

Size of specimens

Revision notes · Use magnification = image size ÷ actual size to find magnification and real size, and convert between mm and μm .

For Cambridge IGCSE Biology 0610 (and 0970, which has the same content). **Supplement** is Extended content, only examined on Papers 2 and 4.

Size of specimens Spec 2.2

Magnification and actual size Spec 2.2.1, 2.2.2, 2.2.3

Many biological specimens are too small to see clearly. A microscope makes an **image** that is larger than the **actual size** of the specimen. The **magnification** tells you how many times larger.

$$\text{magnification} = \text{image size} \div \text{actual size}$$

Rearranged: actual size = image size ÷ magnification, and image size = actual size × magnification. Measure the image with a ruler, in millimetres. Magnification has no units.

Calculating magnification

A drawing of a cell is 36 mm wide. The actual width of the cell is 0.12 mm. Calculate the magnification.

- Both sizes are in mm, so no conversion is needed.
- magnification = image size ÷ actual size = $36 \div 0.12 = 300$.

Answer: × 300

Calculating actual size

A photograph of a plant cell is magnified × 400. The cell in the photograph is 20 mm long. Calculate the actual length of the cell in mm.

- Rearrange: actual size = image size ÷ magnification.
- actual size = $20 \div 400 = 0.05$ mm.

Answer: 0.05 mm

Supplement

Converting between mm and μm

Supplement

The unit for very small things is the **micrometre (μm)**. There are 1000 μm in 1 mm. To change mm to μm , multiply by 1000. To change μm to mm, divide by 1000.

Supplement

Converting units

A cell has an actual width of 0.04 mm. Give this in μm . A nucleus is 8 μm wide. Give this in mm.

1. mm to μm : $0.04 \times 1000 = 40 \mu\text{m}$.
2. μm to mm: $8 \div 1000 = 0.008 \text{ mm}$.

Answer: 40 μm ; 0.008 mm

Maths skill: Image size and actual size must be in the same unit (mm) before you divide. Magnification has no units: write $\times 300$, not 300 mm.

Practical skill: To find the magnification of your drawing, measure the same feature (e.g. the widest part) on the drawing and on the specimen, both in mm, then divide drawing length by specimen length. Draw a clear, continuous outline with no shading, and label with ruled lines.

Quick check

1. State the magnification formula.
2. A cell has an image size of 30 mm and an actual size of 0.1 mm. What is the magnification?
3. **Supplement** How many micrometres are in 1 millimetre?
4. **Supplement** Convert 0.5 mm to μm .

Quick check answers

Size of specimens

1. Magnification = image size $\div$ actual size.
2. $\times 300$.
3. 1000 μm .
4. 500 μm .