

## GCE

# Biology

Unit F211: Cells, Exchange and Transport

Advanced Subsidiary GCE

### Mark Scheme for June 2014

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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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These are the annotations, (including abbreviations), including those used in scoris, which are used when marking

Annotation	Meaning of annotation
✓	Tick
×	Cross
BP	Blank Page – this annotation <b>must</b> be used on all blank pages within an answer booklet (structured or unstructured) and on each page of an additional object where there is no candidate response.
BOD	Benefit of doubt use sparingly
SEEN	Noted but no credit given
<b>A</b>	Omission
Green blob	To denote term for QWC
NBOD	Not benefit of doubt
Red squiggly underline	Incorrect statement / word

### Mark Scheme

June 2014

Q	uesti	on	Answer	Mark	Guidance
1	(a)	(i)		2 max	Mark the first answer on each prompt line. If the answer is correct and a further answer is given that is incorrect or contradicts the correct answer then = 0 marks
			cellulose / cell, wall ;		DO NOT CREDIT wall unqualified, DO NOT CREDIT if incorrect compound e.g peptidoglycan / chitin
			chloroplast(s);		
			starch grain(s) / amyloplast(s) ; large / permanent, vacuole ;		IGNORE plastid IGNORE vacuole alone – must be qualified as large or
			large / permanent, vacuole,		permanent
			tonoplast;		
			plasmodesma(ta);		
		(ii)		1	Mark the first answer. If the answer is correct and a further answer is given that is incorrect or contradicts the correct answer then = 0 marks
			centriole / glycogen granule ;		ACCEPT lysosomes, cilia, flagella
		(iii)		3 max	IGNORE 'movement of, cell / membrane' unqualified
			1 (whole) cell, support / stability / scaffolding / maintain shape ;		IGNORE strength / structure / rigid
			2 movement of, cilia / flagella / undulipodia OR use of cilia / flagellum / undulipodium to move cell ;		IGNORE make up cilia / flagella
			3 changing shape of cell / cytokinesis / pseudopodia / phagocytosis / endocytosis / exocytosis / muscle contraction;		ACCEPT descriptions
					ACCEPT movement of vesicle
			4 (named) organelles, moved / held in place;		IGNORE movement of substances / materials
			E movement of obromonomen ( obromotide / /m)DNA -		ACCEPT formation of spindle / centrioles
			5 movement of, chromosomes / chromatids / (m)RNA ;		

Question	Answer	Mark	Guidance
(b)		4 max	Max 4 marks for content Look for name of organelle and its function / role ACCEPT enzyme / protease for protein MAX 3 if answer refers to insulin or incorrect protein
	1 <u>nucleus</u> , contains gene (for protein) / site of <b>transcription</b> / produces <u>m</u> RNA ;		ACCEPT DNA / genetic material / genetic information for 'gene' IGNORE 'mRNA leaves nucleus'
	2 ribosomes / rough endoplasmic reticulum / RER, site of, protein synthesis / translation ;		ACCEPT description of assembling a <i>chain</i> of amino acids
	3 <b>vesicles</b> for transport (of protein) ;		mp3 can be awarded either for transport between ER and Golgi or between Golgi and Plasma membrane
	4 Golgi (apparatus / body), processes / modifies / (re)packages, proteins ;		E.G. tertiary folding / quaternary structure / carbohydrate added / converted to glycoprotein / placed in vesicles <b>IGNORE</b> ref to RER
	5 (vesicles) fuse to, <b>cell surface</b> / <b>plasma, membrane ;</b>		IGNORE binds / attach / joins IGNORE exocytosis IGNORE ref to vesicles leaving cell ACCEPT merges with / becomes part of
	QWC ;	1	Any two technical terms from the list below used appropriately and spelled correctly : ribosomes rough endoplasmic reticulum (NOT RER for QWC) transcription (and derivatives) translation (and derivatives) golgi vesicles
			plasma membrane / cell surface membrane
	Total	11	

Q	luesti	on	Answer	Mark	Guidance
					<b>DO NOT ALLOW</b> marks for use of just 'oxygen' in place of 'air' throughout question 2
2	(a)		<ol> <li>volume, inside / of, jar increases ;</li> <li><u>pressure</u> inside, jar / balloons, decreases ;</li> </ol>	3 max	IGNORE references to chest / lungs
			3 to below pressure in atmosphere ;		CREDIT idea of creating a pressure gradient (between balloon and exterior) IGNORE hydrostatic Note: 'makes pressure in jar lower than atmosphere' = 2 marks
			4 (therefore) air, moves / pushed / forced, into, balloons / glass tube ;		ACCEPT flows / enter / fills DO NOT CREDIT suction / drawn / pulled in / diffuse in / taken in IGNORE just into bell jar
	(b)	(i)	volume of air, inhaled / exhaled ; in, one / each, breath ;	2 max	ACCEPT breathed / moved, in (and / or out of lungs) IGNORE amount
			during, steady / regular, breathing ;		ACCEPT at rest / during steady exercise / normal / quiet breathing
		(ii)	up / down, movements (of rubber sheet / band) ;	2	ACCEPT pull / push on rubber sheet / band ACCEPT pull / push and let go
			<i>idea of:</i> small / steady / regular, movements (of rubber sheet) ;		ACCEPT rhythmically / in time with breathing / repetitively IGNORE gently Note: pulled down slightly = 2 marks

C	uestion	Answer		Guidance
	(iii)	the maximum <u>volume</u> of air ; inhaled / exhaled, in one breath ;	2	<ul> <li>ACCEPT tidal volume + inspiratory reserve + expiratory reserve = 2</li> <li>ACCEPT total lung capacity – residual volume = 1 mark IGNORE total volume</li> <li>ACCEPT breathed, in / out, in one breath DO NOT CREDIT held in lungs or max vol in lungs DO NOT CREDIT breathed in and out in one breath</li> </ul>
	(iv)	<i>idea that</i> pulled down on rubber, sheet / band, as far as possible <b>and</b> pushed up as far as possible ;	1	ACCEPT pull / push in either order ACCEPT pull and push as hard as possible
		Total	10	

C	Questic	on	Answer	Mark	Guidance
3	(a)		gap(s) between <u>endotheli</u> um cells (too) small ;	2 max	IGNORE holes in wall ACCEPT pores / fenestrations too small
			(erythrocytes) too large / cannot change shape (much);		Look for idea that they are <b>too</b> big not just big <b>ACCEPT</b> not small enough
			to, fit / move / pass, between (endothelium) cells <b>OR</b> through, gaps / pores / fenestrations;		ACCEPT squeeze DO NOT CREDIT diffusion of cells IGNORE to pass through capillary wall (it is in question and we want to know how they get through)
					<b>Note:</b> too big to pass through gaps = 2 marks (mp2 & 3)
	(b)		1 (haemoglobin has) <u>high</u> affinity for oxygen;	3 max	
			2 oxygen binds to haemoglobin in, lungs / alveoli / high $pO_2$ ;		ACCEPT high, oxygen tension / concentration ACCEPT attaches / combines / loads / associates / becomes more saturated IGNORE picks up / oxygenated DO NOT CREDIT reacts with
			3 <u>oxyhaemoglobin</u> ;		
			4 oxygen released, in tissues / where needed / where pO <sub>2</sub> is low / where respiration is occurring ;		ACCEPT unloads / dissociates from Hb Note: do not give a mark for ' <i>oxygen</i> dissociates' as this implies oxygen is forming ions / atoms ACCEPT low, oxygen tension / concentration IGNORE gives up / drops off IGNORE ref to high carbon dioxide concentration

Questi	ion	Answer	Mark	Guidance
(c)	(i)		3 max	<b>CREDIT</b> mark points taken from equations or flow charts e.g.
				$CO_2 + H_2O \rightarrow H_2CO_3 \rightarrow H^+ + HCO_3^-$ this = mp 2 & 4
				to award mp 3 & 5 correctly located annotations needed
				ACCEPT correct symbols and formulae throughout (but NOT for QWC mark)
				<b>CON</b> If name and formula contradict e.g. hydrogencarbonate ions = $H_2CO_3$
		1 carbon dioxide, enters / diffuses into, erythrocytes ;		ACCEPT red blood cells
		2 (carbon dioxide) combines / reacts, with water ;		
		3 correct ref to carbonic anhydrase;		Note: correct context is it catalyses, combination of carbon dioxide and water / formation of carbonic acid IGNORE if linked to dissociation of carbonic acid
		4 forms carbonic acid ;		IGNORE carbolic/carboxylic
		5 (carbonic acid) <b>dissociates</b> to form hydrogencarbonate ions <i>and,</i> <b>hydrogen ions</b> / <b>protons ;</b>		ACCEPT splits / broken down ACCEPT bicarbonate ions Note: both products must be ions produced from dissociation of a compound (not dissociation of hydrogencarbonate ions)
		QWC ;	1	Any two technical terms from the list below used appropriately and spelled correctly : carbonic acid carbonic anhydrase, dissociates (or derivatives of this word) hydrogen ions / protons

Question	Answer	Mark	Guidance
(ii)	Name 1 Bohr (effect / shift) ;	3 max	Maximum 2 marks if effect not named correctly           ACCEPT phonetic spelling
	Explanation (any 2 of the following marks)		
	2 reduces affinity (of Hb) for oxygen ;		IGNORE ref to 'curve shifting'
	3 formation of haemoglobinic acid / hydrogen ions interact with haemoglobin ;		ACCEPT hydrogen ions, combine / bind, with Hb ACCEPT HHb for haemoglobinic acid ACCEPT $H^* + Hb \rightarrow HHb$
	4 prevents, fall in pH / build-up of H <sup>+</sup> , in cells <b>OR</b> provides buffering effect ;		
	5 alter, structure / shape, of haemoglobin ;		
	6 <i>more</i> oxygen released where, needed / more respiration / carbon dioxide concentration high ;		ACCEPT causes more oxygen to leave (oxy)haemoglobin / higher levels of oxygen released IGNORE ref to oxygen released more quickly or more easily Note: do not give a mark for 'more oxygen dissociates' as this implies oxygen is forming ions / atoms
	7 CO <sub>2</sub> binds to haemoglobin forming carb <u>amino</u> haemoglobin ;		(as this explains reduced oxygen transport)
	Total	12	

C	Questi	on	Answer	Mark	Guidance
4	(a)	(i)	letter <b>X</b> marking upper part of vascular bundle <u>and</u> letter <b>P</b> marking lower part of vascular bundle ;	1	ACCEPT Xylem & Phloem DO NOT CREDIT Y
		(ii)	vascular bundle / vein ;	1	IGNORE tissue / midrib
	(b)	(i)	(the charged particles are) hydrogen ions / H <sup>+</sup> / protons ; (ions are) moved out of the cells / move into surrounding (solution) ;	2	IGNORE descriptions of observations 2 and / or 3 IGNORE ref to OH <sup>-</sup> / alkaline substances Note do not need to refer to hydrogen ions for mp 2 Note that 'hydrogen ions move out of the cell' = 2 marks
					Note that hydrogen lons move out of the cell – 2 marks
		(ii)	active transport involved / cyanide prevents active transport / (mechanism) is active / (mechanism) needs energy / (mechanism) needs ATP ;	1	IGNORE descriptions of observation 4 e.g. no ATP is made IGNORE 'mechanism / active loading, does not work in presence of cyanide' as too vague
	(c)	(i)	active transport ; concentration / pH / H <sup>+</sup> / proton / electrochemical ; facilitated ; diffusion ;	5	Mark the first answer. If the answer is correct and a further answer is given that is incorrect or contradicts the correct answer then = 0 marks IGNORE active loadingIGNORE highDO NOT ACCEPT diffusionACCEPT facilitated diffusionACCEPT plasmodesmata DO NOT CREDIT facilitated diffusion
			amino acids ;		DO NOT CREDIT glucose / fructose / ions

(	Question	Answer		Guidance
	(ii)	many / large, <u>mitochondria</u> ;	2	
		plasmodesmata (between companion cell and sieve tube) / described ;		
		many ribosomes / extensive RER ;		
		many proteins in the, plasma / cell surface, membrane ;		IGNORE qualification of type of protein
		Total	12	

C	Questi	ion	Answer	Mark	Guidance
5	(a)	(i)	mitosis ;	1	CREDIT correct spelling only ACCEPT binary fission
		(ii)	in the grex / 3 ;	1	
	(b)	(i)	cell signalling;	1	
		(ii)		2 max	<b>NOTE</b> must name the chemical involved for description (except mp 3 coordinated movement)
			1 attraction of cell(s) to folic acid from bacteria;		ACCEPT attraction of cells to bacteria by folic acid
			2 attraction of cells to each other by cAMP;		IGNORE makes cells stick together
			3 coordinated movement in grex;		
			4 differentiation / described, of (grex / slime mould) <u>cells</u> in response to DIF;		
		(iii)	contains , receptors / glycoproteins / glycolipids / glycocalyx ;	2	DO NOT CREDIT consists of receptors
			for , folic acid / cAMP / DIF ;		
	(c)		17 (hours) ;	1	
			Total	8	

Question		Answer	Mark	Guidance
6				Mark the first answer for each question part. If the answer is correct and a further answer is given that is incorrect or contradicts the correct answer then = 0 marks
	(a)	homologous (chromosomes) <b>OR</b> homologue(s) ;	1	IGNORE bivalent
	(b)	(organ) <u>system</u> ;	1	<b>DO NOT CREDIT</b> specific named system unless given as example
	(c)	<u>open</u> (circulatory system) ;	1	
	(d)	meiosis;	1	CREDIT correct spelling only
	(e)	ultrastructure;	1	
	(f)	apoplast / apoplastic;	1	
	(g)	exocytosis;	1	DO NOT CREDIT endocytosis / mass flow IGNORE bulk flow
		Total	7	

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