

Cell structure · supported focus

International Baccalaureate · IB Diploma · Biology · HL

Scope and prerequisites

Supported HL focus. First assessment 2025; current subject brief acquired; full Biology guide not acquired. Remaining guide, assessment and practical requirements retain their recorded holds.

Prerequisites: read the stated quantities and units, use arithmetic and the model conditions below. Each lesson develops its own method before independent transfer.

These are original or explicitly fictional teaching examples, not actual measurements or completed assessed learner investigations.

Cell measurements and scale

■ What would explain this observation?

- A cell can look larger on a screen without changing its real size. Two photographs at different zoom settings cannot be compared by eye alone.
- Start with a prediction. State the quantities or features you would compare, then decide what evidence could distinguish two explanations.

■ Build the model

- Eukaryotic cells contain a nucleus. Prokaryotic cells have genetic material but no membrane-bound nucleus. A bacterial cell is a living cell; a virus depends on a host cell to reproduce.
- **magnification** : Image length divided by actual length; **resolution** : Ability to distinguish two close points.

Measured image length = 30 mm

Real cell length = 50 μm

Scale must be stated

■ Choose evidence that can test it

- A scale bar provides a known real distance in the same image. Convert the image length and real length to the same unit before dividing. Magnification is a ratio and has no unit.
- Focus a prepared slide at low power first. Move to a higher power and use fine focus. Make a clear line drawing, label structures with straight lines, and record the scale rather than shading the image.

■ Work from known quantities

- State the known values and their units. Choose the relation because its assumptions fit this case, then rearrange before substitution.
- Known: a cell image is 30 mm long and represents a 50 micrometre cell. Use $\text{magnification} = \text{image size} / \text{actual size}$. Convert 30 mm to 30,000 micrometres. $\text{Magnification} = 30,000 / 50 = 600$. A 10 mm scale bar representing 20 micrometres gives the same ratio of 500 for every object in that image.

Example:

An image is 12 mm long; the cell is 40 micrometres long. Calculate magnification. Use the same sequence: known quantities $\rightarrow$ model $\rightarrow$ relation $\rightarrow$ substitution $\rightarrow$ unit and interpretation.

■ Check the conclusion and its limits

- A nucleus is not the only cell structure. Do not claim bacteria have no DNA, or that more magnification always means better resolution.
- Return to the original observation. Explain what the result supports, which conditions it assumes, and one way to test a competing explanation.

Warn:

Every bacterial cell has a membrane-bound nucleus. This claim is false: A nucleus is not the only cell structure. Do not claim bacteria have no DNA, or that more magnification always means better resolution.

Key:

Cell measurements and scale: A scale bar provides a known real distance in the same image. Convert the image length and real length to the same unit before dividing. Magnification is a ratio and has no unit.