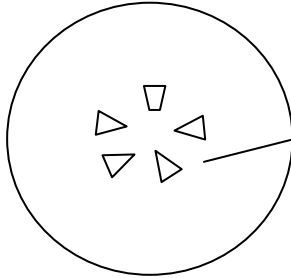


Question		Expected Answers	Marks	Additional Guidance
1	(a)	3 – 5 discrete patches in ring (near centre) ;	1	<p>if xylem drawn then phloem <u>must</u> be labelled</p> <p><b>DO NOT ACCEPT</b> vascular bundles around edge  <b>DO NOT ACCEPT</b> if phloem occupies more than half total width</p>  <p>patches can be any shape</p>
1	(b)	<p><b>A</b> / labelled carbon can be observed in the phloem soon after being supplied to the plant ;</p> <p><b>B</b> / the rate of flow of sugars in the phloem is higher than diffusion ;</p> <p><b>C</b> / an insect such as an aphid feeds by inserting its proboscis (mouth parts) into the phloem ;</p>	max 2	<i>mark first two letters only</i>

Question		Expected Answers	Marks	Additional Guidance
	(c)	<p><i>source</i> site where, sucrose / sugars / assimilates, loaded (into phloem) / AW ;</p> <p><i>sink</i> site where, sucrose / sugars / assimilates, unloaded / removed (from phloem) / AW ;</p>	2	<p><b>DO NOT ACCEPT</b> glucose / substance throughout</p> <p><b>ACCEPT</b> where, sucrose / sugars / assimilates, produced/created or converted from stored products</p> <p><b>DO NOT ACCEPT</b> terms 'loading' and 'unloading' in wrong context</p> <p><b>ACCEPT</b> where, sucrose / sugars / assimilates, stored or used (in metabolic processes)</p> <p><b>DO NOT ACCEPT</b> 'required' or 'needed' instead of 'used'</p>
1	(d)	<p>(sugars) cannot pass the cut / AW ;</p> <p>decrease water potential ; water moves into cells ;</p> <p>(damage triggers) increased cell division ; to produce cells to store sugars ;</p> <p>cut causes, gall / infection ;</p>	2 max	<p><b>ACCEPT</b> sugars, stuck above cut / stuck at top of tree / can't move down/build up above cut</p>
			[Total: [7]	

Question		Answer	Marks	Guidance
2	(a) (i)	<u>0.6 : 1</u> ; ;	2	<p>Correct answer = 2 marks  <b>Ratio must be correct way round</b> 1: 0.6 is not correct but can still allow mark for correct working if shown</p> <p>If answer incorrect <b>ALLOW</b> 1 mark for working  e.g. <math>600 \div 1000</math></p> <p>600 : 1000 = 1 mark</p>
	(ii)	<p>as SA:VOL ratio decreases rate of diffusion decreases  <b>OR</b>  as SA:VOL ratio increases rate of diffusion increases ;</p> <p>use of two pairs of figures with correct units (<math>\text{mms}^{-1}</math>) for rate to illustrate trend ;</p> <p>ref to rate of diffusion in either of the first two cubes not fitting trend ;</p>	max 2	<p><b>ACCEPT</b> <u>positive</u> correlation  <b>DO NOT CREDIT</b> as rate of <i>diffusion</i> decreases SA:VOL ratio decreases</p> <p>use of figs requires ratio quote and rate quote at two points  e.g. at SA:VOL of 3:1 rate is <math>0.02 \text{ mms}^{-1}</math>, at SA:VOL ratio of 0.2:1 rate is <math>0.013</math> (correct units only need to be used once)  <b>DO NOT CREDIT</b> if unit for SA:Vol given</p> <p><b>ACCEPT</b> correct calculation of rate change  e.g. when the SA:VOL ratio was 3:1 the rate of diffusion was <math>0.020 \text{ mms}^{-1}</math> which is <math>0.007 \text{ mms}^{-1}</math> faster than the cube with 0.2:1 SA:VOL ratio</p>
	(iii)	<p>(large plants) have a, small / low, SA : VOL ratio ;</p> <p><i>idea of</i> diffusion too slow (to supply requirements) ;</p> <p><i>idea of</i> need transport system (for water / minerals / assimilates) ;</p> <p><i>idea of</i> need (special) surface area for, gaseous exchange / uptake of minerals ;</p>	max 2	<p><b>DO NOT CREDIT</b> smaller unless we know smaller than what  <b>ACCEPT</b> e.g. larger plants have a smaller SA : Vol ratio</p> <p>must have idea of <b>too</b> slow  <b>ACCEPT</b> diffusion takes <b>too</b> long  <b>DO NOT CREDIT</b> transport of gases</p>

Question		Answer	Marks	Guidance
	(b) (i)	divided length of side by time taken ;	1	<b>IGNORE</b> divide mm by s (units alone too vague)
	(ii)	<i>idea that</i> student used whole length of side, rather than half length ;	1	<b>ACCEPT</b> needs to divide answer by 2 / distance has to be to centre of cube rather than whole length of side / assumed diffusion occurs (across whole cube) from one side
	(c)	<p><i>squamous epithelium</i> short(er) diffusion, distance / path ;</p> <p><i>large number of alveoli</i> large(r) surface area ;</p> <p><i>good blood supply</i> high / large / steep, concentration gradient OR removes oxygen (from lung surface) / brings carbon dioxide (to lung surface);</p> <p><i>good ventilation</i> high / large / steep, concentration gradient OR supplies oxygen (to alveoli) / removes carbon dioxide (from alveoli) ;</p>	4	<p><b>ACCEPT</b> reduced / shorter diffusion distance <b>ACCEPT</b> thin diffusion barrier <b>IGNORE</b> thin diffusion pathway</p> <p><b>ACCEPT</b> increases surface area <b>IGNORE</b> SA : Vol ratio</p> <p><b>ACCEPT</b> maintains / creates concentration gradient <b>IGNORE</b> ref diffusion gradient</p> <p><b>ACCEPT</b> maintains / creates concentration gradient <b>IGNORE</b> ref diffusion gradient <b>IGNORE</b> ref to air</p>
<b>Total</b>			<b>12</b>	

Question			Answer	Marks	Guidance
3	(a)	(i)	<p>provides, strength / support ;</p> <p>to keep, it / the vessel / the tube, open</p> <p><b>OR</b></p> <p>prevent collapse of, vessel / tube ;</p> <p>(because) transpiration produces, tension / negative pressure ;</p> <p>to waterproof the, cell / vessel / tube / wall ;</p> <p>(so) <u>cell</u>, dies / content decays ;</p> <p>to create a hollow, tube / vessel</p> <p><b>OR</b></p> <p>to create a continuous column / allow unimpeded flow ;</p> <p>to limit lateral flow of water ;</p> <p>ref to adhesion (between water molecules and wall) ;</p>	3 max	<p><b>IGNORE</b> ref to flexibility</p> <p><b>IGNORE</b> xylem unqualified</p> <p><b>IGNORE</b> 'collapse of wall'</p> <p><b>IGNORE</b> 'xylem'</p> <p><b>IGNORE</b> xylem vessels die</p> <p><b>CREDIT</b> reduce / prevent lateral movement</p> <p><b>ACCEPT</b> lignin helps water move by adhesion</p>
		(ii)	<p>(provides) strength / support, to keep, it / trachea / airway, open</p> <p><b>OR</b></p> <p>(provides) strength / support, to prevent collapse ;</p> <p>during, inspiration / inhaling / breathing in ;</p> <p>volume of, chest cavity / thorax / lungs, increases ;</p> <p>low(er) / negative, pressure in, trachea / thorax / lungs ;</p>	3 max	<p><b>IGNORE</b> ref to alveoli / C-shape of cartilage</p> <p><b>ACCEPT</b> in context of bending the neck</p>

Question		Answer	Marks	Guidance
	(b)	<p>body has small <u>surface area to volume ratio</u>  <b>OR</b>  lungs, provide / have, large <u>surface area to volume ratio</u> ;</p> <p>correct calculation of (one) surface area to volume ratio ;</p> <p><i>idea of:</i>  body SA / SA:Vol is not big enough to meet body's needs  <b>OR</b>  lung SA / SA:Vol is big enough to meet body's needs ;</p> <p>oxygen into (blood / body) <b>and</b> carbon dioxide out (of blood / body) ;</p>	3 max	<p>ensure that 'surface area to volume ratio' is used correctly</p> <p><b>CREDIT</b> SA/Vol, SA:Vol  <b>ACCEPT</b> person for body</p> <p>25.7 /26 (:1) for body OR 1000(:1) for lungs  DO NOT CREDIT 1 : 1000 OR 1 : 26</p> <p><b>e.g.</b> allows gaseous exchange at a high enough rate  <b>IGNORE</b> ref to efficiency</p> <p><b>CREDIT</b> O<sub>2</sub> and CO<sub>2</sub></p>
		<b>Total</b>	<b>9</b>	

Question		Answer	Marks	Guidance
4	(a)	stem / undifferentiated ; (bone) marrow ; differentiate ; meristem(atic) / cambium ;	4	<b>Mark the first answer for each prompt line.</b> If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks  <b>ACCEPT</b> totipotent / pluripotent <b>IGNORE</b> unspecialised (as specialised in the passage)  <b>IGNORE</b> specialise as given in the passage  <b>ACCEPT</b> callus
	(b) (	<i>idea of:</i> create flow of water / move water ;	1	<b>Mark the first answer only.</b> If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks  <b>DO NOT CREDIT</b> ref to movement of, organism / cell <b>IGNORE</b> ref to liquid / food particles
	(ii)	strain / filter (the water) <b>OR</b> trap particles ; to catch food (particles) ;	1 max	<b>Mark the first answer only.</b> If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks  <b>IGNORE</b> trap substances unqualified  <b>ACCEPT</b> named suitable food particles eg bacteria <b>IGNORE</b> ref to preventing infection / catching pathogens <b>IGNORE</b> ref to nutrients unqualified as these are dissolved <b>IGNORE</b> ref to catching dust

Question	Answer	Marks	Guidance
(c)	<p><i>xylem</i> consists of vessels ;</p> <p>one cell specialisation described ;</p> <p><u>transpiration stream</u> <b>OR</b> movement of, water / minerals ;</p> <p><i>phloem</i> sieve tube element(s) <u>and</u> companion cell(s) ;</p> <p>one cell specialisation described ;</p> <p><u>translocation</u> <b>OR</b> transports, sucrose / assimilates / products of photosynthesis / amino acids ;</p> <p>AVP ;</p>	4 max	<p><b>ACCEPT</b> cells joined end to end <b>ACCEPT</b> continuous column / tube</p> <p>eg wall water proof / wall lignified / no end walls / (bordered) pits / hollow / no organelles / no cell contents</p> <p><b>IGNORE</b> dead</p> <p><b>IGNORE</b> transpiration unqualified</p> <p><b>ACCEPT</b> sieve element / sieve tube, and companion cell</p> <p>eg sieve plates (between phloem elements) no nucleus / few organelles, in sieve tube (elements) little cytoplasm in sieve tube (elements) many plasmodesmata many mitochondria / dense cytoplasm, in companion cells</p> <p><b>ACCEPT</b> sugar <b>IGNORE</b> load / unload sugars alone</p> <p><i>in either xylem or phloem</i> ref to fibres ref to, packing cells / parenchyma cells</p>
	<b>Total</b>	<b>10</b>	



Question			Expected Answers	Marks	Additional Guidance
5	(a)		<u>1500</u> ;	2	<b>ACCEPT</b> 1400 <b>and</b> 300,000 for 1 max only
			<u>500 000</u> ;		
5	(b)		ability to see (two) objects (that are close together) as separate objects / AW ; see detail ;	2	<b>ACCEPT</b> ability to distinguish two objects <b>IGNORE</b> clarity / clear
5	(c)	(i)	transports water (up plant) ;	1 max	<b>ACCEPT</b> alternative wording for transport e.g. movement <b>DO NOT ACCEPT</b> up <b>and</b> down <b>DO NOT ACCEPT</b> water and sugars
			transports, minerals / ions, (up plant) ;		<b>ACCEPT</b> alternative wording for transport <b>IGNORE</b> ref nutrients / solutes <b>DO NOT ACCEPT</b> sugars
			support (plant / stem / shoot) ;		<b>ACCEPT</b> keeps plant upright

Question			Expected Answers	Marks	Additional Guidance
5	(c)	(ii)	<p><i>Functions:</i></p> <p><b>F1</b> (lignin), strengthens / thickens, the (xylem) <u>wall</u> ;</p> <p><b>F2</b> waterproofing (wall) / AW ;</p> <p><b>F3</b> (improving) adhesion of water (molecules) ;</p> <p><b>F4</b> (spiral) pattern allows flexibility / stretching / movement;</p> <p style="text-align: right;"><b>2 max</b></p>		<p><b>ACCEPT</b> support only if in specific context of supporting the xylem <u>wall</u></p> <p><b>ACCEPT</b> waterproofs cell</p> <p><b>DO NOT ACCEPT</b> adhesion <b>and</b> cohesion when used together</p> <p>Flexibility / stretching must ref, <i>pattern</i> of lignin laid down i.e. spirals</p>
			<p><i>Explanation:</i></p> <p><b>E1</b> prevents collapse of xylem ;</p> <p><b>E2</b> (water) under tension / at low pressure / negative pressure;</p> <p><b>E3</b> reduces (lateral) loss of water, through wall ;</p> <p><b>E4</b> increases capillarity / AW ;</p> <p><b>E5</b> prevents stem breaking / AW ;</p> <p style="text-align: right;"><b>2 max</b></p>	<b>3 max</b>	<p><i>Award mark(s) for function and explanation independently</i></p> <p><b>DO NOT CREDIT</b> loss of water unqualified</p>

Question			Expected Answers	Marks	Additional Guidance
5	(c)	(iii)	(pits) allow water to move, in / out / between, <u>vessel(s)</u> ; to bypass blockage ; supply water to other, tissues / (other types) cells / parts of plant ;	2 max	<b>ACCEPT</b> lateral movement for 'out' <b>ACCEPT</b> bypass air lock <b>ACCEPT</b> any named, tissue / cells e.g. to allow water to other tissues 1 mark to allow water out to other tissues 1 mark to allow water out of vessel to other tissues 2 marks
			<b>Total</b>	<b>10</b>	