

**Biology**

Advanced Subsidiary GCE

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

**Mark Scheme for June 2012**

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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	<b>Mark the first answer.</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>
		(ii)	<i>idea that:</i> cells, <u>genetically</u> identical / have same DNA ;  so both (daughter) cells receive a full, copy / complement ;	2	<b>ACCEPT</b> in context of identical to each other or identical to parent <b>ACCEPT</b> 'same genetic information/material'  <b>ACCEPT</b> same / correct amount of DNA <b>ACCEPT</b> same / correct number of chromosomes <b>IGNORE</b> ref to clones unqualified <b>IGNORE</b> '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)		<b>1</b> one maternal and one paternal / AW ; <b>2</b> carry same <u>genes</u> ;  <b>3</b> carry, same / different, alleles ; <b>4</b> (usually) same / similar, length ;  <b>5</b> centromere in same position ; <b>6</b> same banding pattern ;  <b>7</b> pair up in meiosis / form bivalent ;	3 max	<b>CREDIT</b> 'same loci' <b>IGNORE</b> 'genetic material', 'genetically identical' 'genetic information'  <b>ACCEPT</b> 'same shape' 'same size'  <b>IGNORE</b> 'same pattern'
	(c)	(i)	a, group / collection, of cells ; (cells) specialised / AW ; to perform a function(s) / working together ;	2 max	<b>IGNORE</b> 'same' or 'different' cells  <b>ACCEPT</b> 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  <b>or</b> short (diffusion) pathway ;</td> <td>alveoli  <b>or</b> cheek lining  <b>or</b> in blood vessels ;</td> </tr> <tr> <td>move, mucus / AW  <b>or</b> secrete mucus ;</td> <td>bronchioles  <b>or</b> bronchi  <b>or</b> trachea  <b>or</b> airways ;</td> </tr> </tbody> </table>	function	location	acts as a surface  <b>or</b> short (diffusion) pathway ;	alveoli  <b>or</b> cheek lining  <b>or</b> in blood vessels ;	move, mucus / AW  <b>or</b> secrete mucus ;	bronchioles  <b>or</b> bronchi  <b>or</b> trachea  <b>or</b> airways ;	4	<p><b>Mark the first answer in 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>  <b>Mark each box independently.</b></p> <p><b>IGNORE</b> description e.g. 'one cell thick'  <b>ACCEPT</b> glomerulus as blood vessel</p> <p><b>ACCEPT</b> move fluid / liquid for mucus  <b>IGNORE</b> removal of germs / dirt / substances / particles</p> <p><b>ACCEPT</b> 'move ovum' and 'in fallopian tubes'</p> <p><b>ACCEPT</b> removal of bacteria / fungal spores / dust if in mucus</p>
function	location									
acts as a surface  <b>or</b> short (diffusion) pathway ;	alveoli  <b>or</b> cheek lining  <b>or</b> in blood vessels ;									
move, mucus / AW  <b>or</b> secrete mucus ;	bronchioles  <b>or</b> bronchi  <b>or</b> trachea  <b>or</b> airways ;									
<b>Total</b>			<b>12</b>							

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

Question		Answer	Marks	Guidance
	(b) (i)	nucleus <b>or</b> nuclear, envelope / pore / membrane ; mitochondrion / mitochondria ; (rough / smooth) endoplasmic reticulum / ER OR ribosomes attached to membrane ; Golgi (body / apparatus) ; (secretory) vesicle(s) ;	2 max	<b>Mark the first two answers only.</b>  <b>IGNORE</b> 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 ;		<b>Mark the first answer.</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>  <b>IGNORE</b> 'chromosomes', 'chromatin'  <b>IGNORE</b> mesosome (as this is an infolding of plasma membrane and not <u>in</u> the cytoplasm)
		<b>Total</b>	<b>10</b>	

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><b>ACCEPT</b> cross / other mark  <b>DO NOT CREDIT</b> 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><b>IGNORE</b> 'the heart' or 'the heart beating' or 'the heart pumping' without further qualification  <b>IGNORE</b> ref to right (side) for mp 1 - 3</p> <p><b>ACCEPT</b> ref to peak on graph for increasing pressure</p> <p><b>ACCEPT</b> ref to trough on graph for decrease in pressure</p> <p><b>ACCEPT</b> 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>		1	<b>IGNORE</b> heart beat / beats per minute										



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><b>ACCEPT</b> from aorta to arteries / correctly named blood vessels – look for decrease in pressure trend</p> <p><b>ACCEPT</b> plateaus / level</p> <p><b>IGNORE</b> ref to frequency of fluctuations  <b>ACCEPT</b> ‘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><b>ACCEPT</b> 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><b>IGNORE</b> ref to pressure fluctuations and structure of vessel walls as not relevant to overall pressure change</p> <p><b>ACCEPT</b> idea of vessels branching to many/more (smaller) vessels</p> <p><b>IGNORE</b> 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><b>IGNORE</b> ref to rate of flow</p> <p><b>IGNORE</b> ref to capillary walls small / made of squamous cells</p> <p><b>ACCEPT</b> cannot withstand (high) pressure</p>
<b>Total</b>			<b>11</b>	

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

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

Question			Answer	Marks	Guidance
5	(a)	(i)	<u>tidal volume</u> ;	1	
		(ii)	being stretched / stretching ;	1	<b>ACCEPT</b> lengthening <b>DO NOT CREDIT</b> relaxing <b>IGNORE</b> expanding 'stretching and contracting' = <b>CON</b>
	(b)		<p><i>between B &amp; C expiration:</i></p> <p><b>1</b> (external) <b>intercostal</b> muscles / <b>diaphragm</b>, relax ;</p> <p><b>2</b> rib cage / ribs, move down OR diaphragm, moves / pushed, up ;</p> <p><b>3</b> <b>volume</b> of, <b>thorax</b> / chest cavity / lungs, drops / decreases ;</p> <p><b>4</b> <b>pressure</b> inside, thorax / chest cavity / lungs, increases ;</p> <p><b>5</b> above, external / atmospheric, pressure ;</p> <p><b>6</b> air leaves down pressure <b>gradient</b> ;</p> <p><b>7</b> (elastic) <b>recoil</b> of alveoli ; <b>3 max</b></p> <p>QWC – <b>two</b> technical terms used in context and spelt correctly ; <b>1</b></p>	4 max	<p><b>1</b> <b>ACCEPT</b> ref to <u>internal</u> intercostal muscles contracting <b>1</b> <b>DO NOT CREDIT</b> ref to diaphragm relaxing and intercostal muscles (unqualified) contracting</p> <p><b>2</b> <b>IGNORE</b> 'diaphragm becomes domed / curved'</p> <p><b>3</b> <b>ACCEPT</b> 'space inside' or 'air in' for volume</p> <p><b>5</b> <b>ACCEPT</b> (pressure) higher than outside</p> <p><b>Answers given in context of 'at B' or 'at C' – QWC not awarded.</b> Any <b>two</b> from <b>intercostal, diaphragm, recoil, volume</b> <b>thorax, pressure, gradient</b></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> <b>and</b> <u>phloem</u> ;	1	Both needed for one mark <b>Mark the first answer on each 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> <b>DO NOT CREDIT</b> sucrose <b>DO NOT CREDIT</b> phloem sieve tubes / companion cells
		(ii)	<p><b>1</b> hydrogen ions / H<sup>+</sup> / protons, pumped out of companion cells ;</p> <p><b>2</b> increases, hydrogen ion / H<sup>+</sup> / proton, concentration (gradient) (outside companion cell) ;</p> <p><b>3</b> hydrogen ions, re-enter / flow back into, companion cells ;</p> <p><b>4</b> sucrose / sugar, moves with hydrogen ions / AW ;</p> <p><b>5</b> down <u>concentration</u> gradient ;</p> <p><b>6</b> ref. cotransporter proteins / cotransport(ation) ;</p> <p><b>7</b> by <u>facilitated</u> diffusion ;</p> <p><b>8</b> sucrose / sugar, diffuses into sieve tube (element) ;</p> <p><b>9</b> through plasmodesmata ;</p>	3 max	<p><b>1 ACCEPT</b> hydrogen ions leave companion cells using ATP</p> <p><b>2 ACCEPT</b> creates gradient</p> <p><b>2 DO NOT CREDIT</b> increase, hydrogen ion / H<sup>+</sup> / proton concentration, in sieve tube element</p> <p><b>3 ACCEPT</b> diffuse / move</p> <p><b>4 DO NOT CREDIT</b> glucose (penalise once)</p> <p><b>4 DO NOT CREDIT</b> sucrose follows H<sup>+</sup></p> <p><b>8 IGNORE</b> sucrose diffuses into <i>phloem</i></p>

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



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