

Mark scheme – The Challenges of Size (F)

Question	Answer/Indicative content	Marks	Guidance
1	B ✓	1 (AO2.1)	
	Total	1	
2	C ✓	1 (AO1.1)	
	Total	1	
3	D ✓	1 (AO2.1)	
	Total	1	
4	B ✓	1 (AO2.2)	
	Total	1	
5	D ✓	1 (AO1.1)	
	Total	1	
6	B	1 (AO 2.2)	<p><u>Examiner's Comments</u></p> <p>This is an AO2.2 question testing the ability to apply knowledge of ratios. Several candidates answered A, with correct workings shown for the surface area and volume. This indicates that the candidate could not apply their knowledge of surface area and volume to producing a ratio.</p>
	Total	1	
7	A ✓	1 (AO 1.1)	
	Total	1	
8	B ✓	1 (AO 1.1)	<p><u>Examiner's Comments</u></p>

				This is an AO1.1 question testing recall of cell types. In general, this was successfully done, however, the number of candidates who thought the cells were sperm cells indicates a lack of knowledge of cells.
		Total	1	
9		<p>Please refer to the marking instructions on page 4 of this mark scheme for guidance on how to mark this question.</p> <p>Level 3 (5–6 marks) Provides a detailed explanation linking cholesterol to heart disease.</p> <p>AND Provides a detailed analysis to explain if this link is supported by the graph.</p> <p><i>There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.</i></p> <p>Level 2 (3–4 marks) Provides a detailed explanation linking cholesterol to heart disease.</p> <p>OR Provides a detailed analysis to explain if this link is supported by the graph.</p> <p>OR Provides a basic explanation linking cholesterol to heart disease.</p> <p>AND Provides a basic analysis of the information to explain if this link is supported by the graph.</p> <p><i>There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.</i></p> <p>Level 1 (1–2 marks) Provides a basic explanation linking cholesterol to heart disease.</p>	6 (AO2 x 1.1) (AO2 x 2.1) (AO2 x 3.1b)	<p>AO1.1 Demonstrate knowledge and understanding of the importance of the blood supply to the heart muscle.</p> <ul style="list-style-type: none"> coronary artery carries blood to heart/muscle blood takes oxygen/glucose to the heart/muscle heart/muscle carries out aerobic respiration/needs energy energy is needed for the heart/muscle to contract <p>AO2.1 Apply knowledge and understanding of the requirements of the heart muscle</p> <ul style="list-style-type: none"> cholesterol build up (partially) blocks the blood flow in the artery this reduces blood/oxygen/glucose carried to the heart/muscle heart/muscle carries out less aerobic respiration/less energy released heart/muscle can't contract as forcefully <p>AO3.1b Analyse information and ideas to interpret the results on the study</p> <p>Support the link:</p> <ul style="list-style-type: none"> men with heart disease had (on average) a higher blood cholesterol level. Men without heart disease had (on average) a lower blood cholesterol level. build-up of cholesterol can lead to heart disease <p>Doesn't support the link:</p> <ul style="list-style-type: none"> considerable overlap between the two groups men can still have heart disease with low blood cholesterol levels Men without heart disease can still have high blood cholesterol levels

		<p>OR Provides a basic analysis of the information to explain if this link is supported by the graph.</p> <p>OR Demonstrates knowledge of the importance of the blood supply to the heart muscle.</p> <p><i>There is an attempt at a logical structure with a line of reasoning. The information is in the most part relevant.</i></p> <p>0 marks <i>No response or no response worthy of credit</i></p>		
		Total	6	
10	a i	<p>FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 3 : 1 award 2 marks</p> <p>24 : 8 or 3 ✓ 3 : 1 ✓</p>	2 (AO2.2)	ALLOW answer in the table but answer on answer line takes preference
	ii	higher SA:V ratio faster rate of diffusion / ORA ✓	1 (AO3.2 b)	ALLOW positive correlation ALLOW reference to less time instead of faster rate IGNORE they are directly proportional
	ii i	<p>reduces (total) SA of alveoli/air sacs / reduces SA : Vol ratio of alveoli/air sacs ✓</p> <p>so diffusion (of oxygen) reduced ✓</p>	2 (AO2 x 3.1a)	ALLOW harder for oxygen to diffuse IGNORE oxygen cannot diffuse into the blood in emphysema
	b	<p>sickle red blood cells release/take up/carry/deliver/transport less oxygen ✓</p> <p>sickle cells have a smaller surface area (to vol ratio) / tend to get stuck in blood vessels/capillaries / cannot pass through blood vessels/capillaries so easily ✓</p>	2 (AO1.1) (AO2.1)	IGNORE less oxygen binds to RBCs / sickle cells cannot carry oxygen IGNORE references to smaller volume / less Hb / less space on the RBCs
		Total	7	
11	a	<p>clots the blood ✓</p> <p>prevents bleeding / allows wounds to heal / forms a scab ✓</p>	2 (AO 1.1)	IGNORE clump blood ALLOW prevents pathogens getting into the body


				<p><u>Examiner's Comments</u></p> <p>There was some confusion in the responses describing the role of platelets whereby candidates thought platelets had a role in the specific immune response. Only higher ability candidates gained a mark here.</p>															
	b	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td></td> <td></td> <td style="text-align: center;">Rr</td> </tr> <tr> <td></td> <td style="text-align: center;">R</td> <td style="text-align: center;">r</td> </tr> <tr> <td style="text-align: center;">Rr</td> <td style="text-align: center;">R</td> <td style="text-align: center;">r</td> </tr> <tr> <td></td> <td style="text-align: center;">RR</td> <td style="text-align: center;">Rr</td> </tr> <tr> <td></td> <td style="text-align: center;">Rr</td> <td style="text-align: center;">rr</td> </tr> </table> <p>ratio 3 : 1 ✓</p>			Rr		R	r	Rr	R	r		RR	Rr		Rr	rr	<p>3 (AO 2.1)</p> <p>(AO 3.2b)</p>	<p>correct gametes = one mark correct genotypes of offspring = 1 mark</p> <p>ALLOW ECF for ratio ALLOW 3 in 4</p> <p><u>Examiner's Comments</u></p> <p>The majority of candidates achieved two or three marks correctly identifying the gametes and genotypes. Most went onto correctly identifying the ratio if they achieved the gametes mark. Very few candidates achieved the error carried forward mark.</p>
		Rr																	
	R	r																	
Rr	R	r																	
	RR	Rr																	
	Rr	rr																	
	c	<p>Any three from:</p> <p>variation with some rats resistant and some who are not ✓</p> <p>(resistant rats) more likely to survive/less likely to be killed ORA ✓</p> <p>(resistant rats more likely) reproduce ORA ✓</p> <p>pass on the allele / gene for resistance ORA ✓</p>	<p>3 (AO 2.1)</p>	<p>IGNORE selective breeding</p> <p>ALLOW mutation for resistance</p> <p>ALLOW offspring produced / breed together</p> <p>ALLOW pass on advantageous gene IGNORE trait is passed on / genes are passed on</p> <p><u>Examiner's Comments</u></p> <p>Candidates had to apply their knowledge of natural selection to explain why the percentage of resistant rats was increasing. There were a range of marks given for this question. Most none scoring responses were too vague and not using key terms. Most candidates did not appreciate that there was variation for resistance within the population.</p>															
	d	<p>Any two from:</p> <p>(stops/less) respiration ✓</p> <p>(no/less) energy/ATP ✓</p> <p>key process interrupted e.g. cell metabolism/protein synthesis/chemical reactions/active transport ✓</p>	<p>3 (AO 2.1)</p>	<p><u>Examiner's Comments</u></p> <p>This question was one of the most challenging application of knowledge and understanding questions. The most common awarded mark was appreciation that energy release would be affected. A lot of responses were very general and would say the rat can't breathe or can't get any oxygen.</p>															
		Total	11																
12	a	<p>blood travels through pump/heart twice ✓</p>	<p>2 (AO1.1)</p>	<p>ALLOW idea that there are two pumps / idea that blood is pumped twice</p>															




		on full circuit around body ✓		<p>ALLOW idea that blood passes separately to lungs and body</p> <p>Examiner's Comments</p> <p>In this AO1.1 question many candidates described the diagram but got confused. Some wrote about blood vessels rather than the heart. Candidates that gained credit identified that blood passes through the heart twice but were often unable to identify that this happens on a complete full circuit of the body.</p>
	b	<p>bird ✓</p> <p>bird has 4 chambered heart ✓</p> <p>bird has double circulation ✓</p>	3 (AO 2.1)	<p>If bird is not ticked or bird not selected in answer, then zero for question</p> <p>ALLOW bird has heart with 4 sections/compartments/named four chambers</p> <p>ALLOW description of double circulation</p> <p>Examiner's Comments</p> <p>In this AO2.1 question many candidates were identifying the bird, and some went on to justify their choice. However, most candidates often repeated similar descriptions to their previous answer, with few clearly identifying birds as having double circulation. It was very rare to see candidates who had recognised both birds and humans as having 4 chambers to the heart. Some did gain credit for this mark for correctly naming all 4 chambers.</p>
	c i	<p>FIRST CHECK THE ANSWER ON ANSWER LINE</p> <p>If answer = 4 award 2 marks</p> <p>$25\ 000 \div 5800 = 4.3$ ✓</p> <p>= 4 (nearest whole number) ✓</p>	2 (AO 2.2) (AO 1.2)	<p>ALLOW ECF mark for correct rounding if calculation is incorrect</p> <p>Examiner's Comments</p> <p>This question tested AO1.2 and AO2.2. Most candidates did this correctly although some stated 4.3 and did not gain the second marking point. There were a minority who just subtracted the two numbers.</p>
	ii	<p>Any two from:</p> <p>muscles need more energy / more ATP / more respiration ✓</p> <p>muscles need more oxygen / more carbon dioxide to be removed / more glucose / to avoid anaerobic respiration / to avoid lactic acid production ✓</p> <p>other organs not needed (in exercise) ✓</p>	2 (AO 3.2a)	<p>need to include only one comparative word e.g. more, to be able to score the first two marking points, e.g. muscles need more oxygen for energy = 2 marks</p> <p>ALLOW to remove more heat</p> <p>ALLOW other organs not prioritised / blood diverted from other organs</p> <p>Examiner's Comments</p> <p>This AO3.2 question proved challenging. Most responses focused on increased blood flow but gave no indication of why this was needed. Marks were often gained for muscles needing 'more</p>

				oxygen' or 'other organs not needed', with a few marks being given for the lactic acid/respiration ideas.
		Total	9	
13		MRI / X-ray imaging / new technology allows new evidence to be collected ✓ ideas/explanations have changed to fit new observations/technologies ✓	2 (AO 3.1b)	<p>ALLOW idea MRI etc. shows precise position of water whereas older techniques give approximate position</p> <p>ALLOW couldn't see what they can see now with new methods</p> <p>ALLOW tissue easily disturbed by injected dyes / AW</p> <p>ALLOW modern methods give more accurate results</p> <p>ALLOW different techniques give different results so different conclusions drawn</p> <p><u>Examiner's Comments</u></p> <p>This AO3.1 question required evaluation. A lot of candidates thought that plants may have evolved in the last 50 years so water moves differently. However, most just restated the question without addressing the idea of collecting new evidence, so did not demonstrate an ability to evaluate.</p>
		Total	2	
14	a	xylem cell ✓	1 (AO 1.1)	<p><u>Examiner's Comments</u></p> <p>This AO1 question was targeting candidates' knowledge of plant transport structure, with many candidates opting between xylem and phloem in almost equal numbers.</p>
	b	<p>Any two from:</p> <p>dead cells ✓</p> <p>thick/strengthened cell wall ✓</p> <p>hollow (lumen) ✓</p>	2 (AO 1.1)	<p>ALLOW ECF from the cell selected in 16(b)</p> <p>ALLOW lignin present/lignified</p> <p>IGNORE cellulose</p> <p>ALLOW waterproof walls</p> <p>ALLOW forms continuous walls/column for water/ continuous tube</p> <p>IGNORE contain water</p> <p><u>Examiner's Comments</u></p> <p>Very few gave 2 correct responses to this AO1 question. Most common responses related to thick cell walls, lignified cells and dead cells. Some candidates did not score due to just referencing normal plant cell features such as a rigid cell wall or cell membrane rather than adaptations shown by xylem. Some candidates who had put phloem for (c) were able to get the ECF (error carried forward), but usually only 1 mark for perforated end or no nucleus but rarely both. This does indicate a need to reinforce the difference between xylem and phloem and the differences in their adaptations.</p>

		Total	3	
15	i	phloem ✓	1 (AO 2.1)	<p><u>Examiner's Comments</u></p> <p>This AO1 question was targeting candidates' knowledge of the location of plant transport structures. Like in the previous question on adaptations, many candidates opted between xylem and phloem in almost equal numbers.</p>
	ii	<p>idea that sugar / food / nutrients removed (by the greenfly) ✓</p> <p>Any one from: So less left for growth ✓</p> <p>So less for respiration / energy / ATP ✓</p>	2 (AO 2.1)	<p>IGNORE xylem / root hair IGNORE water / minerals</p> <p>ALLOW so not enough for growth / so unlikely to grow / difficult to grow healthily</p> <p>ALLOW less sugar translocated/transported to other parts</p> <p><u>Examiner's Comments</u></p> <p>This AO2.1 question tested candidates' ability to apply knowledge of plant transport. Many candidates thought the greenfly was feeding from the xylem or that phloem transported water, and therefore focused on the plant having insufficient water for growth. Others thought that the greenfly was damaging the plant and the need for repair of the damage would prevent growth.</p>
		Total	3	
16	a i	<p>idea that it widens/opens the (lumen) of the artery ✓</p> <p>more blood/oxygen will be able to reach the heart muscle ✓</p>	<p>1 (AO 2.2)</p> <p>1 (AO 3.1b)</p>	<p>IGNORE expands the artery</p> <p><u>Examiner's Comments</u></p> <p>Most common credited mark was for the idea the stent widens/opens up the artery. Few candidates stated that more blood/oxygen would be able to reach the heart muscle.</p>
	ii	<p>advantage: avoids an operation ✓</p> <p>disadvantage: could be side effects of the drug / must take it on a regular basis ✓</p>	2 (AO 2 × 2.1)	<p>ALLOW named side effect e.g. liver damage/upset stomach ALLOW may forget to take the drug / misuse of the drug</p> <p><u>Examiner's Comments</u></p> <p>Most candidates didn't gain the marks for the advantage of taking statins because they just repeated the question and stated it lowers the level of cholesterol in a person's blood. A number of candidates achieved the disadvantage marking point, with the most common answer being that they have to take it on a regular basis. A number of candidates stated that the blood cholesterol would become too low, which wasn't credited.</p>

				<p>ALLOW atheroma / plaque formed</p> <p>IGNORE no blood</p> <p>IGNORE no oxygen</p> <p>IGNORE references to blood circulation to body cells</p> <p>Examiner's Comments</p> <p>Over half of candidates scored at least one mark here mainly for less blood flow (to the heart muscle). A lot of candidates got confused with the blood flow to the heart muscle with blood flow to the body cells, therefore not gaining credit. Exemplar 8 demonstrates this confusion and is not credited any marks.</p> <p>Exemplar 8</p> <p>Use the information in the diagram and your biological knowledge.</p> <p>The lack of consistent, potent flow to the body causes the body to have to adjust blood flow means and causes a far lesser oxygen. The body inclines around this by using respiratory to ensure enough respiration occur</p>
	b	<p>blood vessels / arteries are blocked/narrowed ✓</p> <p>(heart muscle) gets less blood ✓</p> <p>(heart muscle) gets less oxygen ✓</p>	<p>3 (AO 2.1)</p>	
		Total	7	
17	a	<p>left side thicker (than the right side)✓</p> <p>left pumps blood further✓</p>	<p>2 (AO 2 x 1.1)</p>	<p>ALLOW it's thicker / it's more muscular</p> <p>ALLOW left ventricle thicker than right</p> <p>IGNORE left is bigger</p> <p>ALLOW left pushes blood all around the (rest of the) body / right only pushes to lungs</p> <p>ALLOW left side must generate more pressure</p> <p>IGNORE left side contains blood at high pressure</p> <p>Examiner's Comments</p> <p>In this AO1.1 question, there were some candidates who mistakenly identified the right side of the heart, however, these were in the minority. The main issue was candidates linking the thickness of the heart wall to resisting pressure, rather than to needing to generate pressure.</p>
	b i	<p>Any two from:</p> <p>artery thicker walled/ ORA ✓</p> <p>artery more muscle tissue/ ORA ✓</p>	<p>2 (AO 2 x 2.1)</p>	<p>ALLOW artery (more) elastic</p>

		artery narrower bore/lumen/ ORA ✓	<p>ALLOW artery has smaller area for blood to pass through</p> <p>Examiner's Comments</p> <p>The AO2.1 diagram specifically directed candidates to consider applying their knowledge of the structures of the blood vessels to the diagrams. The main reason for not gaining marks was candidates not referring to the structure. Many just said the artery was thicker, without identifying which part of the artery. More able candidates were able to refer to differences in the wall and the lumen.</p> <p>Candidates often limit the mark gained in multiple mark questions by repeating their initial response in a different way.</p>  <p>Examination technique can be developed to encourage candidates to avoid this.</p> <p>Exemplar 1</p> <p>1. Arteries have a smaller lumen ✓</p> <p>2. Veins have a bigger lumen</p> <p>This candidate has assumed they have given two separate differences. However, their response covers the same marking point so only scores 1 mark. It is clear with the way the response is set out that the candidate thought they were giving two separate marking points but had just described the difference in size of lumen.</p>
	ii	<p>Any one from: veins have valves ✓ arteries take blood away from the heart / veins take blood to the heart ✓ blood flows faster / higher pressure in arteries /ORA ✓</p>	<p>IGNORE valves unqualified</p> <p>1 (AO 1.1)</p> <p>ALLOW arteries carry oxygenated / veins carry deoxygenated blood</p> <p>Examiner's Comments</p> <p>This recall AO1.1 question was well answered. Most candidates identified that arteries carried blood away from the heart or veins back to the heart. Some candidates identified veins having valves.</p>

		Total	5	
18	i	guard cell✓	1 (AO 1.1)	<p>IGNORE stomatal cells</p> <p>Examiner's Comments</p> <p>This AO1.1 question assessing recall of knowledge of guard cells proved challenging. Very few candidates could name the guard cell. Most candidates referenced organelles such as chloroplasts and mitochondria. Some responded with cell membrane and even cytoplasm (already labelled).</p>  <p>The question did ask for the name of the cell and candidates need to check carefully that they have responded to the question.</p>
	ii	allows gaseous exchange (of CO ₂ and O ₂)✓ allows water evaporation (to help transpiration)✓	2 (AO 2 x 1.1)	<p>ALLOW to release/let water out of the leaf/plant IGNORE to let water enter the leaf/plant</p> <p>Examiner's Comments</p> <p>These two marks were assessing AO1.1. Most candidates seemed to be confused with the role of stomata. The most common misconception was that the function of stomata was to let water into the leaves.</p>  <p>The role of gas exchange seemed poorly understood as only a limited number of candidates were able to show an understanding of the gases that move through the stomata.</p>
		Total	3	
19	a i	marked correctly on diagram ✓	1 (AO 1.1)	<p>ALLOW centre of X anywhere inside the shaded area</p> 

				<p><u>Examiner's Comments</u></p> <p>The question required candidates to demonstrate a knowledge of the structure of the heart AO1.1.</p> <p>Candidates made responses in all four chambers in almost equal numbers. Lower ability candidates put their response inside blood vessels or in some cases did not respond at all. Candidates should be encouraged to attempt all questions, especially those that can be answered using, for example, a choice of placing a letter on a diagram or completing sentences using words from a list.</p>
		ii	aorta / arteries✓ lungs✓	<p>2 (AO 2 x 1.1)</p> <p><u>Examiner's Comments</u></p> <p>This question targeted knowledge of the circulatory system AO1.1. Generally, the sequence of blood circulating the body was a well understood with many getting maximum marks. In some cases, either the artery/aorta or lungs were identified but not both.</p>
		b i	double (circulation)✓	<p>ALLOW double</p> <p><u>Examiner's Comments</u></p> <p>This AO1.1 question assessed if candidates can recall the name of the circulation if blood travels through the heart twice in one circuit. Some candidates correctly identified double circulation but many just referred to blood circulation and seemed to be unaware of double circulatory systems.</p>
		ii	<p>Any two from: increases the pressure of the blood / higher blood pressure✓</p> <p>increases the flow rate of the blood✓</p> <p>idea of faster transport of materials✓</p>	<p>2 (AO 2 x 1.1)</p> <p><u>Examiner's Comments</u></p> <p>ALLOW pushes blood more DO NOT ALLOW pushes more blood unqualified</p> <p>ALLOW to make the blood flow faster IGNORE makes blood flow fast</p> <p>ALLOW more oxygen / glucose to the tissues ALLOW keeps the blood well oxygenated / gets more oxygenated blood ALLOW faster removal of carbon dioxide from blood</p> <p>This AO2.1 question required an understanding of the advantages of a double circulatory system.</p> <p>Increased flow rate was the most common correct response. Some candidates were able to identify the increased pressure, or materials will be able to be transported faster/ in greater amounts. Only higher ability candidates gained maximum marks. A common misconception is that it allows more blood to travel around. Candidates do not seem to be aware that it is the same volume of blood but travelling faster.</p>

			Total	6	
20			larger surface area (to take up pollutants) (1)	1	allow sticks out more from bark
			Total	1	
21		i	blood in arteries is under higher pressure (1)	1	
		ii	arteries have thicker walls / elastic walls (1)	1	
			Total	2	
22	a	i	6(1)	1	
		ii	7.6 × 10 ⁻³ 3.0 × 10 ⁻³ 1.5 × 10 ⁻³		
		ii	correct calculation of 1 / time (1)	1	
		ii	answer in standard form (1)	1	
		ii	as size increases the rate of diffusion decreases / as size increases the diffusion distance increases (1)	1	ORA
		i	idea that would take too long for substances to diffuse in and out of large organisms (1)	1	
		ii			
		i			
		ii			
		i	spheres are an improvement because animal cells tend to be round shapes not cubes (1)	1	
		v	students used cubes because they are easier to cut / prepare (1)	1	allow the calculations of surface area:volume are easier
		i			
		v			
		i			
		v			
	b		any five from small size (1) flexible (1) <ul style="list-style-type: none"> to get in to small vessels / capillaries (1) biconcave disc shape (1) <ul style="list-style-type: none"> large surface area:volume (1) haemoglobin (1)	5	can only gain explanation marks (bullet points) if correctly linked to a feature max 4 marks if only given features without explanations

		<ul style="list-style-type: none"> to carry oxygen (1) lack of nucleus (1) <ul style="list-style-type: none"> (so) more room (for haemoglobin) (1) 										
		Total	12									
23	a	(more water / mass lost when fan is on because)		allow reverse argument								
		air movement removes water vapour / reduces water vapour concentration outside leaves / increases water vapour concentration gradient (1)	1									
		so evaporation / diffusion happens more quickly (1)	1									
	b	i (because otherwise) an increase in light intensity would open stomata (1)	1									
		i increasing transpiration / ORA (1)	1									
		ii (because otherwise) an increase in temperature would increase evaporation / ORA (1)	1									
		Total	5									
24	i	<table border="1"> <tbody> <tr> <td>a communicable disease</td> <td>✓</td> </tr> <tr> <td>a disease that is caused by defective alleles</td> <td></td> </tr> <tr> <td>a non-communicable disease</td> <td></td> </tr> <tr> <td>a disease that is affected by lifestyle</td> <td>✓</td> </tr> </tbody> </table>	a communicable disease	✓	a disease that is caused by defective alleles		a non-communicable disease		a disease that is affected by lifestyle	✓	1	Both correct answers are required for the mark
		a communicable disease	✓									
		a disease that is caused by defective alleles										
		a non-communicable disease										
a disease that is affected by lifestyle	✓											
ii antibodies (1)	1											
ii idea that it stops blood flowing backwards (1)	1											
ii inefficient circulation to lungs / less blood would go to the lungs (1)	1											
		ii Increased ventilation required for gaseous exchange (1)	1									
		ii idea of less oxygen available to the tissues / fatigue / oxygen debt (1)	1									

			Total	6	
25	a	i	6:1	1	
		ii	7.6×10^{-3} 3.0×10^{-3} 1.5×10^{-3} correct calculation of 1 / time (1)	1	
		ii	answer in standard form (1)	1	
		ii i	Comment on the rate of colour change / smaller block changed faster (1) Diffusion alone is sufficient in smaller organisms / smaller organisms have a larger surface area to volume ratio / diffusion alone may not be effective in multicellular organisms (may require circulatory system) (1)	1	ORA
		ii i	Diffusion alone is sufficient in smaller organisms / smaller organisms have a larger surface area to volume ratio / diffusion alone may not be effective in multicellular organisms (may require circulatory system) (1)	1	
	b		small size (1) <ul style="list-style-type: none"> to travel through capillaries (1) to get in to small vessels / capillaries (1) biconcave disc shape (1) <ul style="list-style-type: none"> large surface area : volume (1) haemoglobin (1) <ul style="list-style-type: none"> to carry oxygen (1) lack of nucleus (1) (so) more room (for haemoglobin) (1)	5	can only gain explanation marks (bullet points) if correctly linked to a feature max 4 marks if only given features without explanations
			Total	10	
26	a		stop evaporation of water (1)	1	
			so any loss in mass / water is from the plant (1)	1	
	b		same temperature (1) same light intensity (1) same windspeed / air movement (1)	3	allow same humidity
	c		* Please refer to the marking instruction point 10 for guidance on how to mark this question.	6	AO3.2a: Analyse the information from the experiment and use judgement to ascertain if the result is as expected

		<p>Level 3 (5–6 marks) Concludes whether this result would be expected in this experiment and includes scientific reasons in their answer. <i>There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.</i></p> <p>Level 2 (3–4 marks) Draws a conclusion from the data supported with suitable calculations. <i>There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.</i></p> <p>Level 1 (1–2 marks) Draws a conclusion from the data without the use of calculations. <i>The information is basic and communicated in an unstructured way. The information is supported by limited evidence and the relationship to the evidence may not be clear.</i></p> <p>0 marks <i>No response or no response worthy of credit.</i></p>		<ul style="list-style-type: none"> • Bigger plants would be expected to lose more mass – because of their larger surface / ora • Smaller plants could have lost more mass in this experiment – because they may have a higher number of stomata per unit area / ora • Results may be inconclusive as the experiment has not been repeated / there are an insufficient number of repeats <p>AO3.1a: Apply knowledge and understanding of the experiment with respect to the data</p> <ul style="list-style-type: none"> • Convert from water loss to percentage water loss plant A 12.6% plant B 15.4% and explained • Plant A lost more water / lost water more slowly • Plant A lost $261-228 = 33$ g, • Plant A rate of water loss – $33/24 = 1.38$ g/hr • Plant B lost $273-231 = 42$ g • Plant B rate of water loss – $42/24 = 1.75$ g/hr • Plant B lost 5 g more mass than plant A <p>AO2.2: Apply knowledge of transpiration to the different leaf sizes</p> <ul style="list-style-type: none"> • both experiments lose mass • that mass can be because of water loss • that water loss is due to transpiration
		Total	11	
27		D	1	
		Total	1	
28		C	1	
		Total	1	
29		A	1	
		Total	1	

