

Biology

Advanced Subsidiary GCE

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

Mark Scheme for June 2011

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Question		Expected Answer	Mark	Additional Guidance
1	(a) (i)	<p>production of vesicles / packaging proteins ;</p> <p>modification of / processing of / adding carbohydrate to , proteins ;</p> <p>production of lysosomes ;</p>	max 1	<p>Mark the first answer. If the first answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks</p> <p>ACCEPT lipids IGNORE ref to transport / secretion / exocytosis / substances / materials DO NOT CREDIT stores proteins</p> <p>ACCEPT makes glycoproteins</p>
1	(a) (ii)	<p>allow movement (of substances) in or out of nucleus ;</p> <p>correctly named substance (entering or leaving nucleus) ;</p> <p>ref to correct destination of substance ;</p>	max 2	<p>IGNORE messages / information / communication IGNORE name of substance for MP 1 IGNORE ref to mechanism of movement</p> <p>e.g. RNA / (m)RNA / (r)RNA (t)RNA / polymerase / nucleotides / ribosomes / helicase / proteins / (steroid) hormones</p> <p>IGNORE ref nutrients DO NOT CREDIT if incorrect direction of movement described (e.g. RNA into nucleus or RNA in and out of nucleus) DO NOT CREDIT DNA as named substance</p> <p>Note 'allows mRNA out of nucleus' = two marks</p> <p>e.g. RNA to ribosomes or RER helicase to DNA polymerase to , DNA / gene nucleotides to DNA (steroid) hormones to , DNA / gene / chromosome</p>

Question			Expected Answer	Mark	Additional Guidance
1	(a)	(iii)	<p>contain / release , lysins / lytic enzymes / hydrolytic enzymes / digestive enzymes ;</p> <p>digest / break down , organelles / foreign objects / toxins / cells / pathogens ;</p> <p>apoptosis / autolysis / described ;</p>	max 1	<p>DO NOT CREDIT 'engulf'</p> <p>DO NOT CREDIT 'lysosomes are digestive enzymes'</p> <p>ACCEPT destroy</p> <p>ACCEPT ref to digestion of contents of phagocytic vesicle</p> <p>IGNORE ref to (unwanted) substances / materials / food</p> <p>IGNORE ref to acrosomes</p>
1	(b)		<p><i>idea of</i> more than one (type of) tissue ;</p> <p>working together / performing a function(s) ;</p>	2	<p>ACCEPT named examples of tissues</p> <p>ACCEPT job or task</p>

Question		Expected Answer	Mark	Additional Guidance
1	(c)	<p>C1 thin / squamous, epithelium ;</p> <p>C2 thin endothelium (of capillary) ;</p> <p>F1 (provides) short diffusion distance / described ;</p> <p>F2 ref to surfactant (from epithelial cells) , reducing surface tension / preventing alveoli collapsing ;</p> <p>C3 blood / red blood cells / erythrocytes ;</p> <p>F3 transports (named) gas(es) , to / from , exchange surface / alveoli ;</p> <p>C4 diaphragm / intercostals , muscles ;</p> <p>F4 (maintains / creates) diffusion / concentration , gradient ;</p> <p>C5 ciliated epithelium / goblet cells / ciliated cells ;</p> <p>F5 <i>idea of:</i> protection from / removal of , dust / bacteria / pollen / spores ;</p> <p>C6 cartilage ;</p> <p>F6 hold airway open ;</p> <p>C7 smooth muscle ;</p>		<p>allow F marks even if C mark not quite accurate</p> <p>C1/C2 IGNORE ref to alveolus / alveolar wall / capillary wall , without ref to epithelium / endothelium</p> <p>F1 ACCEPT diffusion barrier , thin / one cell thick IGNORE refs to speed or rate of diffusion IGNORE ref to reduces diffusion distance alone – must be in context of short distance DO NOT CREDIT ref to thin , cell walls / membranes</p> <p>F2 IGNORE ref to moisture</p> <p>C3 IGNORE (named) blood vessel ACCEPT blood supply / supply of blood</p> <p>F3 IGNORE ref to lungs IGNORE description of gas exchange</p> <p>F4 This can be awarded in context of F3 or C4</p> <p>F5 ACCEPT trap , dust / bacteria / pollen / spores IGNORE dirt / germs</p>

continued

Question	Expected Answer	Mark	Additional Guidance
<i>continued</i>	<p>F7 constrict / control diameter of , airway / blood vessel ;</p> <p>C8 elastic , fibres / tissue ;</p> <p>F8 for recoil / aiding ventilation ;</p> <p>C9 macrophage / neutrophil ;</p> <p>F9 engulf / destroy pathogens or protect from infection ;</p>	max 4	<p>F7 ACCEPT narrows lumen</p> <p>C8 IGNORE elastin / elasticated</p> <p>F8 ACCEPT prevent alveoli bursting</p> <p>C9 IGNORE ref to white blood cell unqualified</p>
	QWC ;	1	<p>Any three with correct spelling and a suitable context from:</p> <p>epithelium / epithelial, endothelium, cartilage, diffuse / diffusion, gradient, goblet, ciliated, concentration, squamous, macrophage, neutrophil, surfactant, muscle, erythrocyte</p>
	Total	[11]	

Question		Expected Answer	Mark	Additional Guidance
2	(a)	<p>phospholipids ; proteins ; glycoproteins ; cholesterol ; glycolipids ;</p>	max 3	<p>Mark the first <u>three</u> components in continuous prose or first suggestion in bullet point / (numbered) list.</p> <p>IGNORE lipids, bilayer, hydrophilic head, hydrophobic tail, ref to intrinsic / extrinsic</p> <p>Count all refs to different types of protein as one e.g. intrinsic protein ✓ extrinsic protein Ignore pore protein Ignore glycoprotein ✓ phospholipids ✓ = 3 marks</p>
2	(b) (i)	<p>(movement of substances) against / up , concentration gradient or from low to high concentration ;</p> <p>using , ATP / (metabolic) energy ;</p> <p>using a , transport / carrier , protein ;</p>	2	<p>CREDIT diffusion gradient for concentration gradient DO NOT CREDIT along / across , concentration gradient</p> <p>DO NOT CREDIT 'diffusion against concentration gradient'</p> <p>DO NOT CREDIT pore / channel protein</p>

Question		Expected Answer	Mark	Additional Guidance																											
2	(b) (ii)	<p>(mineral) ions / salts / named e.g, (into) root hair (cell) ;</p> <p>hydrogen ions (out of) companion cells ;</p> <p>(mineral) ions / salts / named e.g, (across) endodermis ; sucrose out of sieve tube at sink ;</p> <p>AVP ; ;</p>	max 2	<p>Mark the first <u>two</u> examples. Ensure candidate refers to ions e.g. nitrates, phosphates, calcium ions, magnesium ions etc. ACCEPT correct symbols with charge DO NOT CREDIT ref to water ACCEPT ref to loading of sucrose into , phloem cell / companion cell ACCEPT ref to uptake of glucose by cells lining , (small) intestine / nephron / PCT IGNORE references to endocytosis / exocytosis / phagocytosis / secretion DO NOT CREDIT incorrect direction of movement if stated</p> <p>e.g.</p> <table border="1"> <thead> <tr> <th>substance</th> <th>cell</th> <th>(direction)</th> </tr> </thead> <tbody> <tr> <td>sodium/potassium ion(s)</td> <td>neurone</td> <td>K⁺ in Na⁺ out</td> </tr> <tr> <td>sodium/potassium ion(s)</td> <td>named cell</td> <td>Ion pump to drive cotransport</td> </tr> <tr> <td>potassium ion(s)</td> <td>guard cell (to open stomata)</td> <td>in</td> </tr> <tr> <td>sodium ion(s)</td> <td>cell of loop of Henle</td> <td>out</td> </tr> <tr> <td>calcium <u>ion</u>(s)</td> <td>muscle cell</td> <td>(into sarcoplasmic reticulum)</td> </tr> <tr> <td>calcium ions</td> <td>presynaptic knob</td> <td>out</td> </tr> <tr> <td>hydrogen ions</td> <td>in cell , respiring (aerobically) / photosynthesising</td> <td>for chemiosmosis</td> </tr> <tr> <td>named ion(s)</td> <td>cells lining distal convoluted tubule</td> <td>in / out</td> </tr> </tbody> </table>	substance	cell	(direction)	sodium/potassium ion(s)	neurone	K ⁺ in Na ⁺ out	sodium/potassium ion(s)	named cell	Ion pump to drive cotransport	potassium ion(s)	guard cell (to open stomata)	in	sodium ion(s)	cell of loop of Henle	out	calcium <u>ion</u> (s)	muscle cell	(into sarcoplasmic reticulum)	calcium ions	presynaptic knob	out	hydrogen ions	in cell , respiring (aerobically) / photosynthesising	for chemiosmosis	named ion(s)	cells lining distal convoluted tubule	in / out
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2	(c)	<p>osmosis ; <u>facilitated diffusion</u> ; diffusion ;</p>	3	<p>Mark the first answer for each example. If the first answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks</p>																											
Total			[10]																												

Question			Expected Answer	Mark	Additional Guidance
3	(a)	(i)	<p>X = <u>right</u> atrium ;</p> <p>Y = aorta ;</p> <p>Z = (left) pulmonary artery ;</p>	3	<p>Mark the first answer for each letter. If the first answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks</p> <p>ACCEPT <u>right</u> atria IGNORE RA</p> <p>IGNORE PA</p>
3	(a)	(ii)	<p><i>left ventricle</i></p> <p>1 (more muscle to create) more force ;</p> <p>2 (needs to create) <u>higher</u> pressure ;</p> <p>3 push blood against greater , resistance / friction ;</p> <p>4 (left ventricle) pumps blood further / pumps blood to all parts of body / supplies systemic circulation ;</p>	3 max	<p>Assume answer refers to left ventricle unless otherwise stated. ACCEPT ORA for left atrium throughout</p> <p>1 IGNORE more powerful contraction ACCEPT stronger contraction</p> <p>2 IGNORE withstanding or maintaining pressure</p> <p>4 ACCEPT pumps blood , all round body / greater distance IGNORE pumps blood to the body DO NOT CREDIT references to , right ventricle / lungs</p>

Question		Expected Answer	Mark	Additional Guidance
3	(a) (iii)	<p>1 ventricular systole or ventricle , wall / muscle , contracts ;</p> <p>2 (ventricular contraction) raises ventricular pressure ;</p> <p>3 (ventricular pressure) higher than atrial pressure ;</p> <p>4 <i>idea of</i> (pressure / movement of blood, generated by ventricular contraction) pushes valve shut ;</p> <p>5 chordae tendinae prevent inversion ;</p>	max 2	<p>DO NOT CREDIT statements that refer to right atrium or right ventricle</p> <p>1 IGNORE ref to atrial contraction</p> <p>4 DO NOT CREDIT 'valve shuts' alone DO NOT CREDIT in context of blood flowing from atrium to ventricle resulting in pressure increase to close valve</p> <p>5 ACCEPT valve tendons / tendinous cords</p>
	(b)	<p>aorta / (named) artery / arteries / arteriole(s) ;</p> <p>blood / plasma ;</p> <p>capillary / capillaries / capillary wall / (capillary) endothelium ;</p>	3	<p>Mark the first answer for each role. If the first answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks</p> <p>ACCEPT smooth muscle / elastic tissue / collagen / narrow lumen</p> <p>DO NOT CREDIT valves</p>
Total			[11]	

Question		Expected Answer	Mark	Additional Guidance
4	(a)	(just behind) tip / apex , of root ; (just behind) tip / apex , of shoot ; cambium / pericycle / vascular bundle ; bud ;	max 2	Mark the first <u>two</u> suggestions. ACCEPT behind root cap IGNORE root unqualified IGNORE stem / root unqualified / shoot unqualified ACCEPT between xylem and phloem
4	(b) (i)	1 chromosomes / chromatin / nucleus , can be seen / are visible ; 2 determine / distinguish between , different stages (of mitosis / division / cell cycle) ; 3 (staining) provide contrast (between cell structures) / AW ; 4 (because) different , structures / chemicals , take up different amounts of stain ;	max 2	IGNORE ref to organelles throughout 1 ACCEPT DNA for chromosomes / chromatin ACCEPT chromosomes / chromatin / DNA / nucleus , not normally visible 3 IGNORE different structures can be seen (this is visibility not contrast) 4 IGNORE different tissues or cells , take up different amounts of stain
4	(b) (ii)	mitosis / mitotic ;	1	spelling must be correct

Question		Expected Answer	Mark	Additional Guidance
4	(c)	<p><i>Two marks for correct answer, even if no working shown</i></p> <p>18.00 ; ;</p>	2	<p>CREDIT 18 / 18.0</p> <p>If answer is incorrect or missing allow one mark for working</p> <p>100 – 82 or 4.34.+ 3.23 + 3.23 + 7.20 or 18 somewhere in working</p>
4	(d)	<p><i>in meiosis</i></p> <p>(cells produced are) not <u>genetically</u> identical ;</p> <p>one set of chromosomes / haploid ;</p> <p>(they are) gametes ;</p> <p>four cells produced ;</p>	max 1	<p>Mark the first answer. If the first answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks</p> <p>IGNORE ref to cells produced by mitosis (as qu asks about meiosis)</p> <p>ACCEPT not clones Award in context of genetically different from parent or from each other</p> <p>ACCEPT half number of chromosomes / half genetic material</p>
Total			[8]	

Question			Expected Answer	Mark	Additional Guidance
5	(a)	(i)	<p>1 <i>idea of</i> not breathing through nose ;</p> <p>2 subject breathes , evenly / normally / regularly ;</p> <p>3 <i>idea of</i> (measure) height / amplitude , of waves (from trace) ;</p> <p>4 measure at least three waves and calculate mean ;</p> <p>5 detail of how spirometer works ;</p>	max 3	<p>1 e.g. subject wears nose clip / plug or holds nose</p> <p>2 IGNORE at rest</p> <p>3 ACCEPT (measure) difference between peak and trough ACCEPT annotated diagram / annotations on graph</p> <p>5 e.g. as breathe <u>in</u> lid goes <u>down</u> / as breathe <u>out</u> lid goes <u>up</u> e.g. movement of lid recorded , on trace / by data logger e.g. pen attached to lid moves up/down as breathe DO NOT CREDIT description of water level changing IGNORE ref to using mouthpiece, soda lime, oxygen</p>
5	(a)	(ii)	<p>10 further waves drawn with similar heights ;</p> <p>trace falls ;</p>	2	<p>Look for 10 extra peaks and 10 extra troughs Note 'similar' means no wave drawn for vital capacity – all waves should be approximately same height</p>

Question		Expected Answer	Mark	Additional Guidance
5	(a) (iii)	<p>1 measure , volume of oxygen used / decrease in volume in chamber ;</p> <p>2 one detail of how to measure volume change ;</p> <p>3 measure time taken (to use this oxygen) ;</p> <p>4 divide (volume) by time taken ;</p>	3	<p>1 ACCEPT annotations on graph ACCEPT 'measure how much the trace has gone down' or 'measure decrease in trace'</p> <p>2 e.g. draw line along tips of , peaks / troughs e.g. find difference in height from one , peak / trough , to another</p> <p>3 ACCEPT (measure volume of oxygen used) in a given time</p> <p>4 ACCEPT unit stated to indicate rate has been calculated e.g. dm^3s^{-1} / $\text{dm}^3\text{min}^{-1}$</p> <p>NOTE 'draw line along tips of, peaks / troughs and calculate gradient of line' = 3 marks (mark points 1, 3 & 4)</p>
5	(b)	<p>1 check health of volunteer ;</p> <p>2 oxygen used ;</p> <p>3 new / sterilised / disinfected , mouthpiece (for each volunteer);</p> <p>4 <i>idea of:</i> soda lime working ;</p> <p>5 sufficient oxygen in chamber ;</p> <p>6 water level not too high / water must not enter tubes ;</p> <p>7 ensure valves working correctly ;</p>	max 2	<p>Mark the first two factors.</p> <p>1 e.g. check medical history of volunteer ask about asthma / TB / pneumonia / flu / bronchitis / emphysema</p> <p>3 IGNORE clean mouthpiece</p> <p>4 CREDIT need to remove CO_2 / CO_2 accumulates</p> <p>5 IGNORE enough air in chamber</p> <p>6 IGNORE general ref to leaks</p>
Total			[10]	

Question			Expected Answer	Mark	Additional Guidance
6	(a)	(i)	sucrose ;	1	Mark the first answer. If the first answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks
6	(a)	(ii)	sink ; neither ; sink ;	3	Mark the first answer for each tissue. If the first answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks
6	(b)		<p>1 elongated elements ;</p> <p>2 elements , joined end to end / form column ;</p> <p>3 sieve plates / pores in end walls / perforated end plates / sieve pores ;</p> <p>4 little cytoplasm / cytoplasm pushed to cell edges / thin (layer of) cytoplasm ;</p> <p>5 no nucleus / few organelles ;</p>	max 2	<p>Mark the first <u>two</u> adaptations.</p> <p>1 ACCEPT cells</p> <p>2 ACCEPT cells</p> <p>3 response must refer to pores at ends of sieve elements</p> <p>4 IGNORE hollow</p> <p>5 IGNORE no organelles / few cell contents</p>

Question		Expected Answer	Mark	Additional Guidance
6	(c)	<p>1 active transport of, hydrogen ions / protons / H⁺ , out of companion cells ;</p> <p>2 creates , hydrogen ion / concentration / diffusion , gradient ;</p> <p>3 (facilitated) diffusion (of H⁺) back into companion cells ;</p> <p>4 sucrose / assimilates , move in with hydrogen ions ;</p> <p>5 by cotransport / through cotransport protein ;</p> <p>6 sucrose / assimilates , (diffuse) through plasmodesmata (from companion cell to sieve element) ;</p> <p>7 into sieve, tube / element ;</p>	max 3	<p>1 ACCEPT description of active transport DO NOT CREDIT hydrogen, H, H₂, hydrogen molecules</p> <p>2 ACCEPT description of gradient created</p> <p>5 IGNORE carrier protein</p> <p>For mark points 4 and 6 IGNORE sugar If wrong assimilate is named e.g. glucose penalise once and then apply ECF</p>
		QWC ;		<p>Any three with correct spelling and a suitable context from: companion, diffuse / diffusion, gradient, concentration, facilitated, cotransport, plasmodesmata, sieve tube, sieve element, hydrogen ions / protons</p>
Total			1 [10]	

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