

Topic 1: Cell biology

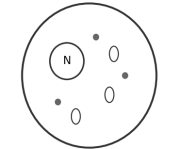
AQA GCSE Biology 8461 · spec 4.1 · sheets 1.1–1.3

Cells: the unit of life

- Eukaryotes keep DNA in a nucleus; prokaryotes do not.
- Structure links to function — for cells and for specialised cells.
- Three required practicals live in this topic.

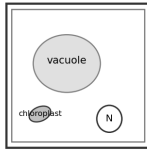
Three cells to label

Animal cell



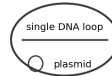
nucleus, membrane, cytoplasm,
mitochondria, ribosomes

Plant cell



cell wall, chloroplasts,
permanent vacuole as well

Bacterial cell



no nucleus; cell wall;
much smaller

- Nucleus, membrane, cytoplasm; mitochondria; ribosomes.
- Plants add chloroplasts, vacuole, cellulose wall.
- Bacteria: DNA loop and plasmids, no nucleus.

Your turn: real size

- Cell specialisation, differentiation and microscopy: the magnification sum.
- Image 4.8 cm wide at magnification 1200.
- Find the real size in micrometres.

Real size worked

1 Convert $4.8 \text{ cm} = 48\,000 \mu\text{m}$.

2 Equation $\text{real size} = \frac{\text{image size}}{\text{magnification}}$.

3 Answer $\frac{48\,000}{1200} = 40 \mu\text{m}$.

Culturing microorganisms (biology only)

- Bacteria divide every ~20 minutes in broth or on agar.
- Aseptic technique: sterilise, flame, tape, 25 degrees.
- Zones of inhibition measured with πr^2 .

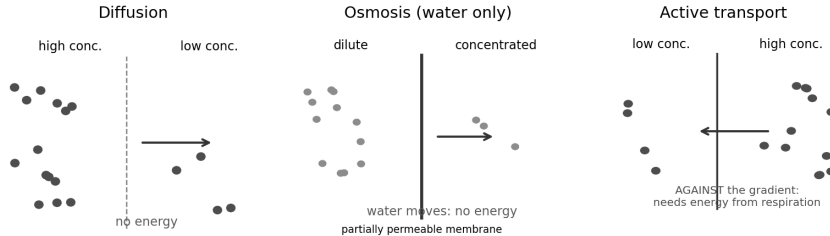
Divide, differentiate, specialise

- Cell division: chromosomes, mitosis and the cell cycle: grow, copy DNA, mitosis, split.
- Mitosis: two identical cells — growth and repair.
- Stem cells: embryo, marrow, meristem.

Stem cells: both sides

- Benefits: diabetes, paralysis, no-rejection cloning.
- Risks: viral transfer; ethical objections.
- Meristems clone rare and resistant plants.

Three transports



- Diffusion: down the gradient, no energy.
- Osmosis: water, dilute to concentrated.
- Active transport: against the gradient, respiration pays.

Surface area to volume

Small: large SA:V



2 mm cube
 $SA = 24 \text{ mm}^2$ $V = 8 \text{ mm}^3$
 $SA:V = 3 : 1$

Big: small SA:V



4 mm cube
 $SA = 96 \text{ mm}^2$ $V = 64 \text{ mm}^3$
 $SA:V = 1.5 : 1$

- Small cell: large SA:V — surface exchange is enough.
- Big organism: small SA:V — needs exchange surfaces.
- Thin walls, blood supply, ventilation.

Your turn: potato percentage

- A 2.5 g potato piece ends at 2.9 g.
- Calculate the percentage change in mass.

Potato worked

- 1 Change** $2.9 - 2.5 = 0.4 \text{ g}$.
- 2 Equation** $\% \text{ change} = \frac{0.4}{2.5} \times 100$.
- 3 Answer** $+16\%$ — water entered by osmosis.

Check yourself

- Checklist before you call this topic done.
- Labels and functions; magnification sums; aseptic whys.
- Cell cycle stages; stem-cell evaluation; three transports and SA:V.