

GCE

Biology

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

Advanced GCE

Mark Scheme for June 2015

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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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These are the annotations, (including abbreviations), including those used in scoris, which are used when marking

Annotation	Meaning
	Benefit of Doubt
	Contradiction
	Cross
	Error Carried Forward
	Given Mark
	Extendable horizontal wavy line
	Ignore
	Large dot (various uses as defined in mark scheme)
	Benefit of the doubt not given
	additional QWC credit given
	Tick
	Tick 1
	Tick 2
	Omission Mark
	Blank Page

Here are the subject specific instructions for this question paper

Unless otherwise stated, accept phonetic spelling throughout unless there is clear ambiguity with another term.

For each correct mark point awarded the tick annotation should be used.

Ensure that the answers to all part questions are acknowledged with a suitable annotation – e.g.

an omission mark or NBOD if the answer is incomplete or not good enough

a wavy line if some information is inaccurate

CON if a potential mark point is contradicted

a cross if the answer is completely wrong.

Use BOD with care and only if you are certain that the answer is close enough to the required information for the mark.

Question			Answer	Mark	Guidance
1	(a)	(i)	<p>A inner membrane (of , double membrane / envelope , surrounding organelle) ;</p> <p>B stroma ;</p> <p>C granum / grana / granal stack / thylakoid stack ;</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 DO NOT CREDIT inter membrane DO NOT CREDIT inner envelope membrane DO NOT CREDIT ref to cell / surface / plasma / membrane</p> <p>B correct spelling only</p> <p>C IGNORE thylakoid unqualified / lamellae</p>
1	(a)	(ii)	<p>1 contain , (named) pigment (molecules) / photosystems ;</p> <p>2 contain , (named) electron carriers / ETC / ATP synth(et)ase ;</p> <p>3 <i>idea that</i> has a large surface area (in a small volume) for , light absorption / light dependent reaction(s) / light dependent stage / electron transport ;</p>	2 max	<p>1 IGNORE 'accessory'</p> <p>2 IGNORE enzymes unqualified</p> <p>3 IGNORE ref to different wavelengths</p> <p>Note: 'the membranes containing the pigments have a large surface area for absorbing light' = 2 marks (mps 1 & 3) Note: 'there is a large surface area for electron transport chain' = 2 marks (mps 2 & 3)</p>

Question			Answer	Mark	Guidance						
1	(a)	(iii)	<table border="1"> <tr> <td>A</td> <td></td> </tr> <tr> <td>B</td> <td>✓</td> </tr> <tr> <td>C</td> <td></td> </tr> </table> ;	A		B	✓	C		1	DO NOT CREDIT if more than one tick entered
A											
B	✓										
C											
1	(b)		<p>1 <i>at high light intensity</i> other (named) factor becomes a <u>limiting factor</u> ;</p> <p>2 <i>idea that</i> temperature becomes limiting as , Calvin cycle / light independent reaction , involves enzymes / relies on kinetic energy of molecules ;</p> <p>3 <i>idea that</i> CO₂ (concentration) becomes limiting as it is required for , Calvin cycle / light independent reaction / formation of (named) Calvin cycle compound / reaction with RuBP / fixation by Rubisco ;</p>	2 max	<p>IGNORE ref to photorespiration (as Q specifies photosynthesis)</p> <p>1 ACCEPT light is no longer the <u>limiting factor</u> e.g. of named factor = temperature / CO₂ concentration DO NOT CREDIT if light is given as a limiting factor DO NOT CREDIT ref to the rate slowing down IGNORE water or other suggestions</p> <p>2 ACCEPT ref to Rubisco being limited by temp (as a named enzyme being in the Calvin cycle)</p> <p>3 e.g. of named compound = GP / TP / RuBP</p>						

Question			Answer	Mark	Guidance
1	(c)	(i)	<p>No ora</p> <p><i>species E because</i></p> <p>1 E starts photosynthesising at low(er) light intensity ;</p> <p>2 E reaches its maximum rate at low(er) light intensity ;</p> <p>3 E steep(er) <u>increase</u> in rate of photosynthesis (with small increase in light intensity) ;</p> <p>4 E has a , higher / greater / faster , rate of photosynthesis (than D) at low light intensities ;</p>	2 max	<p>Only credit answers stating that species E is the shade plant. Please indicate this with the green dot annotation. IGNORE ref to time / earlier / later / etc.</p> <p>2 IGNORE plateau (as this is a description of the curve) IGNORE ref to optimum rate</p> <p>3 Needs to relate to the increase, not just rate i.e. referring to the gradient part of the graph</p> <p>4 i.e. referring to any point at low light intensity when E is photosynthesising at a higher rate than D</p> <p>Note – ‘E has a faster <u>increase</u> in the rate of photosynthesis at <u>low light intensities</u>’ = 2 marks (mps 3 & 4)</p>
1	(c)	(ii)	<p><i>shade leaf will have</i></p> <p>1 large(r) / more , chloroplast(s) / (palisade) mesophyll ;</p> <p>2 more , grana / thylakoids (in chloroplast) ;</p> <p>3 large(r) surface area (of leaves) ;</p>	1 max	<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><i>Assume shade leaf unless otherwise stated</i> CREDIT ora for sun leaf IGNORE adaptations related to temperature</p> <p>1 ACCEPT more , chlorophyll / photosystems IGNORE ref to colour / accessory pigments</p>

Question		Answer	Mark	Guidance
1	(d)	<p>1 animals / heterotrophs (need to) , eat / obtain organic material from / AW , plants / autotrophs ;</p> <p>2 (plants / autotrophs) produce (named) organic molecules during , <u>photosynthesis</u> / <u>Calvin cycle</u> / <u>light independent</u> stage ;</p> <p>3 (plants / autotrophs) produce oxygen during , <u>photosynthesis</u> / <u>photolysis</u> / <u>light dependent</u> stage;</p> <p>4 glucose / carbohydrate / oxygen , (produced in photosynthesis) are used in <u>respiration</u> by , animals / heterotrophs ;</p>	<p>3 max</p>	<p>IGNORE ref to providing habitat / shelter DO NOT CREDIT ref to creating (etc.) energy</p> <p>1 CREDIT (plants / autotrophs) are the start of food chain(s)</p> <p>3 IGNORE photophosphorylation</p> <p>4 ALLOW ref to other respiratory substrate</p>
		Total	14	

Question		Answer	Mark	Guidance
2	(a)	endocrine ; hormone ; cortex / cortical ; target / effector ;	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
2	(b) (i)	<p>1 glucose , respired / phosphorylated / metabolised , to produce ATP ;</p> <p>2 ATP , blocks / closes , potassium ion channel(s) and potassium ions / K⁺ , build up (inside cell) / cannot leave ;</p> <p>3 (voltage-gated) calcium ion / Ca²⁺ , channels open and calcium ions / Ca²⁺ , enter (cell by diffusion) ;</p> <p>4 (more) calcium ions / Ca²⁺ , resulting in , movement of vesicles to membrane / exocytosis / described ;</p>	4	<p>IGNORE the numbered prompt lines, but the events must be in the correct sequence.</p> <p>1 IGNORE 'glucose is broken down to form ATP'</p> <p>2 ion must be indicated at least once If symbol used, must have correct charge IGNORE ref to 'depolarisation' (as not indicated on fig.)</p> <p>3 ion must be indicated at least once If symbol used, must have correct charge IGNORE ref to polarisation</p> <p>4 if ion had been mentioned in stage 3, then allow 'calcium' alone for this mp ACCEPT ecf for this mp if mp 3 not awarded because Na⁺ stated instead of Ca²⁺ IGNORE 'secretion' as given in question</p>

Question			Answer	Mark	Guidance
2	(b)	(ii)	<p>1 (continues to be secreted) as long as <u>blood / plasma</u> , glucose (concentration) , remains high / is higher than normal ;</p> <p>2 (sufficient) ATP is still present and so K⁺ channels remain closed ;</p> <p>3 (exocytosis) still being triggered by , calcium ions / Ca²⁺;</p>	<p>2 max</p>	<p>IGNORE ref to what happens once the glucose level returns to normal and secretion stops (as Q asks about the continued secretion of insulin)</p> <p>3 CREDIT Ca²⁺ , still present / remain high CREDIT exocytosis continues until Ca²⁺ can be removed from cell</p>
			Total	10	

Question			Answer	Mark	Guidance
3	(a)	(i)	<p>W ; Z ; X ; W ;</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>
3	(a)	(ii)	<p>1 some <u>ATP</u> used to (actively) transport pyruvate (into the mitochondrion) ;</p> <p>2 some <u>ATP</u> used to (actively) transport H⁽⁺⁾ from (reduced) NAD , formed in glycolysis / into the mitochondrion ;</p> <p>3 some energy released in ETC , is not used to transport H⁺ (across inner membrane) / is released as heat ;</p> <p>4 not all the H⁺ movement (back across membrane) , is used to generate ATP / is through ATP synth(et)ase ;</p> <p>5 not all the, reduced NAD / red NAD / NADH , is used to feed into the ETC ;</p>	2 max	<p>IGNORE ref to phosphorylation of glucose as this is taken into account in estimate.</p> <p>2 DO NOT CREDIT transport of (reduced) NAD</p> <p>3 ACCEPT in context of oxidative phosphorylation</p> <p>4 ACCEPT ref to H⁺ leaking (back into matrix or out into cytoplasm) resulting in less ATP generated</p> <p>5 CREDIT use of (some of) the red NAD for other purpose</p>

Question			Answer	Mark	Guidance
4	(a)		93 (to nearest whole number) / 93.4 (to 3 sig figs) ; per million (people) / million ⁻¹ ;	2	Correct answer with correct units = 2 marks Correct answer with no/incorrect units = 1 mark If answer incorrect or no numerical answer given then allow 1 mark for using correct units.
4	(b)	(i)	error bar(s) ;	1	CREDIT standard deviation / variance / standard error DO NOT CREDIT range bars (as they would not all be equidistant from the mean)

Question			Answer	Mark	Guidance
4	(b)	(ii)	<p><i>In the context of starting RRT</i></p> <p>1 more males ora or higher percentage are males / lower percentage are females ;</p> <p>2 the lowest percentage of males is 60% / the highest percentage of females is 40% ;</p> <p>3 percentage of males increases with age from age group 35-44 or ratio / proportion , of male to female increases with age from age group 35-44 or percentage of males decreases with age until age group 35-44 or ratio / proportion , of male to female decreases with age until age group 35-44 ;</p> <p>4 <i>idea that</i> (as bars overlap) any differences (in proportions of the genders) between age groups are not (statistically) significant ;</p>	2 max	<p>IGNORE ref to likelihood of / risk of / more likely to , start / have , RRT</p> <p>1 ACCEPT 'more than 50% are males' or 'over half are males' or 'less than 50% are females' or 'less than half are females' IGNORE refs to data relating to single age groups</p> <p>2 Needs to emphasise that this is the least CREDIT 55% instead of 60% 45% instead of 40%</p> <p>3 IGNORE ref to number of males CREDIT ora for female to male ratio / proportion IGNORE ref to number of males CREDIT ora for female to male ratio / proportion</p> <p>4 Illustrates why the conclusions in mp 3 may not be secure</p>

Question			Answer	Mark	Guidance
4	(c)	(i)	<i>uncertain diagnosis because idea that</i> older people may have more complex medical problems ;	1	e.g. 'older people may have more than one thing wrong with them' 'more likely to have more than one cause of kidney failure'
4	(c)	(ii)	renal vascular disease and x 5 increase / (percentage) increase of 400% ;	1	IGNORE ref to 9.2%
4	(d)	(i)	it can perform , active transport / facilitated diffusion ;	1	IGNORE ref to structural features e.g. channel proteins
4	(d)	(ii)	<p>1 <i>idea that</i> (dialysis is replicating function of kidney and) part of kidney's function is to remove (excess) water from blood ;</p> <p>2 (dextrose / sugar) reduces , <u>water potential</u> / Ψ (of dialysis fluid)</p> <p>or (dextrose / sugar , solution) has a lower , <u>water potential</u> / Ψ (than water) ;</p> <p>3 water moves from blood (into dialysis fluid) by <u>osmosis</u></p> <p>or prevents water moving into the blood (from dialysis fluid) by <u>osmosis</u> ;</p> <p>4 (if it was water alone) cells would , swell / burst ;</p>	2 max	IGNORE ref to the use of dextrose rather than glucose IGNORE ref to ions

Question			Answer	Mark	Guidance
4	(d)	(iii)	<p>1 peritoneal dialysis can remove less (named) waste (than haemodialysis) ;</p> <p>2 <i>idea that</i> in haemodialysis dialysis fluid is constantly , refreshed / changed (but not in peritoneal dialysis) ;</p> <p>3 haemodialysis uses counter-current flow ;</p> <p>4 <i>idea that</i> haemodialysis maintains concentration gradient or in peritoneal dialysis the concentration gradient , reduces / is lower ;</p> <p>5 (in peritoneal dialysis) the fluid reaches equilibrium with the blood ;</p>	2 max	<p>IGNORE ref to 'cleaning' blood</p> <p>1 ora e.g. haemodialysis is more , efficient / effective , at removing (named) waste</p>
4	(e)		stem / erythropoietic , cell(s) and bone marrow ;	1	
Total				13	

Question		Answer	Mark	Guidance
5	(a)	<p><i>both have</i></p> <p>1 dendrite(s) ;</p> <p>2 an axon ;</p> <p>3 a cell body with a , nucleus / named organelle ;</p> <p>4 myelin sheath / myelinated / (covered with) Schwann cell / nodes of Ranvier ;</p> <p>5 <u>voltage-gated</u> channels / sodium-potassium (ion) pump ;</p>	3 max	<p>1 DO NOT CREDIT if states that motor neurone has dendrites and a dendron</p> <p>3 e.g. mitochondria / Golgi / SER / RER</p> <p>4 CREDIT may have / can have</p>
		<p>QWC ;</p>		<p>1 Award if 3 of the following terms have been used in a correct context with correct spelling: dendrite(s) axon(s) cell body(ies) myelin (or derived term) schwann</p> <p><i>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.</i></p>
5	(b)	<p>M ;</p> <p>B ;</p> <p>M ;</p>	3	<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>

Question			Answer	Mark	Guidance
5	(c)	(i)	<p>1 evaporation will , have a cooling effect / reduce (body) temperature ;</p> <p>2 heat , taken from / supplied by , the body / blood / skin , is , needed / used for , evaporation ;</p> <p>3 <i>idea that</i> water has a high latent heat of , vaporisation / evaporation ;</p>	2 max	<p>2 ACCEPT evaporation uses latent heat Look for a clear statement that <i>body heat</i> is being used for evaporation</p> <p>3 e.g. evaporation of water needs a lot of , energy / heat</p>
5	(c)	(ii)	<i>idea that</i> to increase body temperature as it is lower than the 'new' set-point (even though body is hot) ;	1	e.g. as the new 'normal' body temperature is higher, the body is using shivering to raise the temperature of the internal environment.
5	(d)		<p>1 vasodilation results in more blood nearer to the skin surface ;</p> <p>2 <i>idea that</i> will lose (even) more heat / further heat loss (from body) / body temperature decreases further ;</p> <p>3 (named) organ(s) will not be able to maintain , function / metabolism ;</p>	2 max	<p>1 Vasodilation must be in correct context (arterioles). DO NOT CREDIT (large) arteries / capillaries / veins , relaxing / dilating / expanding DO NOT CREDIT blood vessels moving closer to the surface</p> <p>2 just 'the body loses heat' is not enough</p> <p>3 ACCEPT ref to lack of kinetic energy for enzymes ACCEPT ref to lack of enzyme activity</p>
			Total	12	

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