

**Biology**

Advanced Subsidiary GCE

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

**Mark Scheme for January 2011**

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Question		Expected Answers	Marks	Additional Guidance
1	(a)	mitosis / mitotic division ;	1	<b>DO NOT CREDIT</b> meiosis, miosis <b>ACCEPT</b> mytosis
	(b)	<b>N ;</b> <b>L ;</b> <b>K ;</b> <b>J ;</b>	4	<b>Mark the first answer for each stage.</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> .
	(c)	1 checking, genetic material / DNA / chromatin / chromosome(s) / genes, (for errors) ;  2 protein synthesis ;  3 synthesis / replication / increase in number of, organelles / named organelle ;  4 ATP production / respiration ;  5 <u>cell</u> growth / increase in <u>cell</u> , volume / size ;	2 max	<b>Mark the first two suggestions only.</b> <b>IGNORE</b> DNA , replication / synthesis <b>ACCEPT</b> checking for mutations <b>DO NOT CREDIT</b> check for <i>cell</i> mutations  <b>ACCEPT</b> named step e.g. transcription / translation / described  <b>CREDIT</b> one named organelle only <b>ACCEPT</b> centriole as organelle <b>IGNORE</b> organelle growth  <b>IGNORE</b> release energy <b>DO NOT CREDIT</b> produce / create, energy (in form of ATP)  <b>IGNORE</b> cytoplasm replicates

Question	Expected Answers	Marks	Additional Guidance
(d)	<p><i>in plant</i></p> <p>(cell), plate / wall, forms (between new cells) ;</p> <p><i>idea of :</i></p> <p>cytokinesis starts from middle of cell ;</p> <p>(only) occurs in meristem ;</p> <p>no centrioles ;</p> <p>AVP ;</p>	2 max	<p><b>Mark the first <u>two</u> suggestions only. Read as prose unless candidate has indicated two points by bullets or numbers – in this case mark the first comment in each bullet.</b></p> <p>Assume response refers to plants unless stated otherwise. Accept reverse argument for animals. <b>CREDIT</b> in animal no cell plate <b>IGNORE</b> plants have cell walls unqualified</p> <p><b>ACCEPT</b> cytokinesis starts at outer edge in animals</p> <p><b>ACCEPT</b> cambium / specialised tissues / cells <b>IGNORE</b> ref (root) cap, root tip / shoot tip <b>CREDIT</b> in animals most, cells / tissues, can divide</p> <p><b>ACCEPT</b> centrioles not used to pull chromatids apart <b>DO NOT CREDIT</b> no spindle fibres in plants</p> <p>e.g. nuclear envelope does not reform in most plant cells in telophase I (it does form in most animal cells)</p>
	<b>Total</b>	<b>9</b>	

Question		Expected Answers	Marks	Additional Guidance
2	(a)	A = bronchiole ; B = alveolus / alveoli ;	2	<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> . <b>DO NOT CREDIT</b> bronchus <b>ACCEPT</b> phonetic spelling of alveolus and bronchiole e.g. aveoli
	(b)	1 large, surface area / SA :VOL ;  2 (alveolar) wall / epithelium, one cell thick ;  3 (made of) squamous, cells / epithelium ;  4 ref to surfactant ;  <i>idea of:</i> 5 (very) close to, capillaries / blood supply <b>OR</b> rich blood supply / many capillaries ;	2 max	<b>Mark the first <u>two</u> suggestions only. Read as prose unless candidate has indicated two points by bullets or numbers – in this case mark the first comment in each bullet.</b>  <b>ACCEPT</b> large SA / VOL, (alveoli) are small <b>and</b> in large number <b>DO NOT CREDIT</b> large amounts of tiny alveoli  <b>ACCEPT</b> thin wall / thin barrier <b>DO NOT CREDIT</b> ref to cell wall / lining <b>IGNORE</b> alveolus one cell thick  <b>ACCEPT</b> correct description of squamous cells (e.g. thin flat cell layer) <b>ACCEPT</b> pavement epithelium <b>IGNORE</b> reference to moist <b>DO NOT CREDIT</b> endothelium  <b>IGNORE</b> ref to elastic fibres

Question	Expected Answers	Marks	Additional Guidance
(c)	<p>1 (histamine), binds / attaches, to, receptor / glycoprotein ;</p> <p><i>idea of :</i></p> <p>2 in / on, plasma / cell surface, membrane (of muscle cell) ;</p> <p>3 <u>complementary</u> (shape) ;</p> <p>4 triggers response / causes effect, inside cells ;</p>	2 max	<p><b>binds to complementary receptor = 2 marks</b></p> <p><b>ACCEPT</b> glycolipids</p> <p><b>IGNORE</b> binding site, ref antigens</p> <p><b>ACCEPT</b> in / on, cell surface / cell membrane (of muscle cells)</p> <p><b>ACCEPT</b> membrane bound receptors (on muscle cells)</p> <p><b>CREDIT</b> correct examples of effects / details inside cells e.g. ref to opening sodium channels in cell surface membrane ref to second messenger ref to cyclic AMP ref to activation of enzymes / kinases ref to phosphorylation</p>
(d)	<p><i>idea of :</i></p> <p>1 more tissue fluid formed / increase in volume of tissue fluid ;</p> <p>2 increase pressure in tissue ;</p> <p>3 swelling / inflammation / oedema;</p> <p>4 (more) white blood cells pass into tissues ;</p> <p>5 larger molecules / (named) proteins , pass into tissue fluid ;</p>	2 max	<p><b>Mark the first <u>two</u> suggestions only. Read as prose unless candidate has indicated two points by bullets or numbers – in this case mark the first comment in each bullet.</b></p> <p><b>IGNORE</b> refs to the capillaries becoming more leaky</p> <p><b>IGNORE</b> more water passes out</p> <p><b>DO NOT CREDIT</b> cells swell</p> <p><b>ACCEPT</b> (more) white blood cells leave the capillary</p> <p><b>IGNORE</b> ref to more, glucose / nutrients / gases, leave blood capillary</p> <p><b>IGNORE</b> ref to increased rate of diffusion</p>
	<b>Total</b>	<b>8</b>	

Question	Expected Answers	Marks	Additional Guidance
3	surface area to volume ratio ;  <u>erythrocytes</u> ;  affinity ;  oxyhaemoglobin ;  carbon dioxide / CO <sub>2</sub> / hydrogen ions / H <sup>+</sup> ;  Bohr / bohr (shift) ;	6	<b>ACCEPT</b> SA / VOL or SA:Vol  <b>ACCEPT</b> minor spelling errors if phonetically correct e.g. erythrocyte <b>DO NOT CREDIT</b> erthocytes, erephosite, erthrocyte <b>IGNORE</b> red blood cells  <b>ACCEPT</b> attraction  <b>ACCEPT</b> HbO / HbO <sub>8</sub> <b>DO NOT CREDIT</b> HbO <sub>2</sub> etc  <b>ACCEPT</b> carbonic acid <b>DO NOT CREDIT</b> CO <sup>2</sup> <b>DO NOT CREDIT</b> hydrogen, H, H <sub>2</sub>  <b>ACCEPT</b> phonetic spellings e.g. borr, bore, borh
	<b>Total</b>	<b>6</b>	

Question		Expected Answers	Marks	Additional Guidance
4	(a)	U ; R ; V ;	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> .
	(b)	no cross walls / cells joined end to end / continuous ;  hollow / no contents / no organelles / no cytoplasm ;  (walls / vessels) lignified ;  (bordered) pits in walls ;	2 max	<b>IGNORE</b> ref to dead cells / tubes  <b>DO NOT CREDIT</b> lined / covered with lignin <b>DO NOT CREDIT</b> (walls) made of lignin <b>ACCEPT</b> xylem has lignin
	(c) (i)	evaporation / loss of water vapour ;  from, aerial parts of plant / leaf / leaves ;  via stomata ;	2 max	<b>movement of water vapour out of leaf = 2 marks</b>  <b>DO NOT CREDIT</b> loss of water alone  <b>CREDIT</b> loss through cuticle / epidermis



Question		Expected Answers	Marks	Additional Guidance
(c)	(ii)	<p><i>In the leaf:</i> <i>idea of :</i> 1 water loss (from leaf) is replaced ;</p> <p>2 via, <b>apoplast / symplast / vacuolar</b>, pathways ;</p> <p>3 down <b>water potential</b> gradient / AW ;</p> <p>4 (lost water replaced) by water from the <b>xylem</b> ;</p> <p><i>In the xylem:</i> 5 (loss of water) causes, low / negative, (<b>hydrostatic</b>) pressure (at top / in leaf) <b>OR</b> creates pressure gradient ;</p> <p><i>idea of :</i> 6 water moves, from higher pressure to lower pressure / down pressure <b>gradient</b> ;</p> <p>7 under <b>tension</b> / pulled up / drawn up ;</p> <p>8 by <b>mass flow</b> ;</p> <p>9 <b>cohesion</b> / attraction, between water molecules ;</p> <p><i>idea of :</i> 10 column / stream / chain, of water (molecules) ;</p> <p><b>QWC</b> ;</p>	<p>4 max</p> <p>1</p>	<p><b>DO NOT CREDIT</b> ref to water potential in context of xylem <b>IGNORE</b> ref to root pressure or capillarity <b>ACCEPT</b> <math>\Psi</math> / WP for water potential</p> <p>For mp 2 &amp; 3 <b>DO NOT CREDIT</b> in context of root <b>CREDIT</b> pathways described in correct context</p> <p>Idea of : water leaving xylem to enter leaf cells (that have lost water)</p> <p><b>IGNORE</b> 'water moves by the cohesion-tension theory' without further explanation <b>ACCEPT</b> along pressure gradient</p> <p>Idea of: pulling force and not just water movement created by transpiration <b>DO NOT CREDIT</b> mp 7 or 8 in context of adhesion / capillarity or water potentials <b>IGNORE</b> suction, transpiration pull unqualified <b>CREDIT</b> hydrogen bonding between water molecules</p> <p><b>IGNORE</b> long unqualified</p> <p><u>TWO</u> terms used appropriately and spelt correctly: <b>xylem , apoplast/symplast/vacuolar , hydrostatic , gradient , cohesion / cohesive , tension , mass flow , water potential</b></p>

Question		Expected Answers	Marks	Additional Guidance
	(iii)	<i>Ref to :</i> bubbles / air (present / being removed) ;  (blockage) in xylem ;  restore (continuous) column of water (in xylem) ;	2 max	air in the xylem = 2 marks
<b>Total</b>			<b>14</b>	

Question			Expected Answers	Marks	Additional Guidance
5	(a)	(i)	nucleus / nuclear envelope / nuclear membrane / nucleolus ;  membrane bound organelles / named organelle ;  ribosomes larger ; (large) cell size / 20µm wide ;	2 max	<b>Mark the first <u>two</u> suggestions. Read as prose unless candidate has indicated two points by bullets or numbers – in this case mark the first comment in each bullet.</b>  <b>ACCEPT</b> SER / RER / vesicle / cilia <b>DO NOT CREDIT</b> presence of ribosome / vacuole / flagellum / undulipodium
		(ii)	<i>Two marks for correct answer</i>  4500 ; ;	2	<b>No tolerance in initial measurement = exactly 90mm</b>  If answer is incorrect, allow one mark for correct working i.e. any measurement divided by 20 e.g. 8.9 / 20
		(iii)	<b>1</b> provides, strength / stability / support (cell) ;  <b>2</b> determines shape / changes shape / moves membrane (for endo / exocytosis) ;  <b>3</b> movement of, organelles / named organelle / RNA / protein / chromosomes / chromatids ;  <b>4</b> attachment to / hold, organelles / named organelle, in place;  <b>5</b> make up, centrioles / spindle fibres ;	2 max	<b>Mark the first <u>two</u> suggestions. Read as prose unless candidate has indicated two points by bullets or numbers – in this case mark the first comment in each bullet.</b>  <b>IGNORE</b> structure  <b>IGNORE</b> movement of (whole) cell  e.g. vesicles, cilia, mitochondria, ribosome

Question		Expected Answers	Marks	Additional Guidance
	(b) (i)	differentiation ;	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> . <b>DO NOT CREDIT</b> specialisation
	(ii)	<p>1 (many) <b>lysosomes</b> / vesicles containing enzymes ;</p> <p>2 (many) microfilaments / microtubules <b>OR</b> ref to, extensive / well developed, cytoskeleton ;</p> <p>3 (many) <b>ribosomes</b> / (a lot of) <b>rough endoplasmic reticulum</b> / (a lot of ) RER ;</p> <p>4 (many) <b>mitochondria</b> ;</p> <p>5 (lots of) <b>Golgi</b> ;</p> <p>6 (many) receptor (sites) on, <b>cell surface / plasma , membrane</b> ;</p> <p><b>QWC</b> ;</p>	<p>3 max</p> <p>1</p>	<p><b>Max 2 marks for content if no reference is made at least once to large numbers of named organelles / receptors</b></p> <p><b>IGNORE</b> reasons or explanations</p> <p><b>IGNORE</b> lobed nucleus</p> <p><b>IGNORE</b> many enzymes</p> <p><b>IGNORE</b> lysosomes</p> <p><b>ACCEPT</b> lysosomes</p> <p><b>DO NOT CREDIT</b> lysosomes are enzymes</p> <p><b>IGNORE</b> ref glycoproteins / glycolipids unqualified</p> <p><u>TWO</u> terms used appropriately and spelt correctly: <b>lysosome(s), ribosome(s), rough endoplasmic reticulum, mitochondria / mitochondrion, Golgi/golgi, microfilaments/microtubules / cytoskeleton, cell surface membrane / plasma membrane.</b></p>
<b>Total</b>			<b>11</b>	

Question			Expected Answers	Marks	Additional Guidance
6	(a)	(i)	osmosis ;	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> . <b>DO NOT CREDIT</b> diffusion
		(ii)	fit between (phospho)lipids / through (phospho)lipid (bi)layer ; via, protein <u>channels</u> / protein <u>pores</u> / aquaporins ;	2	<b>DO NOT CREDIT</b> fit through phospholipids (molecules) <b>DO NOT CREDIT</b> carrier proteins – if this is used do not award mp 2 <b>IGNORE</b> transport proteins
	(b)		cell wall ; provides strength / withstands (internal) pressure / prevents cell membrane over expanding / exerts pressure potential ; limits uptake of water ;	2 max	'has a strong cell wall' = 2 marks <b>IGNORE</b> rigidity (of wall), cytoplasm pushes against cell wall <b>ACCEPT</b> stops uptake of water (when turgid)
	(c)	(i)	between –1451 and –1799 ;	1	<b>Ensure figure is a negative number</b> <b>CREDIT</b> a range or single value within this range

Question	Expected Answers	Marks	Additional Guidance
(ii)	<p><i>idea of:</i>  <b>1</b> plot, percentage plasmolysed against water potential (of solution) / water potential on X axis and % plasmolysed on Y axis ;</p> <p><i>idea of:</i>  <b>2</b> read down from 50% plasmolysed to water potential ;</p> <p><b>OR</b></p> <p><i>idea of:</i>  <b>1</b> plot, % plasmolysed against sucrose concentration / sucrose concentration on X axis and % plasmolysed on Y axis ;</p> <p><i>idea of :</i>  <b>2</b> read down from 50% plasmolysed to sucrose concentration  <b>AND</b>  look up equivalent water potential ;</p>	<b>2</b>	<p><b>IGNORE</b> ref to bars / bar graph  <b>ACCEPT</b> axes wrong way round  <b>ACCEPT</b> marking points shown correctly on annotated sketch line graph</p>

Question	Expected Answers	Marks	Additional Guidance
(d)	<p><i>reliable</i></p> <p><b>R1</b> observe more pieces of onion (epidermis from each solution) ;</p> <p><b>R2</b> count more cells (in each piece of epidermis) ;</p> <p><b>R3</b> calculate a mean ;</p> <p><b>R4</b> identify / ignore anomalous results ;</p> <p style="text-align: center;"><b>max 3</b></p> <p><i>accurate</i></p> <p><i>idea of:</i></p> <p><b>A1</b> use, more / intermediate, concentrations within existing range / smaller gap between concentrations / closer (concentration) values ;</p> <p><b>A2</b> narrower range around 50% plasmolysis / 0.4 - 0.7 mol dm<sup>-3</sup> / -1120 to -2180 kPa ;</p> <p><b>A3</b> take photographs and mark cells as counting ;</p>	<b>4 max</b>	<p><b>DO NOT CREDIT</b> 'repeats' unless qualified <b>ALLOW</b> 'repeat the results / experiment' to indicate more pieces of epidermis</p> <p><b>IGNORE</b> average</p> <p><b>ACCEPT</b> outliers for anomalies <b>IGNORE</b> removes / avoids, anomalies</p> <p><b>IGNORE</b> lack of units</p> <p><b>ACCEPT</b> examples of values quoted in between original values e.g. 0.25, 0.35, etc. <b>ACCEPT</b> 0.2 and 0.9</p> <p><b>ACCEPT</b> examples of values if clearly showing application of correct narrower range e.g. 0.45, 0.55 , 0.65 For A2 <b>DO NOT CREDIT</b> quoted values extend beyond correct narrower range e.g. 0.35, 0.55, 0.75</p>
<b>Total</b>		<b>12</b>	

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