AQA

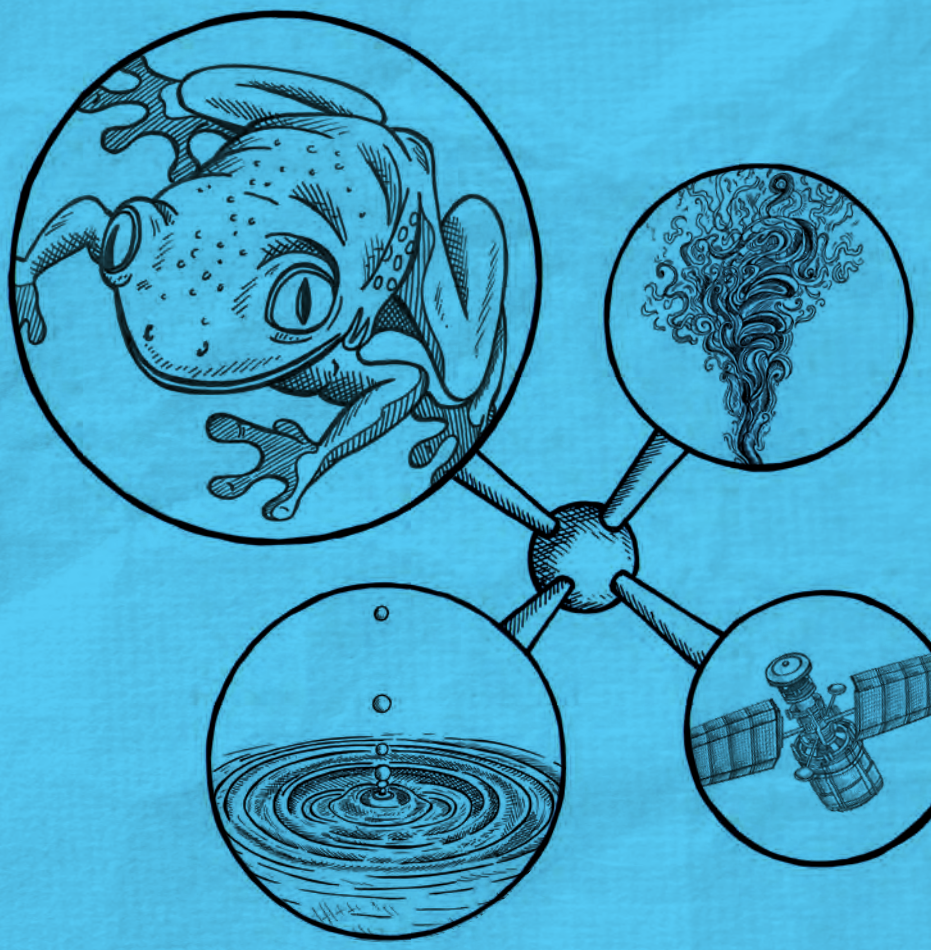
REVISE AQA GCSE (9–1)

Biology

REVISION WORKBOOK

Higher

For the 9–1 exams



Pearson

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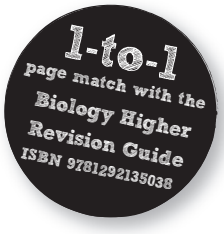
Pearson



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AQA publishes Sample Assessment Material and the Specification on its website. This is the official content and this book should be used in conjunction with it. The questions have been written to help you practise every topic in the book. Remember: the real exam questions may not look like this.

Had a go ☐ Nearly there ☐ Nailed it! ☐

Paper 1

Microscopes and magnification

1 A student uses a light microscope. The eyepiece lens has a magnification of ×10 and the objective lens has a magnification of ×5. What is the total magnification? Tick **one** box.

Always answer multiple-choice questions, even if you don't actually know the answer or can't work it out.

×2 ☐ ×5 ☐ ×15 ☐ ×50 ☐ **(1 mark)**

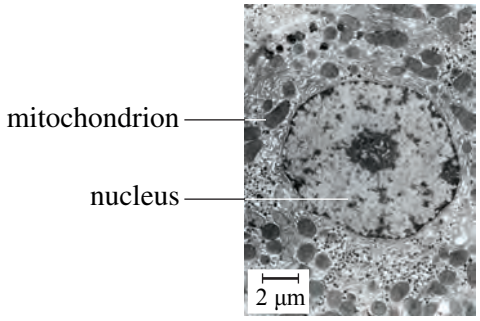
2 Scientists use light microscopes and electron microscopes to study cells. Describe how these two types of microscope differ in their magnification and resolution.

Guided

The magnification of a light microscope is usually ..... than the magnification of an electron microscope. The level of detail seen with a light microscope is ..... than that with an electron microscope because its resolution is ..... **(2 marks)**

3 The photo is an electron micrograph of part of a human liver cell.

Maths skills An answer to 1 significant figure is sufficient.



(a) Estimate the length of the mitochondrion.

.....

..... **(1 mark)**

(b) Estimate the diameter of the nucleus.

..... **(1 mark)**

4 A bacterial cell is 3 µm long. Its image in a microscope is 1.5 mm long.

(a) Calculate the magnification of the microscope when it forms this image.

Maths skills 1 mm = 1000 µm

.....

..... **(2 marks)**

(b) The magnification is adjusted to ×750. Calculate the new size of the image of the bacterial cell.

.....

.....

..... **(1 mark)**

5 Explain how electron microscopy has increased scientists' understanding of sub-cellular structures.

.....

..... **(2 marks)**

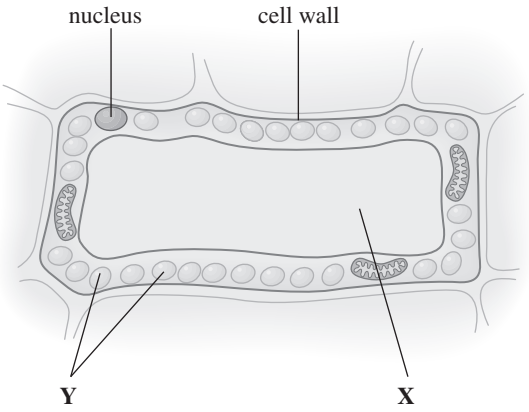
Had a go ☐ Nearly there ☐ Nailed it! ☐

Animal and plant cells

1 Which of the following structures is the site of protein synthesis in a cell? Tick **one** box.

cell membrane ☐ mitochondrion ☐ ribosome ☐ nucleus ☐ **(1 mark)**

2 The diagram shows a type of cell.



Look at the labelled features of the cell. Are these found in animal cells, plant cells or both types of cell?

(a) Name the type of organism that has cells like this.

..... **(1 mark)**

(b) Identify the structures labelled **X** and **Y**.

X .....

Y ..... **(2 marks)**

(c) Describe the function of the nucleus.

.....

..... **(2 marks)**

3 Compare the functions of the cell membrane and the cell wall.

Compare means that you need to describe the similarities and/or differences of both structures, not just one structure.

Guided

The cell membrane controls .....

.....

.....

However, the cell wall is made of cellulose which.....

..... **(2 marks)**

4 Algal cells contain sub-cellular structures called chloroplasts. Explain the function of these sub-cellular structures.

.....

.....

..... **(3 marks)**

Eukaryotes and prokaryotes

1 Animal cells are examples of eukaryotic cells. Bacterial cells are examples of prokaryotic cells. Complete the table to show which features are present in these cells. Place a tick (✓) in each correct box to show where a feature is present.

	Animal cells	Bacterial cells
Cytoplasm		
Cell membrane		
Cell wall		
Nucleus		

(4 marks)

2 Describe how the genetic material is arranged in prokaryotic cells, such as bacterial cells.

Guided

The chromosomal DNA is arranged to form a .....

Some bacterial cells also contain ..... **(2 marks)**

3 Write the following measurements in order of increasing size.

1 cm	50 μm	100 mm	200 nm

(Smallest) ..... (largest) **(1 mark)**

4 Convert the following measurements to metres in standard form.

Maths skills Numbers in standard form are written as: $A \times 10^n$

- A is a number greater than or equal to 1, and less than 10
- n is a power of 10

(a) 0.0022 m

..... **(1 mark)**

(b) 0.45 mm

..... **(1 mark)**

(c) 97 μm

..... **(1 mark)**

5 The diameter of a liver cell is 2.5×10^{-5} m. The diameter of a bacterial cell is 2.0×10^{-7} m.

(a) Calculate how many times larger the liver cell is than the bacterial cell.

.....

.....

..... **(2 marks)**

(b) Give the order of magnitude of the diameter of the bacterial cell.

The order of magnitude of the diameter of the liver cell is –5.

..... **(1 mark)**

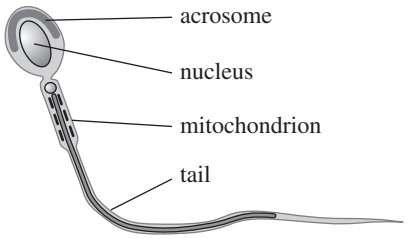
(c) Determine how many orders of magnitude larger the liver cell is than the bacterial cell.

..... **(1 mark)**

Had a go ☐ Nearly there ☐ Nailed it! ☐

Specialised animal cells

1 The diagram shows a sperm cell.

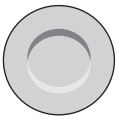


Draw **one** line to link each structure to its correct function.

Structure	Function
acrosome	releases energy for the cell
nucleus	allows cell to move
mitochondrion	carries genetic information
tail	releases enzymes to aid entry to an egg cell

(4 marks)

2 The diagram shows a human red blood cell.

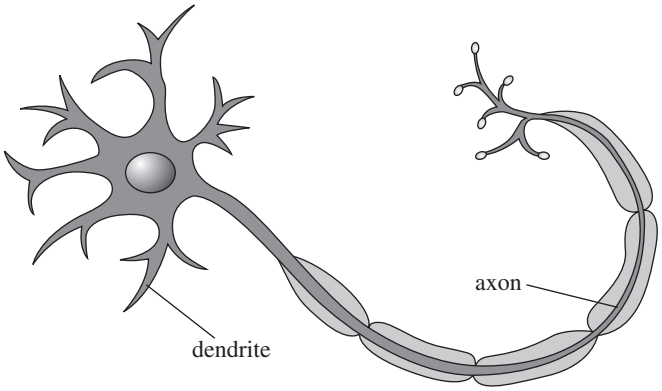


Red blood cells contain haemoglobin. This protein binds to oxygen so it can be carried in the bloodstream.

Suggest a reason why the red blood cell does not contain a nucleus.

..... **(1 mark)**

3 The diagram shows a nerve cell.



Nerve cells connect with other cells, and carry electrical impulses between distant parts of the body.

Explain how the nerve cell is adapted to its function.

Explain means that you need to describe each labelled part and then say how it allows the cell to do its job.

.....

.....

.....

..... **(4 marks)**

4 Describe what happens as cells differentiate in animals.

Guided

Most types of animal cells differentiate at an ..... stage.

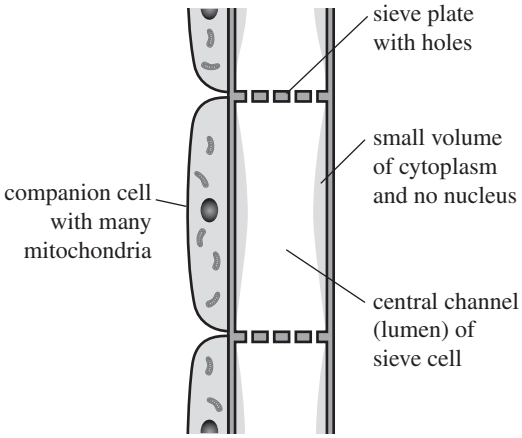
As a cell differentiates, it acquires different .....

that allow it to .....

Cell division in mature animals is mainly restricted to ..... **(4 marks)**

Specialised plant cells

1 The diagram shows a longitudinal section through phloem tissue. It consists of sieve cells and companion cells. Phloem is a transport tissue that carries dissolved sugars through a plant.



Choose from the labelled features on the diagram in your answers.

Identify the feature which:

(a) provides a lot of room for a central channel

.....

..... **(1 mark)**

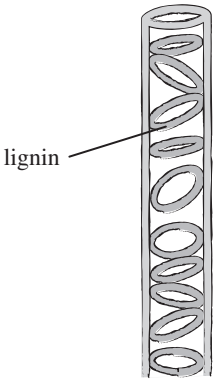
(b) allows liquids to flow from one cell to the next

..... **(1 mark)**

(c) transfers energy for active transport

..... **(1 mark)**

2 Xylem tissue is a transport tissue that carries water and mineral ions from the roots to the rest of the plant. The diagram shows part of a xylem vessel.



Guided

(a) Suggest a reason why there are no end walls between individual xylem cells.

Xylem tissue consists of hollow tubes formed by dead xylem cells. There are no end walls so that

.....

..... **(2 marks)**

(b) Lignin is a tough substance that builds up in xylem cells.

(i) Give a reason why the presence of lignin is important to the function of xylem tissue.

..... **(1 mark)**

(ii) Lignin is insoluble in water. Explain why this is important for the function of lignin in xylem tissue.

.....

..... **(2 marks)**

3 Describe how, during the life of the organism, the ability of plant cells to differentiate differs from the ability of animal cells to differentiate.

What is different about when the cells can differentiate?

.....

..... **(2 marks)**

Had a go ☐ Nearly there ☐ Nailed it! ☐

Using a light microscope

1 Describe the function of the following parts of a light microscope.

Some designs of microscope use a mirror instead of a lamp.

(a) the lamp

..... **(1 mark)**

(b) the stage with clips

..... **(1 mark)**

(c) the coarse focusing wheel

..... **(1 mark)**

Guided

2 A student viewed plant cells using a light microscope. He made a biological drawing of some of the cells.

Figure 1 shows the image seen through the microscope. **Figure 2** shows the student's drawing.

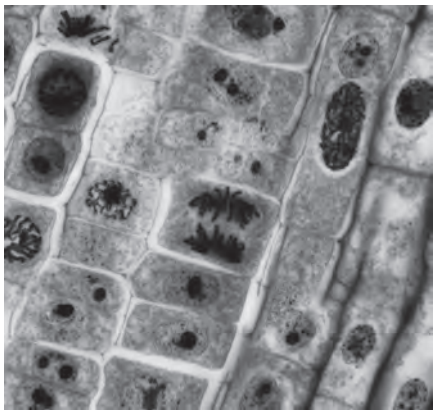


Figure 1

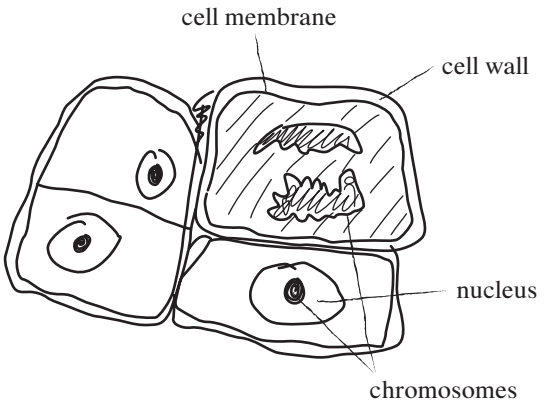


Figure 2

Identify **three** faults with the student's drawing.

1 The drawing is made with a pen rather than with a .....

2 .....

3 ..... **(3 marks)**

3 The highest magnification of a microscope allows smaller details to be observed. Describe **two** drawbacks of using the highest magnification rather than the lowest magnification.

.....

..... **(2 marks)**

4 A student is observing a slide under high power. She cannot find the part she wants to study. Describe how the student should bring this part into view.

Think about the steps needed to use the microscope safely to make the necessary adjustments.

.....

.....

..... **(3 marks)**

Had a go ☐ Nearly there ☐ Nailed it! ☐

Paper 1

Aseptic techniques

1 The mean division time for a strain of bacteria is 0.5 hours. A culture with 2000 of these bacteria is incubated. How many bacteria will there be after 1.5 hours? Tick **one** box.

6000 ☐ 8000 ☐ 16 000 ☐ 32 000 ☐ **(1 mark)**

2 Give a reason why the following steps are used when working with cultures of bacteria.

(a) The bench is wiped with disinfectant before starting work.

..... (**1 mark**)

(b) The Petri dish lid is not completely sealed before incubating the culture.

..... (**1 mark**)

(c) In school and college laboratories, cultures are incubated at 25 °C even though they grow faster at 37 °C.

..... (**1 mark**)

(d) The inoculating loop is sterilised after use.

..... (**1 mark**)

3 A student is culturing some bacteria. Here are the steps he uses:

- Agar gel is heated to 80 °C.
- The gel is cooled to about 20 °C and sets solid before adding a sample of bacteria.
- The gel is put into sterilised Petri dishes, then incubated.

Give a reason why each of these steps is important in making the bacterial culture safely and efficiently.

Write about each bullet point in turn.

.....

.....

.....

.....

.....

..... **(3 marks)**

Guided

4 It is important that people doing experiments to culture bacteria follow some safety precautions. For each precaution given, explain why it is important.

(a) The lid of the Petri dish is opened enough only to inoculate the agar plate.

This will ..... bacteria from the air that are

..... (**2 marks**)

(b) The inoculating loop is held in a flame before use.

.....

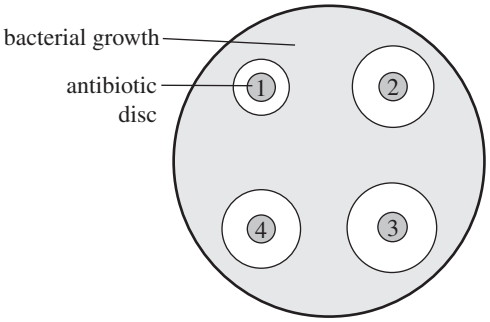
..... (**2 marks**)

Had a go ☐ Nearly there ☐ Nailed it! ☐

Practical skills

Investigating microbial cultures

1 A student investigated the effect of four different antibiotics on bacterial growth. She placed paper discs containing the antibiotics onto a culture of bacteria in a Petri dish. She then incubated the dish for 2 days. The diagram shows her results.



(a) Explain why there are clear zones around each antibiotic disc.

.....

..... **(2 marks)**

(b) Complete the table using information in the diagram. Give the areas to 3 significant figures.

Maths skills Use a ruler to measure the diameter of each clear zone in millimetres. Then calculate the area:

area of a circle = $\pi \times r^2$ (where r = radius)

Antibiotic	Diameter of clear zone in mm	Area of clear zone in mm^2
1		
2		
3		
4		

(4 marks)

(c) Identify the most effective antibiotic (**1**, **2**, **3** or **4**). Explain your answer.

.....

..... **(2 marks)**

Guided

2 (a) The student wanted to investigate the effect of the concentration of one of the antibiotics on bacterial growth. Describe how the student should adapt the method she used in question 1 to do this.

Use different concentrations of .....

..... **(2 marks)**

(b) Give **two** variables the student should control in the investigation.

1 .....

2 ..... **(2 marks)**

Mitosis

1 Which of the following are produced when a cell divides by mitosis? Tick **one** box.

two genetically different diploid daughter cells ☐

two genetically identical diploid daughter cells ☐

four genetically identical haploid daughter cells ☐

four genetically different haploid cells ☐ **(1 mark)**

2 Give **three** reasons why mitosis takes place.

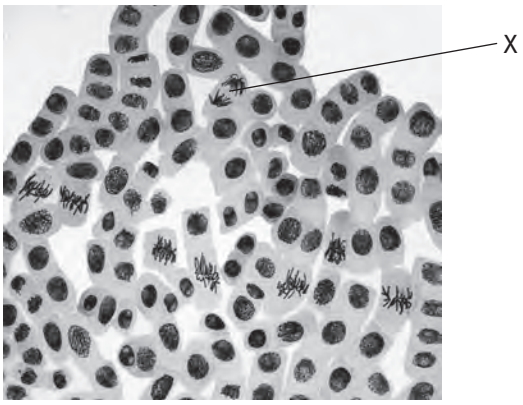
Guided

1 to produce new individuals by ..... reproduction

2 .....

3 ..... **(3 marks)**

3 The photograph shows onion root tip cells viewed through a microscope.



(a) Describe what is happening in the cell labelled **X**.

.....

.....

.....

.....

..... **(2 marks)**

(b) Describe what would happen next to the cell labelled **X** so it would form daughter cells.

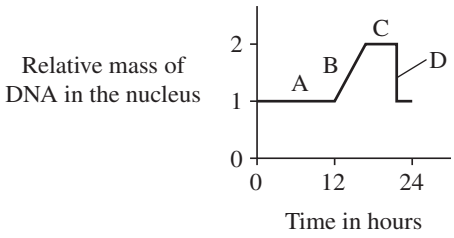
Think about the cytoplasm and cell membrane of the cell.

.....

..... **(2 marks)**

4 The graph shows the mass of DNA in the nucleus of a cell over a 24-hour period.

Give the stages in the cell cycle at the parts on the graph labelled **A**, **B**, **C** and **D**.



Remember that you need to understand the three overall stages of the cell cycle, but do not need to know the different phases of the mitosis stage.

.....

.....

.....

.....

.....

..... **(4 marks)**

Had a go ☐ Nearly there ☐ Nailed it! ☐

Stem cells

Guided

1 What is a stem cell? Tick **one** box.

an undifferentiated cell ☐

a specialised cell of an organism ☐

a cell found only in embryos ☐

~~a cell that causes diabetes and~~ paralysis ☐

The last option cannot be correct because stem cells may be able to help conditions such as these.

(1 mark)

2 Some plant tissues contain stem cells.

(a) Give the name of the tissue where plant stem cells are found.

..... **(1 mark)**

(b) The tissue named in part (a) is found at the tip of roots.

(i) Give **one** other place in a plant where this tissue is found.

..... **(1 mark)**

(ii) Describe the function of stem cells in the tip of roots.

Include the name of at least one other tissue in your answer.

.....

..... **(2 marks)**

Guided

(c) Plant stem cells can be used to produce clones of plants quickly and economically. Describe **two** reasons why people may want to produce such clones.

Rare species can be cloned so they .....

.....

..... **(2 marks)**

3 Some disorders may be treated using adult stem cells. For example, leukaemia is a disorder in which white blood cells are produced in excess numbers and do not function normally. Adult stem cells from the bone marrow of a donor are transplanted to the patient, where they differentiate to produce normal white blood cells.

(a) Describe the meaning of the term 'differentiate'.

.....

..... **(2 marks)**

(b) Give **two** risks of using adult stem cells for medical treatments.

1 .....

2 ..... **(2 marks)**

(c) In therapeutic cloning, an embryo is produced with the same genes as the patient. Suggest **one** advantage and **one** disadvantage of using stems cells from an embryo like this.

Advantage: .....

Disadvantage: ..... **(2 marks)**

Diffusion

1 Explain what is meant by the term 'diffusion'.

Guided

Diffusion is the ..... of particles, so that there is a net movement of particles from an area of ..... to an area of ..... **(2 marks)**

2 Substances can diffuse when they are in the gas state or in solution. The temperature of the gas or solution is one of the factors that affects the rate of diffusion.

(a) Give **three** other factors that can affect the rate of diffusion.

Remember that diffusion can happen across cell membranes.

1 .....

2 .....

3 ..... **(3 marks)**

(b) Explain why the rate of diffusion depends upon the temperature.

Think about what happens to the movement of particles in gases and solutions as the temperature increases.

.....

..... **(2 marks)**

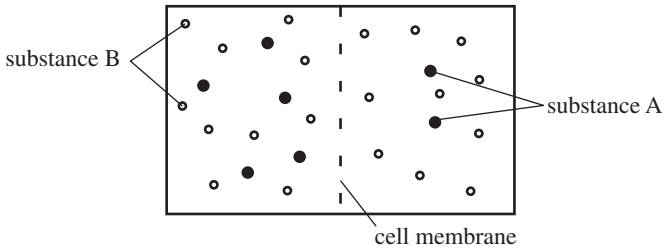
3 Urea is a waste product. It diffuses from cells into the blood plasma for excretion by the kidneys. Describe how the concentration of urea in these cells compares with its concentration in the blood plasma. Justify your answer.

.....

.....

..... **(3 marks)**

4 The diagram shows two dissolved substances in neighbouring cells, separated by a cell membrane.



Explain what happens to these two dissolved substances when the cells are left for some time.

.....

.....

.....

..... **(4 marks)**

Had a go ☐ Nearly there ☐ Nailed it! ☐

Exchange surfaces

1 A student investigated how quickly diffusion happens in agar gel. The gel contained dilute sodium hydroxide solution and phenolphthalein indicator, which made it pink. He cut the gel into cubes of different side lengths and placed all the cubes in dilute hydrochloric acid. The student timed how long the cubes took to become completely colourless. Which of the following took the longest time for this change? Tick **one** box.

Hydrochloric acid diffuses into the cubes and neutralises the sodium hydroxide inside, causing a colour change.

one 5-mm cube	☐	two 10-mm cubes	☐
four 5-mm cubes	☐	one 20-mm cube	☐

(1 mark)

2 The small intestine is adapted for the efficient absorption of digested food molecules.

(a) Name the finger-like structures that cover the lining of the small intestine.

..... **(1 mark)**

Guided

(b) Describe **three** ways in which the structures named in part (a) are adapted to provide an effective exchange surface.

Their shape gives them a large .....

They provide a short diffusion path because .....

..... A network of blood capillaries inside them ensures that ..... **(3 marks)**

3 Calculate the surface area to volume ratio of a cube-shaped cell with a side length 50 μm.

Maths skills Calculate the total surface area in μm^2 and the volume in μm^3. Remember that a cube has six equal square sides.

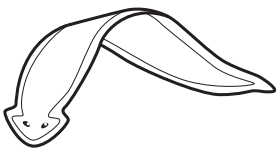
.....

.....

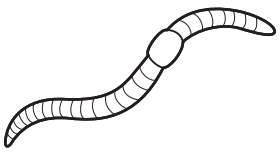
.....

Surface area to volume ratio = ... **(2 marks)**

4 The diagrams show two types of worm, a flatworm and an earthworm. They are similar in size.



Flatworm



Earthworm

The earthworm has a transport system (a heart and blood vessels) but the flatworm does not. Explain these observations.

.....

.....

.....

..... **(4 marks)**

Osmosis

1 Describe what is meant by osmosis.

Guided

Osmosis is the diffusion of ..... from a .....

solution to a ..... solution through a

..... (**4 marks**)

2 A student cut two pieces of the same size from a potato. She put one piece of potato into some distilled water. She put the other piece of potato into a strong solution of glucose. She left the potato pieces for 5 hours and then looked to see if they had become longer.

(a) Explain why it is important that the two pieces of potato are the same size at the start.

.....

.....

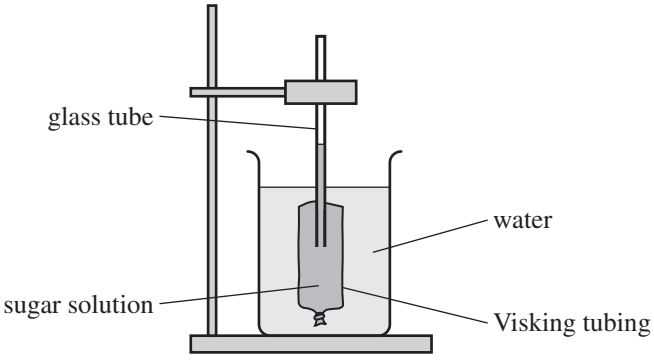
..... (**2 marks**)

(b) Describe what she would notice about the size of each piece of potato at the end of the experiment.

Potato in distilled water: .....

Potato in strong glucose solution: ..... (**2 marks**)

3 This apparatus can be used to model osmosis in cells.



(a) The Visking tubing is partially permeable. Describe what 'partially permeable' means.

.....

.....

..... (**2 marks**)

(b) Explain why the level of liquid in the glass tube gradually rises when the apparatus is left for a few hours.

.....

.....

..... (**3 marks**)

(c) Predict what would happen to red blood cells placed in water. Explain your answer.

Think about whether the volume of cytoplasm will increase or decrease, and why. What effect will this change have on the appearance of the cells?

.....

.....

.....

..... (**4 marks**)

Had a go ☐ Nearly there ☐ Nailed it! ☐

Practical skills

Investigating osmosis

1 A student investigated the effect of solutions with different concentrations of sucrose on the mass of potato tissue. He used a cork borer to cut equal-sized cylinders of potato, then weighed each one. The student placed the cylinders in the different solutions. He removed them after a few hours, dried them with a paper towel, and weighed them again. The table shows his results.

Concentration in mol/dm^3	Initial mass in g	Final mass in g	Change in mass in g	Percentage change in mass
0	2.60	2.85		9.6
0.2	2.51	2.67	0.16	6.4
0.4	2.65	2.72	0.07	2.6
0.6	2.52	2.45	–0.07	–2.8
0.8	2.58	2.43	–0.15	

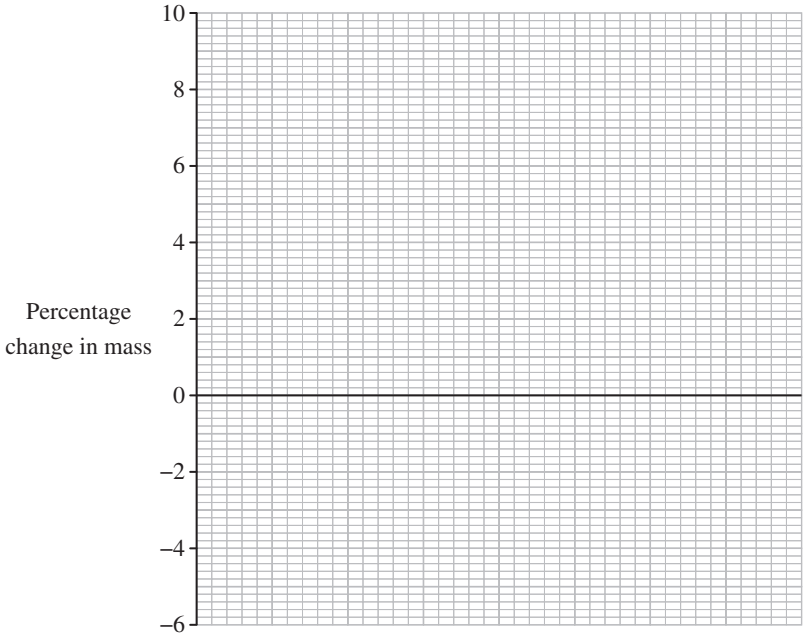
Guided

(a) Calculate the **two** missing values in the table. Use these values to complete the table.

Change in mass = 2.85 − 2.60 = ... g

Percentage change in mass = (−0.15/2.58) × 100 = ...% **(2 marks)**

(b) Plot a graph to show the percentage change in mass against concentration in mol/dm^3. **(3 marks)**



Maths skills Choose a suitable scale for the horizontal axis. The scale should allow the plotted points to cover at least half of the area of the graph.

Draw a line of best fit. This can be curved or straight, depending on the data, but should ignore points that are clearly anomalies.

(c) Use the completed graph to estimate the concentration of the potato tissue.

..... **(1 mark)**

(d) The student used a balance with a resolution of ±0.01 g. Explain, using the readings at 0.2 mol/dm^3 as an example, why the student did not use a balance with a resolution of ±0.1 g instead.

The **resolution** of an instrument is the smallest change in the quantity being measured that gives a perceptible change in the reading. What readings would a ±0.1 g balance give?

.....

.....

..... **(3 marks)**

Active transport

1 Cells move sodium ions from a low concentration inside the cell to a high concentration outside the cell. What process do cells use to do this? Tick **one** box.

diffusion ☐ osmosis ☐ active transport ☐ dissolving ☐ **(1 mark)**

2 Plants require nitrate ions for healthy growth. Plants move nitrate ions from very dilute solutions in the soil to higher concentrations in the root hair cells.

(a) Give a reason that explains why nitrate ions cannot be moved by osmosis.

..... (**1 mark**)

(b) Use the information given to explain why diffusion is not responsible for moving these ions.

Think about what happens during diffusion.

.....

..... (**2 marks**)

(c) Explain why the rate of respiration may increase in root hair cells during the uptake of nitrate ions.

Guided

The nitrate ions are being moved by .....

This process requires ..... from ..... (**3 marks**)

3 Active transport is used to move dissolved glucose from the gut to the blood plasma.

(a) Describe an advantage of absorbing glucose into the blood in this way.

.....

..... (**1 mark**)

(b) Some toxins prevent the release of energy by mitochondria. Predict the effect of these toxins on the absorption of glucose into the plasma. Explain your answer.

.....

.....

..... (**3 marks**)

4 Substances are transported into and out of cells by diffusion, osmosis and active transport.

(a) Compare the main features of diffusion and osmosis.

Describe the similarities and differences between the two processes.

.....

..... (**2 marks**)

(b) Compare the main features of diffusion and active transport.

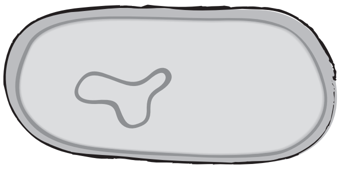
.....

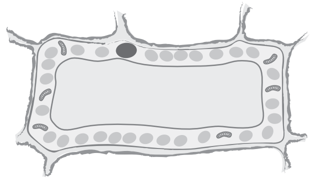
.....

..... (**3 marks**)

Extended response – Cell biology

The diagrams show a bacterial cell and a plant cell. The diagrams are not drawn to scale.


Bacterial cell


Plant cell

Compare the structures of these two cells, including sub-cellular structures and their functions.

In your answer to this question, you need to think about:

- the similarities between the cells
- the differences between the cells.

For each structure that you identify, remember to describe its function.

It may help if you make a brief plan before you start writing.

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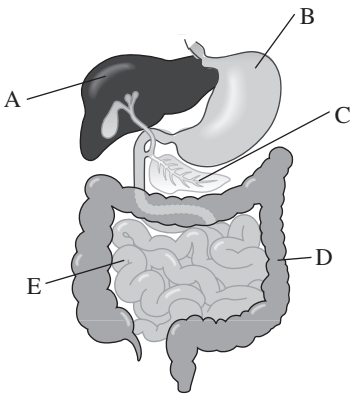
.... **(6 marks)**

The digestive system

1 The diagram shows part of the human digestive system. Identify the organs labelled A to E.

Organs in the digestive system include the liver, large intestine, pancreas, small intestine and stomach.



A .....

B .....

C .....

D .....

E ..... **(5 marks)**

Guided

2 The stomach is an organ in the digestive system. It is composed of several types of tissue.

(a) Describe what is meant by a tissue.

A tissue is a group of cells with a similar ..... and

..... (**2 marks**)

(b) Describe what is meant by an organ.

.....

..... (**2 marks**)

(c) The digestive system is an organ system. Name **two** other organ systems in the human body.

1 .....

2 ..... (**2 marks**)

3 Digestive enzymes in the digestive system convert large, insoluble molecules in food into small soluble molecules.

(a) Complete the table to show the features of carbohydrase, protease and lipase enzymes.

The **substrate** is the substance changed by an enzyme.

Type of enzyme	Substrate	Product(s)
carbohydrase		simple sugars
protease	proteins	
lipase		

(4 marks)

(b) Amylase is an example of a carbohydrase. Name the substance broken down by amylase.

..... (**1 mark**)

Had a go ☐ Nearly there ☐ Nailed it! ☐

Practical skills

Food testing

1 A student carried out a test to detect lipids in a food sample. This is the method she used.

Detecting lipids	
A	Grind up a small sample of dry food and transfer it to a beaker.
B	Add distilled water and stir to disperse the food.
C	Half fill a test tube with this mixture and add three drops of Sudan III stain.
D	Shake gently to mix, and record your observations.

(a) Name suitable laboratory apparatus that can be used to grind up dry food samples.

..... (**1 mark**)

(b) What will the student observe if the food sample contains lipids? Tick **one** box.

a blue-stained layer floating on a layer of water ☐

a blue-stained layer underneath a layer of water ☐

a red-stained layer floating on a layer of water ☐

a red-stained layer underneath a layer of water ☐ **(1 mark)**

2 Describe the test you would use to find out if protein is present in egg white.

Guided

Put some egg white in a test tube. Add an equal volume of .....

..... and shake to mix. If protein is present, the mixture turns

..... (**2 marks**)

3 A student carried out a test on samples of two different foods. He dissolved each sample in water and added Benedict's solution. The student heated the mixtures in test tubes for about 5 minutes, and then recorded his observations.

(a) Describe how the student can heat the mixtures safely.

A Bunsen burner is not necessary to carry out these tests.

.....

..... (**2 marks**)

(b) One mixture turns green and the other turns red. Explain what these observations show.

.....

..... (**2 marks**)

4 Flour is a powdery dry food.

(a) Describe the test you would use to find out if starch is present in a sample of flour.

Say what you would do and what you would see.

.....

..... (**2 marks**)

(b) Give **one** hazard associated with the reagent used in this test.

..... (**1 mark**)

Enzymes

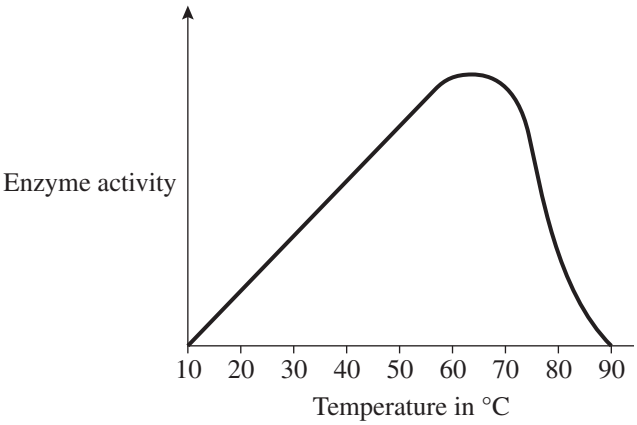
Guided

1 'Biological' washing powders contain enzymes including proteases and lipases. These break down food stains on clothes. Explain why proteases can break down proteins in food stains but lipases cannot.

The active site in proteases matches the shape of ..... but

..... (**2 marks**)

2 Certain bacteria are adapted to live in hot water springs. The graph shows how the activity of an enzyme found in these bacteria is affected by temperature.



(a) Give the optimum temperature for this enzyme.

..... (**1 mark**)

(b) Explain why enzyme activity increases between 10 °C and 50 °C.

Think about the rate of collisions involving molecules.

.....

..... (**2 marks**)

(c) Explain the change in enzyme activity above 70 °C.

Use your knowledge of the effect of high temperatures on the structure of proteins such as enzymes.

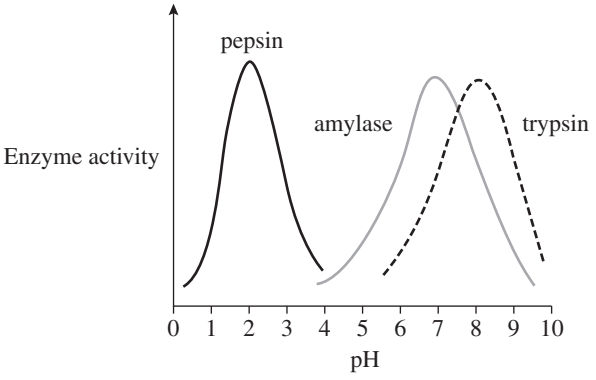
.....

.....

.....

..... (**3 marks**)

3 Pepsin and trypsin are proteases. Pepsin is produced in the stomach (pH 2) and trypsin is found in pancreatic juice (pH 8.6) released into the small intestine. Saliva (pH 7.5) and pancreatic juice both contain amylase. The graph shows the effect of pH on the activity of these three enzymes.



Proteins are digested in the stomach and small intestine, but starch is digested only in the mouth and small intestine. Use the information to explain why.

.....

.....

.....

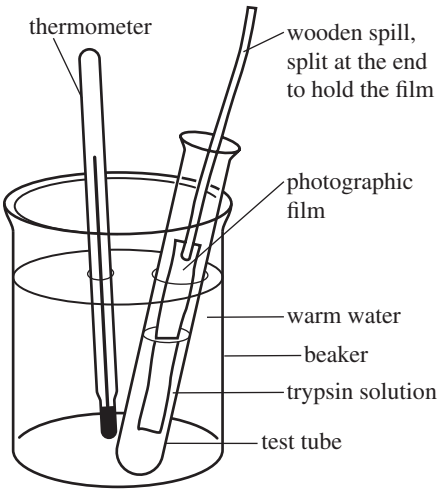
..... (**4 marks**)

Had a go ☐ Nearly there ☐ Nailed it! ☐

Practical skills

Investigating enzymes

1 A student investigated the effect of pH on the activity of trypsin. Trypsin digests the proteins in photographic film, turning it clear. The student used the apparatus shown in the diagram. She measured the time taken for trypsin solution to turn pieces of film clear at different pH values.



The table shows her results.

pH	2	4	6	8	10
Time in min	>10	7.5	3.6	1.2	8.3
Rate in /min	0	0.13			

Guided

(a) Complete the table by calculating the rate at each pH. (**2 marks**)

Use: rate = $\frac{1}{\text{time}}$

(b) Plot a graph to show the rate of reaction against pH. (**4 marks**)

Choose scales that allow the plotted points to cover at least half the area of the graph. Remember to label both axes and draw a line of best fit.

(c) Describe **two** improvements the student could make to her method.

1 .....

2 ..... (**2 marks**)

The blood

1 Draw **one** line from each blood component to a correct function.

Blood component	Function
plasma	carries other blood components
platelet	part of the body's immune system
red blood cell	involved in forming blood clots
white blood cell	carries oxygen

(4 marks)

2 Blood contains red blood cells.

(a) Name the cell structure, normally found in cells, that is missing in human red blood cells.

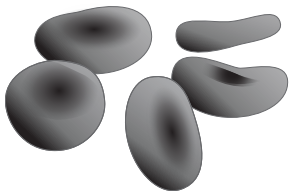
..... **(1 mark)**

(b) Name the compound in red blood cells that gives them their colour.

..... **(1 mark)**

Guided

(c) The diagram shows some red blood cells.



Describe **two** ways in which red blood cells are adapted to carry out their function.

Their biconcave shape gives them a large .....

for diffusion to happen efficiently. They are also flexible, which lets them .....

..... **(2 marks)**

3 The plasma transports soluble products of digestion, including glucose and amino acids. Name **two** waste substances transported by the plasma.

1 .....

2 ..... **(2 marks)**

4 There are different types of white blood cells, phagocytes and lymphocytes. Describe a function of each type of cell.

Phagocytes are named after the Greek word 'phagein', which means 'to eat', but do not write that phagocytes *eat* pathogens (disease-causing organisms).

Phagocyte: .....

..... **(1 mark)**

Lymphocyte: .....

..... **(2 marks)**

5 Explain the role of platelets in protecting the body from infection.

.....

.....

..... **(2 marks)**