

Microscopy and measuring cells: practice questions

9 questions · 23 marks · mark scheme at the back

For Pearson Edexcel International AS Biology XBI11 and International A Level Biology YBI11. **A Level only** is IA2 content (Units 4 to 6), not needed for the International AS.

Name

Total / 23

1 UNIT 2 STYLE [1 mark]

Which statement explains why an electron microscope can resolve smaller structures than a light microscope?

- A. ☐ Electrons have a longer wavelength than light
- B. ☐ Electrons have a shorter wavelength than light
- C. ☐ Electron microscopes can view living specimens
- D. ☐ Electron microscopes use glass lenses of higher quality

2 UNIT 2 STYLE [1 mark]

An image of a cell is 45 mm long and the magnification is $\times 900$. What is the actual length of the cell?

- A. ☐ 5 μm
- B. ☐ 50 μm
- C. ☐ 0.5 mm
- D. ☐ 0.05 μm

3 UNIT 2 STYLE [2 marks]

State what is meant by the terms magnification and resolution.

[4 marks]

[illegible]

[3 marks]

[illegible]

[3 marks]

[illegible]

UNIT 3 STYLE

[4 marks]

A student wants to measure the length of cheek cells using an eyepiece graticule. Describe how she should calibrate the graticule and use it to find the mean length of the cells.

[illegible]

UNIT 3 STYLE

[3 marks]

A student made a drawing of some stained animal cells seen through a light microscope. State three rules she should follow to make a good drawing.

[illegible]

UNIT 3 STYLE

[2 marks]

The student used her own cheek cells. State two safety precautions she should take.

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Mark scheme

One mark for each point unless a maximum is given. Words in brackets are not needed for the mark.

1. [1]

B B

2. [1]

B B ($45 \text{ mm} = 45\,000 \text{ }\mu\text{m}$; $45\,000 \div 900 = 50 \text{ }\mu\text{m}$)

3. [2]

- magnification: how many times larger the image is than the real object / $\text{image size} \div \text{actual size}$ (1)
- resolution: the smallest distance between two points at which they can be seen as separate (1)

4. [4]

- TEM has a higher resolution / shows more detail (1)
- TEM uses electrons, which have a shorter wavelength than light (1)
- TEM can show ultrastructure / organelles such as ribosomes (1)
- light microscope can be used to view living cells, TEM only dead specimens (in a vacuum) (1)
- light microscope image is in colour (if stained), TEM is black and white (1)
- light microscope specimens are easier / quicker to prepare, TEM may produce artefacts (1)
- Max 4

5. [3]

- $40 \text{ mm} = 40\,000 \text{ }\mu\text{m}$ (1)
- $40\,000 \div 25\,000$ (1)
- $1.6 \text{ }\mu\text{m}$ (1)
- correct answer with no working gains full marks; do not accept 1.6 mm or $0.0016 \text{ }\mu\text{m}$

6. [3]

- most cell structures are transparent / have little contrast (1)
- stain binds to structures and absorbs light, making them visible / increases contrast (1)
- electron microscopes use electrons, not light, so stains must scatter / absorb electrons (1)
- heavy metal salts such as lead or uranium are used (1)
- Max 3

7. [4]

- use a stage micrometer of known scale (1)
- line up the graticule scale with the micrometer scale (1)
- count graticule divisions that match a known number of micrometer divisions (1)
- calculate the length of one graticule division (in μm) (1)
- calibrate separately for each objective lens (1)
- measure several cells in graticule divisions, multiply by the calibration value and calculate the mean (1)
- Max 4

8. [3]

- sharp pencil and clear, continuous lines (1)
- no shading or colouring (1)
- labels drawn with ruled lines that touch the structure (1)
- drawing large enough, including a title and magnification / scale bar (1)
- Max 3

9. [2]

- use only her own cells / do not share swabs (1)
- dispose of the swab / slide in disinfectant (1)
- wear eye protection / take care with glass (1)
- Max 2