OCR
RECOGNISING ACHIEVEMENT

GCE

Biology

Advanced GCE

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

Mark Scheme for June 2012

Oxford Cambridge and RSA Examinations

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

Annotation	Meaning
	Correct answer
	Incorrect response
	Benefit of Doubt
	Not Benefit of Doubt
	Error Carried Forward
	Given mark
	Underline (for ambiguous/contradictory wording)
	Omission mark
	Ignore
	Correct response (for a QWC question)
	QWC* mark awarded

*Quality of Written Communication

Subject Specific Information

SPELLING
Accept phonetic spelling throughout unless otherwise specified.
Underlined terms must be used to gain the mark, but can be spelt phonetically unless otherwise stated.
Correct spelling is required if being credited as a QWC term.

Question			Answer	Marks	Guidance
1	(a)		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**
1	(b)	(i)	synaptic (cleft / space / gap) ;	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** **ALLOW** synapse **DO NOT CREDIT** synoptic / synopse / synapsis

Question			Answer	Marks	Guidance
1	(b)	(ii)	**1** (named) **neurotransmitter** / **acetylcholine ,** released from **pre-synaptic** / first **,** cell / membrane **;** **2** **diffus**es across **,** gap / cleft / **synaptic cleft** ***or*** reaches second **,** neurone / cell / membrane **,** by diffusion **;** **3** attaches to **, receptors** / binding sites of sodium channels **,** on **post-synaptic** membrane / membrane of second cell **;** **4** neurotransmitter / acetylcholine **,** broken down (in cleft) **;**	2 max	**DO NOT CREDIT a mark point** if stated that complete *vesicles* (even if containing neurotransmitter) are involved ***1*** *release of neurotransmitter* must be clearly stated ***2*** **IGNORE** synapse ***3*** **DO NOT CREDIT** post-synaptic knob / bulb ***Note*** *that a statement reading:* *'Diffuses across and attaches to receptors on the post-synaptic membrane'* **= 2 marks** (mps 2 & 3) ***4*** **CREDIT** ref to action of cholinesterase
			QWC – technical terms used appropriately and spelt correctly **;**	1	Use of **three** terms from: **neurotransmitter**, **acetylcholine**, **pre-synaptic / presynaptic**, **diffus**e / **diffus**ion, **synaptic cleft**, **receptor**, **post-synaptic / postsynaptic** 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 You should use the green dot to identify the QWC terms that you are crediting.

Question			Answer	Marks	Guidance
1	(b)	(iii)	**1** ensures movement of **,** impulse / action potential **,** in one direction (only) **;** **2** integration **or** one neurone can **,** connect to / receive impulses from / transmit impulses to **,** many neurones **;** **3** allows summation **;** **4** *idea* that filters out **,** 'background' / low level **,** stimuli **or** ensures that only stimulation that is strong enough will be passed on**;** **5** AVP **;**	3 max	**IGNORE** ref to 'signals' / 'messages' / coordination ***1*** **ACCEPT** description eg ACh only released from presynaptic and receptors only on postsynaptic ***3*** **ACCEPT** description eg enough action potentials arrive to trigger depolarisation in next neurone ***5*** eg • permits **,** memory / learning • acclimatisation (or described) • prevents continuous stimulation of neurones • synapses are of two types – excitatory and inhibitory
1	(c)	(i)	endotherm(s) **;**	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** **CREDIT** homoiothermic

Question			Answer	Marks	Guidance
1	(c)	(ii)	(vaso)dilation ;	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** 'arteriole' **DO NOT CREDIT** 'arterial dilation'
1	(d)	(i)	thyroxine / adrenaline;	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** adrenalin / thyroxin **/** epinephrin(e)
1	(d)	(ii)	hypothalamus ;	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**
			Total	**12**	

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>2</td><td>(a)</td><td></td><td>L glomerulus ;

M Bowman’s / renal , capsule ;

N proximal convoluted tubule ;</td><td>3</td><td>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

L ACCEPT ‘capillary knot’
IGNORE ‘capillary unqualified’

N IGNORE ‘first’
IGNORE PCT / pct (as Q asks for ‘name’)</td></tr>
<tr><td>2</td><td>(b)</td><td></td><td>
<table>
<tr><th>statement</th><th>part(s) of the nephron</th></tr>
<tr><td>walls are impermeable to water</td><td>ascending (limb of loop of Henle) ;</td></tr>
<tr><td>glucose is reabsorbed into the blood</td><td>proximal convoluted tubule / N ;</td></tr>
<tr><td>ADH acts on the walls</td><td>collecting duct / distal convoluted tubule ;</td></tr>
<tr><td>contains podocytes</td><td>Bowman’s capsule / renal capsule / M ;</td></tr>
<tr><td>most of the water is reabsorbed into the blood</td><td>proximal convoluted tubule / N ;</td></tr>
</table>
</td><td>5</td><td>Mark the first answer in each box. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks

ACCEPT rising limb

ACCEPT pct / first convoluted tubule

ACCEPT DCT / dct / second convoluted tubule

ACCEPT pct / first convoluted tubule</td></tr>
</table>

Question			Answer	Marks	Guidance
2	(c)		**1** *role of loop of Henle is to* cause a decrease in **water potential** in / establish water potential gradient going down **,** **<u>medulla</u>** **;** **2** (as) in **ascending** limb **active transport** outwards of **,** solutes / (sodium and chloride) **ions** **;** **3** (walls of) **descending** limb permeable to water **;** **4** water removed from descending limb **;** **5** water potential of tissues surrounding collecting duct is low(er) than fluid inside it **;** **6** water removed from **,** filtrate / urine (in collecting duct) **;** **7** AVP **;**	4 max	***1*** **Do not award** for a simple statement that 'there is a lower water potential in the medulla' ***2*** **ACCEPT** 'pumped' for active transport ***3*** **IGNORE** ref to permeability to ions ***5*** **ACCEPT** 'contents of collecting duct' ***7*** eg • acts as a countercurrent **,** system / multiplier • the drier the habitat the longer the loop • *idea that* urea contributes to low water potential in medulla • (facilitated) diffusion of ions out of the loop at the bottom
			QWC – technical terms used appropriately and spelt correctly **;**	1	Use of **three** terms from: **water potential**, **medulla**, **ascending**, **active transport** (or derived term), **ion**(s), **descending** **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** **You should use the green dot to identify the QWC terms that you are crediting.**
			Total	**13**	

Question			Answer	Marks	Guidance
3	(a)		crista(e) / inner mitochondrial membrane ;	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** thylakoid membrane / lamella(e) (of chloroplast)
3	(b)	(i)	**A** has more stain than **B** **and** **C** has none ;	1	All 3 seeds must be mentioned Staining ref. could relate to area or intensity of stain. **DO NOT CREDIT** implication that C has any staining **ACCEPT** 'shading' instead of 'staining' **IGNORE** ref to presence or absence of TTC (as it is present in all regions of all seedlings and it is the *staining* that is important)
3	(b)	(ii)	**1** *idea that* shaded areas in **A** are respiring ; **2** *idea that* 22^{o}C is suitable temperature for respiration ; **3** reduced , NAD / FAD / coenzymes , produced in , glycolysis / link reaction / Krebs cycle ; **4** lots of / more , electron transfer (to TTC) / (oxidative) phosphorylation / chemiosmosis ;	2 max	***1*** **ACCEPT** a description of the respiring area(s) eg the outer regions of the seed are respiring ***3*** **ACCEPT** NADH / $NADH^{+}$ / NADH + H^{+} / $NADH_2$ / FADH / $FADH^{+}$ / FADH + H^{+} / $FADH_2$

Question			Answer	Marks	Guidance
3	(b)	(iii)	(named stage of) respiration uses **,** enzymes / proteins in ETC / electron carriers **;** *group B* not enough <u>kinetic</u> energy for **,** ESC formation / substrates and enzymes to collide (successfully) **;** *group C* enzymes / proteins in ETC / electron carriers **,** <u>denatur</u>ed by **,** high temperature / (almost) boiling water **;**	2 max	**IGNORE** coenzymes ***Note** that a statement reading:* 'the respiratory enzymes are denatured by 90^{o}C in C' **= 2 marks** (mps 1 and 3)
3	(c)	(i)	ethan<u>a</u>l **;**	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** acetaldehyde **IGNORE** formulae (as name asked for in Q)
3	(c)	(ii)	ethan<u>a</u>l **;**	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** acetaldehyde **IGNORE** formulae (as name asked for in Q)

Question			Answer	Marks	Guidance
3	(c)	(iii)	ethanol **and** carbon dioxide **;**	1	**Mark the first 2 answers.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **ACCEPT** formulae **IGNORE** alcohol unless specified as 'ethyl alcohol' **IGNORE** (oxidised) NAD **DO NOT CREDIT** NADP / reduced NAD / ATP
3	(c)	(iv)	**1** releases NAD **,** to accept more H / to be reduced again / so glycolysis can continue **or** allows (some) ATP to be generated (in glycolysis) **;** **2** (some ATP available) for named cellular process **;** **3** AVP **;**	2 max	***1*** the idea that cells can still respire is not quite enough ***2*** eg • active transport • endocytosis / exocytosis / pinocytosis • mitosis / meiosis • protein synthesis • DNA replication • Calvin cycle / light-independent stage of photosynthesis ***3*** eg • stated situation where oxygen is in short supply (e.g. waterlogging / compacted soil / roots situated very deep in soil) **IGNORE** can respire in low oxygen conditions (as stated in Q)
			Total	**11**	

Question			Answer	Marks	Guidance
4	(a)		*oxygen* **1** oxygen ***only*** produced in one (named) stage of photosynthesis **;** **2** oxygen ***produced*** might be used for respiration **;** *carbon dioxide* **3** CO_2 ***only*** used in one (named) stage of photosynthesis **;** **4** CO_2 ***produced*** during respiration might be used for **,** photosynthesis / light independent reaction / Calvin cycle **;** **5** O_2 / CO_2 / both **,** could be an underestimate **or** represents net production (O_2) **or** represents net use (CO_2) **;**	2 max	***1*** **CREDIT** for O_2 'only measures the rate of the light dependent stage / photolysis' ***3*** **CREDIT** for CO_2 'only measures the rate of the Calvin cycle' ***5*** **ACCEPT** a description e.g. 'measurement is less than expected because not all the oxygen produced can be measured' (but not if expressed in terms of terms of experimental error – e.g. dissolves in the water) **IGNORE** refs to reliability / accuracy
4	(b)	(i)	light <u>intensity</u> **;**	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**

Question			Answer	Marks	Guidance
4	(b)	(ii)	carbon dioxide <u>concentration</u> / partial pressure of CO_2 / temperature **;** AVP **;**	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** 'high' or 'low', as these indicate situations rather than factors eg • stomatal density • stomatal size • chlorophyll concentration • number of chloroplasts • enzyme turnover rate **IGNORE** (temporary) changes in stomatal **,** opening / closing **IGNORE** ref to water availability
	(b)	(iii)	(aerobic / anaerobic) respiration **;**	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** Krebs cycle / link reaction / decarboxylation **DO NOT CREDIT** photorespiration (as light intensity stated as being low)

Question			Answer	Marks	Guidance
4	(b)	(iv)	**1** at 0 **,** respiration only / no photosynthesis **;** *between 0 and X* **2** *idea that* (rate of) respiration is greater than (rate of) photosynthesis **;** *at X* **3** *idea that* (rate of) respiration equals (rate of) photosynthesis / at compensation point **;** *after X* **4** *idea that* (rate of) photosynthesis is greater than (rate of) respiration **;**	3 max	Assume that candidate is answering in the same order as the bullet points, unless otherwise indicated. **IGNORE** photorespiration throughout **CREDIT** **'**Calvin cycle' for 'photosynthesis' throughout For **mps 2, 3 & 4** must include clear ref. to both respiration and photosynthesis ***2*** **DO NOT CREDIT** no photosynthesis
4	(c)	(i)	reduced NADP / NADPH / $NADPH_2$ / $NADPH^+$ **;** ATP **;** oxygen **;**	3	**Mark the first 3 answers.** **IGNORE** numbers of molecules **ACCEPT** O_2 (to be consistent with the other answers to this question)

Question			Answer	Marks	Guidance
4	(c)	(ii)	**1** prevents <u>photophosphorylation</u> **;** **2** cyclic **<u>and</u>** non-cyclic **;** **3** no / less **,** ATP / reduced NADP **,** for **,** light-independent stage / Calvin cycle / GP to TP **;** **4** no (named) substrate made for <u>respiration</u> **;**	2 max	***3*** 'no ATP for photosynthesis' is not quite enough **DO NOT CREDIT** (oxidised) NADP ***4*** substrate eg glucose / starch / carbohydrate / sucrose / sugars **IGNORE** triose phosphate / food / nutrients
			Total	**13**	

Question			Answer	Marks	Guidance
5	(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** **IGNORE** α and β cells
5	(a)	(ii)	beta / β ;	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** b **IGNORE** islets (of Langerhans) **DO NOT CREDIT** B (confusion with immune system)

Question			Answer	Marks	Guidance
5	(b)		*in gap order* **1** increases **;** **2** glycolytic / glycolysis **;** **3** depolarised **;** **4** calcium **;** **5** exocytosis **;**	5	**Mark the first answer on each prompt line.** If the answer is correct and an answer is given that is incorrect or contradicts the correct answer then **= 0 marks** ***1*** **CREDIT** rises / gets higher **ACCEPT** 'is high' ***2*** **IGNORE** metabolic / respiratory ***3*** **ACCEPT** **'**less negative / more positive **,** on the inside (than previously)' **or** 'less positive / more negative **,** on the outside (than previously)' **IGNORE** figures (as Q has asked for words) **DO NOT CREDIT** ionised / polarised ***4*** **IGNORE** Ca or Ca^{2+} (as Q has asked for words) **DO NOT CREDIT** if incorrect symbols given (e.g. Ca^{+} , CA^{2+})
5	(c)	(i)	ribosome / <u>rough</u> endoplasmic reticulum / <u>R</u>ER **;**	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** rRNA (as this is not *where* proteins are made)

Question			Answer	Marks	Guidance
5	(c)	(ii)	**1** transported to Golgi **;** **2** modified / processed **,** in Golgi **;** **3** packaged into / stored in **,** (Golgi) vesicle(s) **;** **4** vesicles transported towards **,** plasma / cell surface **,** membrane **;** **5** AVP **;**	3 max	**IGNORE** ref. to mechanism of insulin secretion **IGNORE** ref. to negative feedback control of insulin secretion ***2*** **DO NOT CREDIT** if ref. to carbohydrate ***4*** **IGNORE** 'fuses with membrane' ***5*** eg • detail of modification (splitting / recombining, polypeptide) • role of cytoskeleton • use of ATP (in context of, modification / movement)
			Total	**11**	

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