



GCE

Biology

Advanced GCE

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

Mark Scheme for June 2013

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

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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1. Annotations

Annotation	Meaning
	Correct answer
	Incorrect response
	Benefit of doubt
	No 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

2. Subject-specific Marking Instructions

ALLOW alternative wording throughout, as long as the essence of the mark point remains.

In some questions (especially **Q1(b)**, **Q3(a)**, **Q3(c)** and **Q5(c)(i)**) candidates have been given information or data that they have to explain or discuss. In such questions they cannot score marks by simply lifting text or figures from the information given in the question.

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Question			Answer	Marks	Guidance
1	(a)	(i)	<p>A cytoplasm ;</p> <p>B cell surface (plasma) membrane / neurone / neurilemma / axon / dendron ;</p> <p>C nucleus (of Schwann cell) ;</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>A ACCEPT cytosol IGNORE myelin</p> <p>B IGNORE nerve DO NOT CREDIT cell body</p>
1	(a)	(ii)	node(s) of Ranvier ;	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>
1	(b)		<p><i>in myelinated neurones</i></p> <p>1 conduction <u>faster</u> in myelinated neurone ; ora</p> <p>2 depolarisation / action potential , can only occur where (voltage-gated / Na⁽⁺⁾) <u>channels</u> present ;</p> <p>3 <i>idea that</i> myelinated neurones have long(er) sections with no, (voltage-gated / Na⁽⁺⁾) channels present ;</p> <p>4 ion , movement / transfer , can only take place at the gaps / nodes ; ora</p> <p>5 <u>longer</u> local circuits / <u>fewer</u> local circuits ;</p> <p>6 saltatory conduction / action potential jumps from node to node ; ora</p>	4	<p>1 must be a comparative statement and not from figs alone</p> <p>2 IGNORE ref to nodes of Ranvier (as they should be using information in Q)</p> <p>3 e.g. (only) 0.2% of the myelinated neurone has voltage-gated Na channels ACCEPT channels are further apart in myelinated</p> <p>4 This is a general mark for Na⁺ or K⁺ movement, regardless of direction</p> <p>5 ACCEPT 'currents' for 'circuits'</p> <p>6 ACCEPT 'gap' for 'node' ACCEPT jumping <i>between</i> nodes</p>

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1	(c)	(i)	exocytosis ;	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 secretion</p>
1	(c)	(ii)	synaptic knob / synaptic bulb / presynaptic 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 bouton ACCEPT presynaptic knob IGNORE vesicle DO NOT CREDIT synapse</p>
1	(c)	(iii)	<p>1 vesicle cannot fuse with cell membrane and acetylcholine not secreted ;</p> <p>2 protease / enzyme / toxin / it , hydrolyses , VAMP / SNARE / protein / peptide bonds ;</p> <p>3 (because of hydrolysis) VAMP (protein) cannot bind to SNARE (complex) ;</p> <p>4 microtubules broken down so vesicle cannot move towards membrane ;</p>	2 max	<p>1 ACCEPT bind / attach , for fuse (see diagram)</p> <p>2 ACCEPT acts on / digests / breaks down , for 'hydrolyses'</p> <p>3 ACCEPT attach / join / lock , for 'bind' IGNORE fuse DO NOT CREDIT in context of , inhibition / denaturation</p>
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Question			Answer	Marks	Guidance
2	(a)	(i)	(thermoregulatory centre in) 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 ACCEPT hyperthalamus
2	(a)	(ii)	<u>thermoreceptor</u> / <u>peripheral</u> temperature receptor ;	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 'heat' / 'sensory cell'
2	(a)	(iii)	<u>negative feedback</u> / <u>thermoregulation</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 IGNORE homeostasis
2	(b)	(i)	M <u>and</u> N <u>and</u> P ;	1	If the answer is correct and an additional letter is given that is incorrect then = 0 marks All 3 correct letters required for one mark IGNORE J
2	(b)	(ii)	K <u>and</u> O ;	1	If the answer is correct and an additional letter is given then = 0 marks Both correct letters required for one mark
2	(b)	(iii)	L ;	1	Mark the first answer. If the answer is correct and an additional letter is given that is incorrect then = 0 marks ACCEPT J

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2	(b)	(iv)	N ;	1	Mark the first answer. If the answer is correct and an additional letter is given then = 0 marks
2	(c)	(i)	<p>Look for ref to , heat loss / cooling , at any point in the answer before awarding any marks</p> <p>large surface area (to lose heat) ; (thin) so , blood flows / (named) blood vessel are , close to the (skin) surface (to lose heat) ; (movement) increases air movement over , skin / surface (to lose heat) ;</p>	2 max	<p>DO NOT CREDIT evaporation of heat IGNORE ref to sweating</p> <p>ACCEPT SA:Vol</p>
2	(c)	(ii)	<p>Needs to be in the context of reducing heat loss from the blood</p> <p>blood loses less heat because , less <u>blood</u> flows to feet / warm <u>blood</u> diverted from arterioles to veins</p> <p>or less <u>blood</u> flows to feet so core body temperature maintained ;</p>	1	<p>DO NOT CREDIT prevents / stops , blood flowing to feet ACCEPT 'extremities' for 'feet' IGNORE ref to vasoconstriction of peripheral arterioles DO NOT CREDIT vasoconstriction of shunt vessels IGNORE ref to countercurrent (as not answering Q)</p>
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Question		Answer	Marks	Guidance
3	(a)	<p>1 large molecules / proteins / blood cells , cannot , leave blood / enter the filtrate</p> <p>or</p> <p>(named) small molecules can , leave blood / enter filtrate;</p>	4 max	<p>1 Needs more than a figs ref DO NOT CREDIT through , cells / membranes DO NOT CREDIT ref to erythrocytes being large molecules or proteins ACCEPT capillary / glomerulus , for 'blood'</p>
		<p>2 endothelium / fenestrations / basement membrane , prevents , large molecules / erythrocytes , reaching , renal / Bowmans capsule ;</p>		<p>2 Needs ref to entering Bowmans capsule to explain data in table DO NOT CREDIT basal membrane</p>
		<p>3 <u>all</u> glucose / glucose completely , reabsorbed at the , proximal convoluted tubule / PCT ;</p>		<p>3 Needs to be a clear statement, not from figs DO NOT CREDIT distal convoluted tubule / DCT</p>
		<p>4 <u>all</u> amino acids / amino acids completely , reabsorbed at the , proximal convoluted tubule / PCT ;</p>		<p>4 Needs to be a clear statement, not from figs DO NOT CREDIT distal convoluted tubule / DCT</p>
		<p>5 (some / not all) ions , reabsorbed / move into blood (at any part of , nephron / tubule) ;</p>		<p>5 ACCEPT ref to named ions IGNORE salts DO NOT CREDIT if stated that all ions are reabsorbed</p>
		<p>6 urea / ion , <u>concentration</u> increases (between filtrate and urine) because , movement (of urea / ion) into tubule / water removed ;</p>		<p>6 Must be a clear specific statement and not part of a list Reason must refer only to water removal</p>
		<p>QWC – technical terms used appropriately <u>and</u> spelled correctly ;</p>	1	<p>Use of three terms from: endothelium / endothelial fenestration(s) basement membrane Bowmans capsule reabsorb (or derived term) proximal convoluted tubule Please insert a QWC symbol next to the pencil icon, followed by a tick (✓) if QWC has been awarded or a cross (x) if QWC has not been awarded You should use the green dot to identify the QWC terms that you are crediting.</p>

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Question			Answer	Marks	Guidance
3	(b)	(i)	<i>idea that</i> (high creatinine concentration indicates) reduced function because , less filtration / low GFR ;	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>Answer must include statement about lack of ‘working’ or ‘functioning’ of kidney as well as some reference to reduced filtration</p> <p>IGNORE ref to creatinine or creatine ACCEPT ref to no filtration DO NOT CREDIT ref to creatinine <i>causing</i> kidney damage</p>
3	(b)	(ii)	55 ; ;	2	<p>Correct answer = 2 marks</p> <p>If the answer is incorrect, award 1 mark for working: $82 \times \frac{1.73}{2.56}$</p> <p>If the answer is unrounded, incorrectly rounded or not given to the nearest whole number, award 1 mark for seeing an unrounded answer (e.g. 55.4140625)</p>
3	(b)	(iii)	stage 3 and moderate reduction (in kidney function) ;	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>Needs to quote the effect on the kidney stated in the table.</p> <p>If the answer is incorrect, then look at the candidate’s answer to Q3(b)(ii) (scroll down – it’s situated below this answer) and CREDIT a stage that correctly follows on from candidate’s answer to (ii) as ecf.</p>

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Question		Answer	Marks	Guidance
3	(c)	<p><i>general</i></p> <p>1 <i>idea that</i> people should have a right to choose (freely) what to do with their kidney ;</p> <p><i>perceived donor advantages</i></p> <p>2 <i>idea that</i> donors / donors' families , can benefit from money raised (by selling a kidney) ;</p> <p>3 people can donate a kidney to family member ;</p> <p>4 <i>idea that</i> people can donate without payment ;</p> <p><i>perceived donor disadvantages</i></p> <p>5 <i>idea of</i> exploiting people's poverty ;</p> <p>6 <i>idea of</i> exploitation of , children / minors ;</p> <p><i>recipient issues</i></p> <p>7 <i>idea that</i> people should receive transplants irrespective of wealth ;</p> <p>8 <i>idea that</i> it is wrong that recipients are being charged excessively ;</p> <p>9 AVP ;</p>	3 max	<p>IGNORE 'yes' or 'no'</p> <p>IGNORE religious / cultural , considerations</p> <p>IGNORE ref to kidneys sourced from animals</p> <p>Answers need not be a balanced account.</p> <p>4 ACCEPT choosing to donate for , free / the good of it</p> <p>IGNORE ref to giving to charity</p> <p>5 ora ethical if not doing it just for money they receive</p> <p>6 ACCEPT ref to illegality of child donors</p> <p>IGNORE 'young' unqualified</p> <p>ora ethical as long as (donor) of legal age</p> <p>9 e.g. family member may feel pressured into donating e.g. can survive with only one healthy kidney e.g. potential for complications if donor has subsequent kidney failure e.g. people should have access to kidneys if needed e.g. danger of operating on , healthy person / donor e.g. <i>idea that</i> wrong for large profits to be made</p>
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Question		Answer	Marks	Guidance
4	(a)	<p>endocrine ;</p> <p>islets of Langerhans ;</p> <p>glycogen ;</p> <p>glycogenolysis ;</p>	4	<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>ACCEPT 'isles' / 'eyelets' (as phonetic) DO NOT CREDIT 'islands'</p> <p>spelling must be correct</p> <p>spelling must be unambiguous IGNORE hydrolysis</p>
	(b) (i)	<p>adrenaline / epinephrine / noradrenaline / norepinephrine ;</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>ACCEPT thyroxine / (named) corticosteroid</p>
	(ii)	<p>impulses along parasympathetic nerve / impulses along vagus nerve / nerve endings releasing acetylcholine ;</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>Ref to structure alone is not good enough CREDIT 'stimulation' / 'action potentials', for 'impulses along'</p> <p>ACCEPT 'activates' / 'uses', parasympathetic / vagus , nerve</p> <p>DO NOT CREDIT 'messages' / 'signals' / 'information'</p>
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5	(a)	(i)	cytoplasm (of cell) ;	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 cytosol</p>
5	(a)	(ii)	<p>1 phosphorylation of glucose ;</p> <p>2 so forming hexose (1,6) bisphosphate ;</p> <p>3 (then) splitting into / formation of , <u>two / 2</u> , triose phosphate(s) / TP ;</p> <p>4 (for formation of pyruvate) dehydrogenation / oxidation / formation of reduced NAD ;</p> <p>5 pyruvate produced (from , TP / (3C) intermediate) ;</p> <p>6 total production 4 ATP / net production of 2 ATP ;</p>	3 max	<p>Marks can be awarded from a diagram</p> <p>1 DO NOT CREDIT substrate level phosphorylation</p> <p>2 IGNORE glucose-6-phosphate / fructose-6-phosphate CREDIT fructose(-1,6-)bisphosphate ACCEPT hexose biphosphate DO NOT CREDIT hexose diphosphate</p> <p>3 IGNORE hydrolysis DO NOT CREDIT if ATP or NAD or red NAD involved in conversion of hexose bisphosphate to TP</p> <p>4 ACCEPT formation of , NADH₂ / NADH (+H⁺) / red NAD DO NOT CREDIT NADPH₂ / NADPH (+H⁺) DO NOT CREDIT hydrogen ion without electron / H₂</p> <p>6 Needs to be a clear statement</p>
			<p>QWC – technical terms used appropriately <u>and</u> spelled correctly ;</p>	1	<p>Use of three terms (including from a flow chart) from: phosphorylation (or derived term) glucose hexose (1,6) bisphosphate triose phosphate dehydrogenation OR oxidation (or derived terms) pyruvate</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
5	(b)	<p>W ethanal ;</p> <p>X carbon dioxide / CO₂ ;</p> <p>Y reduced NAD ;</p> <p>Z NAD⁽⁺⁾ ;</p>	4	<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>W Correct spelling only DO NOT CREDIT ethanol</p> <p>X DO NOT CREDIT CO² / CO</p> <p>Y ACCEPT NADH₂/ NADH⁽⁺⁾ (+H⁺) / red NAD DO NOT CREDIT NADPH₂/ NADPH⁽⁺⁾ (+H⁺) / red NADP</p> <p>Z DO NOT CREDIT NADP</p>
5	(c) (i)	<p>1 A / alkaline , produced less alcohol (than the control) at all times ;</p> <p>2 V / <i>Vateria</i> , produced less alcohol (than the control) , at 30 and 45 and 60 hours / from 30 hours / after 15 hours</p> <p>or</p> <p>V / <i>Vateria</i> had the same alcohol as the control at 15 hours ;</p> <p>3 C / <i>Careya</i> , produced less alcohol (than the control) at 30 and 45 hours</p> <p>or</p> <p>C / <i>Careya</i> , produced more alcohol (than the control) at 15 and 60 hours ;</p>	2	<p>CREDIT ora for all mark points</p> <p>ora e.g. control always produced more alcohol than A</p>

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Question			Answer	Marks	Guidance
5	(c)	(ii)	<p><i>at 60 hours</i></p> <p>V has fewer yeast cells (which would ferment the sugar) or C has more yeast cells ;</p> <p>only a small number of bacteria in V are , fermenting the sugar / producing alcohol or the , type / species , of bacteria in V are not , fermenting the sugar / producing alcohol or most / all / type of , bacteria in C are , fermenting the sugar / producing alcohol ;</p>	1	<p>IGNORE ref to a compound inhibiting production of alcohol in V Must be clear statements, not implied by the use of figs</p> <p>IGNORE 'V has fewer bacteria' without ref to fermentation</p> <p>IGNORE 'C has more bacteria' without ref to fermentation</p>
5	(c)	(iii)	<p>A / (weak) alkaline (solution) ;</p> <p>(A has the least contamination as) it has very few bacteria and little alcohol ;</p>	2	<p>ONLY CREDIT in context of treatment A</p>
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6	(a)	rubisco ;	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
6	(b)	ATP / reduced NADP ;	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 oxygen (as it is not used in the light independent reaction)
6	(c)	glycerate-3-phosphate / GP / triose phosphate / TP ;	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
6	(d)	amino acid ;	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
6	(e)	ribulose biphosphate / RuBP ;	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 ribulose biphosphate
6	(f)	oxygen ;	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 ATP / reduced NADP (as they are used in the light independent reaction)
Total			6	

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