

Mark scheme

Question			Answer/Indicative content	Marks	Guidance
1			Gains sugars (from the tree/phloem) ✓	2 (AO 2.1) (AO 1.1)	ALLOW all named sugars ALLOW mistletoe makes less sugar/glucose IGNORE nutrients DO NOT ALLOW minerals/ions ALLOW translocation of sugars in phloem IGNORE minerals <u>Examiner's Comments</u> This question was a good discriminator, and candidates did find this challenging applying their knowledge of the role of the phloem. Both marking points were equally given. Some candidates did not give specific responses and vague responses relating to nutrients provided so did not gain any marks. Other candidates incorrectly confused the role of the phloem with the xylem.  Misconception Some candidates identified the role of the phloem transporting water and minerals instead of translocation of sugars. This could be prevented by regular revisiting of key ideas numerous times through the GCSE course.
			Sugar is transported in the phloem ✓		
Total				2	

2	a	Any two from: Highest incidences of varicose veins appeared in the age group 40–49/between 30 and 59/60 ✓ Fewest incidences of varicose veins were observed in those over 70 ✓ More females develop varicose veins than males ORA✓ Males are most likely to develop varicose veins when they are 60–69 / least likely when they are 30–39 ✓	2 (2 x AO 3.2b)	ALLOW Most incidences of varicose veins appear after 40 ✓ DO NOT ALLOW people aged 40–49 mostly have varicose veins <u>Examiner's Comments</u> Most candidates correctly concluded that females were more likely to have varicose veins as the percentages that were males were all under 50%. The other marking points were also regularly awarded. Some candidates did not score marks due to incorrectly expressing themselves, such as stating that 'most people aged 40–49 have varicose veins'.
	b	i With varicose veins: $\frac{458}{43724} \times 100 = 1.0\%$ $\frac{1434}{43724} \times 100 = 3.3\%$ $\frac{1116}{43724} \times 100 = 2.6\%$ Without varicose veins: $\frac{79}{18491} \times 100 = 0.4\%$ $\frac{638}{18491} \times 100 = 3.5\%$ $\frac{472}{18491} \times 100 = 2.6\% \therefore$ The percentage of participants with deep vein thrombosis was higher if they had varicose veins ✓ The percentage of participants with the other two conditions was the same/lower if they had varicose veins ✓	4 (AO 2.2) (AO 2.2) (2 x AO 3.1b)	Award 1st mark for any correct percentage calculated Award 2nd mark for any two corresponding percentages calculated enabling comparison ALLOW calculations of ratios/decimals e.g., 1 to 95 or 0.0105 IGNORE risk of deep vein thrombosis is higher if a person has varicose veins IGNORE risk of other conditions is the same or lower if a person has varicose veins <u>Examiner's Comments</u> Many candidates realised that

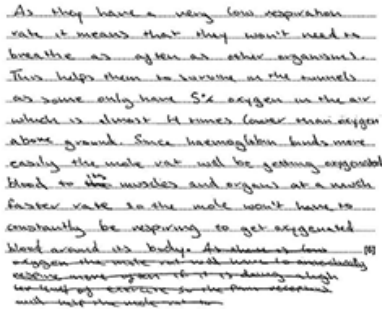
					it was necessary to take into account the two differing sample sizes and so calculated percentages, ratios or fractions so that they could compare the data in the two tables. Candidates who did not score marks often just compared the raw data from each table.
		ii	Any two from: Methods used are checked ✓ Conclusions formed from the data are checked ✓ Information/facts contained are checked ✓ Gives greater confidence/reliability (in the findings of the research) ✓	2 (2 x AO 2.1)	IGNORE study/experiment checked / content checked ALLOW errors/mistakes are eliminated / more likely to be accurate ALLOW trustworthy/more valid/reduce bias <u>Examiner's Comments</u> The importance of peer review is covered in Working Scientifically (1.1i) in the appendix of the specification. Many candidates were clearly aware of the function of peer review in checking aspects of the work and for increasing reliability or validity. However, some candidates thought that peer review simply involved repetition of the experiment.
			Total	8	
3			In the blood/bloodstream/blood vessels ✓ In the plasma ✓	2 (2 x AO 1.1)	ALLOW named type of blood vessel In the blood plasma = 2 marks <u>Examiner's Comments</u> This question discriminated well between candidates at different grades. High performing candidates were more precise in their answers, stating the plasma of the blood, rather than just in the bloodstream.

			Total	2													
4	a		There will be backflow (of blood in the veins) ✓	1 (AO 2.1)	ALLOW (blood) will be able to flow in both directions IGNORE reference to speed of blood flow Examiner's Comments There were some references to the speed of blood flow which were not credited but most candidates correctly highlighted the possibility that blood could flow backwards.												
	b		Swelling (of legs/feet) ✓	1 (AO 2.1)	ALLOW blood clots / (muscle) cramps / numbness / itchy skin / painful legs / bulging veins on legs / tiredness / fatigue IGNORE reference to breathlessness Examiner's Comments Blood clots or fatigue were the most common correct responses. Some candidates discussed the level of oxygenation of the blood which was not credited.												
			Total	2													
5	a	i	Aorta ✓	1 (AO 1.1)													
		ii	Translocation ✓	1 (AO 1.1)													
		iii	Vena cava ✓	1 (AO 1.1)													
	b		<table><tr><td></td><td>Active transport</td><td>Diffusion</td><td>Osmosis</td></tr><tr><td>Water moving into guard cells</td><td></td><td></td><td>✓</td></tr><tr><td>Mineral ions moving into root hair cells against a concentration gradient</td><td>✓</td><td></td><td></td></tr></table>		Active transport	Diffusion	Osmosis	Water moving into guard cells			✓	Mineral ions moving into root hair cells against a concentration gradient	✓			3 (3 x AO 1.1)	1 mark for each correct row Examiner's Comments Virtually all candidates followed the instruction of only ticking one box in each row and most put their ticks in the correct boxes.
	Active transport	Diffusion	Osmosis														
Water moving into guard cells			✓														
Mineral ions moving into root hair cells against a concentration gradient	✓																

			<table><tr><td>Oxygen entering red blood cells</td><td></td><td>✓</td><td></td></tr></table> ✓✓✓	Oxygen entering red blood cells		✓			
Oxygen entering red blood cells		✓							
			Total	6					
6		A		1 (AO 2.2)	<u>Examiner's Comments</u> Candidates' understanding of uncertainty in measurements is improving, with many answering this question correctly. The majority of incorrect responses were where candidates chose B, not appreciating that on an analogue scale, the uncertainty is half of the smallest graduation. i OCR support A useful guide to the concept of uncertainty can be found in the OCR publication <u>Language of measurement in context</u>.				
			Total	1					
7		Breathlessness / Tiredness/fatigue/lethargy/lightheaded/headaches/stitches / (muscle) cramps / Pale/blue skin / Irregular heartbeats/palpitations / Anaemia ✓		1 (AO 2.1)	<u>Examiner's Comments</u> References to fatigue or tiredness were the most common correct responses seen here.				
			Total	1					
8		A		1 (AO 1.1)	<u>Examiner's Comments</u> This was the most challenging question with a significant number of candidates choosing option D.				
			Total	1					

9			C	1 (AO 2.1)	<u>Examiner's Comments</u> About two thirds of the candidates answered correctly. The most common incorrect response was B, where candidates followed the passage of blood from vein to ventricle, to artery but did this on the right side of the heart rather than the left.
			Total	1	
10			D	1 (AO 1.1)	<u>Examiner's Comments</u> If candidates answered incorrectly, they tended to reverse the direction of water movement and so gave the answer C.
			Total	1	
11			A	1 (AO 1.1)	<u>Examiner's Comments</u> This was one of the more challenging questions with diffusion and osmosis acting as distractors for some candidates.
			Total	1	
12			Level 3 (5–6 marks) Gives a detailed explanation how each of the features allows the mole rats to survive in the tunnels. <i>There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.</i> Level 2 (3–4 marks) Partially explains how the features allow the mole rats to survive in the tunnels. <i>There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.</i> Level 1 (1–2 marks) Gives a limited explanation of how a feature allows the mole rats to survive in the tunnels. <i>There is an attempt at a logical structure with a line of</i>	6 (3 xAO 1.1) (3 x AO 2.1)	AO1.1 Demonstrates knowledge and understanding of scientific ideas to describe the features. - oxygen required for aerobic respiration - haemoglobin in red blood cells transports oxygen to tissues - lactic acid produced during anaerobic respiration AO2.2 Applies knowledge and understanding to explain how the features allow the rats to survive.

			<i>reasoning. The information is in the most part relevant.</i> 0 mark <i>No response or no response worthy of credit</i>		• (a low respiration rate) will reduce the need for oxygen • (haemoglobin that binds oxygen more easily) will allow the oxygen to be picked up at the lungs from the low concentration in the air • (haemoglobin that binds oxygen more easily) more oxygen will be carried to the tissues/cells • less oxygen so anaerobic respiration is more likely • increased production of lactic acid • (lack of pain receptors) will prevent the lactic acid from causing pain and/or reducing movement <u>Examiner's Comments</u> The Level of Response extended writing question proved to be a good discriminator. There was a full range of responses over the 6 marks. The most successful responses were able to explain the benefits of a low respiration rate with the tunnels only having 5% oxygen, haemoglobin binding to oxygen more easily with more oxygen delivered to muscle cells to carry out respiration and few pain receptors would be able to tolerate high levels of lactic acid from anaerobic respiration better. The least successful responses just copied out the information provided in the question or only addressed few pain receptors being able to tolerate lactic acid from
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					anaerobic respiration. The responses that did not achieve Level 3 were not specific about the role of haemoglobin in the delivery of oxygen to tissue/cells. Exemplar 2  Exemplar 2 gained Level 1, 2 marks as the candidate gave a limited explanation of how a feature allows the mole rat to survive in the tunnels. They incorrectly stated that having a low respiration rate meant they could breathe less instead of requiring less oxygen for aerobic respiration. They correctly identified oxygen binding with haemoglobin more easily means faster delivery of oxygen to muscles. They crossed out the part addressing pain receptors and acid.
			Total	6	
13			B	1 (AO 2.1)	<u>Examiner's Comments</u> This was one of the more challenging multiple choice questions and less than half of candidates were able to identify that beta blockers and nitrates would reduce blood pressure from the information provided.

				 Assessment for learning
				Centres could reinforce treatments of coronary heart disease as it has been identified as a knowledge gap.
			Total	1
14	a	Level 3 (5-6 marks) Describes the general role of stem cells AND Describes the development of red blood cells as specialised cells AND Explains the change in RNA concentration or the loss of the nucleus <i>There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.</i> Level 2 (3-4 marks) Describes the general role of stem cells and describes the development of red blood cells as specialised cells OR Describes the development of red blood cells as specialised cells and explains the change in RNA concentration or the loss of the nucleus OR Describes the general role of stem cells and explains the change in RNA concentration or the loss of the nucleus <i>There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.</i> Level 1 (1-2 marks) Describes the general role of stem cells OR Describes the development of red blood cells as specialised cells OR Explains the change in RNA concentration or the loss of the nucleus <i>There is an attempt at a logical structure with a line of reasoning. The information is in the most part relevant.</i> 0 marks <i>No response or no response worthy of credit.</i>	6 (2 × AO1.1) (3 × AO2.1) (1 × AO3.2b)	AO1 Demonstrate knowledge and understanding of scientific ideas of the general role of stem cells. - Stem cells are undifferentiated cells/are able to differentiate to form different cells - Stem cells become specialised for specific functions/become specialised cells AO2 Apply knowledge and understanding of scientific ideas to the development of the red blood cell from a stem cell to a cell that contains the protein haemoglobin. - Red blood cells (are specialised cells as they) - do not have a nucleus - contain haemoglobin - Haemoglobin is made by protein synthesis/by using RNA AO3 Analyse information from the graph to explain changes that occur to RNA and the loss of the nucleus

				• Amount of RNA falls due to the loss/decrease in size of the nucleus • The cell loses the nucleus to give room for large amounts of haemoglobin that have been produced <u>Examiner's Comments</u> This was the level of response question on this paper. To obtain Level 3, candidates had to discuss the importance of stem cells in forming specialised cells. They then had to explain how red blood cells become specialised by losing the nucleus in order to allow more room for haemoglobin. A common misconception in some answers was the idea that the fall in mRNA in the cell made more room for haemoglobin. Also, there was confusion concerning the loss of the nucleus. Many candidates correctly referred to the increase of space for haemoglobin but others said that this would increase the surface area to volume ratio of the cell.
	b	First check answer on answer line. If answer = 2.115×10^{13} award 3 marks correct multiplication of 4.7×4.5 appearing in the working ✓ multiplication of $\times 1\,000\,000$ appearing twice in the working / answer multiplied by 10^{12} ✓ $4.7 \times 4.5 \times 10^{12} = 2.115 \times 10^{13}$ ✓	3 (3 × AO2.2)	ALLOW any correct rounding of 2.115×10^{13} ALLOW one mark for an incorrect answer if it is clearly shown that it has been correctly converted into standard form <u>Examiner's Comments</u> Many of the candidates coped well with the conversion to

					standard form. However, a number of candidates did not take into account the fact that the number of red blood cells was given in millions, so their final answer was 106 out. These candidates were still given 2 out of 3 marks, for two correct stages in their calculations.
			Total	9	
15			Any two from: Reduces blood flow to the heart muscle/cells ✓ Less oxygen/glucose delivered to the heart muscle/cells ✓ Heart (muscle) respire less ✓ Heart (muscle) does not contract properly ✓	2 (2 × AO2.1)	IGNORE Reduces blood flow to the heart IGNORE Less oxygen/glucose delivered to the heart <u>Examiner's Comments</u> The main issue here was candidates did not differentiate between the blood supply to the cardiac muscle being blocked or the blood supply to the whole heart. This is seen in this exemplar which did not score. Exemplar 3 <i>Cholesterol deposits could affect the correct functioning of the heart by slowing the flow of blood through the coronary artery which will slow the flow of blood into the heart.</i> Exemplar 3 was not given any marks for this response.
			Total	2	
16			First check answer on answer line. If answer = 12.5 award 2 marks $5 \div 400 = 0.0125$ ✓ $0.0125 \times 1000 = 12.5$ ✓	2 (2 × AO2.2)	ALLOW a mark for a correct conversion by $\times 1000$ <u>Examiner's Comments</u> Most candidates correctly calculated the width of the stoma.
			Total	2	

17			Capillary ✓	1 (1 × AO1.1)	<u>Examiner's Comments</u> Most answers correctly stated capillaries.
			Total	1	
18			A ✓	1 (AO 2.2)	
			Total	1	
19			D ✓	1 (AO1.1)	
			Total	1	
20			D ✓	1 (AO1.1)	
			Total	1	
21			A ✓	1 (AO1.1)	
			Total	1	
22			C ✓	1 (AO1.1)	
			Total	1	