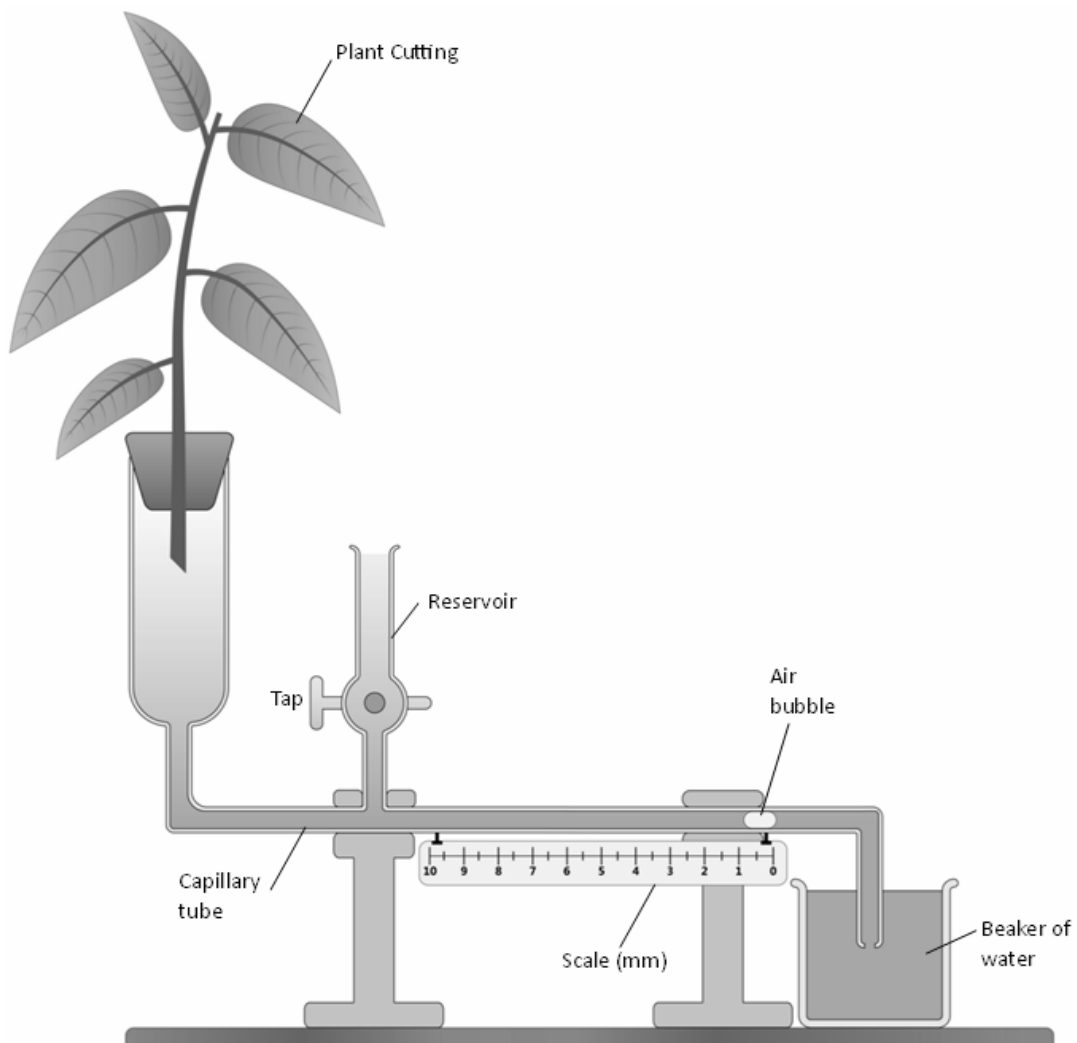
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Students wanted to investigate the rate of uptake of water from a plant shoot in different conditions.

A potometer is a piece of apparatus that can measure the uptake of water by a plant shoot.

The students set up a potometer like the one shown in the image below.



- They measured the water taken up by the shoot in normal classroom conditions.
- As the water was taken up by the shoot the air bubble moved to the left.
- The students recorded the distance moved by the bubble in mm at 4-minute intervals for 20 minutes.



Their results are shown in the table below:

Time (mins)	Distance moved by air bubble (mm)	Rate of water uptake (mm / min)
0	0.00	.....
4	2.10	.....
8	5.00	.....
12	7.90	.....
16	11.10	.....
20	14.20	.....

- e)** Calculate the rate of water uptake to complete the table.
Round your answers to the correct number of decimal places.

[2 marks]

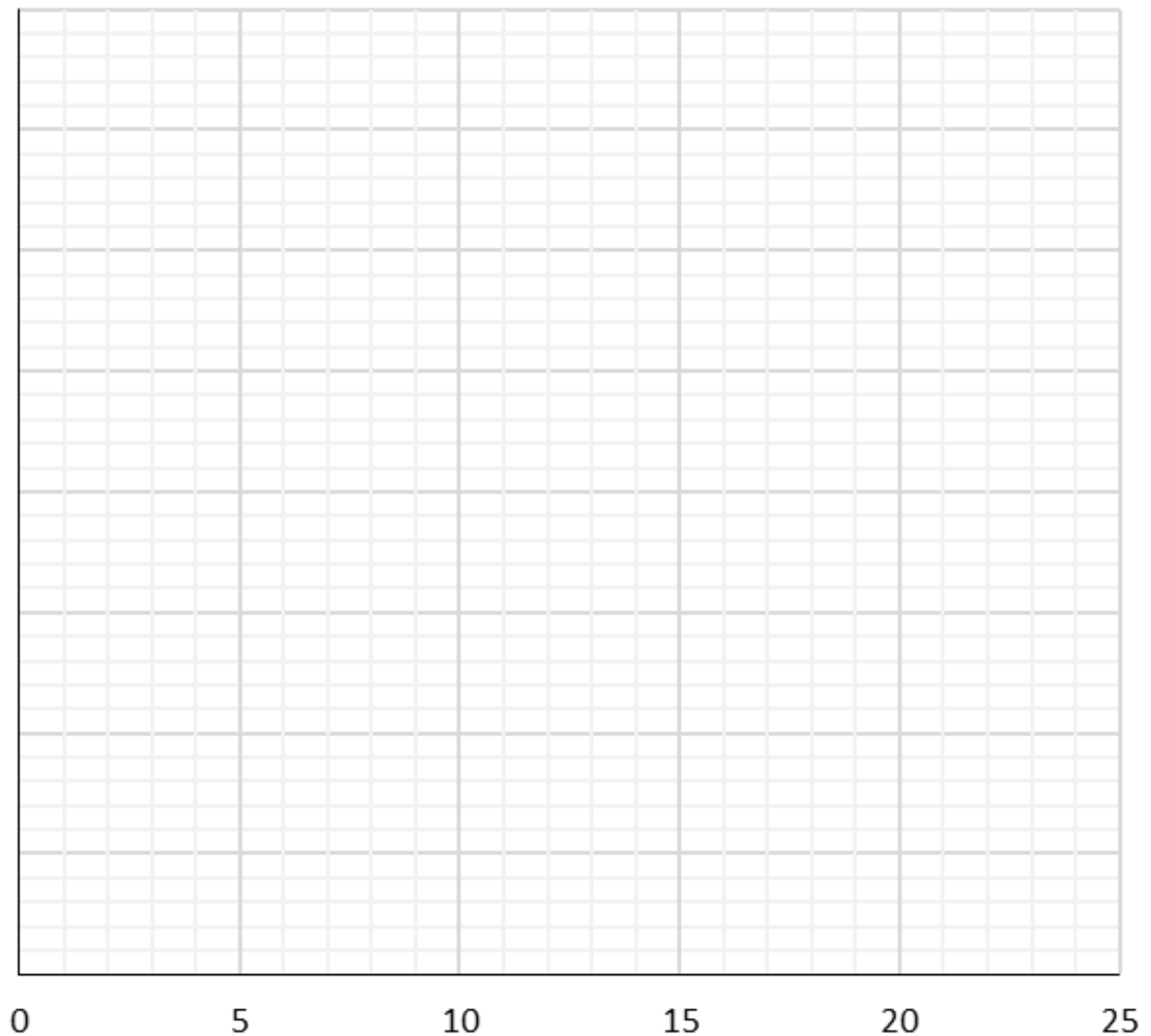


- f)** Plot a graph showing the rate of water uptake using the data in the table.

You should:

- Label the axes
- Use a suitable scale for the y axis
- Plot the data from the table
- Draw a line of best fit

[4 marks]





g) The students repeated the experiment with a fan placed next to the plant shoot so that air was blowing over it.

i) Suggest a difference you would expect to see in the results with the fan in place.
Explain your answer.

[3 marks]

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ii) Sketch a line onto the graph to show the results you would expect with the fan.
Label this line "With fan".

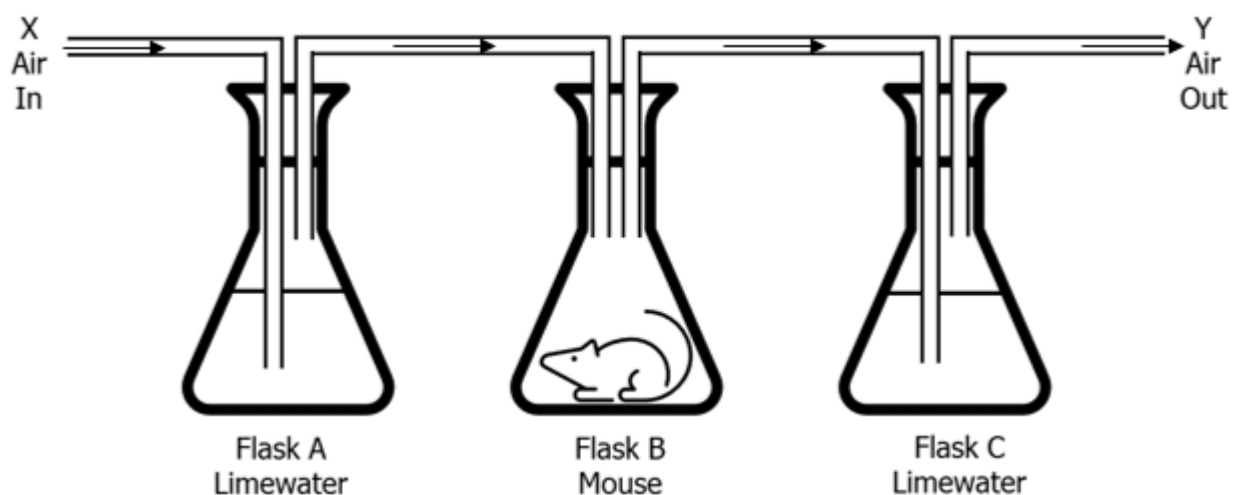
[1 mark]



- 07** A student wanted to investigate whether there was more carbon dioxide in inhaled air or exhaled air.

They set up a basic respirometer with one way air flow like the diagram below.

When the mouse breathes in air from the atmosphere is pulled in through tube x and moves through flask A. When the mouse breathes out the air flows out through flask C and out through tube Y.



- a)** Explain what you would expect the limewater to look like in flasks A and C after 30 minutes.

[4 marks]

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- b)** Suggest how this experiment could be changed so that the rate of respiration could be calculated.
Include any extra apparatus you would need to use.

[2 marks]

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- c)** The students repeated the experiment without the mouse.
Describe what you would expect to see in flask A and C after 10 minutes.

[1 mark]

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There are two types of respiration, aerobic and anaerobic.

- d)** Complete the word equations for the two types of **anaerobic** respiration.

[2 marks]

In animal cells:

Glucose →

In plant cells:

Glucose → +



- e)** Anaerobic respiration can only sustain exercise for a short time.
Explain why.

[2 marks]

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- f)** Anaerobic respiration in yeast cells is important for the food industry.
Explain why yeast cells are important to the brewing and baking industries.

[4 marks]

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- 08** *Cuscuta* is a genus of parasitic plants. They are unusual in that they have no roots or leaves and are usually yellow or red coloured as they have no chlorophyll.

The image shows the vines of a *Cuscuta* wrapped around the stem of a green plant.



They grow wrapped around the stem of a host plant and grow through the epidermis into the hosts phloem tissue.

- a)** Explain why plants usually contain chlorophyll.

[2 marks]

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- b)** Suggest why the *Cuscuta* attach to the phloem of other green plants.
[2 marks]

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- c)** Explain one reason why plants that have *Cuscuta* growing on them do not grow properly.
[2 marks]

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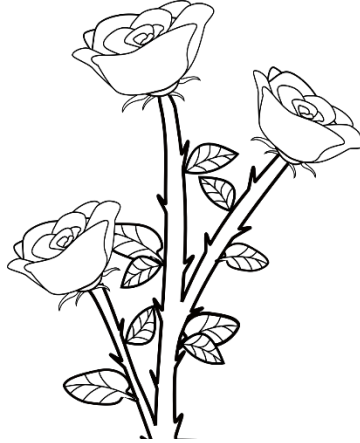
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- d)** Some plants have adaptations to help defend themselves against herbivores and parasitic plants like *Cuscuta*.

The image shows a rose, which has thorns.



- i)** State the type of defence response that thorns belong to.

[1 mark]

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- ii)** Suggest how the thorns could help defend the rose against *Cuscuta*.

[1 mark]

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09 The human body can function due to numerous metabolic reactions occurring throughout it.

a) Define 'metabolism'.

[1 mark]

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b) Amino acids and sugars are two essential biological molecules that take part in metabolic reactions.

Explain how these two molecules are used and removed from the body through metabolic processes. Your answer should include:

- The metabolic reactions these molecules are used for
- The importance of each molecule to the functioning of the body
- How the products of the breakdown of these molecules are removed from the body.

[6 marks]

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END OF QUESTIONS



MARKING GUIDANCE

Question	Answer		Additional Guidance	Marks
01a	A cell that is adapted to carry out a particular function		AO1 (accept: has differentiated for adapted)	1
01b	Feature	Explanation	AO2 1 mark for each correct feature. 1 mark for the explanation only if it matches the feature given	2
	No nucleus	More space for haemoglobin/more space to bind oxygen		
	Contains haemoglobin	To bind/carry oxygen		
	Bi concave shape	To create large surface area for oxygen diffusion		
01c	10mm = 10,000 μ m Magnification = 10,000/8 = 1,250 OR 8 μ m = 0.008mm Magnification = 10/0.008 = 1,250		AO2 maths skills 1 mark for converting mm to μ m/ μ m to mm 1 mark for correct calculation Answer is based on printing onto standard UK sized A4 paper, answers will vary depending on screen/ paper size.	2
01di	Any two from: <ul style="list-style-type: none">• Urea• carbon dioxide• water• lactic acid		Do not accept oxygen or glucose	2



01dii	1. by <u>diffusion</u> 2. because there is a higher concentration of glucose OR more glucose in blood than in muscle cells		2
TOTAL			9



Question	Answer	Additional Guidance	Marks
02a	Any four from: <ul style="list-style-type: none">• By <u>mitosis</u>• DNA/ chromosomes is replicated/duplicated / copied• chromosomes separate, one set of chromosomes is pulled / moved to each end of the cell• the cytoplasm and cell membrane divides/cytokinesis• forming two genetically identical daughter cells	AO1 – describe Should be in logical order	4
02b	Any one from: <ul style="list-style-type: none">• Increase in cell size• Organelle replication• DNA replication• Protein synthesis	AO1 Accept cell elongation Do not accept growth Accept increasing numbers of and named organelle e.g. ribosomes or mitochondria	1
02c	$1/10 \times 48 = 4.8$ hours $4.8 \times 60 = 288$ 290 to 2 sig fig	AO2 maths high demand 1 mark for either conversion (x60) if answer incorrect 1 mark for correct sig fig	3
02d	<u>Uncontrollable</u> cell division	AO1	1
02e	(exposure to) <u>UV</u> rays (from sunlight)	AO1 Accept: CT scans, X-RAYS, Nuclear Radiation (or specific names radiation) Do not accept radiation(only)	1
TOTAL			10



Question	Answer	Additional Guidance	Marks
03a	Any one from: <ul style="list-style-type: none">• Cut in a direction away from yourself• Cut on a cutting board not in your hand	AO2 Allow idea of keeping fingers away from the sharp edge/blade	1
03b	Any two from: <ul style="list-style-type: none">• Temperature• Age/type potato• Size, volume, length, width, or surface area of chip• Volume of solution• Time left in solution	Allow take chips from the same potato	2
03c	So that changes in mass are only due to cells/tissue not external liquid OR To remove excess liquid that could affect/change/add to the mass.	Ignore “so it doesn’t affect results” unqualified	1
03d	0.2: $12.2 - 10.6 = 1.6$ 0.6: $7.9 - 10.1 = -2.2$ $(1.6/10.6) \times 100 = 15.1\%$ $(-2.2/10.1) \times 100 = -21.8\%$	1 mark for correctly calculating differences 1 mark for both correct % calculation	2



03e	1. There is a higher concentration of sodium chloride outside the cell than inside the cell OR there is a higher concentration of water molecules inside the cell than outside 2. So, water moves out of the cell/cylinders (into the solution) 3. By <u>osmosis</u>	A02	3
03f	1. (Crinkle cut chip) has a greater <u>surface area</u> 2. So <u>more</u> water moved across the cells and cylinder/solution	A03 Accept water moved faster	2
TOTAL			11



Question	Answer	Additional Guidance	Marks
04a	A disease that can spread/be passed from one organism to another	AO1	1
04b	<p>Indicative Content</p> <p>Skin</p> <ul style="list-style-type: none">• acts as a barrier• produces sebum / oil that repels pathogens• platelets in blood form clots / scab at wounds• scabs prevent pathogen entry at wounds <p>Eyes</p> <ul style="list-style-type: none">• produce tears• tears contain enzymes to kill bacteria/low pH• tears are antiseptic <p>Breathing System</p> <ul style="list-style-type: none">• Cells lining the nose/trachea / bronchi produce mucus• mucus is sticky• (mucus) traps bacteria• cilia/ciliated cells move mucus to be removed <p>Stomach</p> <ul style="list-style-type: none">• contains (hydrochloric) acid• acid/low pH kills bacteria• in food or in swallowed mucus	<p>0 marks; no relevant points are made</p> <p>1-2 marks; some relevant points are made but the answer is not coherent or covering a broad range of organs. (2 or less)</p> <p>3-4 marks; all points made are relevant; the answer is coherent, and it covers more than 2 organs but no logical linking of points.</p> <p>5-6 marks; the answer is fully correct; coherent and covers 3-4 organs in detail and logical linking between points.</p>	6
04c	Antiretroviral	Ignore antiviral Do not accept antibiotics	1



04d	1. immune system is damaged / weakened or immune system doesn't function properly, so 2. white blood cells cannot kill bacteria/ pathogens (as effectively)	Allow immunocompromised Allow lack of / no white blood cells Allow no / fewer antibodies so bacteria not killed or less phagocytosis so bacteria not killed or no / fewer antitoxins to counter toxins	2
04ei	1. increased from 2013-2014 2. Then decreased from 2014 to 2022 3. Any data point from graph to support point		3
04eii	Any two from: <ul style="list-style-type: none"> • better education (into prevention of spread of HIV) • condoms more widely available or condoms easier to source or condoms cheaper • new / better drugs (to prevent HIV infection / spread) • better / more testing / identification (of people with HIV) 	Allow increased awareness about HIV Ignore contraception / protection unqualified Allow PrEP / anti-retrovirals stop the virus being passed on Ignore new treatments Do not accept antibiotics Ignore vaccination	2
TOTAL			15



Question	Answer	Additional Guidance	Marks
05a	Middle box		1
05b	Small intestine	(Do not allow intestine unqualified)	1
05c	Independent = Temperature Dependent = pH or change in pH		2
05d	A water bath		1
05e	Fatty acids are produced		1
05fi	Any 2 from: <ul style="list-style-type: none">• increase in temperature increases rate / speed of reaction• reference to molecules moving faster / colliding faster / harder / more collisions• enzyme optimum / works best at 40°C		2
05fii	<ul style="list-style-type: none">• (increasing the temperature above 40 degrees) <u>denatures</u> the enzyme OR changes the shape of the <u>active site</u>• So enzyme can no longer bind to the substrate	Do not allow enzyme 'killed' Allow enzyme substrate complexes cannot form	2
TOTAL			10



Question	Answer	Additional Guidance	Marks
06a	A group of similar cells working together to carry out a function		1
06b	Xylem		1
06c	Any two from: <ul style="list-style-type: none">• xylem is made of dead cells• xylem cells do not have end walls• xylem is hollow OR xylem does not contain cytoplasm• xylem contains lignin		2
06d	Transpiration stream	(Ignore "transpiration" unqualified)	1
06e	0 0.53 0.63 0.66 0.69 0.71	1 mark for all correct 1 mark for correct rounding	2



06f		<p>1 mark for correct scale and axes labelled with correct units</p> <p>2 marks for all points plotted correctly</p> <p>Allow ecf from 06e</p> <p>Allow a tolerance of $\pm \frac{1}{2}$ small square</p> <p>Allow 4 or 5 correct plots for 1 mark</p> <p>1 mark for suitable curved line of best fit</p> <p>Ignore line joined point to point with straight lines</p>	4
06gi	<ol style="list-style-type: none"> 1. Increased rate of uptake 2. Due to more transpiration/evaporation 3. Because <ul style="list-style-type: none"> • air movement increases/maintains the concentration/diffusion gradient <p>OR</p> <ul style="list-style-type: none"> • Air movement lowers the concentration of water outside of the plant/leaf 	Ignore any references to osmosis	3
06gii	Similar shaped line above original plotted line		1
TOTAL			15



Question	Answer	Additional Guidance	Marks
07a	<ol style="list-style-type: none">1. Flask A colourless2. Very less carbon dioxide in inhaled/atmospheric air, does not turn limewater milky/limewater remains colourless3. Flask C cloudy4. More carbon dioxide exhaled by mouse turns flask C lime water cloudy	Accept flask C more cloudy than A for 2 marks	4
07b	<ol style="list-style-type: none">1. collect the CO₂ / exhaled gas with a measuring cylinder / gas syringe2. (volume collected) in a certain time using a timer / watch		2
07c	In both flasks, limewater remains colourless		1
07d	<ol style="list-style-type: none">1. Lactic acid2. Carbon dioxide + ethanol	Yeast words can be in either order	2
07e	<ol style="list-style-type: none">1. muscles become fatigued / stop contracting2. because they do not have enough energy/not enough energy is released		2
07f	Baking <ol style="list-style-type: none">1. produces carbon dioxide2. CO₂ makes bread rise Brewing – any 2 from: <ol style="list-style-type: none">1. Produces ethanol2. CO₂ can make alcoholic drinks fizzy3. Ethanol is the alcohol in alcoholic drinks	Accept named alcoholic drinks e.g beer, cider, wine, spirits	4
TOTAL			15



Question	Answer	Additional Guidance	Marks
08a	1. Traps/absorbs light energy 2. For photosynthesis/making sugar/carbohydrates/starch	Accept uses light Ignore "food"	2
08b	1. The phloem contains sugar/glucose/sucrose 2. <i>Cuscata</i> takes/absorbs/needs this as it cannot make its own sugar/glucose/sucrose	Accept amino acids, fatty acids or other organic molecules Ignore food, minerals, water or nutrients	2
08c	1. Less sugars for respiration 2. So less energy released OR 1. Less cellulose made 2. So less cell division/weaker cell walls/cell walls can't be made OR 1. Less amino acids made 2. So less protein produced/synthesised (for growth)	Must be marked in matching pairs	2
08di	Mechanical		1
08dii	Any one from: <ul style="list-style-type: none">physically obstructing the movement of <i>Cuscata</i>preventing <i>Cuscata</i> from wrapping around the stem	Accept preventing them entering the epidermis/ phloem	1
TOTAL			8



Question	Answer	Additional Guidance	Marks
09a	The sum of all the chemical reactions in (the cells of) the body		1
09b	<p>Indicative content:</p> <p>Metabolic reactions:</p> <ul style="list-style-type: none">• Amino acids are used to synthesise proteins• Glucose is converted to glycogen• Glucose is broken down in respiration <p>Importance</p> <ul style="list-style-type: none">• Glycogen acts as a store of glucose in muscles for respiration• Energy transferred/released from respiration in cells is used by the organism for further metabolic reactions• Link to uses of energy from respiration: Need energy to synthesise new molecules, carry out active transport, heat energy – maintain body temp• Amino acids are needed to make proteins which are needed for: enzymes to catalyse reactions, hormones, antibodies, growth and repair of tissues. <p>Removal of waste products:</p> <ul style="list-style-type: none">• Water from breakdown of glucose/ respiration is removed by the lungs	<p>5–6 marks</p> <p>All points made are relevant; the answer is coherent, and it covers all three sections with logical linking between points.. For full marks both glucose and amino acids should be discussed in all three sections.</p> <p>3-4 marks</p> <p>All points made are relevant; the answer is coherent, and it covers all three sections but no logical linking of points.</p> <p>1-2 marks</p> <p>Some relevant points are made but the answer is not coherent and does not cover all three sections.</p> <p>0 marks – no relevant content given</p>	6



	<p>during exhalation, as sweat from skin, and in urine via the kidney</p> <ul style="list-style-type: none">• Carbon dioxide from the breakdown of glucose/ respiration is removed by the lungs during exhalation• Excess amino acids are deaminated to form ammonia in the liver. Ammonia is converted to urea for safe excretion in urine via the kidney.		
TOTAL			7