

Question	Answers	Extra information	Mark	AO / Specification reference
01.1	A – chloroplast		1	AO2
	B – nucleus		1	4.1.1.2
	C – cell membrane		1	
01.2	when filled with cell sap		1	AO1
	it puts pressure on cell wall		1	4.1.1.2
	keeping the cell rigid / supporting plant		1	
01.3	nucleus		1	AO2 4.1.1.1
01.4	leaf / stem		1	AO2
	contains chloroplasts		1	4.1.1.2
02.1	wear gloves / wash hands methylene blue / stain is an irritant or disinfect work surfaces / dispose of used swabs to prevent spread of possible infection	allow 1 mark for safety measure allow 1 mark for linked explanation	2	AO1 4.1.1.5
02.2	makes nucleus / subcellular structures more visible		1	AO1 4.1.1.5
02.3	use a higher power objective lens	allow use an electron microscope	1	AO1 4.1.1.5

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02.4	length of the cell = 4.8 cm		1	AO2
	$\frac{4.8}{1350} = 0.0036 \text{ cm}$	allow 36 (μm) with no working shown for 3 marks	1	4.1.1.5
	= 36 (μm)	allow 35 (μm) for 2 marks	1	
03.1	group of cells with similar structure working together to perform a function		1	AO1 4.1.1.3
03.2	lignin builds up in cell walls cells die form (long hollow) tubes		1	AO1
			1	4.1.1.3
			1	
03.3	long hollow tubes allow water / mineral ions to move easily around plant lignin makes cells very strong can withstand pressure of water moving / help support the plant stem		1	AO1
			1	4.1.1.3
			1	
			1	
03.4	phloem		1	AO1 4.1.1.3
04.1	chloroplast		1	AO2 4.1.1.2
04.2	once light spot has detected light, it causes flagella to move euglena 'swims' towards area of higher light intensity more light means higher rate of photosynthesis		1	AO2
			1	4.1.1.2
			1	4.1.1.3

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05.1	<p>advantages of electron microscope:</p> <ul style="list-style-type: none"> • higher magnification • higher resolution • scanning electron microscopes can be used to examine the surface structure of cells/structures <p>advantages of light microscope:</p> <ul style="list-style-type: none"> • do not damage living cells / can be used to observe living things • light microscopes are cheaper • more readily available • can be used by less-skilled operator <p>evaluation</p> <ul style="list-style-type: none"> • light microscopes are appropriate to use when the whole organism / behaviour of the organism is to be studied / without damaging the organism • electron microscopes are appropriate to use when detail of (sub-cellular) structures is required 	<p>award 2 marks for two advantages</p> <p>award 2 marks for two disadvantages</p> <p>award 2 marks for explanations of points</p> <p>accept reverse answer as a disadvantage other technique</p>	6	AO2 × 4 AO3 × 2 4.1.1.5
05.2	<p>diameter of amoeba: $10\ \mu\text{m} = 1 \times 10^{-5}\ \text{m}$</p> <p>diameter of egg cell: $0.1\ \text{mm} = 1 \times 10^{-4}\ \text{m}$</p> <p>difference in order of magnitude: $5 - 4 = 1$ / a factor of 10</p>		1 1 1	AO2 4.1.1.1
06.1	A		1	AO2 4.1.1.2 4.1.1.5

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06.2	where protein synthesis takes place / proteins are made		1	AO1 4.1.1.2
06.3	mitochondria		1	AO2 4.1.1.2
06.4	Level 3: All key steps are identified and logically sequenced.		5–6	AO1 4.1.1.2 4.1.1.5
	Level 2: Most steps are identified, but the method is not fully logically sequenced.		3–4	
	Level 1: Some relevant steps are identified, but links are not made clear.		1–2	
	No Relevant content		0	
	Indicative content			
	<ul style="list-style-type: none"> • cut slice of plant (using a knife or scalpel) • place on microscope slide • add a drop of stain (such as iodine) • carefully lower a coverslip onto the slide • use a piece of filter paper to soak up any liquid from around the edge of the coverslip • put the slide on the microscope stage at its highest setting • choose the lowest powered objective lens • lower slide using focusing knob until the cells come into focus • repeat with higher objective lens to get a more detailed image 			
07.1	1 μm		1	AO1 4.1.1.1

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07.2	plant cell walls contain cellulose / bacterial cell walls contain peptidoglycan		1	AO1 4.1.1.1
07.3	in eukaryotic cells DNA is contained in nucleus long strands called chromosomes in bacteria cells DNA is found in cytoplasm / not in a nucleus in a single loop also have extra small rings of DNA / plasmids		1 1 1 1	AO1 4.1.1.1
07.4	flagellum / flagella		1	AO1 4.1.1.1
08.1	any four from: <ul style="list-style-type: none"> the visual pigment detects / is affected by light light causes a chemical change in visual pigment the chemical change creates an impulse impulse passed through synapses to the optic nerve / through optic nerve to the brain (lots of) mitochondria transfer (lots of) energy for the cell to reform the visual pigment / reverse change in the visual pigment 		4	AO3 4.1.1.3
08.2	$\frac{6\,000\,000}{3}$ = 2 000 000 = 2×10^6	allow 2×10^6 with no working shown for 3 marks	1 1 1	AO2 4.1.1.3

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09.1	a cell that is adapted / has special features to perform a particular function		1	AO1 4.1.1.3
09.2	to contract (and relax)		1	AO1 4.1.1.3
09.3	digestive system to squeeze food along the gut or in the heart so heart can contract to pump blood around the body	allow 1 mark for muscle location allow 1 mark for description of role in that location	2	AO1 4.1.1.3
09.4	to respire to transfer the energy needed for the cell to contract		1 1	AO1 4.1.1.3
09.5	contain proteins / actin and myosin that slide over one another to cause the cell to contract or store glycogen that can be broken down (into glucose) and used for respiration	allow 1 mark for feature allow 1 mark for explanation	2	AO1 4.1.1.3
10.1	cell wall present cells fit clearly together / no gaps between cells / uniform appearance		1 1	AO2 4.1.1.2 4.1.1.5

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10.2	$\frac{1000}{3}$ = 77 (μm)	allow 77 (μm) with no working shown for 2 marks	1 1	AO2 4.1.1.5
10.3	vacuole		1	AO1 4.1.1.2
11.1	A		1	AO2 4.1.1.2
11.2	control what comes in and out of the cell		1	AO1 4.1.1.2
11.3	axon would be present to transmit impulses around the body dendrites / dendrons present to connect to other nerve cells	allow reference to myelin sheath and its function	1 1 1 1	AO1 4.1.1.3
11.4	length = $\pi \times d = 3.14 \times 20 \times 10^{-6}$ = 6.28×10^{-5} m / 62.8 μm	unit must be given to award mark allow 6.28×10^{-5} m / 62.8 μm with no working shown for 2 marks	1 1	AO2 4.1.1.1
11.5	62.8 μm = 62 800 nm $\frac{62\ 800}{4}$ = 15 700	allow 15 700 with no working shown for 3 marks	1 1 1	AO2 4.1.1.1

Question	Answers	Extra information	Mark	AO / Specification reference
12.1	10 μm		1	AO2 4.1.1.5
12.2	similarities: <ul style="list-style-type: none"> • presence of cytoplasm • presence of cell membrane • both contain genetic material • cell wall found in prokaryotes and some (plant) eukaryotes differences: <ul style="list-style-type: none"> • prokaryotes have plasmids • prokaryotes have no nucleus • prokaryotes have single loop of genetic material • plant cell walls are made of cellulose, prokaryote cell walls are made of peptidoglycan / not made of cellulose 	award 1 mark per similarity or difference award a maximum of 4 marks for similarities or 4 marks for differences allow converse statements	6	AO1 4.1.1.1
12.3	1 μm cyanobacteria are prokaryotes, which are one order of magnitude smaller than typical eukaryotes	accept answer given in 12.1	1 1	AO2 4.1.1.5
12.4	algal cells contain features / cell components / organelles also seen in plant cells: cell wall chloroplasts	ignore reference to nucleus and cell membrane	1 1 1	AO2 4.1.1.2

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13.1	any two from: <ul style="list-style-type: none"> • long tail – move • lots of mitochondria – transfer energy needed to move the cell • acrosome contains digestive enzymes – to break down outer layers of the egg • nucleus – contains genetic material (to pass on) 	award 1 mark for adaptation award 1 mark for explanation of adaptation	4	AO1 4.1.1.3
13.2	sperm cells need to be alive / not damaged to observe movement light microscope are cheap / readily available / do not require high level of training to use		1 1	AO3 4.1.1.3 4.1.1.5
13.3	7.5 cm = 75 000 μm $\frac{75\,000}{1500}$ = 50 (μm)	allow 50 (μm) with no working shown for 3 marks	1 1 1	AO2 4.1.1.5
14.1	Level 3: All key steps are identified and logically sequenced.		5–6	AO1 4.1.1.5
	Level 2: Most steps are identified, but the method is not fully logically sequenced.		3–4	
	Level 1: Some relevant steps are identified, but links are not made clear.		1–2	
	No Relevant content		0	

Question	Answers	Extra information	Mark	AO / Specification reference
	Indicative content <ul style="list-style-type: none"> wipe inside of the cheek with a cotton swab smear cotton swab on the centre of the microscope slide add a drop of stain carefully lower a coverslip onto the slide. use filter paper to soak up any liquid from around the edge of the coverslip. put the slide on the microscope stage at its highest setting choose the lowest powered objective lens carefully lower slide using focusing knob until the cells come into focus for more detail repeat with higher power objective lens 			
14.2	cell membrane nucleus cytoplasm	allow additional label to mitochondria	1 1 1	AO2 4.1.1.2 4.1.1.5
14.3	magnification used		1	AO2 4.1.1.5
14.4	the smallest object which can be viewed under a microscope		1	AO1 4.1.1.5
14.5	by using an electron microscope		1	AO1 4.1.1.5