OCR
RECOGNISING ACHIEVEMENT

GCE

Biology

Advanced GCE

Unit **F214:** Communication, Homeostasis & Energy

Mark Scheme for June 2011

Oxford Cambridge and RSA Examinations

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Question	Expected Answer	Mark	Additional Guidance
In ALL questions	**CREDIT AW throughout** i.e. credit any alternatively worded statement that conveys the same sense as the whole mark point. If a particular word is essential and no other will do it is underlined. **ACCEPT** incorrect spellings if they are recognisable and sound the same when pronounced, even for underlined terms. If correct spelling is essential, this will be indicated in the Additional Guidance. For QWC marks, correct spelling **and** context are necessary. **IGNORE** wrong or vague statements unless Additional Guidance states **DO NOT CREDIT**, in which case the mark point is not awarded.		

Question			Expected Answer	Mark	Additional Guidance
1	(a)			3	**Award 1 mark for each correct side by side comparison.** Comparative statements **must** be made on the same row. **ALLOW two valid comparisons in the same pair of boxes, e.g** Cell body at end of neurone in the CNS | Cell body in middle and in the PNS **= 2 marks** mps 2, 3 and 4 can be taken from a labelled diagram All mps can be taken from annotated diagrams

	motor neurone	*sensory neurone*	
1	cell body in CNS	cell body **,** not in CNS / in PNS	;
2	cell body at end (of neurone)	cell body **,** not at end / in middle (of neurone)	;
3	dendrites connect directly to cell body	dendrites do not connect directly to cell body **or** dendrites at the end(s) of **,** dendron / axon	;
4	long(er) axon	short(er) axon	;
5	dendron absent / no dendron	dendron present	;
6	ends at motor end plate	starts at / connects to **,** (sensory) receptor	;

Question			Expected Answer	Mark	Additional Guidance
1	(b)				**Mark the first answer on each prompt line.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then **= 0 marks**
			1 **-** 60 to **-**70 **;**		***1*** **ACCEPT** any single figure or range (within this range) Must be a negative number
			2 depolarisation **;**		
			3 <u>threshold potential</u> / <u>threshold value</u> **;**		
			4 all or nothing **;**		***4*** **ALLOW** all or none
			5 size / magnitude **;**		***5*** **ALLOW** amplitude **DO NOT CREDIT** intensity / strength / value / potential difference / voltage
			6 <u>frequency</u> **;**	**6**	
			Total	**9**	

Question			Expected Answer	Mark	Additional Guidance
2	(a)	(i)	0.0017 ; ;	2	• Correct answer, given to 4 dp = 2 marks • If answer **not** shown on answer line, **CREDIT** correct answer written in the appropriate space in the table. • If answer is incorrectly rounded **or** rounded to the wrong number of dp **or** written in standard form (1.7×10^{-3}) then award 1 working mark • If answer is incorrect then award 1 working mark for seeing $1 \div 576$ **or** $1 \div 24^2$
2	(a)	(ii)	**1** (internal) radius / diameter **,** of capillary tube **;** **2** cross-sectional area (of capillary tube) **;** **3** (use) $\pi r^2 h$ **;**	**1 max**	***1*** **ACCEPT** radius / diameter **,** of bubble **ACCEPT** width of tube ***2*** **ACCEPT** cross-sectional area of bubble
2	(a)	(iii)	**1** (sodium) hydrogen carbonate **;** **2** bubble in **,** CO_2 / exhaled air **;** **3** dry ice **;**	**1 max**	***1*** **ACCEPT** bicarbonate **DO NOT CREDIT** carbonate

Question			Expected Answer	Mark	Additional Guidance
2	(b)	(i)	*idea that some of the oxygen* **1** would dissolve in the water **;** **2** used in **,** respiration / oxidative phosphorylation **;** **3** may escape the collection apparatus **;** **4** trapped in **,** a bubble attached to / air spaces in **,** the leaf **;**	**2 max**	***1*** **IGNORE** 'oxygen is in the water' **2** **IGNORE** produces energy
2	(b)	(ii)	**1** (nitrogen) was present in the air (spaces) in the **,** leaf / plant **;** **2** (nitrogen) leaves the plant with the oxygen **;** **3** *idea that* (nitrogen) comes out of solution / 'undissolved' (as less soluble in warm water) **;**	**1 max**	
2	(b)	(iii)	**1** higher than **,** expected / normal / in atmosphere **;** **2** (plant is) respiring / produces CO_2 during respiration **;** **3** CO_2 **,** has been added to water / is present in excess **;** **4** (CO_2) comes out of solution / 'undissolved' (as less soluble in warm water) **;** **5** less / low(er) **,** as some CO_2 will dissolve in **,** water / solution **;** **6** less / low(er) **,** as CO_2 used in photosynthesis **;**	**3 max**	***2*** **IGNORE** produces energy ***5*** **DO NOT CREDIT** if in context of lower than O_2 and N_2 ***6*** **DO NOT CREDIT** if in context of lower than O_2 and N_2

Question			Expected Answer	Mark	Additional Guidance
2	(c)		*intensity* **1** in deeper water there is , less / lower **,** light <u>intensity</u> **;** **2** (these pigments) can absorb what (little) light there is **;** *wavelength* **3** not all wavelengths of light can penetrate **or** mainly shorter wavelengths can penetrate **or** (mostly) blue light (450 – 520 nm) penetrates **;** **4** (these pigments) can absorb wavelengths of light that can penetrate (deeper water) **;**	**2 max**	**IGNORE** ref to photosynthesis (as 'photosynthetic' stated in Q) ***2*** **ACCEPT** trap / harvest / capture **IGNORE** use / collect ***3*** idea of restricted range of wavelengths able to penetrate (rather than wavelengths are different) **ACCEPT** '**higher** frequency' instead of '**shorter** wavelength' ***4*** **ACCEPT** trap / harvest / capture **IGNORE** use / collect
			Total	**12**	

Question			Expected Answer	Mark	Additional Guidance
3	(a)		**1** less ventilation / *Idea of* difficulty in exhaling due to less recoil / small surface area for gaseous exchange / less oxygen entering capillaries / less oxygen entering blood ; **2** less oxygen (reaching cells) for , (aerobic) respiration / oxidative phosphorylation ; **3** (so) less ATP produced ; **4** *idea of* increased acidity (as CO_2 / lactate builds up) interfering with / affects , enzymes / respiratory metabolism ;	**2 max**	**IGNORE '**produces' energy in any mark point ***1*** **DO NOT CREDIT no** oxygen ***2*** **DO NOT CREDIT no** respiration ***3*** **DO NOT CREDIT no** ATP
3	(b)		**1** not enough / less , glucose uptake into cells ; **2** not enough / less , glucose / substrate , for , respiration / ATP production ; **3** glucose not , stored as / converted to , glycogen ;	**2 max**	**ACCEPT** 'sugar' for glucose **IGNORE** (excess) glucose lost in urine (as does not answer the Q) **Only CREDIT ora** if candidate clearly states that the sequence of events does **not** happen in this case ***1*** **DO NOT CREDIT no** glucose uptake ***2*** **IGNORE** produces energy **DO NOT CREDIT no** respiration / **no** ATP / **no** glucose

Question			Expected Answer	Mark	Additional Guidance
3	(c)				**IGNORE '**produces' energy in any mark point
			1 *idea of* slow rate of / sluggish **,** blood flow **or** low(er) blood pressure **;**		***1*** **IGNORE** 'heart doesn't beat strongly enough' or 'heart beat is inefficient' **IGNORE** ref to volume of blood without time/rate
			2 less / irregular amount of **,** oxygen (reaching cells) for **,** (aerobic) respiration / oxidative phosphorylation **;**		***2*** **DO NOT CREDIT** **no** oxygen / **no** respiration
			3 less glucose (reaching cells) for respiration **;**		***3*** **IGNORE** sugar **DO NOT CREDIT** **no** glucose / **no** respiration
			4 (so) less ATP produced **;**		***4*** **DO NOT CREDIT** **no** ATP
			5 *idea of* increased acidity (as CO_2 / lactate builds up) interfering with / affects **,** enzymes / respiratory metabolism **;**	**2 max**	

Question			Expected Answer	Mark	Additional Guidance
3	(d)	(i)	**1** less pyruvate for **,** link reaction / Krebs cycle **or** link reaction / Krebs cycle **,** cannot take place / reduced **or** only / mainly **,** glycolysis takes place **;** **2** no / little **,** oxidative phosphorylation **;** **3** less **,** energy / ATP **,** for muscle contraction / resulting in muscle weakness / for mental processes **;** **4** <u>anaerobic</u> respiration takes place **;** **5** lactate / decrease in pH **,** causing aching muscles **;** **3 max**	*2* **IGNORE** produces energy *3* **DO NOT CREDIT no** ATP **IGNORE** produces energy **IGNORE** muscle fatigue *5* **CREDIT** 'lactic acid' instead of 'lactate' **ACCEPT** muscle cramps
3	(d)	(ii)	**1** *idea that* B lymphocytes do not respond to cytokines (that have been produced) **;** **2** little **,** energy / ATP **,** for B cell **,** mitosis / clonal expansion **;** **3** little **,** energy / ATP **,** for **,** production / release **,** of antibodies **;** **1 max**	
			Total	**10**	

Question			Expected Answer	Mark	Additional Guidance
4	(a)	(i)	islet(s) of Langerhans ;	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then **= 0 marks** **ACCEPT** α and β cells in islets of Langerhans **DO NOT CREDIT** α cells in islets of Langerhans **DO NOT CREDIT** β cells in islets of Langerhans

Question			Expected Answer	Mark	Additional Guidance
4	(a)	(ii)	use ✓1 *endocrine* **H1** **hormone**(s) released directly into blood ; **H2** **beta** / β , cells , secrete / produce / release , insulin ; **H3** **alpha** / α , cells , secrete / produce / release , **glucagon** ; **H4** **islet /** α and β , cells , detect / monitor , blood glucose concentration ; **3 max** use ✓2 *exocrine* **E1** fluid / juice / secretion / enzymes , released into duct ; **E2** (release triggered by) nervous / hormonal , stimulation ; **E3** **pancreatic** secretions into , gut / small intestine / **duodenum** ; **E4** alkaline / pH 8 / (sodium) hydrogen carbonate ; **E5** containing **2** named **enzyme**(s) ; **3 max**	**4 max**	**If endocrine and exocrine terms are muddled, then ignore endocrine and exocrine refs but only award max 2 for both sections and do not award the QWC mark.** ***H1*** **DO NOT CREDIT** carried / transported , in ***H2*** **ACCEPT** b cells ***H3*** **ACCEPT** a cells **DO NOT CREDIT** incorrect spelling of glucagon ***H4*** **ACCEPT** a and b cells α cells and β cells secrete glucagon and insulin = **2 marks** α cells and β cells secrete insulin and glucagon = **0 marks** ***E1*** **IGNORE** substances **DO NOT CREDIT** carried / transported , in ***E5*** **CREDIT** 2 enzymes but no more than 1 enzyme from each bullet point • lipase • **amylase** / carbohydrase • **trypsin** / **chymotrypsin** / protease / trypsinogen / chymotrypsinogen
			QWC – technical terms used appropriately with correct spelling ;	**1**	**Do not award if endocrine & exocrine are muddled.** Use of **3** terms from: **hormone**(s), **beta**, **alpha**, **glucagon**, **islet**(s), **pancreatic**, **duodenum**, **enzyme**(s), **amylase**, **trypsin**(ogen) / **chymotrypsin**(ogen) **You should use the GREEN DOT to identify the QWC terms that you are crediting.** **Please insert a QWC symbol next to the PENCIL ICON, followed by** **a tick (✓) if QWC has been awarded** **or a cross (×) if QWC has not been awarded**

Question			Expected Answer	Mark	Additional Guidance
4	(b)		**D A G H C F ; ; ; ;**	4	All letters in correct sequence = 4 marks If letters are **not all** in the correct sequence, then mark as follows: **D** at the beginning and **F** at the end = 1 mark **A** somewhere before **G** = 1 mark **G** somewhere before **H** = 1 mark **H** somewhere before **C** = 1 mark
4	(c)	(i)	**1** *idea of* plentiful / dependable **,** supply **;** **2** cheap **;** **3** not cruel to pigs / more ethical **;** **4** no religious objections / can be used by vegetarians **;** **5** reliable **,** quality / standard **;** **6** (exact match to) human insulin / no allergic reaction **;**	2	**Mark the first <u>two</u> advantages** ***1*** e.g. can meet demand / can be mass produced **IGNORE** ref to speed ***6*** **ACCEPT** ref to not spreading prions **IGNORE** spread of disease from pigs / no rejection **DO NOT CREDIT** genetically identical insulin
4	(c)	(ii)	**1** (has the potential to) cure / do more than manage **,** the condition **;** **2** long term effect / permanent / no need for repeated treatments **;**	1 max	***1*** e.g. no need to restrict diet ***2*** e.g. no need to inject insulin (regularly)
			Total	13	

Question			Expected Answer	Mark	Additional Guidance
5	(a)		**P** cortex **;** **Q** ureter **;**		**Mark the first answer for each letter.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then **= 0 marks** *Q* **Correct spelling only** **DO NOT CREDIT** incorrect spelling of ureter

Question			Expected Answer	Mark	Additional Guidance
5	(b)	(i)	**1** **ultrafiltration ;** **2** **afferent** arteriole is wider than **efferent** arteriole **;** **3** high **blood pressure** in glomerulus / high(er) **hydrostatic pressure** in glomerulus (than in Bowman's capsule) **;** **4** *idea that* **endothelium** / wall of capillary **,** has gaps to **,** allow / prevent **,** passage (of substances / cells) **;** **5** *idea that* **basement membrane** stops removal of **,** large molecules / cells **;** **6** **podocytes** / **epithelial** cells of Bowman's capsule **,** have (finger-like) projections / processes **;** **7** (projections) ensure gaps to allow passage (of substances) **;**	**3 max**	***4*** e.g. fenestrations in capillary wall don't allow red blood cells to leave **DO NOT CREDIT** cell walls of capillaries ***5*** e.g. basement membrane (only) allows small molecules to pass through
			QWC – technical terms used appropriately and spelt correctly **;**	**1**	Use of **3** terms in the correct context from: **afferent**, **efferent**, **blood pressure** / **hydrostatic pressure**, **endothelium** / **endothelial**, **basement membrane**, **podocyte(s)**, **epithelial** / **epithelium**, **ultrafiltration** **You should use the GREEN DOT to identify the QWC terms that you are crediting.** **Please insert a QWC symbol next to the PENCIL ICON, followed by** **a tick (✓) if QWC has been awarded** **or a cross (×) if QWC has not been awarded**

Question			Expected Answer	Mark	Additional Guidance
5	(b)	(ii)	**1** (large) protein / amino acids **,** present **;** **2** blood (cells) present **;** **3** glucose present **;** **4** more water present / more dilute **;** **5** more **,** ions / salts / electrolytes **,** present **;** **6** (more) vitamins present **;**	**2 max**	**Mark as prose - award marks wherever they occur** ***1*** **ACCEPT** more **,** protein / amino acids **ACCEPT** appropriately named protein e.g. albumin / antibodies / immunoglobulins ***3*** **DO NOT CREDIT** more glucose
5	(c)	(i)	protein / polypeptide **;**	**1**	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then **= 0 marks** **IGNORE** alpha helix / intrinsic / transmembrane **DO NOT CREDIT** glycoprotein
5	(c)	(ii)	**1** the ions (in solution) are too large to pass through the channel **or** the channel is too narrow for the ions (in solution) to pass through **;** **2** shapes not compatible **;** **3** *idea that* positive charge (in the channel) repels the (positively charged) ions **;**	**2 max**	**Mark the first <u>two</u> suggestions** ***1*** **ACCEPT** gap / hole for channel ***3*** **DO NOT CREDIT** repels and/or attracts
			Total	**11**	

Question			Expected Answer	Mark	Additional Guidance
6	(a)	(i)	adrenal cortex ;	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then **= 0 marks** **IGNORE** endocrine gland(s)
6	(a)	(ii)	inner mitochondrial membrane / crista / location described ;	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then **= 0 marks** e.g. between the inter-membrane space and the matrix **IGNORE** stalked particles / ATP synthetase
6	(b)	(i)	positive feedback ;	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then **= 0 marks** **IGNORE** respiratory acidosis / hyperventilation
6	(b)	(ii)	cyclic photophosphorylation ;	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then **= 0 marks** **DO NOT CREDIT** cyclic phosphorylation
6	(b)	(iii)	cell signalling ;	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then **= 0 marks** **IGNORE** homeostasis
			Total	**5**	

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