Higher Combined version — Higher Tier (★) included; Separate-only (◆) removed.

Q1. Write the formula for calculating magnification.

[1 mark]

Q2. A cell image is 45 mm long at ×300 magnification. (a) Calculate the actual cell length in mm. (b) Convert this to µm.

[3 marks]

Q3. Describe how to prepare a slide of onion cells for viewing under a light microscope.

[3 marks]

★ HIGHER TIER

Q4. ★ Compare light and electron microscopes in terms of magnification, resolution and suitability for different purposes.

[4 marks]

Total: 11 marks

E: Microscopy

Q1 (1 mark)

Write the formula for calculating magnification.

• Magnification = Image size ÷ Actual size [1]

Q2 (3 marks)

A cell image is 45 mm long at ×300 magnification. (a) Calculate the actual cell length in …

• (a) Actual size = 45 ÷ 300 = 0.15 mm [1]

• (b) 0.15 mm × 1000 = 150 µm [1]

• Units stated correctly in both answers [1]

Q3 (3 marks)

Describe how to prepare a slide of onion cells for viewing under a light microscope.

• Cut a thin section of onion epidermis / peel a single layer [1]

• Place on a glass slide with a drop of water / iodine stain [1]

• Carefully lower a coverslip at 45° to avoid air bubbles [1]

Q4 (4 marks) [★ HT]

★ Compare light and electron microscopes in terms of magnification, resolution and suitabi…

• Light: max ~×1500; electron: much higher (×500,000+) [1]

• Light: resolution ~200 nm; electron: ~0.1 nm — can resolve much finer detail [1]

• Light: can view living cells; electron: must be dead, in vacuum, complex preparation [1]

• Electron microscope used to study organelle ultrastructure (e.g. cristae of mitochondria, ribosomes) not visible with light [1]