



GCE

Biology

Advanced GCE

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

Mark Scheme for June 2012

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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.

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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 / synopsis / synapsis

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

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Question			Answer	Marks	Guidance
1	(b)	(iii)	<p>1 ensures movement of , impulse / action potential , in one direction (only) ;</p> <p>2 integration or one neurone can , connect to / receive impulses from / transmit impulses to , many neurones ;</p> <p>3 allows summation ;</p> <p>4 <i>idea</i> that filters out , 'background' / low level , stimuli or ensures that only stimulation that is strong enough will be passed on;</p> <p>5 AVP ;</p>	3 max	<p>IGNORE ref to 'signals' / 'messages' / coordination</p> <p>1 ACCEPT description eg ACh only released from presynaptic <u>and</u> receptors only on postsynaptic</p> <p>3 ACCEPT description eg enough action potentials arrive to trigger depolarisation in next neurone</p> <p>5 eg</p> <ul style="list-style-type: none"> • permits , memory / learning • acclimatisation (or described) • prevents continuous stimulation of neurones • synapses are of two types – excitatory <u>and</u> inhibitory
1	(c)	(i)	<p>endotherm(s) ;</p>	1	<p>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</p> <p>CREDIT homoiothermic</p>

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

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Question		Answer	Marks	Guidance												
2	(a)	<p>L glomerulus ;</p> <p>M Bowman's / renal , capsule ;</p> <p>N proximal convoluted tubule ;</p>	3	<p>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</p> <p>L ACCEPT 'capillary knot' IGNORE 'capillary unqualified'</p> <p>N IGNORE 'first' IGNORE PCT / pct (as Q asks for 'name')</p>												
2	(b)	<table border="1"> <thead> <tr> <th>statement</th> <th>part(s) of the nephron</th> </tr> </thead> <tbody> <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> </tbody> </table>	statement	part(s) of the nephron	walls are impermeable to water	ascending (limb of loop of Henle) ;	glucose is reabsorbed into the blood	proximal convoluted tubule / N ;	ADH acts on the walls	collecting duct / distal convoluted tubule ;	contains podocytes	Bowman's capsule / renal capsule / M ;	most of the water is reabsorbed into the blood	proximal convoluted tubule / N ;	5	<p>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</p> <p>ACCEPT rising limb</p> <p>ACCEPT pct / first convoluted tubule</p> <p>ACCEPT DCT / dct / second convoluted tubule</p> <p>ACCEPT pct / first convoluted tubule</p>
statement	part(s) of the nephron															
walls are impermeable to water	ascending (limb of loop of Henle) ;															
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contains podocytes	Bowman's capsule / renal capsule / M ;															
most of the water is reabsorbed into the blood	proximal convoluted tubule / N ;															

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Question		Answer	Marks	Guidance
2	(c)	<p>1 <i>role of loop of Henle is to</i> cause a decrease in water potential in / establish water potential gradient going down , medulla ;</p> <p>2 (as) in ascending limb active transport outwards of , solutes / (sodium and chloride) ions ;</p> <p>3 (walls of) descending limb permeable to water ;</p> <p>4 water removed from descending limb ;</p> <p>5 water potential of tissues surrounding collecting duct is low(er) than fluid inside it ;</p> <p>6 water removed from , filtrate / urine (in collecting duct) ;</p> <p>7 AVP ;</p>	4 max	<p>1 Do not award for a simple statement that ‘there is a lower water potential in the medulla’</p> <p>2 ACCEPT ‘pumped’ for active transport</p> <p>3 IGNORE ref to permeability to ions</p> <p>5 ACCEPT ‘contents of collecting duct’</p> <p>7 eg <ul style="list-style-type: none"> • acts as a countercurrent , system / multiplier • the drier the habitat the longer the loop • <i>idea that</i> urea contributes to low water potential in medulla • (facilitated) diffusion of ions out of the loop at the bottom </p>
		<p>QWC – technical terms used appropriately and spelt correctly ;</p>		1
Total			13	

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Question		Answer	Marks	Guidance
3	(a)	crista(e) / inner mitochondrial membrane ;	1	<p>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</p> <p>ACCEPT thylakoid membrane / lamella(e) (of chloroplast)</p>
3	(b) (i)	<p>A has more stain than B and C has none ;</p>	1	<p>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</p> <p>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 <i>staining</i> that is important)</p>
3	(b) (ii)	<p>1 <i>idea that</i> shaded areas in A are respiring ;</p> <p>2 <i>idea that</i> 22°C is suitable temperature for respiration ;</p> <p>3 reduced , NAD / FAD / coenzymes , produced in , glycolysis / link reaction / Krebs cycle ;</p> <p>4 lots of / more , electron transfer (to TTC) / (oxidative) phosphorylation / chemiosmosis ;</p>	2 max	<p>1 ACCEPT a description of the respiring area(s) eg the outer regions of the seed are respiring</p> <p>3 ACCEPT NADH / NADH⁺ / NADH + H⁺ / NADH₂ / FADH / FADH⁺ / FADH + H⁺ / FADH₂</p>

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

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Question			Answer	Marks	Guidance
3	(c)	(iii)	ethanol and carbon dioxide ;	1	<p>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</p> <p>ACCEPT formulae IGNORE alcohol unless specified as 'ethyl alcohol' IGNORE (oxidised) NAD DO NOT CREDIT NADP / reduced NAD / ATP</p>
3	(c)	(iv)	<p>1 releases NAD , to accept more H / to be reduced again / so glycolysis can continue</p> <p>or</p> <p>allows (some) ATP to be generated (in glycolysis) ;</p> <p>2 (some ATP available) for named cellular process ;</p> <p>3 AVP ;</p>	2 max	<p>1 the idea that cells can still respire is not quite enough</p> <p>2 eg</p> <ul style="list-style-type: none"> • active transport • endocytosis / exocytosis / pinocytosis • mitosis / meiosis • protein synthesis • DNA replication • Calvin cycle / light-independent stage of photosynthesis <p>3 eg</p> <ul style="list-style-type: none"> • stated situation where oxygen is in short supply (e.g. waterlogging / compacted soil / roots situated very deep in soil) <p>IGNORE can respire in low oxygen conditions (as stated in Q)</p>
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Question			Answer	Marks	Guidance
4	(a)		<p><i>oxygen</i></p> <p>1 oxygen only produced in one (named) stage of photosynthesis ;</p> <p>2 oxygen produced might be used for respiration ;</p> <p><i>carbon dioxide</i></p> <p>3 CO₂ only used in one (named) stage of photosynthesis ;</p> <p>4 CO₂ produced during respiration might be used for , photosynthesis / light independent reaction / Calvin cycle ;</p> <p>5 O₂ / CO₂ / both , could be an underestimate or represents net production (O₂) or represents net use (CO₂) ;</p>	2 max	<p>1 CREDIT for O₂ 'only measures the rate of the light dependent stage / photolysis'</p> <p>3 CREDIT for CO₂ 'only measures the rate of the Calvin cycle'</p> <p>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</p>
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

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Question			Answer	Marks	Guidance
4	(b)	(ii)	<p>carbon dioxide <u>concentration</u> / partial pressure of CO₂ / temperature ;</p> <p>AVP ;</p>	1	<p>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</p> <p>DO NOT CREDIT 'high' or 'low', as these indicate situations rather than factors</p> <p>eg</p> <ul style="list-style-type: none"> • stomatal density • stomatal size • chlorophyll concentration • number of chloroplasts • enzyme turnover rate <p>IGNORE (temporary) changes in stomatal , opening / closing</p> <p>IGNORE ref to water availability</p>
	(b)	(iii)	(aerobic / anaerobic) respiration ;	1	<p>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</p> <p>ACCEPT Krebs cycle / link reaction / decarboxylation DO NOT CREDIT photorespiration (as light intensity stated as being low)</p>

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Question			Answer	Marks	Guidance
4	(b)	(iv)	<p>1 at 0 , respiration only / no photosynthesis ;</p> <p><i>between 0 and X</i></p> <p>2 <i>idea that</i> (rate of) respiration is greater than (rate of) photosynthesis ;</p> <p><i>at X</i></p> <p>3 <i>idea that</i> (rate of) respiration equals (rate of) photosynthesis / at compensation point ;</p> <p><i>after X</i></p> <p>4 <i>idea that</i> (rate of) photosynthesis is greater than (rate of) respiration ;</p>	3 max	<p>Assume that candidate is answering in the same order as the bullet points, unless otherwise indicated. IGNORE photorespiration throughout</p> <p>CREDIT 'Calvin cycle' for 'photosynthesis' throughout For mps 2, 3 & 4 must include clear ref. to both respiration and photosynthesis</p> <p>2 DO NOT CREDIT no photosynthesis</p>
4	(c)	(i)	<p>reduced NADP / NADPH / NADPH₂ / NADPH⁺ ; ATP ; oxygen ;</p>	3	<p>Mark the first 3 answers. IGNORE numbers of molecules</p> <p>ACCEPT O₂ (to be consistent with the other answers to this question)</p>

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

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Question			Answer	Marks	Guidance
5	(a)	(i)	islet(s) of Langerhans ;	1	<p>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</p> <p>IGNORE α and β cells</p>
5	(a)	(ii)	beta / β ;	1	<p>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</p> <p>ACCEPT b IGNORE islets (of Langerhans) DO NOT CREDIT B (confusion with immune system)</p>

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Question			Answer	Marks	Guidance
5	(b)		<p><i>in gap order</i></p> <p>1 increases ;</p> <p>2 glycolytic / glycolysis ;</p> <p>3 depolarised ;</p> <p>4 calcium ;</p> <p>5 exocytosis ;</p>	5	<p>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</p> <p>1 CREDIT rises / gets higher ACCEPT 'is high'</p> <p>2 IGNORE metabolic / respiratory</p> <p>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</p> <p>4 IGNORE Ca or Ca²⁺ (as Q has asked for words) DO NOT CREDIT if incorrect symbols given (e.g. Ca⁺ , CA²⁺)</p>
5	(c)	(i)	<p>ribosome / <u>rough</u> endoplasmic reticulum / <u>RER</u> ;</p>	1	<p>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</p> <p>IGNORE rRNA (as this is not <i>where</i> proteins are made)</p>

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Question			Answer	Marks	Guidance
5	(c)	(ii)	<p>1 transported to Golgi ;</p> <p>2 modified / processed , in Golgi ;</p> <p>3 packaged into / stored in , (Golgi) vesicle(s) ;</p> <p>4 vesicles transported towards , plasma / cell surface , membrane ;</p> <p>5 AVP ;</p>	3 max	<p>IGNORE ref. to mechanism of insulin secretion</p> <p>IGNORE ref. to negative feedback control of insulin secretion</p> <p>2 DO NOT CREDIT if ref. to carbohydrate</p> <p>4 IGNORE 'fuses with membrane'</p> <p>5 eg • detail of modification (splitting / recombining, polypeptide)</p> <ul style="list-style-type: none"> • role of cytoskeleton • use of ATP (in context of, modification / movement)
			Total	11	

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