

Microscopy (light microscope, required practical)

Q1. (2018)

A)

01.3	turn the (fine focusing) knob until the cells are in focus	allow focus it do not accept increase magnification ignore decrease magnification ignore clear ignore references to resolution / illumination ignore zoom in / out	1	AO2 4.1.1.2
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B)

01.4	(rotate the) nosepiece / objective lens	allow change the (objective / eyepiece) lens	1	AO2 4.1.1.2
	to a higher power (lens)	allow (to) increase the magnification a comparator is required ignore change / adjust the magnification allow stronger or more powerful lens ignore references to resolution / illumination unqualified ignore zoom in / out ignore references to an electron microscope	1	

C)

01.5	conversion of units: (112 mm →) 112 000 (μm) or (280 μm →) 0.28 (mm)	an answer of 400 (×) scores 3 marks	1	AO2 4.1.1.2
	(magnification =) $\frac{112}{0.28}$ or (magnification =) $\frac{112\,000}{280}$	allow 1 mark for no conversion of units 112 / 280 or incorrect value from step 1 correctly substituted	1	
	400 (×)	do not accept if units are given if no other mark scored allow 1 mark for: magnification = $\frac{\text{size of image}}{\text{size of real object}}$ a triangle with words or letters in is insufficient, as the correct rearrangement is needed	1	

Q2. (2019)

A)

05.1	$50 = \frac{43}{\text{size of real object}}$	an answer of 860 (µm) scores 4 marks	1	AO1 3×AO2 4.1.1.5
	(size of real object =) $\frac{43}{50}$		1	
	(size of real object =) 0.86 (mm)		1	
	(size of real object =) 860 (µm)	allow correct conversion of their calculated value	1	
		if no other marks awarded allow 1 mark for magnification = $\frac{\text{size of image}}{\text{size of real object}}$		

B)

05.2	Level 2: Scientifically relevant facts, events or processes are identified and given in detail to form an accurate account.	3–4	AO1 4.1.1.2
	Level 1: Facts, events or processes are identified and simply stated but their relevance is not clear.	1–2	AO1
	No relevant content	0	
	Indicative content <ul style="list-style-type: none"> place slide on stage use lowest power / ×4 objective lens (initially) adjust mirror or switch light on so light passes through slide move stage as close to lens as possible slide must not touch lens turn focussing knob so slide moves away from lens turn focussing knob until image comes into focus use fine focus to get clear image change objective lens to ×10 ×5 eyepiece and ×10 objective lenses (gives total magnification of ×50) refocus slide using focussing knob For Level 2 reference to how to focus the slide / cells and achieve magnification of ×50 is required		

Q3. (2020)

A)

02.3	any one from: • greater magnification • higher resolving power	allow can see (smaller) sub-cellular structures / parts allow can see more detail (inside cells) allow reference to 3-D images	1	AO1 4.1.1.5
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B)

02.5	$20 = \frac{\text{image length}}{0.8}$		1	AO2 4.1.1.5 RPA 1
	image length = 0.8 × 20		1	
	image length = 16 (mm)		1	

Q4. (2021)

A)

04.3	electron microscope	ignore microscope unqualified ignore scanning / transmission do not accept light microscope	1	AO2 4.1.1.5 4.3.1.2
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B)

04.4	(fungal spore) (16 μm $\Rightarrow$ $1.6 \times 10^{-5} \text{ m}$ or (virus) ($2.5 \times 10^{-7} \text{ m}$ $\Rightarrow$ 0.25 μm)		1	AO2 4.1.1.1 4.1.1.5 4.3.1.2 4.3.1.4
	$\frac{1.6 \times 10^{-5}}{2.5 \times 10^{-7}}$	allow $\frac{0.000\ 016}{0.000\ 000\ 25}$	1	
	or $\frac{16}{0.25}$	allow incorrect attempt at conversion or not converted value for length correctly substituted		
	($\Rightarrow$) 64	allow a correctly calculated value using an incorrectly or not converted value for length allow 1 mark only for $\frac{16}{2.5} = 6.4$	1	

Q5. (2023)

02	Level 3: The method would lead to the production of a valid outcome. All key steps are identified and logically sequenced.	5–6	AO2
	Level 2: The method would not necessarily lead to a valid outcome. Most steps are identified, but the plan is not fully logically sequenced.	3–4	AO1
	Level 1: The method would not lead to a valid outcome. Some relevant steps are identified, but links are not made clear.	1–2	AO1
	No relevant content	0	

<p>Indicative content</p> <p>Method 1</p> <ul style="list-style-type: none"> place ruler on (microscope) stage focus on (scale on) ruler measure diameter / width of field of view in millimetres replace ruler with slide focus on cells use same magnification estimate / count number of cells that fit (lengthwise) across field of view (to calculate mean length of onion cells): divide diameter / width of field of view by (estimated) number of cells or divide diameter / width of field of view by 3 cells <p>Method 2</p> <ul style="list-style-type: none"> focus on cells note magnification take a photograph of the image calculate a mean: <ul style="list-style-type: none"> measure length of several cells (3 or more) cells on the photograph add all image lengths together and divide total by number of cells (to calculate mean cell image length) <p>OR</p> <ul style="list-style-type: none"> measure the length of one cell calculate the real size repeat for other cells (3 or more) calculate the mean real size <ul style="list-style-type: none"> (mean) size of real cell = (mean cell) image size / magnification <p>General points</p> <ul style="list-style-type: none"> focus under low power first using focusing knob then focus at $\times 100$ magnification reference to how total magnification is calculated equation: (mean) size of real cell = (mean cell) image size / magnification <p>For Level 2 attempt at a method to measure cells plus an indication of how to calculate mean length</p> <p>For Level 3 suitable method and calculation of mean length</p>	<p>4.1.1.2 4.1.1.5 RPA1</p>
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Q6. (2024)

<p>05.1</p> <p><i>microscope:</i></p> <p>electron (microscope)</p> <p>and</p> <p><i>reason:</i></p> <p>(has a) high resolution / magnification</p>		<p>1</p>	<p>AO2 4.1.1.5</p>
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Q7. (2024)

05.3		allow correct calculations in cm or mm		AO2 4.1.1.5
	<i>measurement of cell</i> 36 (mm)	allow in the range of 35 to 37 (mm) allow in the range 3.5 to 3.7 (cm)	1	
	<i>conversion</i> $36 \times 1000 = 36\,000\ (\mu\text{m})$		1	
	<i>real size of cell</i> $(30 \times 1.5) = 45\ (\mu\text{m})$		1	
	<i>substitution</i> $\text{magnification} = \frac{36\,000}{45}$		1	
	800	do not accept if unit given if no other mark awarded allow 1 mark for: $\text{magnification} = \frac{\text{image size}}{\text{real size}}$ or correct rearrangement	1	