

**GCE**

**Biology**

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

Advanced Subsidiary GCE

**Mark Scheme for June 2016**

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.












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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## Annotations

<b><i>Annotation</i></b>	<b><i>Description</i></b>
	Point already given (i.e. Given max)
	Underline (for ambiguous / contradictory wording)
	Ignore
	Correct response
	Omission
	Marking point partially met
	Benefit of doubt not given
	Irrelevant response
	Error carried forward
	Contradiction
	Incorrect response

Abbreviations, annotations and conventions used in the detailed Mark Scheme (to include abbreviations and subject-specific conventions).

<b>Annotation</b>	<b>Meaning</b>
/	alternative and acceptable answers for the same marking point
(1)	Separates marking points
<b>reject</b>	Answers which are not worthy of credit
<b>not</b>	Answers which are not worthy of credit
<b>IGNORE</b>	Statements which are irrelevant
<b>ALLOW</b>	Answers that can be accepted
( )	Words which are not essential to gain credit
—	Underlined words must be present in answer to score a mark
<b>ECF</b>	Error carried forward
<b>AW</b>	Alternative wording
<b>ORA</b>	Or reverse argument

Question		Expected Answers	Marks	Additional Guidance
1	(a)	(cell) very small <b>OR</b> large surface area to volume ratio ;  short diffusion pathway ; <i>idea that</i> diffusion sufficient / fast enough, to supply (all) needs ;	max 2	<b>IGNORE</b> low, activity / metabolic rate <b>IGNORE</b> not very big / small (unless qualified) <b>ACCEPT</b> microscopic <b>ACCEPT</b> larger SA:Vol (ratio)
	(b)	<u>nucleus</u> ; (contractile / food) vacuole ;	max 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>
	(c)	(i) phospholipids / phospholipid bilayer ;	1	<b>Mark the first answer.</b> <b>IGNORE</b> cholesterol <b>DO NOT CREDIT</b> phosphate / heads <b>ACCEPT</b> phospholipid tails / lipid tails / fatty acids

Question	Expected Answers	Marks	Additional Guidance
	<p>(ii)</p> <p>control what, enters / leaves, the organelles ;</p> <p>(contains receptors to) detect changes in environment ;</p> <p>compartmentalisation ;</p> <p>site for, enzymes / electron carriers / components of metabolic pathways ;</p> <p>create concentration gradients ;</p> <p>form pseudopodia ;</p>	<p>max 2</p>	<p><b>Mark the first two answers.</b> If two correct responses are given followed by one or two incorrect responses or which contradict the correct answers then = <b>1 or 0 marks</b></p> <p><b>IGNORE</b> ref to control of materials entering / leaving <u>cell</u> / ref. to barrier with outside</p> <p><b>ACCEPT</b> cell, communication / signalling / recognition</p> <p><b>ACCEPT</b> separate, organelles/ DNA / food / enzymes, (from cytoplasm)                      separate organelles from each other                      formation of , vesicles / vacuoles                      hold water                      separate metabolic pathways</p> <p><b>IGNORE</b> ref to increases surface area</p>
(d)	(i) <u>exocytosis</u> ;	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>DO NOT CREDIT pinocytosis / pino(exocytosis)</b></p>

Question		Expected Answers	Marks	Additional Guidance
	(ii)	burst / lysis / plasma membrane would rupture ;	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> <b>ACCEPT</b> haemolysis <b>DO NOT CREDIT</b> plasmolysis
	(e)	WP of -100 solution higher than -400 / ORA ;  (at -100kPa) water potential gradient steeper / described / ORA ;  (at -100kPa) water enters Amoeba more quickly / ORA ;	max 2	<b>IGNORE</b> refs to hyper / hypo tonic solutions <b>ACCEPT</b> -100 less negative than -400 Note: response must contain clear ref to both -100 solution and -400 solution  <b>ACCEPT</b> more water enters Note: ref to osmosis being more rapid <b>only</b> valid if direction of water movement is clear
		<b>Total</b>	<b>10</b>	

Question	Expected Answers	Marks	Additional Guidance
2 (a)	(ability to continue) dividing ;	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>
(b)	move / waft / sweep, mucus ; produce / release / secrete , mucus ; constrict the (named) airways ; provide, thin barrier / short diffusion distance ;	4	<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>DO NOT CREDIT</b> excrete  <b>CREDIT</b> narrows lumen / reduces diameter of airway <b>IGNORE</b> controls, diameter / air flow  <b>IGNORE</b> smooth lining / <i>reduces</i> diffusion distance <b>IGNORE</b> thin, surface / cells, for diffusion
(c)	transport / movement / mass flow, of, assimilates / sucrose / amino acids ;  from source to sink / description ;	2	<b>IGNORE</b> ref to (organic) solutes / food / glucose / sugars  e.g. from cells / tissues / site where produced to cells / tissues / site where used <b>ACCEPT</b> named source AND sink
	<b>Total</b>	<b>7</b>	



Question		Expected Answers	Marks	Additional Guidance
3	(a)	Z ;	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>
	(b)	Fig. 3.1(a) (no mark)  shows surface view ; 3D / three dimensional ; better <u>resolution</u> (than b) ;	max 2	Please place a green blob on paper  Do not allow mp 2 if fig 3.1 b selected Do not allow mp 3 if fig 3.1 b selected Must be comparative comment
	(c)	cell walls ;  plasmodesma(ta) ;  endodermis / endodermal ;  Casparian strip ;	4	<b>DO NOT CREDIT</b> Caspian / Caspiran
	(d) (i)	C ;	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)	small(er) <u>surface area</u> means less, evaporation / transpiration ;	1	<b>Mark independent of (d)(i)</b> <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> less water loss / fewer stomata <b>DO NOT CREDIT</b> small surface area to volume ratio <b>DO NOT CREDIT</b> no, transpiration / evaporation

Question	Expected Answers	Marks	Additional Guidance
	<p>(iii) <u>thick</u> (waxy) cuticle ;            few stomata ;            stomata, sunken / in pits ;            hairs / hairy ;            leaf, curled / rolled ;            dense spongy mesophyll ;            closure of stomata, during day / when water availability low ;</p>	max 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>(e) water <u>vapour</u> around the, stomata / leaf surface, is blown away;</p> <p>reduces water (vapour) potential around, <u>stomata</u> ;</p> <p><i>idea of:</i>            increases / maintains, water (vapour) potential gradient (between air space in leaf and outside) ;</p>	max 2	<p><b>IGNORE</b> moisture (for all mark points)  <b>ACCEPT</b> boundary layer reduced  <b>ACCEPT</b> evaporated water as water vapour</p> <p><b>ACCEPT</b> relative humidity for water potential</p> <p><b>IGNORE</b> diffusion gradient / concentration gradient</p>
	<b>Total</b>	<b>12</b>	

Question		Expected Answers	Marks	Additional Guidance
4	(a)	create / provide / increase contrast ;  make, cells / (named) component(s), visible OR cells / (named) components, can be, identified / distinguished / differentiated ;	2	<b>IGNORE</b> clearer <b>ACCEPT</b> (named) organelle(s) stand out from surroundings  <b>ACCEPT</b> regions / parts / AW, of cell
	(b)	(i) anaphase ;	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>

Question	Expected Answers	Marks	Additional Guidance
	<p>(ii)</p> <p>1. <b>chromosomes</b> coil / <b>supercoil</b> / <b>condense</b> ;</p> <p>2. <b>nuclear envelope</b> disintegrates ;</p> <p>3. <b>nucleolus</b>, no longer visible / disappears ;</p> <p>4. <b>centrioles</b> move to opposite, ends of cell / <b>poles</b> ;</p> <p>5. chromosomes attached to <b>spindle</b> fibres at <b>centromere</b> ;</p> <p>6. chromosomes align at <b>equator</b> ;</p> <p>7. chromosomes move towards opposite, poles / ends of cell ;</p> <p>8. spindle fibres change length / shorten ; <b>max 4</b></p> <p>QWC ; <b>max 1</b></p>	<p>max 5</p>	<p><b>ACCEPT</b> chromatid for chromosome throughout                      Note: There is no mark for naming phases, but if phase is mentioned and description is incorrect for named phase then <b>DO NOT CREDIT</b>                      Accept mp 1-5 in prophase, mp 6 metaphase, mp 7 anaphase mp 8 in any phase  <b>IGNORE</b> ref to events in telophase and cytokinesis, as they occur <i>after</i> anaphase</p> <p><b>ACCEPT</b> chromatin</p> <p><b>ACCEPT</b> nuclear membrane  <b>IGNORE</b> dissolves</p> <p><b>DO NOT CREDIT</b> pairs of chromosomes line up  <b>ACCEPT</b> pairs of chromatids line up</p> <p><b>IGNORE</b> spindle fibres contract</p> <p>Place a green blob next to each word and a tick next to the pencil.                      Award if any two terms spelt correctly and used in correct context from:  <b>chromosomes / chromatids / chromatin</b>  <b>supercoil</b> <b>nucleolus</b>  <b>condense</b> <b>centromere</b>  <b>nuclear envelope</b> (but not membrane)  <b>centriole</b> <b>pole</b>  <b>spindle</b> <b>equator</b></p>

Question	Expected Answers	Marks	Additional Guidance
(c)	<p>DNA / genetic material, replicated / synthesised / checked ;</p> <p>cell growth / increased respiration / protein synthesis / increase in number of organelles ;</p> <p>cytokinesis / cell surface membrane constricts / cytoplasm splits in two / cell plate forms (plants) ;</p> <p>ref to G and S phases ;</p>	max 3	<p>For mp 1 &amp; 2 where candidates link events to S &amp; G phases then description must be correct for phase.  <b>S phase is DNA synthesis only</b>  <b>G phases contain protein synthesis, increasing numbers of organelles, growth, increased respiration and checking of DNA.</b></p> <p><b>IGNORE</b> chromosomes replicate / DNA copied / DNA doubles</p> <p><b>ACCEPT</b> more ATP</p> <p><b>ACCEPT</b> Gap or 'growth' for G and Synthesis for S throughout  <b>ACCEPT</b> in context of diagram</p>
	<b>Total</b>	<b>11</b>	

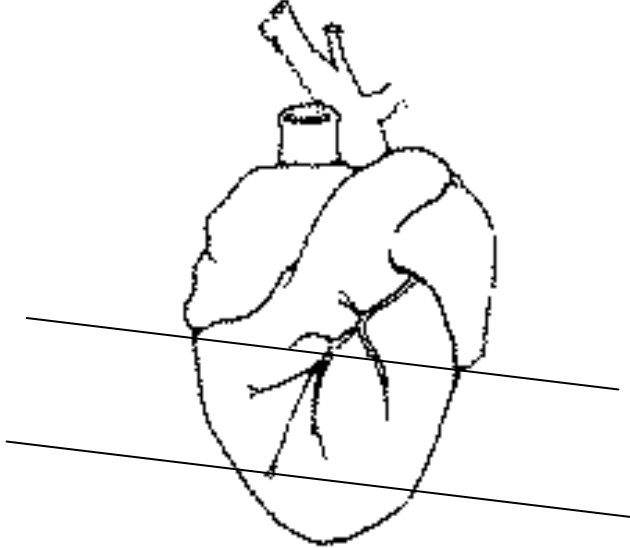
Question		Expected Answers	Marks	Additional Guidance
5	(a)	<p>must remain small OR cannot grow tall / large / big ;</p> <p>no support from vascular tissues / vascular bundles / xylem ;</p> <p>use only diffusion / no mass flow / no rapid transport ;</p> <p>diffusion too slow (to enable substances to move large distances) ;</p> <p>idea of: short diffusion pathway / large surface area to volume ratio ;</p>	<b>Max 2</b>	

Question	Expected Answers	Marks	Additional Guidance												
(b)	<p>1. <i>idea of</i> water lost by <b>evaporation / transpiration / evapotranspiration</b> ;</p> <p>2. (water moves by) <b>symplast</b> and <b>apoplast</b> pathways ;</p> <p>3. through / along cell walls by, <b>capillary action / adhesion</b> (apoplast pathway) ;</p> <p>1. (water loss) reduces the <b>water potential</b> of (leaf) cells ;</p> <p>2. water moves from higher water potential to lower water potential / <u>down</u> <b>water potential gradient</b> (symplast pathway) ;</p> <p>3. by <b>osmosis</b> (symplast pathway) ;</p> <p>4. through <b>plasmodesmata</b> (symplast pathway) ; <b>max 3</b></p> <p><b>QWC ;</b> <b>max 1</b></p>	max 4	<p><b>DO NOT CREDIT</b> mp 2 – 7 in context of water uptake</p> <p><b>DO NOT CREDIT mp 3-7 in context of movement in xylem either stated or implied</b></p> <p>AWARD <b>only</b> where it is clear that the movement is in context of apoplast.</p> <p><b>ACCEPT</b> <math>\psi</math></p> <p><b>IGNORE</b> osmosis if used in context of apoplast pathway</p> <p>Place a green blob next to each word and a tick next to the pencil. Award if any two terms spelt correctly and used in correct context from:</p> <table border="0"> <tr> <td><b>apoplast</b></td> <td><b>osmosis</b></td> </tr> <tr> <td><b>symplast</b></td> <td><b>adhesion</b></td> </tr> <tr> <td><b>capillary action</b></td> <td><b>plasmodesmata</b></td> </tr> <tr> <td><b>evaporation</b> (allow correct derivatives)</td> <td></td> </tr> <tr> <td><b>transpiration</b></td> <td><b>evapotranspiration</b></td> </tr> <tr> <td><b>water potential</b></td> <td><b>water potential gradient</b></td> </tr> </table>	<b>apoplast</b>	<b>osmosis</b>	<b>symplast</b>	<b>adhesion</b>	<b>capillary action</b>	<b>plasmodesmata</b>	<b>evaporation</b> (allow correct derivatives)		<b>transpiration</b>	<b>evapotranspiration</b>	<b>water potential</b>	<b>water potential gradient</b>
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Question		Expected Answers	Marks	Additional Guidance
	(c) (i)	group of cells ; working together / performing a function ;	2	<b>ACCEPT</b> cells derived from same stem cell source
	(ii)	palisade (mesophyll) ; spongy mesophyll ; guard cells ; (upper / lower) epidermal cells ;  AVP ;	2 max	<b>Mark the first two answers.</b> If two correct responses are given followed by one or two incorrect responses or which contradict the correct answers then = <b>1 or 0 marks</b>  e.g. parenchyma, collenchyma, sclerenchyma
		<b>Total</b>	<b>10</b>	



Question		Expected Answers	Marks	Additional Guidance
6	(a)	$14\,000 / 120 = 117\ \mu\text{m} ; ;$	2	<p>length of line A-B = 14mm / 14000 <math>\mu\text{m}</math></p> <p>Correct answer = 2 marks.            Allow one mark if correct working shown including units for cm &amp; mm            e.g. 1.4 cm / 120            14 mm / 120            14000 / 120</p> <p>If answer = 125 <math>\mu\text{m}</math> allow one mark for correct working but incorrect measurement (15mm instead of 14)</p> <p>Allow one mark if not rounded to nearest micrometre</p>
	(b)	<p><b>F ;</b></p> <p><b>A ;</b></p> <p><b>B or D ;</b></p> <p><b>E ;</b></p>	4	

Question		Expected Answers	Marks	Additional Guidance
	(c) (i)	a line drawn across the ventricles ;	1	<p>ACCEPT any line between those shown below</p> 
	(ii)	<p>K = right ventricle ;</p> <p>L = (interventricular) septum ;</p> <p>M = (left) ventricle wall / cardiac muscle / myocardium ;</p>	3	<p>ACCEPT septem</p> <p>IGNORE ventricle</p>
<b>Total</b>			<b>10</b>	

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