Exercise walk-through

1.1
Cell structure, specialisation and microscopy (4.1.1)

AQA · GCSE · Biology

Cell structure

- The **nucleus** contains DNA and controls the cell's activities.
- The cell membrane controls what enters and leaves the cell.
- The **cytoplasm** is a jelly where many chemical reactions happen.

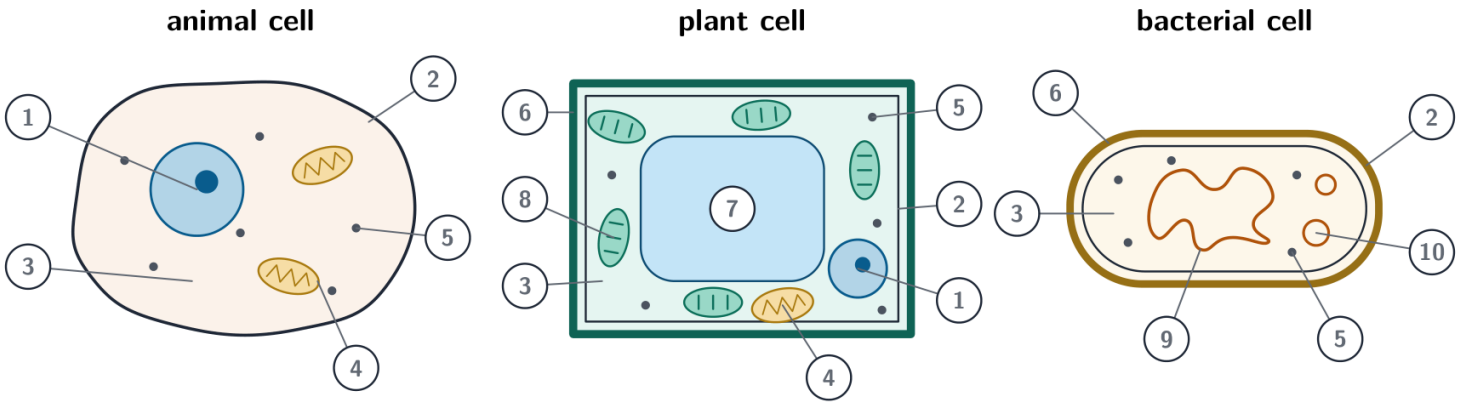
Cell structure (2)

- Each **mitochondrion** is where aerobic respiration releases energy.
- Each **ribosome** is where proteins are made.
- a cell wall made of cellulose, which supports the cell;

Cell structure (3)

- a permanent **vacuole** filled with cell sap, which keeps the cell firm;
- in the green parts of the plant, a **chloroplast** in which photosynthesis happens. Root cells are underground and have no chloroplasts.

Figure: Cell structure

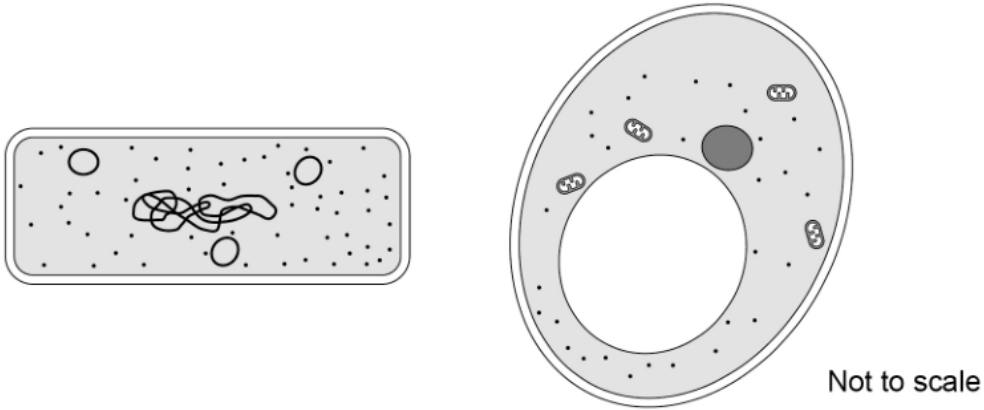


teacher models, not to scale: numbers match the structure key

- An animal cell, a plant cell and a bacterial cell, not to scale; the numbers are listed in the key below
- Match each part of the diagram to the text.

Figure: Cell structure (2)

Figure 10



Not to scale

- A bacterial cell and a yeast cell, not to scale (AQA GCSE Biology Paper 1H, June 2025, Figure 10)
- Match each part of the diagram to the text.

Specialised cells and differentiation

- **Specialised cells** have features that suit their jobs.
- In an answer, give the feature and then explain how it helps.
- **Differentiation** is the process by which a cell gains the special structures it needs to do one job.
- Most animal cells differentiate early in development and then keep their type; cell division in adult animals is mainly for repair and replacement.

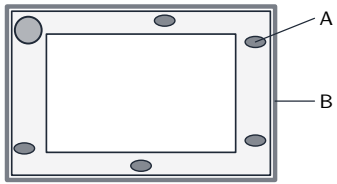
Microscopy and magnification

- A **light microscope** uses light and lenses; it magnifies up to about 1500 times.
- An **electron microscope** uses a beam of electrons.
- Electron microscopes have a much greater **magnification** and **resolving power** (resolution), the ability to show two points close together as separate.
- This is why they revealed ribosomes and the inside of mitochondria, which light microscopes cannot show.

$$\text{magnification} = \frac{\text{image size}}{\text{real size}}$$

Exercises 2.1·2.2

2.1 The diagram shows a plant cell. Name parts A and B. [2]

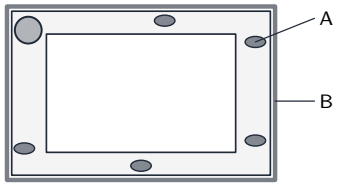


2.2 The diagram shows a bacterial cell. Give **two** ways it is different from an animal cell. [2]



Exercises 2.1·2.2

2.1 The diagram shows a plant cell. Name parts A and B. [2]



2.1

- A: **chloroplast**; B: **cell wall**

2.2 The diagram shows a bacterial cell. Give **two** ways it is different from an animal cell. [2]

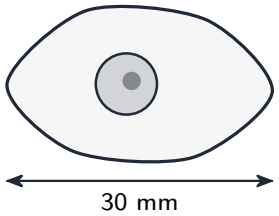


2.2

- any two: no nucleus (its DNA is a single loop); plasmids; a cell wall; much smaller

Exercise 2.3

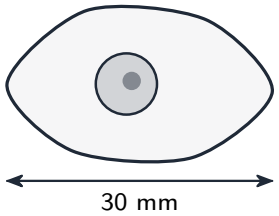
2.3 A cheek cell is 30 mm wide in a photograph. The magnification is ×600. Calculate the real width of the cell in µm. [2]



×600

Exercise 2.3

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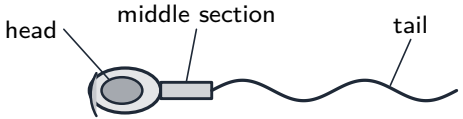
×600

2.3

- real size = 30 ÷ 600 = 0.05 mm = **50** µm

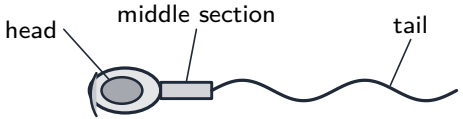
Exercise 3.1

3.1 The diagram shows a sperm cell. Explain how **three** of its features help it to fertilise an egg. [3]



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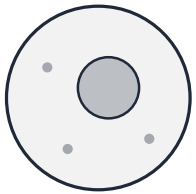


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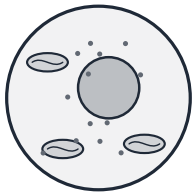
- a tail, so it can swim to the egg
- many mitochondria in the middle section, to release energy for swimming
- enzymes in the head, to digest a way into the egg

Exercise 3.2

3.2 The diagrams show the same kind of cell seen with a light microscope and with an electron microscope. Explain why ribosomes can be seen only with the electron microscope. [3]



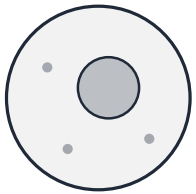
light microscope



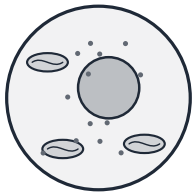
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light microscope



electron microscope

3.2

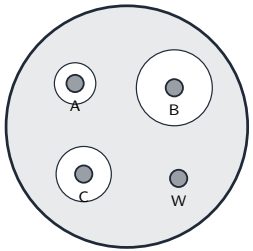
- the electron microscope has a higher resolution: it shows two points close together as separate
- it also has a higher magnification
- ribosomes are too small to be seen with a light microscope

Exercise 3.3 (a)

3.3 A student tests three antibiotics, A, B and C, on bacteria. She spreads bacteria on agar in a Petri dish and adds three paper discs soaked in the antibiotics. Disc W is soaked in sterile water. The dish is kept at 25 °C for two days.

disc	**A**	**B**	**C**	**W**
diameter of clear zone / mm	12	22	16	0

(a) Give **two** steps the student takes to stop other microorganisms getting into the dish. [2]

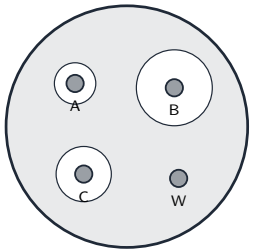


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(a) Give **two** steps the student takes to stop other microorganisms getting into the dish. [2]



(a) any two: flame the loop; use sterile dishes and agar; lift the lid only a little; tape the lid on

Exercise 3.3 (b)

3.3 A student tests three antibiotics, A, B and C, on bacteria. She spreads bacteria on agar in a Petri dish and adds three paper discs soaked in the antibiotics. Disc W is soaked in sterile water. The dish is kept at 25 °C for two days.

disc	**A**	**B**	**C**	**W**
diameter of clear zone / mm	12	22	16	0

(b) Calculate the area of the clear zone around disc B. Use area $= \pi r^2$. [3]

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(b) $r = 22 \div 2 = 11$ mm; $\pi \times 11^2$; $=$ **380** mm^2

Exercise 3.3 (c)

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diameter of clear zone / mm	12	22	16	0

(c) Explain why the student uses disc W. [2]

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disc	**A**	**B**	**C**	**W**
diameter of clear zone / mm	12	22	16	0

(c) Explain why the student uses disc W. [2]

(c) it is a control; it shows that the clear zones are caused by the antibiotics, not by the paper or the water

Exercise 3.3 (d)

3.3 A student tests three antibiotics, A, B and C, on bacteria. She spreads bacteria on agar in a Petri dish and adds three paper discs soaked in the antibiotics. Disc W is soaked in sterile water. The dish is kept at 25 °C for two days.

disc	**A**	**B**	**C**	**W**
diameter of clear zone / mm	12	22	16	0

(d) Describe a method the student could use to find out which antibiotic is best at killing these bacteria. Include how she makes the test fair and safe. [6]

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(d) Describe a method the student could use to find out which antibiotic is best at killing these bacteria. Include how she makes the test fair and safe. [6]

(d) points to include:

- spread the same volume of bacteria evenly on the agar with a sterile spreader
- add same-sized discs soaked in the same concentration of each antibiotic, and a water disc as a control; tape the lid on
- incubate upside down at 25 °C (not 37 °C, so harmful bacteria do not grow) for the same time
- measure the diameter of each clear zone and calculate its area; the biggest zone is the best antibiotic
- repeat with more dishes and find the mean; wash hands and disinfect the bench

Levels: **5–6** a full, logical answer with correct biology and correct terms; **3–4** several correct points, partly linked; **1–2** one or two relevant points.