

**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><b>Mark the first answer.</b> If the first 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> lipids <b>IGNORE</b> ref to transport / secretion / exocytosis / substances / materials <b>DO NOT CREDIT</b> stores proteins</p> <p><b>ACCEPT</b> 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><b>IGNORE</b> messages / information / communication <b>IGNORE</b> name of substance for MP 1 <b>IGNORE</b> 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><b>IGNORE</b> ref nutrients <b>DO NOT CREDIT</b> if incorrect direction of movement described (e.g. RNA into nucleus <b>or</b> RNA in and out of nucleus) <b>DO NOT CREDIT</b> DNA as named substance</p> <p><b>Note</b> 'allows mRNA out of nucleus' = <b>two marks</b></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><b>DO NOT CREDIT</b> 'engulf'</p> <p><b>DO NOT CREDIT</b> 'lysosomes are digestive enzymes'</p> <p><b>ACCEPT</b> destroy</p> <p><b>ACCEPT</b> ref to digestion of contents of phagocytic vesicle</p> <p><b>IGNORE</b> ref to (unwanted) substances / materials / food</p> <p><b>IGNORE</b> 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><b>ACCEPT</b> named examples of tissues</p> <p><b>ACCEPT</b> job or task</p>

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

*continued*

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

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><b>IGNORE</b> 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  <b>or</b>            from low to high concentration ;</p> <p>using , ATP / (metabolic) energy ;</p> <p>using a , transport / carrier , protein ;</p>	2	<p><b>CREDIT</b> diffusion gradient for concentration gradient  <b>DO NOT CREDIT</b> along / across , concentration gradient</p> <p><b>DO NOT CREDIT</b> 'diffusion against concentration gradient'</p> <p><b>DO NOT CREDIT</b> 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><b>Mark the first <u>two</u> examples.</b>  <b>Ensure candidate refers to ions e.g. nitrates, phosphates, calcium ions, magnesium ions etc.</b>  <b>ACCEPT</b> correct symbols with charge  <b>DO NOT CREDIT</b> ref to water  <b>ACCEPT</b> ref to loading of sucrose into ,                      phloem cell / companion cell  <b>ACCEPT</b> ref to uptake of glucose by cells lining ,                      (small) intestine / nephron / PCT  <b>IGNORE</b> references to endocytosis / exocytosis /                      phagocytosis / secretion  <b>DO NOT CREDIT</b> 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<sup>+</sup> in Na<sup>+</sup> 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 <sup>+</sup> in Na <sup>+</sup> 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><b>Mark the first answer for each example.</b> If the first answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks</p>																											
<b>Total</b>			<b>[10]</b>																												



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><b>Mark the first answer for each letter.</b> If the first 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> <u>right</u> atria <b>IGNORE</b> RA</p> <p><b>IGNORE</b> 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. <b>ACCEPT ORA</b> for left atrium throughout</p> <p>1 <b>IGNORE</b> more powerful contraction <b>ACCEPT</b> stronger contraction</p> <p>2 <b>IGNORE</b> withstanding or maintaining pressure</p> <p>4 <b>ACCEPT</b> pumps blood , all round body / greater distance <b>IGNORE</b> pumps blood to the body <b>DO NOT CREDIT</b> references to , right ventricle / lungs</p>

Question		Expected Answer	Mark	Additional Guidance
3	(a) (iii)	<p>1 ventricular systole <b>or</b> 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><b>DO NOT CREDIT</b> statements that refer to right atrium or right ventricle</p> <p>1 <b>IGNORE</b> ref to atrial contraction</p> <p>4 <b>DO NOT CREDIT</b> 'valve shuts' alone <b>DO NOT CREDIT</b> in context of blood flowing from atrium to ventricle resulting in pressure increase to close valve</p> <p>5 <b>ACCEPT</b> 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><b>Mark the first answer for each role.</b> If the first 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> smooth muscle / elastic tissue / collagen / narrow lumen</p> <p><b>DO NOT CREDIT</b> valves</p>
<b>Total</b>			<b>[11]</b>	

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.  <b>ACCEPT</b> behind root cap <b>IGNORE</b> root unqualified  <b>IGNORE</b> stem / root unqualified / shoot unqualified  <b>ACCEPT</b> 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	<b>IGNORE</b> ref to organelles throughout  1 <b>ACCEPT</b> DNA for chromosomes / chromatin <b>ACCEPT</b> chromosomes / chromatin / DNA / nucleus , not normally visible  3 <b>IGNORE</b> different structures can be seen (this is visibility not contrast)  4 <b>IGNORE</b> 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><b>CREDIT</b> 18 / 18.0</p> <p>If answer is incorrect or missing allow one mark for working</p> <p>100 – 82 <b>or</b> 4.34.+ 3.23 + 3.23 + 7.20 <b>or</b> 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><b>Mark the first answer.</b> If the first 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>IGNORE</b> ref to cells produced by mitosis (as qu asks about meiosis)</p> <p><b>ACCEPT</b> not clones <b>Award</b> in context of genetically different from parent or from each other</p> <p><b>ACCEPT</b> half number of chromosomes / half genetic material</p>
<b>Total</b>			<b>[8]</b>	

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 <b>IGNORE</b> at rest</p> <p>3 <b>ACCEPT</b> (measure) difference between peak and trough <b>ACCEPT</b> 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 <b>DO NOT CREDIT</b> description of water level changing <b>IGNORE</b> 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 <b>Note</b> '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 <b>ACCEPT</b> annotations on graph <b>ACCEPT</b> 'measure how much the trace has gone down' <b>or</b> '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 <b>ACCEPT</b> (measure volume of oxygen used) in a given time</p> <p>4 <b>ACCEPT</b> unit stated to indicate rate has been calculated e.g. <math>\text{dm}^3\text{s}^{-1}</math> / <math>\text{dm}^3\text{min}^{-1}</math></p> <p><b>NOTE</b> 'draw line along tips of, peaks / troughs <b>and</b> calculate gradient of line' = <b>3 marks</b> <b>(mark points 1, 3 &amp; 4)</b></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><b>Mark the first two factors.</b></p> <p>1 e.g. check medical history of volunteer ask about asthma / TB / pneumonia / flu / bronchitis / emphysema</p> <p>3 <b>IGNORE</b> clean mouthpiece</p> <p>4 <b>CREDIT</b> need to remove <math>\text{CO}_2</math> / <math>\text{CO}_2</math> accumulates</p> <p>5 <b>IGNORE</b> enough air in chamber</p> <p>6 <b>IGNORE</b> general ref to leaks</p>
<b>Total</b>			<b>[10]</b>	

Question			Expected Answer	Mark	Additional Guidance
6	(a)	(i)	sucrose ;	1	<b>Mark the first answer.</b> If the first answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = <b>0 marks</b>
6	(a)	(ii)	sink ; neither ; sink ;	3	<b>Mark the first answer for each tissue.</b> If the first answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = <b>0 marks</b>
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><b>Mark the first <u>two</u> adaptations.</b></p> <p>1 <b>ACCEPT</b> cells</p> <p>2 <b>ACCEPT</b> cells</p> <p>3 response must refer to pores at ends of sieve elements</p> <p>4 <b>IGNORE</b> hollow</p> <p>5 <b>IGNORE</b> no organelles / few cell contents</p>

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



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