

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
	Blank Page – this annotation must 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.
	Benefit of doubt use sparingly
	Noted but no credit given
	Omission
Green blob	To denote term for QWC
NBOD	Not benefit of doubt
Red squiggly underline	Incorrect statement / word

Question			Answer	Mark	Guidance
1	(a)	(i)	<p>cellulose / cell, wall ;</p> <p>chloroplast(s) ; starch grain(s) / amyloplast(s) ; large / permanent, vacuole ;</p> <p>tonoplast ; plasmodesma(ta) ;</p>	2 max	<p>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</p> <p>DO NOT CREDIT wall unqualified, DO NOT CREDIT if incorrect compound e.g peptidoglycan / chitin</p> <p>IGNORE plastid IGNORE vacuole alone – must be qualified as large or permanent</p>
		(ii)	<p>centriole / glycogen granule ;</p>	1	<p>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</p> <p>ACCEPT lysosomes, cilia, flagella</p>
		(iii)	<p>1 (whole) cell, support / stability / scaffolding / maintain shape ;</p> <p>2 movement of, cilia / flagella / undulipodia OR use of cilia / flagellum / undulipodium to move cell ;</p> <p>3 changing shape of cell / cytokinesis / pseudopodia / phagocytosis / endocytosis / exocytosis / muscle contraction ;</p> <p>4 (named) organelles, moved / held in place ;</p> <p>5 movement of, chromosomes / chromatids / (m)RNA ;</p>	3 max	<p>IGNORE 'movement of, cell / membrane' unqualified</p> <p>IGNORE strength / structure / rigid</p> <p>IGNORE make up cilia / flagella</p> <p>ACCEPT descriptions</p> <p>ACCEPT movement of vesicle IGNORE movement of substances / materials</p> <p>ACCEPT formation of spindle / centrioles</p>

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

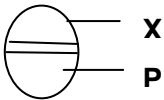
Question		Answer	Mark	Guidance		
				DO NOT ALLOW marks for use of just 'oxygen' in place of 'air' throughout question 2		
2	(a)	<p>1 <u>volume</u>, inside / of, jar increases ;</p> <p>2 <u>pressure</u> inside, jar / balloons, decreases ;</p> <p>3 to below pressure in atmosphere ;</p> <p>4 (therefore) air, moves / pushed / forced, into, balloons / glass tube ;</p>	3 max	<p>IGNORE references to chest / lungs</p> <p>CREDIT idea of creating a pressure gradient (between balloon and exterior)</p> <p>IGNORE hydrostatic</p> <p>Note: 'makes pressure in jar lower than atmosphere' = 2 marks</p> <p>ACCEPT flows / enter / fills</p> <p>DO NOT CREDIT suction / drawn / pulled in / diffuse in / taken in</p> <p>IGNORE <i>just</i> into bell jar</p>		
	(b)	(i)		<p><u>volume</u> of air, inhaled / exhaled ;</p> <p>in, one / each, breath ;</p> <p>during, steady / regular, breathing ;</p>	2 max	<p>ACCEPT breathed / moved, in (and / or out of lungs)</p> <p>IGNORE amount</p> <p>ACCEPT at rest / during steady exercise / normal / quiet breathing</p>
		(ii)		<p>up / down, movements (of rubber sheet / band) ;</p> <p><i>idea of:</i> small / steady / regular, movements (of rubber sheet) ;</p>	2	<p>ACCEPT pull / push on rubber sheet / band</p> <p>ACCEPT pull / push and let go</p> <p>ACCEPT rhythmically / in time with breathing / repetitively</p> <p>IGNORE gently</p> <p>Note: pulled down slightly = 2 marks</p>

Question		Answer	Mark	Guidance
	(iii)	the maximum <u>volume</u> of air ; inhaled / exhaled, in one breath ;	2	ACCEPT tidal volume + inspiratory reserve + expiratory reserve = 2 ACCEPT total lung capacity – residual volume = 1 mark IGNORE total volume 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
	(iv)	idea that pulled down on rubber, sheet / band, as far as possible and pushed up as far as possible ;	1	ACCEPT pull / push in either order ACCEPT pull and push as hard as possible
Total			10	

Question		Answer	Mark	Guidance
3	(a)	<p>gap(s) between <u>endothelium</u> cells (too) small ;</p> <p>(erythrocytes) too large / cannot change shape (much) ;</p> <p>to, fit / move / pass, between (endothelium) cells OR through, gaps / pores / fenestrations;</p>	2 max	<p>IGNORE holes in wall ACCEPT pores / fenestrations too small</p> <p>Look for idea that they are too big not just big ACCEPT not small enough</p> <p>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)</p> <p>Note: too big to pass through gaps = 2 marks (mp2 & 3)</p>
	(b)	<p>1 (haemoglobin has) <u>high</u> affinity for oxygen ;</p> <p>2 oxygen binds to haemoglobin in, lungs / alveoli / high pO_2 ;</p> <p>3 <u>oxyhaemoglobin</u> ;</p> <p>4 oxygen released, in tissues / where needed / where pO_2 is low / where respiration is occurring ;</p>	3 max	<p>ACCEPT haem group / iron ions for haemoglobin</p> <p>ACCEPT high, oxygen tension / concentration ACCEPT attaches / combines / loads / associates / becomes <u>more</u> saturated IGNORE picks up / oxygenated DO NOT CREDIT reacts with</p> <p>ACCEPT unloads / dissociates from Hb Note: do not give a mark for 'oxygen 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</p>

Question		Answer	Mark	Guidance
(c)	(i)	<p>1 carbon dioxide, enters / diffuses into, erythrocytes ;</p> <p>2 (carbon dioxide) combines / reacts, with water ;</p> <p>3 correct ref to carbonic anhydrase;</p> <p>4 forms carbonic acid ;</p> <p>5 (carbonic acid) dissociates to form hydrogencarbonate ions <i>and</i>, hydrogen ions / protons ;</p>	3 max	<p>CREDIT mark points taken from equations or flow charts e.g. $\text{CO}_2 + \text{H}_2\text{O} \rightarrow \text{H}_2\text{CO}_3 \rightarrow \text{H}^+ + \text{HCO}_3^-$ this = mp 2 & 4 to award mp 3 & 5 correctly located annotations needed</p> <p>ACCEPT correct symbols and formulae throughout (but NOT for QWC mark) CON If name and formula contradict e.g. hydrogencarbonate ions = H_2CO_3</p> <p>ACCEPT red blood cells</p> <p>Note: correct context is it catalyses, combination of carbon dioxide and water / formation of carbonic acid IGNORE if linked to dissociation of carbonic acid</p> <p>IGNORE carbolic/carboxylic</p> <p>ACCEPT splits / broken down ACCEPT bicarbonate ions Note: both products must be ions produced from dissociation of a compound (not dissociation of hydrogencarbonate ions)</p>
		QWC ;	1	<p>Any two technical terms from the list below used appropriately and spelled correctly :</p> <p>carbonic acid carbonic anhydrase, dissociates (or derivatives of this word) hydrogen ions / protons</p>

Question	Answer	Mark	Guidance
(ii)	<p><i>Name</i></p> <p>1 Bohr (effect / shift) ;</p> <p><i>Explanation (any 2 of the following marks)</i></p> <p>2 reduces <u>affinity</u> (of Hb) for oxygen ;</p> <p>3 formation of haemoglobinic acid / hydrogen ions interact with haemoglobin ;</p> <p>4 prevents, fall in pH / build-up of H⁺, in cells OR provides buffering effect ;</p> <p>5 alter, structure / shape, of haemoglobin ;</p> <p>6 more oxygen released where, needed / more respiration / carbon dioxide concentration high ;</p> <p>7 CO₂ binds to haemoglobin forming <u>carbaminohaemoglobin</u> ;</p>	3 max	<p>Maximum 2 marks if effect not named correctly</p> <p>ACCEPT phonetic spelling</p> <p>IGNORE ref to 'curve shifting'</p> <p>ACCEPT hydrogen ions, combine / bind, with Hb ACCEPT HHb for haemoglobinic acid ACCEPT H⁺ + Hb → HHb</p> <p>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</p> <p>(as this explains reduced oxygen transport)</p>
	Total	12	

Question			Answer	Mark	Guidance
4	(a)	(i)	letter X marking upper part of vascular bundle and letter P 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 ⁺ / 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 ⁻ / 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
		(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 ⁺ / proton / electrochemical ; facilitated ; diffusion ; amino acids ;	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 loading IGNORE high DO NOT ACCEPT diffusion ACCEPT facilitated diffusion ACCEPT plasmodesmata DO NOT CREDIT facilitated diffusion DO NOT CREDIT glucose / fructose / ions

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

Question			Answer	Mark	Guidance
5	(a)	(i)	mitosis ;	1	CREDIT correct spelling only ACCEPT binary fission
		(ii)	in the grex / 3 ;	1	
	(b)	(i)	<u>cell signalling</u> ;	1	
		(ii)	1 attraction of <u>cell(s)</u> to folic acid from bacteria ; 2 attraction of <u>cells</u> to each other by cAMP ; 3 coordinated movement in grex ; 4 differentiation / described, of (grex / slime mould) <u>cells</u> in response to DIF ;	2 max	NOTE must name the chemical involved for description (except mp 3 coordinated movement) ACCEPT attraction of cells to bacteria by folic acid IGNORE makes cells stick together
		(iii)	contains , receptors / glycoproteins / glycolipids / glycocalyx ; for , folic acid / cAMP / DIF ;	2	DO NOT CREDIT <i>consists</i> of receptors
	(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)	<u>homologous</u> (chromosomes) OR homologue(s) ;	1	IGNORE bivalent
	(b)	(organ) <u>system</u> ;	1	DO NOT CREDIT specific named system unless given as example
	(c)	<u>open</u> (circulatory system) ;	1	
	(d)	<u>meiosis</u> ;	1	CREDIT correct spelling only
	(e)	<u>ultrastructure</u> ;	1	
	(f)	<u>apoplast / apoplastic</u> ;	1	
	(g)	<u>exocytosis</u> ;	1	DO NOT CREDIT endocytosis / mass flow IGNORE bulk flow
		Total	7	

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