

Mark Scheme for January 2012

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

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Annotations

Annotations available in SCORIS

Annotation	Meaning
	Benefit of Doubt
	Contradiction
	Cross
	Error Carried Forward
	Given Mark
	Extendable horizontal wavy line
	Ignore
	QWC point
	Benefit of the doubt not given
	additional QWC credit given
	Tick
	Tick 1
	Tick 2
	Omission Mark

Annotations and conventions used in the detailed Mark Scheme

Annotation	Meaning
/	alternative and acceptable answers for the same marking point
;	separates marking points
not	answers which are not worthy of credit
DO NOT CREDIT	answers which are not worthy of credit
ignore	statements which are irrelevant
ACCEPT	answers that can be accepted
()	words which are not essential to gain credit
—	underlined words must be present in answer to score a mark
ecf	error carried forward
AW	alternative wording
ora	or reverse argument

Question		Answer	Mark	Guidance
1	(a)	(i) <u>alveoli</u> ; to provide large(r), surface area / SA ;	2	ACCEPT alveolus / alvioli, alviolis ACCEPT large(r) surface area to volume ratio OR SA:VOL
		(ii) <u>squamous</u> / <u>pavement</u> ;	1	Look for the name ACCEPT squamas, squamos, squarmous DO NOT CREDIT ref to ciliated
		(iii) to prevent bursting ; recoil ; to return air sac to original, size / shape ; to help expel air ;	2 max	IGNORE stretch / contract DO NOT CREDIT in context of inhaling IGNORE ref to role returning airways back to size IGNORE ref to fibres returning to original size DO NOT CREDIT carbon dioxide / waste gas, expelled
	(b)	(i) 1 increases, partial pressure / concentration, of oxygen (in the air sac) ; 2 so concentration of oxygen (in the air sac) is higher than that in the blood ; 3 decreases, partial pressure / concentration, of carbon dioxide (in air sac) ; 4 so concentration of CO ₂ (in the air sac) is lower than that in the blood ;	2	ACCEPT (provides) high concentration of oxygen (in air sac) IGNORE 'maintains' throughout
		(ii) EITHER D1 (continuous) blood flow (in the capillaries) ; E1 to, bring in (more) carbon dioxide / take away (more) oxygen ; OR D2 oxygen combines with haemoglobin ; E2 to keep concentration in, blood / plasma, low ;	2	idea of blood flow ACCEPT good / copious / continuous, blood supply IGNORE highly vascular / many capillaries present IGNORE short diffusion path / capillaries very close to alveoli
Total			9	

Question		Answer	Marks	Guidance
2	(a)	stem / undifferentiated ; (bone) marrow ; differentiate ; meristem(atic) / cambium ;	4	Mark the first answer for each prompt line. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks ACCEPT totipotent / pluripotent IGNORE unspecialised (as specialised in the passage) IGNORE specialise as given in the passage ACCEPT callus
	(b) (i)	<i>idea of:</i> create flow of water / move water ;	1	Mark the first answer only. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks DO NOT CREDIT ref to movement of, organism / cell IGNORE ref to liquid / food particles
	(ii)	strain / filter (the water) OR trap particles ; to catch food (particles) ;	1 max	Mark the first answer only. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks IGNORE trap substances unqualified ACCEPT named suitable food particles eg bacteria IGNORE ref to preventing infection / catching pathogens IGNORE ref to nutrients unqualified as these are dissolved IGNORE 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> OR 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> OR transports, sucrose / assimilates / products of photosynthesis / amino acids ;</p> <p>AVP ;</p>	4 max	<p>ACCEPT cells joined end to end ACCEPT continuous column / tube</p> <p>eg wall water proof / wall lignified / no end walls / (bordered) pits / hollow / no organelles / no cell contents</p> <p>IGNORE dead</p> <p>IGNORE transpiration unqualified</p> <p>ACCEPT 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>ACCEPT sugar IGNORE load / unload sugars alone</p> <p><i>in either xylem or phloem</i> ref to fibres ref to, packing cells / parenchyma cells</p>
	Total	10	

Question		Answer				Marks	Guidance																									
3	(a)	<table border="1"> <thead> <tr> <th>feature</th> <th>arterial blood</th> <th>tissue fluid</th> <th>lymph</th> <th></th> </tr> </thead> <tbody> <tr> <td>hydrostatic pressure</td> <td>high</td> <td>low</td> <td>low</td> <td>;</td> </tr> <tr> <td>presence of large proteins</td> <td>yes</td> <td colspan="2"> no no OR yes yes </td> <td>;</td> </tr> <tr> <td>presence of neutrophils</td> <td>yes</td> <td>yes</td> <td>(yes / no)</td> <td>;</td> </tr> <tr> <td>presence of erythrocytes</td> <td>yes</td> <td>no</td> <td>no</td> <td>;</td> </tr> </tbody> </table>				feature	arterial blood	tissue fluid	lymph		hydrostatic pressure	high	low	low	;	presence of large proteins	yes	no no OR yes yes		;	presence of neutrophils	yes	yes	(yes / no)	;	presence of erythrocytes	yes	no	no	;	4	<p>Mark the first answer for each box. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks</p> <p>Award 1 mark per correct row.</p> <p>IGNORE yes and no in first row</p> <p>ACCEPT some / few / low / usually, for yes in rows 2 and 3 DO NOT CREDIT not usually for yes</p> <p>In row two mark is awarded for idea that tissue fluid and lymph are the same (proteins in tissue fluid will enter lymph) - both responses must be the same to achieve a mark.</p> <p>Mark is awarded for tissue fluid response only.</p>
feature	arterial blood	tissue fluid	lymph																													
hydrostatic pressure	high	low	low	;																												
presence of large proteins	yes	no no OR yes yes		;																												
presence of neutrophils	yes	yes	(yes / no)	;																												
presence of erythrocytes	yes	no	no	;																												

Question			Answer	Marks	Guidance
	(b)	(i)	<p>maintain / high(er), (blood) pressure ;</p> <p>increase rate of, flow / delivery ;</p> <p>flow can be, diverted / directed / AW ;</p>	2 max	<p>Mark the first suggestion on each prompt line.</p> <p>IGNORE separates oxygenated from deoxygenated blood</p> <p>IGNORE generate / create, pressure</p> <p>IGNORE ref to pressure gradient</p> <p>ACCEPT blood moves faster / quicker</p> <p>IGNORE ref to going to, all cells / where needed</p>

Question	Answer	Marks	Guidance
	<p>(ii)</p> <p><i>to withstand pressure</i></p> <p>D1 wall is thick ; D2 (thick layer of) collagen ; E3 (wall / collagen) provides strength ;</p> <p>D4 endothelium, corrugated / folded ;</p> <p>E5 <i>idea of:</i> no damage to, endothelium / artery (wall) (as it stretches) ;</p> <hr/> <p style="text-align: right;">max 3</p> <p><i>to maintain pressure</i></p> <p>D6 (thick layer of) elastic tissue / elastic fibres / elastin ; E7 to cause recoil / return to original size ;</p> <p>D8 (thick layer of) smooth muscle ; E9 narrows / constricts, lumen / artery ;</p> <p>E10 AVP ;</p> <p style="text-align: right;">max 3</p>	<p style="text-align: center;">4 max</p>	<p>Ensure that there is at least one D mark and one E mark for four marks AND Ensure that there is at least one withstand mark and one maintain mark for four marks</p> <p>ACCEPT tunica media, tunica adventitia, tunica externa for wall</p> <p>ACCEPT (wall / collagen) is strong</p> <p>ACCEPT tunica intima for endothelium IGNORE lining IGNORE prevents artery bursting / breaking ACCEPT wall will not tear</p> <p>IGNORE elastic unqualified</p> <p>Ref to lumen must be in context of explaining how pressure is maintained eg makes lumen small(er) = 1 mark DO NOT CREDIT in context of constriction to push or pump the blood along the artery IGNORE 'lumen is narrow' or 'has small lumen' as these are a description of the lumen not referring to the wall <i>eg:</i> <i>idea of:</i> blood is forced (through narrow, channel / lumen) <i>idea of:</i> restriction of blood flow to one area allows pressure to be maintained elsewhere</p> <p style="text-align: right;">QWC rubric continued on next page.....</p>

Question	Answer	Marks	Guidance
3 (b)(ii)	Q QWC - two technical terms used and spelt correctly ;	1	Words must be used in correct context and section. any 2 from: <i>withstanding pressure:</i> collagen endothelium / endothelial <i>maintaining pressure:</i> elastic / elastin recoil smooth muscle lumen constrict(ion)
	Total	11	

Question		Answer	Marks	Guidance
4	(a)	<p><i>magnification is</i> the number of times larger the image is compared to the object ;</p> <p><i>resolution is</i> ability to, distinguish / differentiate between, two separate points</p> <p>OR the, level / degree, of detail that can be seen ;</p>	2	<p>ACCEPT alternative wording that implies quantitative comparison of image size with object size DO NOT CREDIT comparison of object to image (wrong way round)</p> <p>ACCEPT $\frac{\text{size of image}}{\text{size of object}}$ or $\frac{\text{size of image}}{\text{actual size}}$</p> <p>IGNORE makes image bigger unqualified</p> <p>IGNORE ref to clarity</p> <p>ACCEPT 'how detailed the image is'</p>
	(b)	<p><i>light</i> 50 - 200 nm / 0.05 - 0.2 μm ;</p> <p><i>TEM</i> 0.05 - 1.0 nm ;</p>	2	<p>Mark the first answer for each prompt line. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks</p> <p>ACCEPT a single figure within the range</p> <p>Units are required for both light & TEM</p> <p>ACCEPT 0.00005 - 0.001μm or 5×10^{-5} - $1 \times 10^{-3}\mu\text{m}$</p>
	(c) (i)	3 dimensional / 3D, (image) ; can see the surface (detail) ;	1 max	ACCEPT has depth of field / contours

Question		Answer	Marks	Guidance
	(ii)	120 ;;	2	<p>Award two marks for correct answer if answer incorrect allow one mark for working:</p> $\frac{3\,000\,000}{25\,000} \quad \text{or} \quad \frac{3}{25\,000} \quad \text{or} \quad \text{evidence that candidate is dividing 3mm or 3000000 nm by 25 000}$ <p>OR</p> <p>if 3mm incorrectly converted but still divided by 25000 then allow ecf for one mark eg:</p> $\frac{3\,00000}{25\,000} = 12$ <p>Note: If candidate has measured the pore as 4mm and carried out the calculation using this figure allow one mark ecf</p>
	(iii)	allow communication between nucleus and cytoplasm or allow, molecules / named substances, to, enter / leave (the nucleus) ;	1	<p>IGNORE ref control</p> <p>Note: the term 'substances' is not sufficient on its own DO NOT CREDIT if named example is moving in wrong direction eg. RNA / mRNA / ribosomes, entering nucleus or DNA leaving nucleus</p>

Question	Answer	Marks	Guidance
(d)	(named) membranes / phospholipid bilayer ; ribosomes ; Golgi ; endoplasmic reticulum / ER / RER / SER ; cytoskeleton / microtubules / microfilaments / spindle fibres ; centrioles ; vesicles / lysosomes ; mitochondria ;	2 max	<p>Mark the first <u>two</u> suggestions eg plasma / cell surface / nuclear / thylakoid / cristae / tonoplast, chloroplast membrane</p> <p>DO NOT CREDIT flagellum / chromosomes / chromatin / nucleolus</p> <p>IGNORE ref to molecules</p>
	Total	10	

Question			Answer	Marks	Guidance
5	(a)	(i)	increases / rises / goes up ; use of figures to illustrate ;		figures must include mean values for two comparative points within the range either stated or calculated. eg (between 20 and 50) it rises from 5.7 to 32.3 eg (between 20 and 50) rate rises by 26.6 eg between 30 and 40 rate rises from 11.7 to 24.3 eg between 20 and 50 rate rises by 467% IGNORE units Note: as light intensity goes from 20 to 50, the rate increases from 5.7 to 32.3 = 2 marks DO NOT ACCEPT figures that include 10 a.u. (as not asked for in the question)
		(ii)	stomata are (nearly) closed ; <i>idea that: light intensity not high enough ;</i>	2 1 max	ACCEPT no extra stomata are opened / stomata are not opened wider
	(b)	(i)	1 stomata are open ; 2 allow, gaseous exchange / entry of carbon dioxide / exit of oxygen ; 3 for photosynthesis ; 4 water <u>vapour</u> leaves (the leaf) ; 5 down a water (vapour) potential gradient ; 6 high(er) temperatures (during the day) ; 7 causes greater <u>evaporation</u> / some water vapour loss through leaf surface all the time ;	3 max	DO NOT CREDIT if gases are described moving in wrong direction IGNORE ref to respiration ACCEPT description of light independent stage ACCEPT Ψ for water potential

Question	Answer	Marks	Guidance
	<p>(ii)</p> <p>1 <u>thick</u> , cuticle / waxy or layer ;</p> <p>2 leaf is, folded / rolled / curled / curved / AW ;</p> <p>3 reduces (exposed) surface area (for evaporation) ;</p> <p>4 hairs ;</p> <p>5 reduces, evaporation / diffusion through leaf, surface / epidermis) ;</p> <p><i>for points 6, 7 & 8 credit only in context of folded leaf or hairs:</i></p> <p>6 trap water vapour ;</p> <p>7 creates high water (vapour) potential outside (stomata) ;</p> <p>8 reduces water (vapour) potential gradient ; max 4</p> <p>Q QWC – two technical terms used and spelt correctly ; 1</p>	5 max	<p>IGNORE ref to moisture / moist air IGNORE ref to sunken / small / closed / few stomata</p> <p>ACCEPT waterproof for waxy</p> <p>DO NOT CREDIT ref to surface area to vol ratio / SA:Vol</p> <p>DO NOT CREDIT if hairs described in wrong place eg on palisade DO NOT CREDIT cilia DO NOT CREDIT evaporation of water vapour</p> <p>ACCEPT water <u>vapour</u> builds up in enclosed area ACCEPT stop wind blowing, water vapour / diffusion shells, away</p> <p>ACCEPT humid air collects in enclosed space</p> <p>ACCEPT Ψ for water potential DO NOT CREDIT high water potential gradient outside stoma</p> <p>any 2 from: cuticle water vapour epidermis</p> <p>(derivatives of) evaporation potential gradient surface area diffusion</p>
	Total	11	

Question		Answer	Marks	Guidance
6	(a)	<p>1 form / produce / make, compartments / organelles / named organelles (within a cell) / AW ;</p> <p>2 isolation / AW, of, contents (of organelle) / substance / named substance / reactions / metabolic pathways ;</p> <p>3 site for attachment of, enzymes / other named molecules / ribosomes ;</p> <p>4 provide selective permeability / described ;</p> <p>5 creation of, concentration gradients / specific environments / described ;</p>	3 max	<p>Mark first three suggestions only</p> <p>DO NOT CREDIT ref to cell signalling / cell recognition</p> <p>ACCEPT vesicles as compartments eg mitochondria, ER, nucleus, lysosomes, Golgi, chloroplast</p> <p>ACCEPT compartmentalisation</p> <p>DO NOT CREDIT 'to contain an organelle'</p> <p>eg of AW include hold / contain / store / separates eg of named substance: (hydrolytic) enzymes, hormones / chemical messengers</p> <p>DO NOT CREDIT separates cell contents</p> <p>IGNORE ref to increasing surface area / ref to site for reactions to occur eg of other named molecules : receptors / electron carriers / photosystems / pigments</p> <p>eg controls what can enter and leave an organelle</p> <p>DO NOT CREDIT in context of materials entering and leaving the cell</p> <p>eg of specific environment = pH</p> <p>IGNORE moves substances in vesicles</p>
	(b) (i)	<p>cytoskeleton / microtubule / microfilament ; provide, pathways / tracks, (for movement) ;</p> <p>(vesicle) moves along, <u>microfilaments</u> / <u>microtubule</u> ;</p> <p><u>microtubules</u>, extended / broken down ;</p> <p>uses, ATP / (metabolic) energy ; AVP ;</p>	2 max	<p>ACCEPT guide the vesicles</p> <p>Mp 3 or 4 scores 2 marks as they include mp 1</p> <p>IGNORE moved by microtubules / microfilaments</p> <p>eg ref to (protein) motor / dynein / kinesin</p>

Question		Answer	Marks	Guidance
	(ii)	receptor found only on, correct / target, (named) organelle ; <i>idea that:</i> address protein provides a way of, labelling / identifying / recognising, the vesicle ; protein / COPI / COPII, has a specific shape ; (shape of) receptor and (address) protein are complementary ;	2 max	DO NOT CREDIT statements that relate to events outside a cell (eg protein is a complementary shape to the receptor on the surface of a target cell) as the question is in the context of vesicles moving <i>within</i> cells. ACCEPT correct target organelle is identified for each vesicle ACCEPT receptor fits the shape of the, protein / COPI / COPII
	(c)	<u>exocytosis</u> ; vesicle fuses / merges ; (with), cell surface / plasma, membrane ; discharging / releasing, enzyme / contents (to exterior) ;	2 max	IGNORE bind / attach / join IGNORE ref to, cell membrane / phospholipid bilayer, unqualified IGNORE secretion alone as stated in question
Total			9	

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