OCR
RECOGNISING ACHIEVEMENT

GCE

Biology

Advanced GCE

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

Mark Scheme for June 2013

Oxford Cambridge and RSA Examinations

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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.

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

Question			Answer	Marks	Guidance
1	(c)	(i)	exocytosis ;	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** secretion
1	(c)	(ii)	synaptic knob / synaptic bulb / presynaptic 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** bouton **ACCEPT** presynaptic knob **IGNORE** vesicle **DO NOT CREDIT** synapse
1	(c)	(iii)	**1** vesicle cannot fuse with cell membrane **and** acetylcholine not secreted ; **2** protease / enzyme / toxin / it , hydrolyses , VAMP / SNARE / protein / peptide bonds ; **3** (because of hydrolysis) VAMP (protein) cannot bind to SNARE (complex) ; **4** microtubules broken down **so** vesicle cannot move towards membrane ;	2 max	**1** **ACCEPT** bind / attach , for fuse (see diagram) **2** **ACCEPT** acts on / digests / breaks down , for 'hydrolyses' **3** **ACCEPT** attach / join / lock , for 'bind' **IGNORE** fuse **DO NOT CREDIT** in context of , inhibition / denaturation
			Total	12	

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)	thermoreceptor / peripheral 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)	negative feedback / thermoregulation **;**	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 and N and 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 and 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**

Question			Answer	Marks	Guidance
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)	**Look for ref to , heat loss / cooling , at any point in the answer before awarding any marks** 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) **;**	2 max	**DO NOT CREDIT** evaporation of heat **IGNORE** ref to sweating **ACCEPT** SA**:**Vol
2	(c)	(ii)	**Needs to be in the context of reducing heat loss from the blood** blood loses less heat because **,** less <u>blood</u> flows to feet / warm <u>blood</u> diverted from arterioles to veins **or** less <u>blood</u> flows to feet so core body temperature maintained **;**	1	**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)
			Total	10	

Question			Answer	Marks	Guidance
3	(a)		**1** large molecules / proteins / blood cells **,** cannot **,** leave blood / enter the filtrate **or** (named) small molecules can **,** leave blood / enter filtrate**;**	**4 max**	**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'
			2 **endotheli**um **/ fenestration**s / **basement membrane** **,** prevents **,** large molecules / erythrocytes **,** reaching **,** renal / **Bowmans capsule** **;**		**2** Needs ref to entering Bowmans capsule to explain data in table **DO NOT CREDIT** basal membrane
			3 <u>all</u> glucose / glucose completely **,** **reabsor**bed at the **,** **proximal convoluted tubule** / PCT **;**		**3** Needs to be a clear statement, not from figs **DO NOT CREDIT** distal convoluted tubule / DCT
			4 <u>all</u> amino acids / amino acids completely **,** reabsorbed at the **,** proximal convoluted tubule / PCT **;**		**4** Needs to be a clear statement, not from figs **DO NOT CREDIT** distal convoluted tubule / DCT
			5 (some / not all) ions **,** reabsorbed / move into blood (at any part of **,** nephron / tubule) **;**		**5** **ACCEPT** ref to named ions **IGNORE** salts **DO NOT CREDIT** if stated that **all** ions are reabsorbed
			6 urea / ion **,** <u>concentration</u> increases (between filtrate and urine) because **,** movement (of urea / ion) into tubule / water removed **;**		**6** Must be a clear specific statement and not part of a list Reason must refer **only** to water removal
			QWC – technical terms used appropriately **<u>and</u>** spelled correctly **;**	**1**	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 (✗) 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
3	(b)	(i)	*idea that* (high creatinine concentration indicates) reduced function because **,** less filtration / low GFR **;**	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** **Answer must include statement about lack of 'working' or 'functioning' of kidney <u>as well as</u> some reference to reduced filtration** **IGNORE** ref to creatinine or creatine **ACCEPT** ref to no filtration **DO NOT CREDIT** ref to creatinine ***causing*** kidney damage
3	(b)	(ii)	55 **; ;**	2	**Correct answer = 2 marks** If the answer is incorrect, **award 1 mark** for working: $82 \times \frac{1.73}{2.56}$ 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)
3	(b)	(iii)	stage 3 **<u>and</u>** moderate reduction (in kidney function) **;**	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** **Needs to quote the effect on the kidney stated in the table.** **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**.

Question			Answer	Marks	Guidance
3	(c)			3 max	**IGNORE** 'yes' or 'no' **IGNORE** religious / cultural **,** considerations **IGNORE** ref to kidneys sourced from animals Answers need not be a balanced account.
			general **1** *idea that* people **should** have a **right** to choose (freely) what to do with their kidney **;**		
			perceived donor advantages **2** *idea that* donors / donors' families **,** can benefit from money raised (by selling a kidney) **;** **3** people can donate a kidney to family member **;** **4** *idea that* people can donate without payment **;**		**4** **ACCEPT** choosing to donate for **,** free / the good of it **IGNORE** ref to giving to charity
			perceived donor disadvantages **5** *idea of* exploiting people's poverty **;** **6** *idea of* exploitation of **,** children / minors **;**		**5** **ora** ethical if not doing it just for money they receive **6** **ACCEPT** ref to illegality of child donors **IGNORE** **'**young' unqualified **ora** ethical as long as (donor) of legal age
			recipient issues **7** *idea that* people should receive transplants irrespective of wealth **;** **8** *idea that* it is wrong that recipients are being charged excessively **;**		
			9 AVP **;**		**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. *idea that* wrong for large profits to be made
			Total	**12**	

Question			Answer	Marks	Guidance
4	(a)		endocrine ; islets of Langerhans ; glycogen ; glycogenolysis ;	4	**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** **ACCEPT** 'isles' / 'eyelets' (as phonetic) **DO NOT CREDIT** 'islands' spelling **must be correct** spelling must be **unambiguous** **IGNORE** hydrolysis
	(b)	(i)	adrenaline / epinephrine / noradrenaline / norepinephrine ;	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** thyroxine / (named) corticosteroid
		(ii)	impulses along parasympathetic nerve / impulses along vagus nerve / nerve endings releasing acetycholine ;	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** Ref to structure alone is not good enough **CREDIT** 'stimulation' / 'action potentials' **,** for 'impulses along' **ACCEPT** 'activates' / 'uses' **,** parasympathetic / vagus **,** nerve **DO NOT CREDIT** 'messages' / 'signals' / 'information'
			Total	6	

Question			Answer	Marks	Guidance
5	(a)	(i)	cytoplasm (of cell) **;**	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** cytosol
5	(a)	(ii)	**1** **phosphorylation** of **glucose ;** **2** so forming **hexose** (1,6) **bisphosphate ;** **3** (then) splitting into / formation of **,** two / 2 **, triose phosphate**(s) / TP **;** **4** (for formation of pyruvate) **dehydrogenation** / **oxidation** / formation of reduced NAD **;** **5** **pyruvate** produced (from **,** TP / (3C) intermediate) **;** **6** total production 4 ATP / net production of 2 ATP **;**	3 max	**Marks can be awarded from a diagram** **1** **DO NOT CREDIT** substrate level phosphorylation **2** **IGNORE** glucose-6-phosphate / fructose-6-phosphate **CREDIT** fructose(-1,6-)bisphosphate **ACCEPT** hexose biphosphate **DO NOT CREDIT** hexose diphosphate **3** **IGNORE** hydrolysis **DO NOT CREDIT** if ATP or NAD or red NAD involved in conversion of hexose bisphosphate to TP **4** **ACCEPT** formation of **,** $NADH_2$ / NADH ($+H^+$) / red NAD **DO NOT CREDIT** $NADPH_2$ / NADPH ($+H^+$) **DO NOT CREDIT** hydrogen ion without electron / H_2 **6** Needs to be a clear statement
			QWC – technical terms used appropriately **and** spelled correctly **;**	1	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** **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
5	(b)		**W** ethanal ; **X** carbon dioxide / CO_2 ; **Y** reduced NAD ; **Z** $NAD^{(+)}$;	4	**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** **W** Correct spelling only **DO NOT CREDIT** ethanol **X** **DO NOT CREDIT** CO^2 / CO **Y** **ACCEPT** $NADH_2$ / $NADH^{(+)}$ ($+H^+$) / red NAD **DO NOT CREDIT** $NADPH_2$ / $NADPH^{(+)}$ ($+H^+$) / red NADP **Z** **DO NOT CREDIT** NADP
5	(c)	(i)	**1** **A** / alkaline , produced less alcohol (than the control) at all times ; **2** **V** / *Vateria* , produced less alcohol (than the control) , at 30 **and** 45 **and** 60 hours / from 30 hours / after 15 hours **or** **V** / *Vateria* had the same alcohol as the control at 15 hours ; **3** **C** / *Careya* , produced less alcohol (than the control) at 30 **and** 45 hours **or** **C** / *Careya* , produced more alcohol (than the control) at 15 **and** 60 hours ;	2	**CREDIT** **ora** for all mark points **ora** e.g. control always produced more alcohol than **A**

Question			Answer	Marks	Guidance
5	(c)	(ii)	*at 60 hours* **V** has fewer yeast cells (which would ferment the sugar) **or** **C** has more yeast cells **;** 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 **;**	**1**	**IGNORE** ref to a compound inhibiting production of alcohol in **V** **Must be clear statements, not implied by the use of figs** **IGNORE** '**V** has fewer bacteria' without ref to fermentation **IGNORE** '**C** has more bacteria' without ref to fermentation
5	(c)	(iii)	**A** / (weak) alkaline (solution) **;** (**A** has the least contamination as) it has very few bacteria **and** little alcohol **;**	**2**	 **ONLY CREDIT** in context of treatment **A**
			Total	**14**	

Question			Answer	Marks	Guidance
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 bisphosphate / 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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