OCR
Oxford Cambridge and RSA

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.

OCR will not enter into any discussion or correspondence in connection with this mark scheme.

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

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 nucleus **,** contains gene (for protein) / site of **transcription** / produces mRNA **;**		**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 *chain* of amino acids
	3 **vesicles** 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 **IGNORE** ref to RER
	5 (vesicles) fuse to, **cell surface** / **plasma, membrane ;**		**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**	

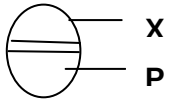
Question			Answer	Mark	Guidance
					DO NOT ALLOW marks for use of just 'oxygen' in place of 'air' throughout question 2
2	**(a)**		1 <u>volume</u>, inside / of, jar increases **;** 2 <u>pressure</u> inside, jar / balloons, decreases **;** 3 to below pressure in atmosphere **;** 4 (therefore) air, moves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

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

Question			Answer	Mark	Guidance
	(c)	(i)		3 max	**CREDIT** 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) **CON** 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) **dissociates** to form hydrogencarbonate ions *and,* **hydrogen ions** / **protons ;**		**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) **;** *Explanation (**any 2** of the following marks)* 2 reduces <u>affinity</u> (of Hb) for oxygen **;** 3 formation of haemoglobinic acid / hydrogen ions interact with haemoglobin **;** 4 prevents, fall in pH / build-up of H^+, in cells **OR** provides buffering effect **;** 5 alter, structure / shape, of haemoglobin **;** 6 ***more*** oxygen released where, needed / more respiration / carbon dioxide concentration high **;** 7 CO_2 binds to haemoglobin forming carb<u>amino</u>haemoglobin **;**	3 max	**Maximum 2 marks if effect not named correctly** **ACCEPT** phonetic spelling **IGNORE** ref to 'curve shifting' **ACCEPT** hydrogen ions, combine / bind, with Hb **ACCEPT** HHb for haemoglobinic acid **ACCEPT** $H^+ + Hb \rightarrow HHb$ **ACCEPT** causes **more** oxygen to leave (oxy)haemoglobin / high**er** 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 (as this explains reduced oxygen transport)
			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)	cell signalling **;**	1	
		(ii)	1 attraction of cell(s) to folic acid from bacteria **;** 2 attraction of cells to each other by cAMP **;** 3 coordinated movement in grex **;** 4 differentiation / described, of (grex / slime mould) cells 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** *consists* 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)		homologous (chromosomes) **OR** homologue(s) **;**	1	**IGNORE** bivalent
	(b)		(organ) system **;**	1	**DO NOT CREDIT** specific named system unless given as example
	(c)		open (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**	

OCR (Oxford Cambridge and RSA Examinations)
1 Hills Road
Cambridge
CB1 2EU

OCR Customer Contact Centre

Education and Learning
Telephone: 01223 553998
Facsimile: 01223 552627
Email: general.qualifications@ocr.org.uk

www.ocr.org.uk

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Facsimile: 01223 552553