OCR GCSE GATEWAY BIOLOGY A · J247

BIOLOGY



EXAM QUESTION PACK

B1.1 CELL STRUCTURES

SCORE	PERCENTAGE
/95	%

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Gateway Biology A (9-1)

Cell structures

Please note that you may see slight differences between this paper and the original.

Candidates answer on the Question paper.

OCR supplied materials:
Additional resources may be supplied with this paper.

Other materials required:
- Pencil
- Ruler (cm/mm)

Duration: Not set

Candidate forename		Candidate surname	

Centre number						Candidate number				

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions, unless your teacher tells you otherwise.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Where space is provided below the question, please write your answer there.
- You may use additional paper, or a specific Answer sheet if one is provided, but you must clearly show your candidate number, centre number and question number(s).

INFORMATION FOR CANDIDATES

- The quality of written communication is assessed in questions marked with either a pencil or an asterisk. In History and Geography a *Quality of extended response* question is marked with an asterisk, while a pencil is used for questions in which *Spelling, punctuation and grammar and the use of specialist terminology* is assessed.
- The number of marks is given in brackets **[ ]** at the end of each question or part question.
- The total number of marks for this paper is **95**.
- The total number of marks may take into account some 'either/or' question choices.

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1 A student uses a microscope.

The magnification on the eyepiece lens is ×10.

The magnification on the objective lens is ×4.

What is the total magnification?

A 2.5
B 6
C 14
D 40

Your answer ☐

[1]

2(a) A student prepares onion cell slides to view under a microscope.

Put the stages in the correct order by writing the numbers **1** to **5** in the boxes.

	add a drop of iodine solution
	cut the onion in to pieces
	peel off a thin layer of onion tissue
	put on a cover slip
	put the onion tissue on a slide

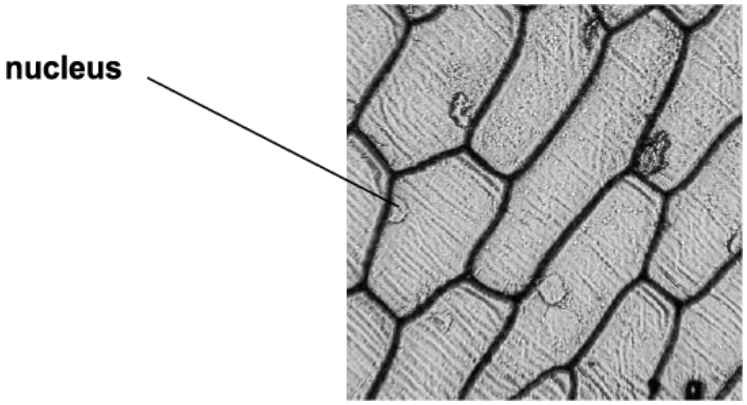
[2]

(b) Explain why the iodine solution is used.

---

[2]

(c) Look at the image below of some onion cells.



(i) Explain how the contents of the nucleus allow it to carry out its function.

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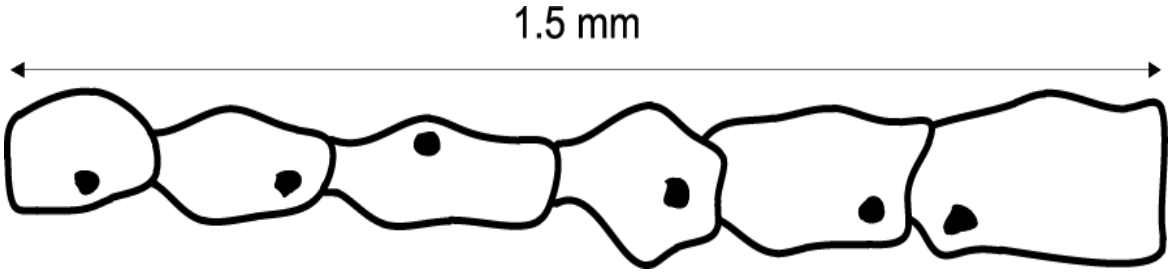
[2]

(ii) Explain why there are **no** chloroplasts in these onion cells.

---

[2]

(d) The diagram shows a layer of onion cells.



The actual length of the layer is 1.5 mm.

Calculate the average length of one onion cell.

answer = _____ mm **[2]**

(e) A student thinks that using the highest magnification of a microscope is always best.

Explain why this may **not** be true.

---

[2]

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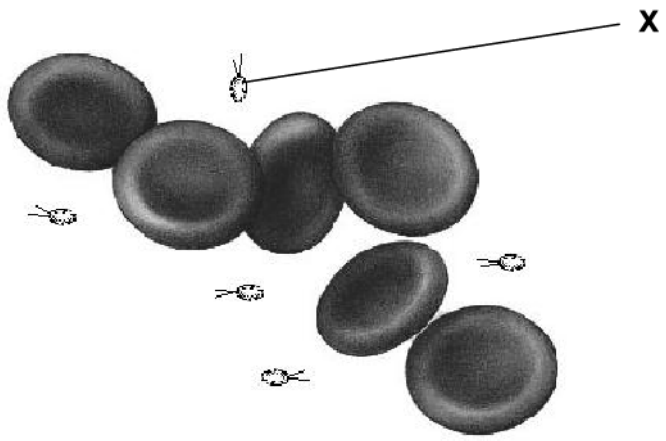
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3 Probash is ill and is having tests in hospital. The doctors took a sample of blood from Probash.

They looked at the specimen under a light microscope.

This is a picture of what they saw.



From this picture, the doctors decide that Probash's illness is caused by bacteria (labelled X).

(i) Why do the doctors not think that the structures labelled **X** are viruses?

---

[1]

(ii) What equipment could the doctors use to get a clearer image to confirm their ideas?

---

[1]

4 Which does **not** contain DNA?

A cell membrane
B chromosome
C nucleus
D plasmid

Your answer ☐

[1]

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5 The diameter of a human egg cell is 120μm.

What is the diameter in mm?

$1\mu m = 1 \times 10^{-3} mm$.

A 1.2×10^{-1}

B 1.2×10^{-2}

C 1.2×10^{-3}

D 1.2×10^{-4}

Your answer ☐

[1]

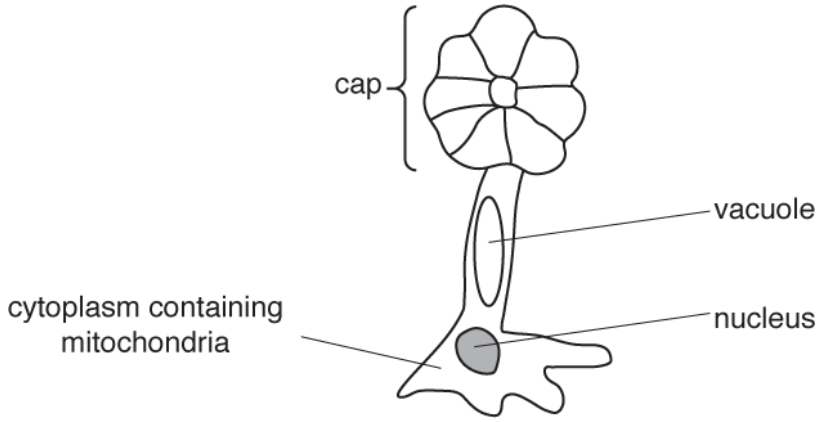
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6(a) *Acetabularia* is a single-celled organism that lives in the sea.

It has rather an unusual shape.



Draw lines to join each **structure** in *Acetabularia* to its **job**.

structure	job
vacuole	contain chromosomes
mitochondria	support
nucleus	respiration

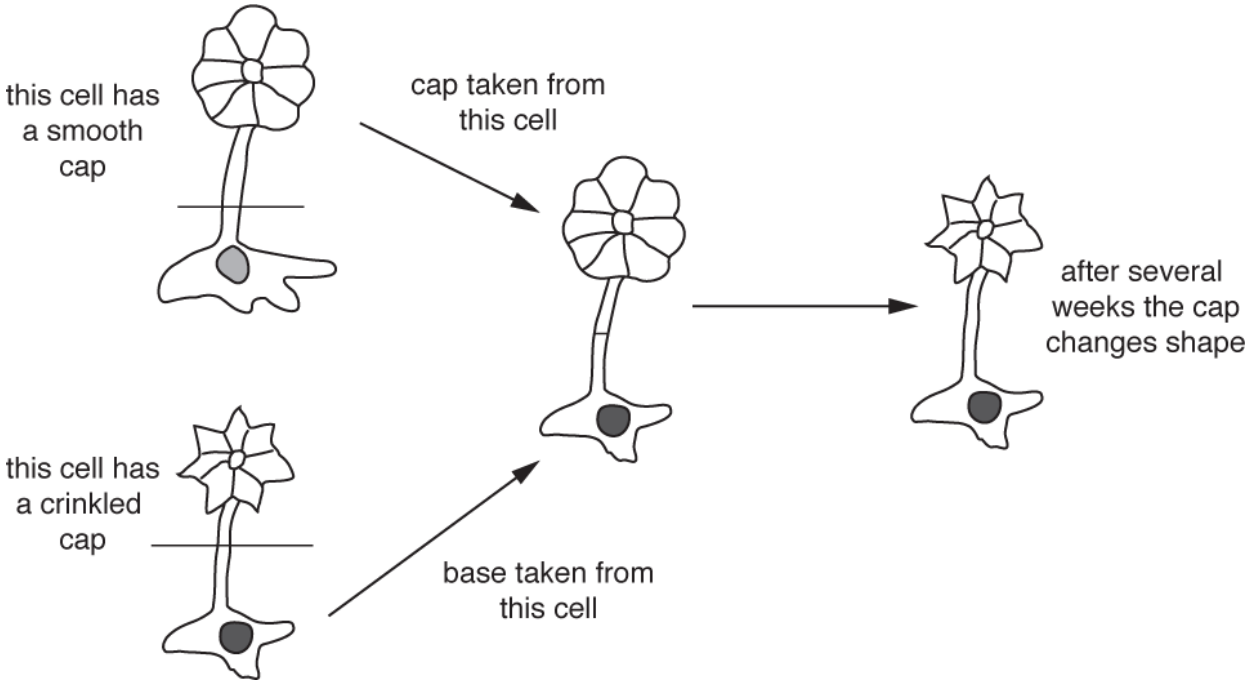
[2]

(b)

A scientist does an experiment with two types of *Acetabularia*.

The two cells have different shaped caps.

The scientist takes parts from each cell and joins them together.



The shape of the cap depends on which **proteins** are made by the cell.

Write about how the making of proteins is controlled in a cell.

Use this idea to explain the results of the scientist's experiment.

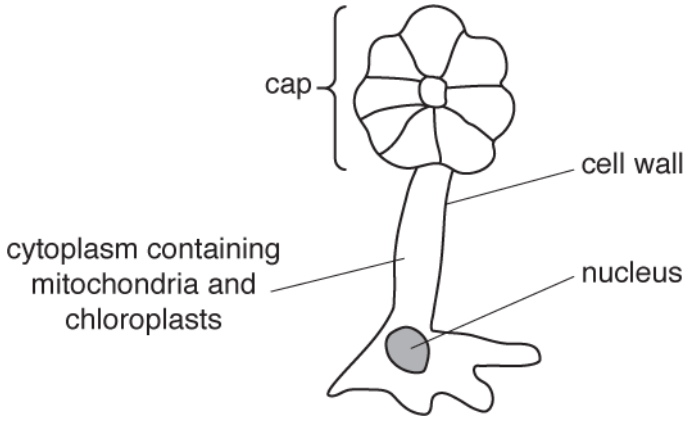
The quality of written communication will be assessed in your answer to this question.

---

[6]

7(a) *Acetabularia* is a unicellular organism that lives in the sea.

It has rather an unusual shape.



(i) Write down **two** features shown in the diagram of *Acetabularia* that tell you that it is **not** a bacterium.

1 ---

2 ---

[2]

(ii) *Acetabularia* is one of the largest unicellular organisms.

To be larger, organisms need to be multicellular.

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What is an advantage of being larger and multicellular?

Put a tick (✓) next to the **correct** answer.

Some genes can be lost from some cells. ☐

Both aerobic and anaerobic respiration can occur. ☐

Cells are able to differentiate and specialise. ☐

Organisms are able to clone themselves. ☐

[1]

(iii) To become multicellular, specialised organ systems may be needed.

Write down **one** of these systems and explain why it is needed.

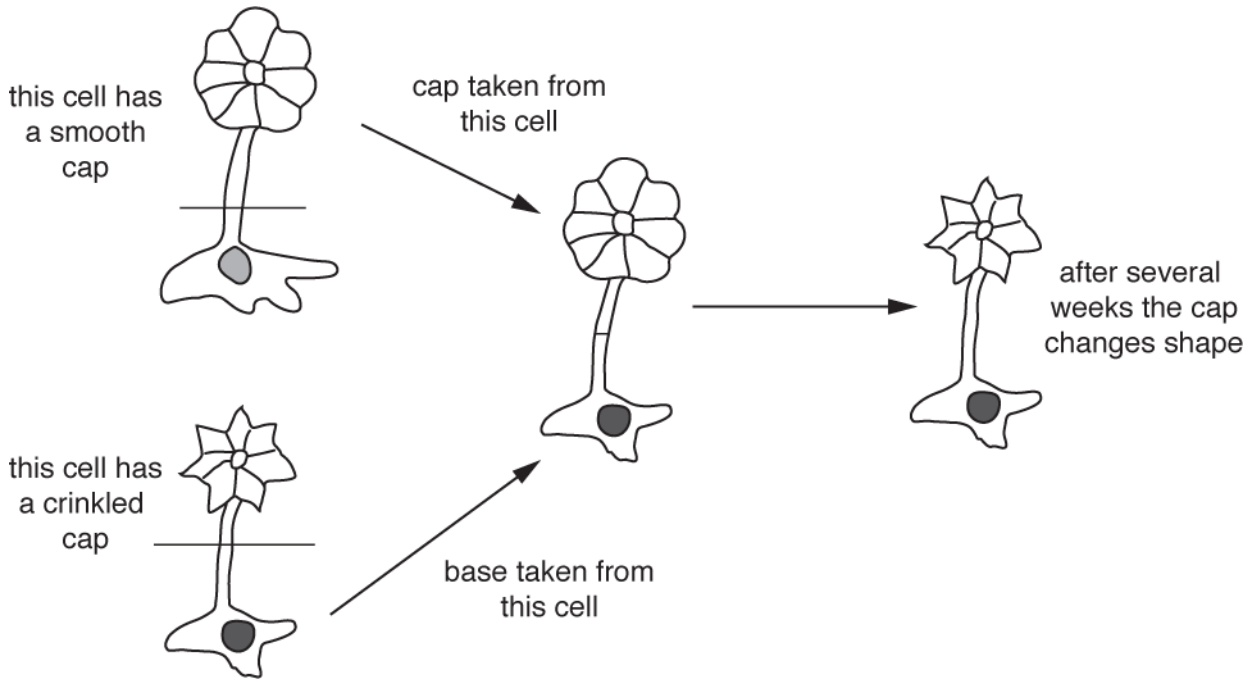
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[1]

(b) A scientist did an experiment with two types of *Acetabularia*.

The two types of *Acetabularia* had different shaped caps.

The diagram shows the scientists experiment.



The shape of the cap depends on which ***proteins*** *are made by the cell.*

Explain how the nucleus codes for proteins that are made elsewhere in the cell and suggest why it took several weeks for the cap to change shape.

The quality of written communication will be assessed in your answer to this question.

---

[6]

8 Mia investigates the effect of two liquids on animal cells.

She puts 5 cm^3 of distilled water into test tube **A**.

She puts 5 cm^3 of concentrated salt solution into test tube **B**.

Mia then adds 3 drops of blood to each of the test tubes.

She records the appearance of the test tubes as soon as the blood is added and then again after 2 minutes.

Here is her results table.

Test tube	Contents	Appearance at start	Appearance after two minutes
A	distilled water and blood	cloudy	clear red liquid
B	concentrated salt solution and blood	cloudy	cloudy

The diagrams show what has happened to the cells in the different liquids.

in test tube **A**



in test tube **B**



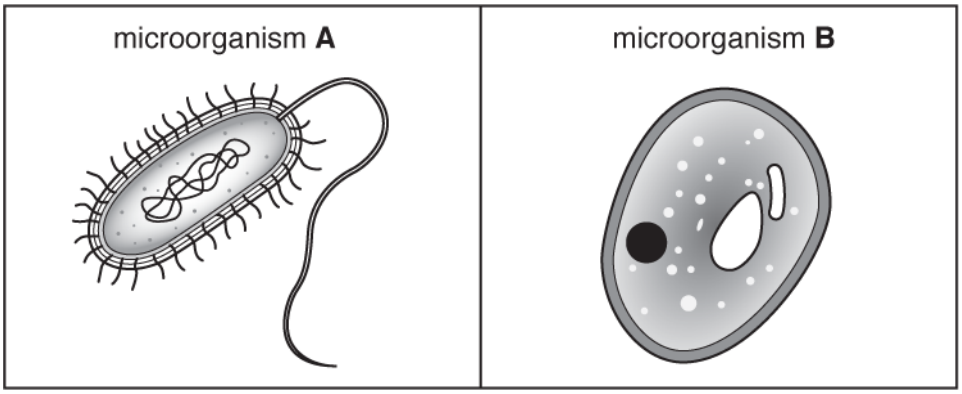
Use ideas about **osmosis** to explain the results.

The quality of written communication will be assessed in your answer to this question.

[6]

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9 Look at the diagrams of two different microorganisms.



One of the microorganisms is yeast and one is a bacterium.

Which is a bacterium? Choose from **A** or **B** _____

Write down **two** reasons for your answer.

1
_____

2
_____

[2]

10 Mia investigates the effect of salt concentration on animal cells.

She puts 5 cm^3 of distilled water into a test tube.

Mia then adds 3 drops of blood to this test tube.

The liquid in the test tube is cloudy.

If the blood cells burst and release their contents then the solution becomes clear.

Mia times how long it takes for the liquid to go clear.

She then repeats the method with different concentrations of salt solution.

Here is her results table.

Concentration of salt in %	Time to go clear in seconds
0.00	20
0.25	300
0.50	600
1.00	remained cloudy after 15 minutes
2.00	remained cloudy after 15 minutes

Explain the results including the correct scientific terms to describe the appearance of the cells in the solution at the end of the investigation.



The quality of written communication will be assessed in your answer to this question.

[6]

11 A student uses a microscope to look at plant cells on a slide.

Which of these methods should they use first?

A Highest power objective lens and focus moving the lens away from the slide

B Highest power objective lens and focus moving the lens towards the slide

C Lowest power objective lens and focus moving the lens away from the slide

D Lowest power objective lens and focus moving the lens towards the slide

Your answer [1]

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12 The microscope used by the student has an eyepiece lens with a magnification of 10×.

Which objective lens would give an image magnification of 200×?

A 10×

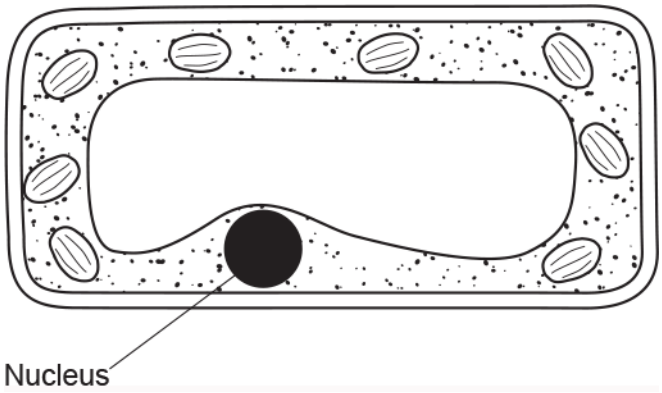
B 20×

C 30×

D 200×

Your answer [1]

13 Look at the diagram showing a plant cell.



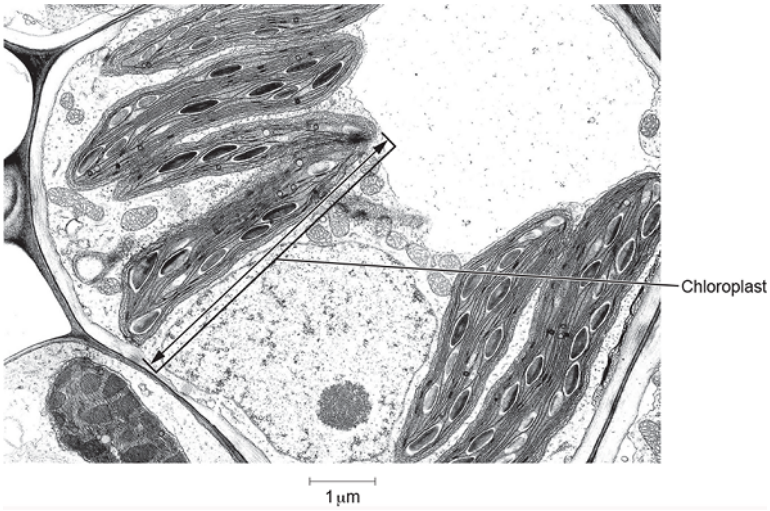
(i) The diameter of the nucleus in the diagram is 10 millimetres. The actual size of the nucleus is 10 micrometres.

Calculate the magnification of the diagram.

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Answer = ---------- × [2]

(ii) Look at the picture of part of a plant cell.



Use the arrow on the picture and the scale to estimate the length of the chloroplast.

Answer = ---------- μm [1]

14 Which of these structures is found in eukaryotic but **not** prokaryotic cells?

A Cell wall

B Cytoplasm

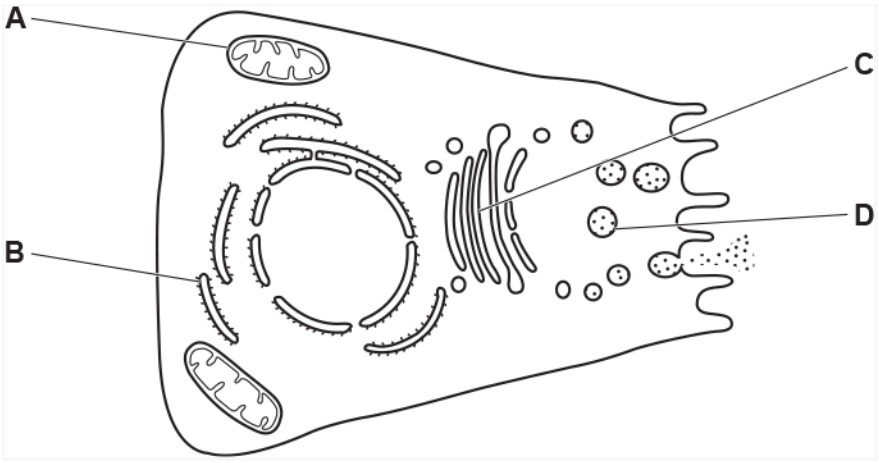
C Nucleus

D Plasmid

Your answer ☐ [1]

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15 This is a cell.

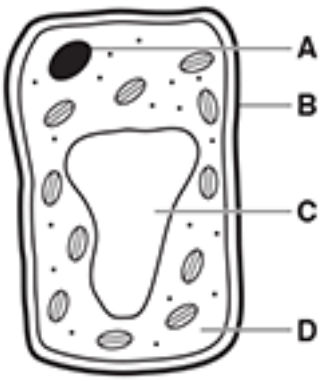


Where does cellular respiration occur?

Your answer [1]

16 The diagram shows a plant cell observed using a light microscope.

Which label is pointing to a structure that contains genetic material?



Your answer [1]

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17(a) The diagram shows cells that are important in the process of **transpiration** in plants.



The diameter of cell **X** has been magnified 500×.

Calculate the actual diameter of cell **X**.

Use the equation: actual diameter = measured size ÷ magnification

Diameter = ... mm **[2]**

(b) Light microscopes let us see objects as small as 0.2 micrometres.

The diameter of cells similar to cell **X**, can vary between 0.008 mm and 0.5 mm.
(1 mm = 1000 micrometres)

Is it possible to see all these types of cells using a light microscope?

Explain your answer.

---

[2]

(c) State why electron microscopy has increased our knowledge of sub-cellular structures.

---

[1]

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18 A gardener carries out an experiment using two similar tomato plants. The tomato plants are grown in pots.

She puts one inside a glasshouse and one outside beside the glasshouse.

To decide which plant loses the most water, the gardener looks to see which plant wilts first.

The diagrams show a plant before and after it has wilted.



(i) On a windy day, the plant **outside** the glasshouse wilts first.

Explain why.

---

[2]

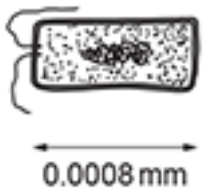
(ii) The gardener's results do not provide very accurate information about the effect of wind on water loss.

How could the gardener improve the design of her experiment?

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[3]

19 Look at the bacterial cell that causes disease in humans.



The human eye can see objects 0.1 mm in size.

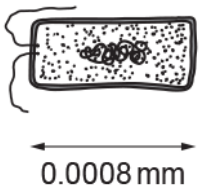
What **minimum** magnification will be needed before the eye can see this bacterial cell?

A 12.5×
B 125×
C 1250×
D 12500×

Your answer ☐ [1]

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20 Look at the bacterial cell that causes disease in humans.



The human eye can see objects 0.1 mm in size.

What **minimum** magnification will be needed before the eye can see this bacterial cell?

A 12.5×
B 125×
C 1250×
D 12500×

Your answer ☐ **[1]**

21 A cell structure measures 1 micrometre in diameter.

What is the diameter of the cell structure in metres?

A 1×10^{-3} metres
B 1×10^{-6} metres
C 1×10^{-9} metres
D 1×10^{-12} metres

Your answer ☐ **[1]**

22 A human cell has 10 000 mitochondria and a yeast cell has 10.

By how many orders of magnitude are there more mitochondria in a human cell than in a yeast cell?

A 2
B 3
C 10
D 1000

Your answer ☐ **[1]**

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23(a) A scientist observes some of the tissues of the growing plants using a light microscope.

The diagram shows some of the plant cells.



The diameter of **X** has been magnified 500×.

What is the actual diameter of **X**?

Give your answer in **standard form**.

Diameter = ... mm **[2]**

(b) Transmission **electron** microscopes (TEM) work by passing a beam of electrons through a very thin slice of an object.

Suggest one advantage and one disadvantage of using TEM rather than a light microscope to look at cells.

advantage _____

_____

disadvantage _____

_____ **[2]**

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24(a) Rats are a major pest in many areas of the world. They can reduce food security and spread diseases.



Warfarin is a chemical that is used as a rat poison. It stops platelets working in the blood.

Describe the function of platelets in the blood.

---

[2]

(b) Some rats are resistant to warfarin. When fed with large amounts of warfarin the rats do not die.

Scientists found that the resistance is due to the dominant allele **R**.

Two resistant rats (**Rr**) mate.

Complete this genetic diagram to find the ratio of resistant rats to non-resistant rats that would be expected to be produced.

		Rr	
		.....	.....
Rr	R	.....	.....
	r	.....	.....

Ratio = ... [3]

(c) After several years, the percentage of resistant rats in the population had increased.

Use Darwin's theory of natural selection to explain this observation.

[3]

(d) Scientists are now trying to find another poison to use on rats.

They have introduced a chemical called phosphine. This blocks the action of mitochondria in rat cells.

Explain why this might kill rats.

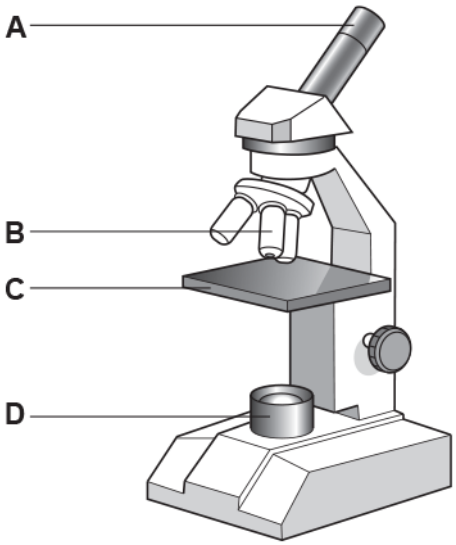
[3]

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25 The diagram shows a light microscope.



Which label is pointing to the eyepiece lens?

Your answer ☐ [1]

26 A light microscope resolution is 0.2 μm. An electron microscope resolution is 0.0001 μm.

How many times closer can two objects be seen as separate objects by using an electron microscope compared to using a light microscope?

A 2x
B 20x
C 200x
D 2000x

Your answer ☐ [1]

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27(a) Cells contain structures that have different features.

Complete the table using structures from this list.

cell membrane **chloroplast** **mitochondria**

nucleus **ribosomes**

Feature	Structure
Contains chlorophyll for photosynthesis	
Contains enzymes for respiration	
Has receptor molecules for communication	

[3]

(b) A student uses a light microscope to see cheek cells.

One cell is shown in **Fig. 16.1**.

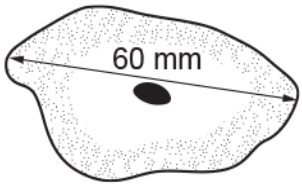


Fig. 16.1

(i) The actual size of the cheek cell is 0.03 mm.

Calculate the magnification of the drawing.

Use the equation: magnification = measured size ÷ actual size

Magnification = × ..... **[2]**

(ii) Which type of substance is used to make structures inside the cell easier to see when using a light microscope?

..... **[1]**

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28 The resolution of an electron microscope is 0.1 nanometres.

The resolution of the eye is 100 micrometres.

How many times greater is the resolution of the electron microscope than the eye?

(1 micrometre = 1000 nanometres)

A 1000
B 10 000
C 100 000
D 1 000 000

Your answer ☐ [1]

END OF QUESTION PAPER

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