

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

Question		Answer	Marks	Guidance
2	(a)	<p>stem / undifferentiated ;</p> <p>(bone) marrow ;</p> <p>differentiate ;</p> <p>meristem(atic) / cambium ;</p>	4	<p><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</p> <p><b>ACCEPT</b> totipotent / pluripotent <b>IGNORE</b> unspecialised (as specialised in the passage)</p> <p><b>IGNORE</b> specialise as given in the passage</p> <p><b>ACCEPT</b> callus</p>
	(b) (i)	<p><i>idea of:</i> create flow of water / move water ;</p>	1	<p><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</p> <p><b>DO NOT CREDIT</b> ref to movement of, organism / cell <b>IGNORE</b> ref to liquid / food particles</p>
	(ii)	<p>strain / filter (the water) <b>OR</b> trap particles ;</p> <p>to catch food (particles) ;</p>	1 max	<p><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</p> <p><b>IGNORE</b> trap substances unqualified</p> <p><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</p>

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		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><b>Mark the first answer for each box.</b> If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = <b>0 marks</b></p> <p><b>Award 1 mark per correct row.</b></p> <p><b>IGNORE</b> yes and no in first row</p> <p><b>ACCEPT</b> some / few / low / usually, for yes in rows 2 and 3  <b>DO NOT CREDIT</b> 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																													
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presence of neutrophils	yes	yes	(yes / no)	;																												
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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><b>Mark the first suggestion on each prompt line.</b></p> <p><b>IGNORE</b> separates oxygenated from deoxygenated blood</p> <p><b>IGNORE</b> generate / create, pressure</p> <p><b>IGNORE</b> ref to pressure gradient</p> <p><b>ACCEPT</b> blood moves faster / quicker</p> <p><b>IGNORE</b> ref to going to, all cells / where needed</p>

Question	Answer	Marks	Guidance
	<p>(ii)</p> <p><i>to withstand pressure</i></p> <p><b>D1</b> wall is thick ;  <b>D2</b> (thick layer of) <b>collagen</b> ;  <b>E3</b> (wall / collagen) provides strength ;</p> <p><b>D4</b> <b>endothelium</b>, corrugated / folded ;</p> <p><b>E5</b> <i>idea of:</i> no damage to, endothelium / artery (wall) (as it stretches) ;</p> <hr/> <p style="text-align: right;"><b>max 3</b></p> <p><i>to maintain pressure</i></p> <p><b>D6</b> (thick layer of) <b>elastic</b> tissue / elastic fibres / <b>elastin</b> ;  <b>E7</b> to cause <b>recoil</b> / return to original size ;</p> <p><b>D8</b> (thick layer of) <b>smooth muscle</b> ;  <b>E9</b> narrows / constricts, <b>lumen</b> / artery ;</p> <p><b>E10</b> AVP ;</p> <p style="text-align: right;"><b>max 3</b></p>	<p style="text-align: center;"><b>4 max</b></p>	<p><b>Ensure that there is at least one D mark and one E mark for four marks</b>  <b>AND</b>  <b>Ensure that there is at least one withstand mark and one maintain mark for four marks</b></p> <p><b>ACCEPT</b> tunica media, tunica adventitia, tunica externa for wall</p> <p><b>ACCEPT</b> (wall / collagen) is strong</p> <p><b>ACCEPT</b> tunica intima for endothelium  <b>IGNORE</b> lining  <b>IGNORE</b> prevents artery bursting / breaking  <b>ACCEPT</b> wall will not tear</p> <p><b>IGNORE</b> elastic unqualified</p> <p>Ref to lumen must be in context of explaining how pressure is maintained eg makes lumen small(er) = 1 mark  <b>DO NOT CREDIT</b> in context of constriction to push or pump the blood along the artery  <b>IGNORE</b> '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;"><b>QWC rubric continued on next page.....</b></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 <b>2</b> from: <i>withstanding pressure:</i> <b>collagen</b> <b>endothelium / endothelial</b>  <i>maintaining pressure:</i> <b>elastic / elastin</b> <b>recoil</b> <b>smooth muscle</b> <b>lumen</b> <b>constrict(ion)</b>
	<b>Total</b>	<b>11</b>	

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><b>OR</b> the, level / degree, of detail that can be seen ;</p>	2	<p><b>ACCEPT</b> alternative wording that implies quantitative comparison of image size with object size <b>DO NOT CREDIT</b> comparison of object to image (wrong way round)</p> <p><b>ACCEPT</b> <math>\frac{\text{size of image}}{\text{size of object}}</math> or <math>\frac{\text{size of image}}{\text{actual size}}</math></p> <p><b>IGNORE</b> makes image bigger unqualified</p> <p><b>IGNORE</b> ref to clarity</p> <p><b>ACCEPT</b> 'how detailed the image is'</p>
	(b)	<p><i>light</i> 50 - 200 nm / 0.05 - 0.2 <math>\mu\text{m}</math> ;</p> <p><i>TEM</i> 0.05 - 1.0 nm ;</p>	2	<p><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 = <b>0 marks</b></p> <p><b>ACCEPT</b> a single figure within the range</p> <p>Units are required for both light &amp; TEM</p> <p><b>ACCEPT</b> 0.00005 - 0.001<math>\mu\text{m}</math> or <math>5 \times 10^{-5}</math> - <math>1 \times 10^{-3} \mu\text{m}</math></p>
	(c) (i)	3 dimensional / 3D, (image) ; can see the surface (detail) ;	1 max	<b>ACCEPT</b> has depth of field / contours

Question		Answer	Marks	Guidance
	(ii)	120 ;;	2	<p><b>Award two marks for correct answer</b> 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><b>OR</b></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><b>Note:</b> 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 <b>or</b> allow, molecules / named substances, to, enter / leave (the nucleus) ;	1	<p><b>IGNORE</b> ref control</p> <p><b>Note: the term 'substances' is not sufficient on its own DO NOT CREDIT</b> 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><b>Mark the first <u>two</u> suggestions</b> eg plasma / cell surface / nuclear / thylakoid / cristae / tonoplast, chloroplast membrane</p> <p><b>DO NOT CREDIT</b> flagellum / chromosomes / chromatin / nucleolus</p> <p><b>IGNORE</b> ref to molecules</p>
	<b>Total</b>	<b>10</b>	

Question			Answer	Marks	Guidance
5	(a)	(i)	increases / rises / goes up ; use of figures to illustrate ;		figures must include <b>mean values</b> 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% <b>IGNORE</b> units <b>Note:</b> as light intensity goes from 20 to 50, the rate increases from 5.7 to 32.3 = <b>2 marks</b>  <b>DO NOT ACCEPT</b> 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	<b>ACCEPT</b> 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	<b>DO NOT CREDIT</b> if gases are described moving in wrong direction <b>IGNORE</b> ref to respiration <b>ACCEPT</b> description of light independent stage  <b>ACCEPT</b> $\Psi$ for water potential

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



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><b>Mark first three suggestions only</b></p> <p><b>DO NOT CREDIT</b> ref to cell signalling / cell recognition</p> <p><b>ACCEPT</b> vesicles as compartments eg mitochondria, ER, nucleus, lysosomes, Golgi, chloroplast</p> <p><b>ACCEPT</b> compartmentalisation</p> <p><b>DO NOT CREDIT</b> '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><b>DO NOT CREDIT</b> separates cell contents</p> <p><b>IGNORE</b> 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><b>DO NOT CREDIT</b> in context of materials entering and leaving the cell</p> <p>eg of specific environment = pH</p> <p><b>IGNORE</b> 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><b>ACCEPT</b> guide the vesicles</p> <p>Mp 3 or 4 scores 2 marks as they include mp 1</p> <p><b>IGNORE</b> 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	<b>DO NOT CREDIT</b> 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.  <b>ACCEPT</b> correct target organelle is identified for each vesicle  <b>ACCEPT</b> 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	<b>IGNORE</b> bind / attach / join <b>IGNORE</b> ref to, cell membrane / phospholipid bilayer, unqualified  <b>IGNORE</b> secretion alone as stated in question
<b>Total</b>			<b>9</b>	

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