

Biology

Advanced Subsidiary GCE

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

Mark Scheme for June 2012

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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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


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Annotations

Annotations available in SCORIS.

Annotation	Meaning
	Benefit of Doubt
	Contradiction
	Cross
	Error Carried Forward
	Odd or incorrect Grammar
	Extendable horizontal wavy line
	Ignore
	Large dot (Key point attempted)
	Benefit of the doubt not given
	additional QWC credit given
	Tick
	Tick 1
	Tick 2
	Omission Mark

Question			Answer	Marks	Guidance
1	(a)	(i)	<u>mitosis</u> ;	1	Mark the first answer. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks
		(ii)	<i>idea that:</i> cells, <u>genetically</u> identical / have same DNA ; so both (daughter) cells receive a full, copy / complement ;	2	ACCEPT in context of identical to each other or identical to parent ACCEPT 'same genetic information/material' ACCEPT same / correct amount of DNA ACCEPT same / correct number of chromosomes IGNORE ref to clones unqualified IGNORE 'new cells need genetic material' without ref to full amount daughter cells have all the identical genetic material = 2 marks (mp 1 and 2)
	(b)		1 one maternal and one paternal / AW ; 2 carry same <u>genes</u> ; 3 carry, same / different, alleles ; 4 (usually) same / similar, length ; 5 centromere in same position ; 6 same banding pattern ; 7 pair up in meiosis / form bivalent ;	3 max	CREDIT 'same loci' IGNORE 'genetic material', 'genetically identical' 'genetic information' ACCEPT 'same shape' 'same size' IGNORE 'same pattern'
	(c)	(i)	a, group / collection, of cells ; (cells) specialised / AW ; to perform a function(s) / working together ;	2 max	IGNORE 'same' or 'different' cells ACCEPT same job

Question		Answer	Marks	Guidance						
	(ii)	<table border="1"> <thead> <tr> <th>function</th> <th>location</th> </tr> </thead> <tbody> <tr> <td>acts as a surface or short (diffusion) pathway ;</td> <td>alveoli or cheek lining or in blood vessels ;</td> </tr> <tr> <td>move, mucus / AW or secrete mucus ;</td> <td>bronchioles or bronchi or trachea or airways ;</td> </tr> </tbody> </table>	function	location	acts as a surface or short (diffusion) pathway ;	alveoli or cheek lining or in blood vessels ;	move, mucus / AW or secrete mucus ;	bronchioles or bronchi or trachea or airways ;	4	<p>Mark the first answer in each box. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks Mark each box independently.</p> <p>IGNORE description e.g. 'one cell thick' ACCEPT glomerulus as blood vessel</p> <p>ACCEPT move fluid / liquid for mucus IGNORE removal of germs / dirt / substances / particles</p> <p>ACCEPT 'move ovum' and 'in fallopian tubes'</p> <p>ACCEPT removal of bacteria / fungal spores / dust if in mucus</p>
function	location									
acts as a surface or short (diffusion) pathway ;	alveoli or cheek lining or in blood vessels ;									
move, mucus / AW or secrete mucus ;	bronchioles or bronchi or trachea or airways ;									
Total			12							

Question			Answer	Marks	Guidance
2	(a)	(i)	<p>C (secretory / Golgi) vesicle ;</p> <p>D plasma membrane or cell <u>surface</u> membrane ;</p> <p>E ribosome ;</p>	3	<p>Mark the first answer on 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>DO NOT CREDIT lysosome</p> <p>ACCEPT cell plasma membrane</p> <p>IGNORE rough endoplasmic reticulum</p>
		(ii)	enzyme / (peptide) hormone / glycoprotein ;	1	<p>Mark the first answer. 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 named example e.g. insulin, mucus, cytokine, antibodies, collagen</p> <p>IGNORE haemoglobin, histamine, steroid hormones e.g. testosterone</p>
		(iii)	<p>transport vesicles to, plasma / cell surface, membrane ;</p> <p>fusing vesicle to membrane / <u>exocytosis</u> ;</p>	1 max	<p>Mark the first answer. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks</p> <p>CREDIT greater detail of cytoskeleton activity e.g. role of protein motors / changing length of microtubules - 'transport' alone not enough</p> <p>IGNORE ref to membrane unqualified</p> <p>ACCEPT binding / merging</p> <p>IGNORE bonding</p>
		(iv)	<p>1 receives proteins from the, (R)ER / ribosomes ;</p> <p>2 modify / process, proteins or make glycoproteins / add named molecule(s) / described ;</p> <p>3 (re)package / AW, into vesicles ;</p> <p>4 make lysosomes ;</p> <p>5 replenishes, plasma / cell surface, membrane ;</p> <p>6 lipid synthesis ;</p>	2 max	<p>IGNORE SER</p> <p>eg add carbohydrate groups / sugars or fold protein</p> <p>modifies and packages proteins into vesicles = 2 marks</p> <p>ACCEPT make glycolipids</p>

Question		Answer	Marks	Guidance
	(b) (i)	nucleus or nuclear, envelope / pore / membrane ; mitochondrion / mitochondria ; (rough / smooth) endoplasmic reticulum / ER OR ribosomes attached to membrane ; Golgi (body / apparatus) ; (secretory) vesicle(s) ;	2 max	Mark the first two answers only. IGNORE membrane bound organelles, lysosomes, free ribosomes, ref to ribosome size
	(ii)	(free / circular / naked) DNA / genetic material / nucleoid ; <u>plasmid</u> ; 18nm / 70S / smaller, ribosomes ;		Mark the first answer. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks IGNORE 'chromosomes', 'chromatin' IGNORE mesosome (as this is an infolding of plasma membrane and not <u>in</u> the cytoplasm)
		Total	10	

Question		Answer	Marks	Guidance									
3	(a)	<table border="1"> <tr> <td></td> <td>open circulatory system</td> <td>closed circulatory system</td> </tr> <tr> <td>single circulatory system</td> <td></td> <td></td> </tr> <tr> <td>double circulatory system</td> <td></td> <td>✓ ;</td> </tr> </table>		open circulatory system	closed circulatory system	single circulatory system			double circulatory system		✓ ;	1	<p>ACCEPT cross / other mark DO NOT CREDIT if a tick is placed in more than one box</p>
			open circulatory system	closed circulatory system									
		single circulatory system											
double circulatory system		✓ ;											
<p>systole / contraction, increases pressure ;</p> <p>diastole / relaxation/ blood flowing onwards, decreases pressure ;</p> <p>(contraction of) ventricle, muscle / wall ;</p> <p>left (ventricle) ;</p>	<p>2 max</p> <p>IGNORE 'the heart' or 'the heart beating' or 'the heart pumping' without further qualification IGNORE ref to right (side) for mp 1 - 3</p> <p>ACCEPT ref to peak on graph for increasing pressure</p> <p>ACCEPT ref to trough on graph for decrease in pressure</p> <p>ACCEPT ventricular systole</p> <p>'contraction of left ventricle' = 1 mark 'contraction of muscle in left ventricle' = 2 marks 'ventricular systole increases pressure' = 2 marks</p>												
<p>(ii) pulse / heart, <u>rate</u> ;</p>		<p>1</p> <p>IGNORE heart beat / beats per minute</p>											

Question	Answer	Marks	Guidance
(c)	<p><i>marks for pressure change:</i> pressure drops, as distance from heart increases ; greatest / rapid / significant, pressure drop while blood is in the arteries ; pressure, constant / does not drop, in veins ;</p> <p><i>marks for amplitude of fluctuations:</i> fluctuation / AW, decreases from aorta to arteries ; no fluctuation in, capillaries / veins ; use of comparative figures with unit ;</p>	3 max	<p>ACCEPT from aorta to arteries / correctly named blood vessels – look for decrease in pressure trend</p> <p>ACCEPT plateaus / level</p> <p>IGNORE ref to frequency of fluctuations ACCEPT ‘smaller fluctuations in artery’</p> <p>correct figures must be quoted from the graph to back up <u>one</u> point – correct unit used at least once. eg ‘peak to peak’, between aorta and arteries, falls 18.5 to 14 kPa pressure in aorta between 18.5 and 12.5 kPa pressure in arteries drops from 12.5 to 5 kPa pressure in capillary drops from 5 to 0.5 kPa overall drop from 18.5 to 0.5 kPa</p> <p><i>Any other figures must be checked against graph</i></p> <p>ACCEPT correct calculated figure eg pressure drops 6kPa in aorta</p>

Question		Answer	Marks	Guidance
	(d) (i)	<p>blood flows into <u>larger</u> number of vessels ;</p> <p>(total) cross-sectional area of the <u>arteries</u> is greater than the aorta ;</p> <p>(total) cross-sectional area of the <u>capillaries</u> is greater than the, aorta / <u>arteries</u> ;</p>		<p>IGNORE ref to pressure fluctuations and structure of vessel walls as not relevant to overall pressure change</p> <p>ACCEPT idea of vessels branching to many/more (smaller) vessels</p> <p>IGNORE ref to lumen size</p>
		<p>capillary (wall) is, thin / only one cell thick ;</p> <p>(high pressure would) burst / damage, capillary (wall) ;</p> <p>reduce chance of, tissue fluid build up / oedema ;</p>	2 max	<p>IGNORE ref to rate of flow</p> <p>IGNORE ref to capillary walls small / made of squamous cells</p> <p>ACCEPT cannot withstand (high) pressure</p>
Total			11	

Question			Answer	Marks	Guidance
4	(a)	(i)	<p>1 cell (cytoplasm) has a <u>lower</u> water potential than (distilled) water / ORA ;</p> <p>2 water moves (into cells) , down water potential gradient / from high Ψ to low Ψ ;</p> <p>3 (water) enters the cell by osmosis ;</p> <p>4 <i>idea of:</i> cell surface / plasma, membrane (of blood cell) weak so, bursts / cannot withstand pressure / haemolyses ;</p> <p>5 <i>idea of:</i> (plant) cell wall , strong / provides support, so, does not burst / can withstand pressure ;</p> <p>6 (plant) cell becomes turgid / turgidity increases, which reduces water uptake ; 4 max</p> <p>QWC – two technical terms used in context and spelt correctly ; 1</p>	5 max	<p>CREDIT mps 1-3 in context of either blood cell or plant cell Comparative statement must be made.</p> <p>1 ACCEPT Ψ ACCEPT more negative water potential</p> <p>2 IGNORE ‘along’ or ‘across’ IGNORE definition of osmosis in isolation, must be in context of explaining observations</p> <p>3 ACCEPT ‘water osmoses into cell’ IGNORE ref to diffusion</p> <p>5 IGNORE ref to rigid wall, wall acts as barrier</p> <p>6 IGNORE ref to plasmolysis anywhere in response</p> <p>any two from: gradient, water potential, osmosis, cell surface membrane / plasma membrane, turgid / turgidity, (derivatives of) haemolysed (note: only allow turgid for plant cells)</p>

Question		Answer	Marks	Guidance
	(ii)	use a, salt / sugar, solution OR add solute to water ; use a solution with the, same / similar / lower, water potential as blood cells ;	1 max	ACCEPT saline solution ACCEPT isotonic / hypertonic ACCEPT same solute concentration / potential IGNORE same water concentration IGNORE use less water / solution with low water potential
	(b)	<u>diffusion</u> ;	1	DO NOT CREDIT facilitated diffusion
	(c)	1 active, transport / uptake ; <i>plus any two from:</i> 2 cells have, extensions / hairs ; 3 thin cell wall ; 4 large / increased, <u>surface area</u> ; 5 many / more, mitochondria ; 6 (many) carrier proteins in cell (surface) membrane ;	3 max	1 ACCEPT facilitated diffusion IGNORE transport using ATP DO NOT CREDIT osmosis Allow max two marks for specialised features 2 ACCEPT cells have root hairs IGNORE roots have root hair cells 4 ACCEPT high, <u>surface area</u> to volume ratio / SA:vol credit in context on root hair cell or root having large surface area 6 ACCEPT transport proteins / protein pumps ACCEPT channel protein in context of facilitated diffusion
		Total	10	

Question			Answer	Marks	Guidance
5	(a)	(i)	<u>tidal volume</u> ;	1	
		(ii)	being stretched / stretching ;	1	ACCEPT lengthening DO NOT CREDIT relaxing IGNORE expanding 'stretching and contracting' = CON
	(b)		<p><i>between B & C expiration:</i></p> <p>1 (external) intercostal muscles / diaphragm, relax ;</p> <p>2 rib cage / ribs, move down OR diaphragm, moves / pushed, up ;</p> <p>3 volume of, thorax / chest cavity / lungs, drops / decreases ;</p> <p>4 pressure inside, thorax / chest cavity / lungs, increases ;</p> <p>5 above, external / atmospheric, pressure ;</p> <p>6 air leaves down pressure gradient ;</p> <p>7 (elastic) recoil of alveoli ; 3 max</p> <p>QWC – two technical terms used in context and spelt correctly ; 1</p>	4 max	<p>1 ACCEPT ref to <u>internal</u> intercostal muscles contracting 1 DO NOT CREDIT ref to diaphragm relaxing and intercostal muscles (unqualified) contracting</p> <p>2 IGNORE 'diaphragm becomes domed / curved'</p> <p>3 ACCEPT 'space inside' or 'air in' for volume</p> <p>5 ACCEPT (pressure) higher than outside</p> <p>Answers given in context of 'at B' or 'at C' – QWC not awarded. Any two from intercostal, diaphragm, recoil, volume thorax, pressure, gradient</p>
	(c)		12 ;;	2	Allow two marks for correct answer. If answer wrong allow one mark for working $\frac{60}{5}$

Question			Answer	Marks	Guidance
6	(a)	(i)	<u>sucrose</u> and <u>phloem</u> ;	1	Both needed for one mark Mark the first answer on each line. 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 sucrose DO NOT CREDIT phloem sieve tubes / companion cells
		(ii)	<p>1 hydrogen ions / H⁺ / protons, pumped out of companion cells ;</p> <p>2 increases, hydrogen ion / H⁺ / proton, concentration (gradient) (outside companion cell) ;</p> <p>3 hydrogen ions, re-enter / flow back into, companion cells ;</p> <p>4 sucrose / sugar, moves with hydrogen ions / AW ;</p> <p>5 down <u>concentration</u> gradient ;</p> <p>6 ref. cotransporter proteins / cotransport(ation) ;</p> <p>7 by <u>facilitated</u> diffusion ;</p> <p>8 sucrose / sugar, diffuses into sieve tube (element) ;</p> <p>9 through plasmodesmata ;</p>	3 max	<p>1 ACCEPT hydrogen ions leave companion cells using ATP</p> <p>2 ACCEPT creates gradient</p> <p>2 DO NOT CREDIT increase, hydrogen ion / H⁺ / proton concentration, in sieve tube element</p> <p>3 ACCEPT diffuse / move</p> <p>4 DO NOT CREDIT glucose (penalise once)</p> <p>4 DO NOT CREDIT sucrose follows H⁺</p> <p>8 IGNORE sucrose diffuses into <i>phloem</i></p>

Question	Answer	Marks	Guidance
(b)	<p>1 active transport requires ATP ;</p> <p><i>at low temperatures:</i></p> <p>2 (molecules have) little kinetic energy ;</p> <p>3 (therefore) less, respiration / ATP made ;</p> <p>4 less active transport or less, movement / loading, of sugars into sieve tube (element) ;</p> <p>5 less, osmosis / movement of water, into sieve tube (element) ;</p> <p>6 low (hydrostatic) pressure created ;</p> <p><i>as temperature increases:</i></p> <p>7 (molecules have) more kinetic energy ;</p> <p>8 (therefore) more, respiration / ATP made ;</p> <p>9 more active transport or more, movement / loading, of sugars into sieve tube (element) ;</p> <p>10 more , osmosis / movement of water, into sieve tube (element) ;</p> <p>11 higher / more (hydrostatic) pressure created ;</p> <p>12 at high temperature (plant), enzymes / proteins, denatured ;</p>	<p>3 max</p>	<p>1 ACCEPT loading / uptake for transport</p> <p>3 IGNORE no respiration / no ATP made / no loading of sucrose</p> <p>4 ACCEPT slow active transport / slow loading</p> <p>9 ACCEPT faster active transport / faster loading</p> <p>12 DO NOT CREDIT cells denatured</p> <p>12 CREDIT change to tertiary structure, damage to proteins</p>
	Total	7	

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