

Virtual Microscope Worksheet: Answer Key

Teacher copy. Total: 58 marks.

Notes for marking

- Accept sensible alternative wording. Do not penalise spelling unless the meaning changes.
- The scale in the virtual microscope is an estimate (based on typical cell sizes), so measurements are marked against ranges: chloroplast length 4 to 10 μm ; cheek cell nucleus width 6 to 14 μm . A typical result is about 7 μm for a chloroplast and about 10 μm for the nucleus.
- For B5, follow the student's own answer to B4 (error carried forward). For a value between 4 and 10 μm the answer should fall between about $\times 3000$ and $\times 7500$.
- Drawings are marked with the guides under B3 and C3.

Part A: Using the microscope

9 marks

Question	Answer and mark points	Marks
A1(a)	10 $\times$ objective: $\times 100$ 40 $\times$ objective: $\times 400$ 1 mark for each.	2
A1(b)	$\times 100$ (the 100 $\times$ oil immersion objective lens)	1
A2	Correct order from 1 to 5: 1. Check that the 10 $\times$ objective lens is in position. 2. Turn the coarse focus until the cells are roughly clear. 3. Turn the fine focus until the image is sharp. 4. Switch to the 40 $\times$ objective lens. 5. Use only the fine focus to make the image sharp again. 2 marks for all five correct. <i>1 mark if only two neighbouring steps are swapped.</i>	2
A3(a)	Any one of: • larger field of view, so the specimen is easier to find • the objective lens is further from the slide, so there is less risk of hitting it • easier to focus	1
A3(b)	• the coarse focus moves the lens too far or too fast at high power • the lens could hit and break the slide (or be damaged) 1 mark for either idea.	1
A3(c)	darker (1) and higher (1)	2

Part B: Leaf cells (Elodea)

17 marks

Question	Answer and mark points	Marks
B1(a)	• rectangular / brick-shaped / long and narrow (1) • arranged in rows / tightly packed / no gaps between the cells (1)	2
B1(b)	midrib (accept central vein or vein)	1
B2	cell wall (1) chloroplasts (1) vacuole / large central vacuole (1)	3

Question	Answer and mark points	Marks
B3	Drawing marking guide • title and magnification ($\times 400$) written in the box (1) • large, clear drawing filling more than half the box, continuous pencil lines, no shading (1) • rectangular cells drawn with a cell wall and chloroplasts inside (1) • labels: cell wall, chloroplast and vacuole, each with a ruled label line touching the structure (2 marks for all three, 1 mark for two)	5
B4	Any value from 4 to 10 μm with the unit (1). A typical result is about 7 μm .	1
B5	• convert to the same units, for example 30 mm = 30 000 μm (1) • divide the drawing length by the measured length (1) Example: 7 μm gives $30\,000 \div 7 \approx \mathbf{\times 4300}$. Follow the student's own B4 value.	2
B6(a)	They contain chloroplasts (accept chlorophyll).	1
B6(b)	The (large central) vacuole (accept cell sap).	1
B6(c)	The chloroplasts are too small to see clearly at low magnification (accept: magnification is too low).	1

Part C: Cheek cells

12 marks

Question	Answer and mark points	Marks
C1(a)	• irregular shape / no fixed shape / flat and rounded (1) • in groups or clumps / overlapping / not in neat rows (1)	2
C1(b)	• round / circular / oval (1) • dark blue / darker than the rest of the cell / near the centre of the cell (1)	2
C2	• cheek cells are thin, colourless or transparent (1) • the stain makes the nucleus (and the cell) easier to see (1)	2
C3	Drawing marking guide • title and magnification ($\times 400$) written in the box (1) • large, clear drawing filling more than half the box, continuous pencil lines, no shading (1) • irregular cell outline with a roughly circular nucleus inside (1) • labels: nucleus, cytoplasm and cell membrane, each with a ruled label line touching the structure (2 marks for all three, 1 mark for two)	5
C4	Any value from 6 to 14 μm with the unit (1). A typical result is about 10 μm .	1

Part D: Comparing plant and animal cells**9 marks**

Question	Answer and mark points	Marks
D1	Cell wall: leaf cell ✓, cheek cell ✗ Chloroplasts: leaf cell ✓, cheek cell ✗ Large central vacuole: leaf cell ✓, cheek cell ✗ Nucleus: leaf cell ✓, cheek cell ✓ Cell membrane: leaf cell ✓, cheek cell ✓ 1 mark for each row (both cells correct).	5
D2	- the leaf cell has a rigid cell wall that holds it in a fixed shape (1) - the cheek cell has no cell wall, only a flexible cell membrane (1)	2
D3(a)	Absorbs light energy for photosynthesis (accept: makes food or glucose).	1
D3(b)	Supports the cell and gives it its shape (accept: stops the cell bursting).	1

Part E: Exam-style questions**11 marks**

Question	Answer and mark points	Marks
E1(a)	$10 \times 40 = \mathbf{\times 400}$	1
E1(b)	- convert to the same units: $3.2 \text{ mm} = 3200 \text{ }\mu\text{m}$ (1) - magnification = image size $\div$ actual size (1) $3200 \div 8 = \mathbf{\times 400}$ (1)	3
E2	- actual size = image size $\div$ magnification (1) $90 \div 1500 = 0.06 \text{ mm}$ (1) $0.06 \text{ mm} \times 1000 = \mathbf{60 \text{ }\mu\text{m}}$ (1)	3
E3	- cheek cells are colourless or transparent, so a stain is needed to show the nucleus and cell (1) - Elodea cells are already green because of the chloroplasts, and the leaf is thin so light passes through (1)	2
E4	- open the diaphragm (1) - turn up the lamp brightness (1)	2