OCR
RECOGNISING ACHIEVEMENT

GCE

Biology

Advanced Subsidiary GCE

Unit **F211:** Cells, Exchange and Transport

Mark Scheme for January 2012

Oxford Cambridge and RSA Examinations

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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)	alveoli ; to provide large(r), surface area / SA ;	2	**ACCEPT** alveolus / alvioli, alviolis **ACCEPT** large(r) surface area to volume ratio **OR** SA:VOL
		(ii)	squamous / pavement ;	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)	*idea of:* 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)		*xylem* consists of vessels **;** one cell specialisation described **;** transpiration stream **OR** movement of, water / minerals **;** *phloem* sieve tube element(s) and companion cell(s) **;** one cell specialisation described **;** translocation **OR** transports, sucrose / assimilates / products of photosynthesis / amino acids **;** AVP **;**	4 max	**ACCEPT** cells joined end to end **ACCEPT** continuous column / tube eg wall water proof / wall lignified / no end walls / (bordered) pits / hollow / no organelles / no cell contents **IGNORE** dead **IGNORE** transpiration unqualified **ACCEPT** sieve element / sieve tube, and companion cell 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 **ACCEPT** sugar **IGNORE** load / unload sugars alone *in either xylem or phloem* ref to fibres ref to, packing cells / parenchyma cells
			Total	**10**	

Question	Answer	Marks	Guidance
3 (a)		4	**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** **Award 1 mark per correct row.**

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	;

IGNORE yes and no in first row

ACCEPT some / few / low / usually, for yes in rows 2 and 3
DO NOT CREDIT not usually for yes

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.

Mark is awarded for tissue fluid response only.

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

Question	Answer	Marks	Guidance
(ii)			**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**
	to withstand pressure		
	D1 wall is thick **;**		**ACCEPT** tunica media, tunica adventitia, tunica externa for wall
	D2 (thick layer of) **collagen ;**		
	E3 (wall / collagen) provides strength **;**		**ACCEPT** (wall / collagen) is strong
	D4 **endothelium,** corrugated / folded **;**		**ACCEPT** tunica intima for endothelium **IGNORE** lining
	E5 *idea of:* no damage to, endothelium / artery (wall) (as it stretches) **;**		**IGNORE** prevents artery bursting / breaking **ACCEPT** wall will not tear
	max 3		
	to maintain pressure		
	D6 (thick layer of) **elastic** tissue / elastic fibres / **elastin ;**		**IGNORE** elastic unqualified
	E7 to cause **recoil** / return to original size **;**		
	D8 (thick layer of) **<u>smooth</u> muscle ;**		
	E9 narrows / constricts, **lumen** / artery **;**		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
	E10 AVP **;**		*eg:* *idea of:* blood is forced (through narrow, channel / lumen) *idea of:* restriction of blood flow to one area allows pressure to be maintained elsewhere
	max 3		
		4 max	**QWC rubric continued on next page……**

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: *withstanding pressure:* **collagen** **endothelium / endothelial** *maintaining pressure:* **elastic / elastin** **recoil** **smooth muscle** **lumen** **constrict(ion)**
	Total	**11**	

Question			Answer	Marks	Guidance
4	(a)		*magnification is* the number of times larger the image is compared to the object **;**		**ACCEPT** alternative wording that implies quantitative comparison of image size with object size **DO NOT CREDIT** comparison of object to image (wrong way round)
					ACCEPT $\frac{\text{size of image}}{\text{size of object}}$ **or** $\frac{\text{size of image}}{\text{actual size}}$
					IGNORE makes image bigger unqualified
			resolution is ability to, distinguish / differentiate between, two separate points		**IGNORE** ref to clarity
			OR the, level / degree, of detail that can be seen **;**	2	**ACCEPT** 'how detailed the image is'
	(b)				**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 a single figure within the range
			light *50* - 200 nm / 0.05 - 0.2 μm **;**		Units are required for both light & TEM
			TEM 0.05 - 1.0 nm **;**	2	**ACCEPT** 0.00005 - 0.001μm or 5 x 10^{-5} - 1x10^{-3}μm
	(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	**Award two marks for correct answer**
					if answer incorrect allow one mark for working:
					
					$\frac{3\,000\,000}{25\,000}$ or $\frac{3}{25\,000}$ or evidence that candidate is dividing 3mm or 3000000 nm by 25 000
					
					OR
					
					if 3mm incorrectly converted but still divided by 25000 then allow ecf for one mark eg:
					$\frac{3\,00000}{25\,000}$ = 12
					
					Note: If candidate has measured the pore as 4mm and carried out the calculation using this figure allow one mark ecf

		(iii)	allow communication between nucleus and cytoplasm **or** allow, molecules / named substances, to, enter / leave (the nucleus) **;**	1	**IGNORE** ref control **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

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	**Mark the first <u>two</u> suggestions** eg plasma / cell surface / nuclear / thylakoid / cristae / tonoplast, chloroplast membrane **DO NOT CREDIT** flagellum / chromosomes / chromatin / nucleolus **IGNORE** ref to molecules
			Total	**10**	

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

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

Question			Answer	Marks	Guidance
		(ii)	receptor found only on, correct / target, (named) organelle **;** *idea that:* 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 *within* 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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