OCR
Oxford Cambridge and RSA

GCE

Biology

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

Advanced GCE

Mark Scheme for June 2015

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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.

OCR will not enter into any discussion or correspondence in connection with this mark scheme.

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

Annotation	Meaning
BOD	Benefit of Doubt
CON	Contradiction
	Cross
ECF	Error Carried Forward
GM	Given Mark
	Extendable horizontal wavy line
I	Ignore
	Large dot (various uses as defined in mark scheme)
NBOD	Benefit of the doubt not given
QWC+	additional QWC credit given
	Tick
	Tick 1
	Tick 2
	Omission Mark
BP	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)	**A** inner membrane (of , double membrane / envelope , surrounding organelle) ; **B** stroma ; **C** granum / grana / granal stack / thylakoid stack ;	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** **DO NOT CREDIT** inter membrane **DO NOT CREDIT** inner envelope membrane **DO NOT CREDIT** ref to cell / surface / plasma / membrane **B** correct spelling only **C** **IGNORE** thylakoid unqualified / lamellae
1	(a)	(ii)	**1** contain , (named) pigment (molecules) / photosystems ; **2** contain , (named) electron carriers / ETC / ATP synth(et)ase ; **3** *idea that* has a large surface area (in a small volume) for , light absorption / light dependent reaction(s) / light dependent stage / electron transport ;	2 max	**1** **IGNORE** 'accessory' **2** **IGNORE** enzymes unqualified **3** **IGNORE** ref to different wavelengths **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)

Question			Answer	Mark	Guidance
1	(a)	(iii)	A ; B ✓ ; C	1	**DO NOT CREDIT** if more than one tick entered
1	(b)		**1** *at high light intensity* other (named) factor becomes a limiting factor ; **2** *idea that* temperature becomes limiting as , Calvin cycle / light independent reaction , involves enzymes / relies on kinetic energy of molecules ; **3** *idea that* CO_2 (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 ;	2 max	**IGNORE** ref to photorespiration (as Q specifies photosynthesis) **1** **ACCEPT** light is no longer the limiting factor e.g. of named factor = temperature / CO_2 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 **2** **ACCEPT** ref to Rubisco being limited by temp (as a named enzyme being in the Calvin cycle) **3** e.g. of named compound = GP / TP / RuBP

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

Question			Answer	Mark	Guidance
1	(d)				**IGNORE** ref to providing habitat / shelter **DO NOT CREDIT** ref to creating (etc.) energy
			1 animals / heterotrophs (need to) **,** eat / obtain organic material from / AW **,** plants / autotrophs **;**		**1** **CREDIT** (plants / autotrophs) are the start of food chain(s)
			2 (plants / autotrophs) produce (named) organic molecules during **,** photosynthesis / Calvin cycle / light independent stage **;**		
			3 (plants / autotrophs) produce oxygen during **,** photosynthesis / photolysis / light dependent stage**;**		**3** **IGNORE** photophosphorylation
			4 glucose / carbohydrate / oxygen **,** (produced in photosynthesis) are used in respiration by **,** animals / heterotrophs **;**	**3 max**	**4** **ALLOW** ref to other respiratory substrate
			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)	**1** glucose , respired / phosphorylated / metabolised , to produce ATP ; **2** ATP , blocks / closes , potassium ion channel(s) **and** potassium ions / K^+ , build up (inside cell) / cannot leave ; **3** (voltage-gated) calcium ion / Ca^{2+} , channels open **and** calcium ions / Ca^{2+} , enter (cell by diffusion) ; **4** (more) calcium ions / Ca^{2+} , resulting in , movement of vesicles to membrane / exocytosis / described ;	4	**IGNORE** the numbered prompt lines, but the events **must** be in the correct sequence. 1 **IGNORE** 'glucose is broken down to form ATP' **2** ion must be indicated at least once If symbol used, must have correct charge **IGNORE** ref to 'depolarisation' (as not indicated on fig.) **3** ion must be indicated at least once If symbol used, must have correct charge **IGNORE** ref to polarisation **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 Ca^{2+} **IGNORE** 'secretion' as given in question

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

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

Question			Answer	Mark	Guidance
3	(b)		*in anaerobic respiration* **1** **glycolysis** / conversion of glucose into **pyruvate** , occurs **;** **2** produces 2 molecules of ATP (net) **;** **3** (only) substrate level phosphorylation (occurs) **;** **4** **oxygen** not available as final **electron acceptor** **;** **5** pyruvate / ethanal **,** used to regenerate NAD for glycolysis (to continue) **;** **6** (Krebs cycle and) electron transport chain / **chemiosmosis** / **oxidative phosphorylation** , do not occur **;**	**4 max**	**2** **IGNORE** little / less / not much **4** **CREDIT** oxygen is available as the final electron acceptor in aerobic **IGNORE** ref to hydrogen acceptor **5** pyruvate refers to lactate pathway, ethanal refers to fermentation **6** ETC (etc.) ***only*** occur(s) in aerobic
			QWC ;	**1**	Award if **3** of the following terms have been used in a correct context with correct spelling: **glycolysis** **pyruvate** **substrate level phosphorylation** **oxygen** **electron acceptor** **chemiosmosis / chemiosmotic** **oxidative phosphorylation** ***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	**11**	

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)	*In the context of starting RRT* **1** more males **ora** **or** higher percentage are males / lower percentage are females **;** **2** the lowest percentage of males is 60% / the highest percentage of females is 40% **;** **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 **;** **4** *idea that* (as bars overlap) any differences (in proportions of the genders) between age groups are not (statistically) significant **;**	**2 max**	**IGNORE** ref to likelihood of / risk of / more likely to **,** start / have **,** RRT **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 **2** Needs to emphasise that this is the ***least*** **CREDIT** 55% instead of 60% 45% instead of 40% **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 **4** Illustrates why the conclusions in mp 3 may not be secure

Question			Answer	Mark	Guidance
4	(c)	(i)	*uncertain diagnosis because* *idea that* 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)	**1** *idea that* (dialysis is replicating function of kidney and) part of kidney's function is to remove (excess) water from blood ; **2** (dextrose / sugar) reduces , <u>water potential</u> / $\underline{\Psi}$ (of dialysis fluid) **or** (dextrose / sugar , solution) has a lower , <u>water potential</u> / $\underline{\Psi}$ (than water) ; **3** water moves from blood (into dialysis fluid) by <u>osmosis</u> **or** prevents water moving into the blood (from dialysis fluid) by <u>osmosis</u> ; **4** (if it was water alone) cells would , swell / burst ;	2 max	**IGNORE** ref to the use of dextrose rather than glucose **IGNORE** ref to ions

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

Question			Answer	Mark	Guidance
5	(a)		*both have* **1** **dendrite**(s) **;** **2** an **axon ;** **3** a **cell body** with a **,** nucleus / named organelle **;** **4** **myelin** sheath / myelinated / (covered with) **Schwann** cell / nodes of Ranvier **;** **5** <u>voltage</u>-gated channels / sodium-potassium (ion) pump **;**	**3 max**	**1** **DO NOT CREDIT** if states that motor neurone has dendrites and a dendron **3** e.g. mitochondria / Golgi / SER / RER **4** **CREDIT** may have / can have
			QWC ;	**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** ***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.***
5	(b)		**M ;** **B ;** **M ;**	**3**	**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**

Question			Answer	Mark	Guidance
5	(c)	(i)	**1** evaporation will **,** have a cooling effect / reduce (body) temperature **;** **2** heat **,** taken from / supplied by **,** the body / blood / skin , is **,** needed / used for **,** evaporation **;** **3** *idea that* water has a high latent heat of **,** vaporisation / evaporation **;**	**2 max**	**2** **ACCEPT** evaporation uses latent heat Look for a clear statement that body heat is being ***used*** for evaporation **3** e.g. evaporation of water needs a lot of , energy / heat
5	(c)	(ii)	*idea that* 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)		**1** vasodilation results in more blood nearer to the skin surface **;** **2** *idea that* will lose (even) more heat / further heat loss (from body) / body temperature decreases further **;** **3** (named) organ(s) will not be able to maintain **,** function / metabolism **;**	**2 max**	**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 **2** just 'the body loses heat' is not enough **3** **ACCEPT** ref to lack of kinetic energy for enzymes **ACCEPT** ref to lack of enzyme activity
			Total	**12**	

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