OCR
Oxford Cambridge and RSA

GCE

Biology

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

Advanced GCE

Mark Scheme for June 2016

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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 (Key point attempted)
NBOD	Benefit of the doubt not given
QWC+	additional QWC credit given
	Tick
	Tick 1
	Tick 2
^	Omission Mark

Question			Answer	Mark	Guidance
1	(a)		1 (pancreas has) <u>pancreatic</u> duct **;** 2 (ducts) carry / transport / take **,** secretions / enzymes / pancreatic juice (to duodenum) **;** 3 (enzyme) not **,** released / secreted **,** directly into the blood **;**	**2 max**	**DO NOT CREDIT** 'excretion' for 'secretion' on first occasion then apply ecf 1 **IGNORE** ref to the other ducts 2 **CREDIT** enzymes secreted into duct **ACCEPT** substances / molecules for 'secretions' **DO NOT CREDIT** incorrect ref to hormones **DO NOT CREDIT** ref to *ducts* secreting enzymes 3 **DO NOT CREDIT** incorrect ref to hormones **IGNORE** 'not transported in the blood' **Note** 'it releases enzymes into the pancreatic duct' **= 2 marks (mps 1 and 2)**
1	(b)	(i)	islet(s) of Langerhan(s) **;**	**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** α <u>and</u> β / alpha <u>and</u> beta **,** cells **DO NOT CREDIT** a / b / A / B **,** cells **DO NOT CREDIT** acinar cells
1	(b)	(ii)	erythrocyte / red blood 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** **IGNORE** RBC **IGNORE** ref to blood vessel

Question			Answer	Mark	Guidance
1	(c)	(i)	1 increase (in blood sugar) is detected (by β cells) **;** 2 *idea that takes time for* depolarisation (in β cells) **;** 3 *time needed for* β cells to **,** produce / release **,** insulin **;**	**2 max**	**DO NOT CREDIT** 'B' or 'b' cell on first occasion then apply ecf A description of a *sequence* of events provides a timeline 2 *time for* making sure that there is enough ATP / ion channels open / to pump out K^+ / for Ca^{2+} to enter 3 **DO NOT CREDIT** ref to α cell(s)
1	(c)	(ii)	1 there should be no straight line(s) (on the graph) **or** line(s) (should) **,** rise and fall / fluctuate **;** 2 glucose and insulin levels fluctuate **;** 3 insulin levels (should) rise (and fall) after those of glucose **;** 4 (glucose) level **,** maintained around / returned to **,** the **norm**(al) / a **set** point / a **set** value **;** 5 ref to **negative feedback** / **homeosta**sis **;**	**3 max**	**DO NOT CREDIT** in the context of eating a meal 2 Must be a statement that implies both levels change 4 **CREDIT** 'within narrow limits' / 'relatively constant' **IGNORE** optimum **CREDIT** maintained at **,** 80 – 120 mg 100cm^{-3} / 4 – 6 mmol dm^{-3} for the glucose value
			QWC **;**	**1**	Award if **3** of the following terms have been used in a correct context with correct spelling: **set** (point / value) **norm**(al) **negative feedback** **homeosta**sis

Question			Answer	Mark	Guidance
1	(d)	(i)	to ensure that the (blood) glucose **,** is at its **,** base (level) / low (level) / normal (level) **;**	1	**ACCEPT** 'sugar' instead of 'glucose' **ACCEPT** to make sure that the glucose (level) is not **,** raised / high **ACCEPT** to make sure that the rise in blood glucose is only due to the (tested) food eaten **DO NOT CREDIT** ref to ***no*** , sugar / carbohydrate
1	(d)	(ii)	1 50 g of <u>glucose</u> must be used **;** 2 the data for glucose should be obtained for the same (ten) people (to eliminate differences between individuals) **;** 3 same age / same age range (as people in original test) **;** 4 same gender balance (as in original test) **;** 5 have the same level of activity (during the test) **;** 6 be at the same temperature **;** 7 don't eat or drink anything else (during the test) **;** 8 same **,** body mass / BMI **;**	2 max	**IGNORE** ref to volume of blood taken or where in the body it is taken from **IGNORE** same number of people 1 **CREDIT** ref to same mass as test carbohydrate **IGNORE** amount 7 **CREDIT** 'only drinks water' (during the test) 8 **ACCEPT** same weight **IGNORE** same build

Question			Answer	Mark	Guidance
1	(d)	(iii)	1 (absorption / effect on blood glucose) **,** variable from person to person **;** 2 it reduces the effect of **,** outliers / anomalous values **;**	**1 max**	**IGNORE** ref to accuracy / precision / reliability / validity
			Total	**14**	

Question			Answer	Mark	Guidance
2	(a)		1 greater light <u>intensity</u> on a sunny day / less light <u>intensity</u> on a cloudy day **;** 2 oxygen produced during **,** photosynthesis / photolysis / light dependent stage **;** 3 (more) oxygen trapped within weed increases buoyancy **;**	**2 max**	**IGNORE** all ref to growth and tropisms 3 **ACCEPT** 'oxygen helps the weed to float' 'oxygen bubbles makes the weed rise' 'trapped oxygen lowers the density'
2	(b)		1 fish are **,** <u>ectotherms</u> / <u>ectothermic</u> **or** body temperature will be similar to surrounding water **;** 2 *idea that* pump will be generating heat / water around pump is warmer **;** 3 AVP **;**	**2 max**	All marks to be applied in the context of warmth rather than oxygen (as the pump circulates water and does not oxygenate) 1 **CREDIT** cannot control body temperature (by physiological means) **DO NOT CREDIT** ref to **,** regulating / maintaining **,** body temperature 3 they are adapted for warmer conditions ref to (named) metabolic function (e.g. metabolic reactions occur at a faster rate / enzymes can work more efficiently)
			Total	**4**	

Question			Answer	Mark	Guidance
3	(a)		*similarities* S1 (both) have **,** **pentose** / 5C **,** sugar **;** S2 (both) have **phosphate ;** S3 (both) have **,** **adenine** / (nitrogenous) base **;** *differences* D1 DNA (nucleotide) has **deoxyribose** ***and*** ATP has **ribose ;** D2 DNA (nucleotide) has 1 phosphate ***and*** ATP has 3 phosphates **;** D3 DNA (nucleotide) **,** has (4 possible) different bases / can have **thymine** / can have **cytosine** / can have **guanine** ***and*** ATP has **,** only 1 (possible) base / adenine **;**	**4 max**	**Accept all mark points from diagrams that are clearly labelled** **IGNORE** letters for bases **IGNORE** bonds S2 **ACCEPT** P_i / $PO_4^{(3-)}$ / (P) **DO NOT CREDIT** phosphate heads / phosphoric acid / phosphorus / P S3 **DO NOT CREDIT** adenosine D2 **ACCEPT** P_i / $PO_4^{(3-)}$ / (P) / 'a phosphate group' for DNA **DO NOT CREDIT** phosphate heads / phosphoric acid / phosphorus / P D3 **DO NOT CREDIT** thiamine / cysteine / adenosine **Note:** 'ATP has adenine but DNA has adenine or thymine' **= 2 marks (S3 and D3)**
			QWC **;**	**1**	Award if **3** of the following terms have been used in a correct context with correct spelling: **adenine** **thymine** / **cytosine** / **guanine** **deoxyribose** **ribose** **pentose** **phosphate**

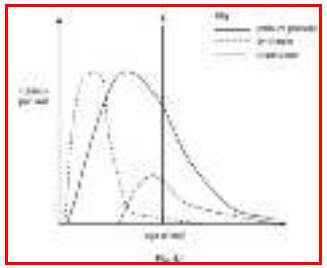
Question			Answer	Mark	Guidance
3	(b)	(i)	(2 molecules of) ATP / adenosine triphosphate **;**	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks**
3	(b)	(ii)	**K** hexose (1,6) (bis)phosphate **;** **L** pyruvate **;** **M** carbon dioxide / CO_2 **;**	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** K **CREDIT** glucose (6) phosphate / fructose (1) phosphate / fructose (1,6) diphosphate / hexose diphosphate **DO NOT CREDIT** glucose (1,6) bisphosphate L **ACCEPT** pyruvic acid M if used, formula must be correct
3	(b)	(iii)	glycolysis / glycolytic **;**	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**

Question			Answer	Mark	Guidance
3	(b)	(iv)	by <u>substrate level phosphorylation</u> **;** detail **;** by **,** <u>chemiosmosis</u> / <u>oxidative phosphorylation</u> **;** detail **;**	**3 max**	e.g. • by removing phosphate from a compound (in the reaction pathway) e.g. • hydrogen lost from **,** redNAD / redFAD • electrons pass down **,** ETC / electron transport chain • ref to proton gradient / electrochemical gradient • ref to ATP synth(et)ase
			Total	**13**	

Question			Answer	Mark	Guidance
4	(a)	(i)	1 rate of photosynthesis increases (reaches peak) **and** then decreases**;** 2 peak / optimum **,** for 0.04% CO_2 **,** between 20°C and 30°C / at 25°C **;** 3 peak / optimum **,** for 0.19% CO_2 **,** between 30°C and 40°C / at 35°C **;** 4 ref to zero rate / no result / no photosynthesis **,** at 40°C and 45°C / from 40°C / above 35°C **,** with 0.04% CO_2 **;**	**3 max**	'it' = rate of photosynthesis Units must be used once (% and °C) for mps 2 to 4 2 either states 25°C **or** states the range 20°C to 30°C 3 either states 35°C **or** states the range 30°C to 40°C 4 **ACCEPT** photosynthesis stops at 40°C
4	(a)	(ii)	143 (%) **; ;**	**2**	**Correct answer = 2 marks** **[please place 2 ticks on script]** **If answer is incorrect, then ALLOW 1 mark for** unrounded or incorrectly rounded answer (e.g. 142.657 or 142) **or** (34.7 - 14.3) ÷ 14.3 **or** 20.4 ÷ 14.3 **or** 100 x (34.7 ÷ 14.3) - 100 **or** 243

Question			Answer	Mark	Guidance
4	(a)	(iii)	*idea that* increases the optimum temperature (for photosynthesis) **or** maximum rate of photosynthesis at higher temperature **or** can photosynthesise at higher temperatures **or** maximum rate of photosynthesis is higher **or** rate of photosynthesis starts to decrease at a higher temperature **or** the rate of photosynthesis increased **,** at a higher rate / faster **;**	1	**ACCEPT** moves peak upwards

Question			Answer	Mark	Guidance
4	(a)	(iv)	1 no **,** photosynthesis / Calvin cycle / carbon fixation **or** rate too low to be recorded **;** 2 CO_2 is <u>limiting</u> **or** *idea that* the level of CO_2 is too low to compensate for the high temperature **;** 3 rubisco is binding to O_2 (instead) **;** 4 decreased enzyme activity **;** 5 (high temperature has) distorted rubisco active site **;** 6 AVP **;**	**2 max**	2 (as activity had been observed at these temperatures with 0.19% CO_2) 3 look for a clear statement **CREDIT** switches to **,** photorespiration / oxygenase activity 4 **DO NOT CREDIT** (fully) denatured 5 **DO NOT CREDIT** (fully) denatured (as there is activity at these higher temperatures) 6 e.g. stomatal closure to conserve water reduces CO_2 **Note:** 'the rubisco active site is distorted so it binds to O_2 instead' **= 2 marks (mps 3 and 5)**

Question			Answer	Mark	Guidance
4	(b)		 1 rate of photosynthesis would decrease **;** 2 little rubisco being synthesised **and** the rubisco present being broken down **or** more rubisco is being broken down than being synthesised **;** 3 less / no **,** enzyme / rubisco **,** available to fix **,** carbon dioxide / CO_2 **;** 4 less / no **,** Calvin cycle / light independent stage **,** can take place **;** 5 rubisco becomes limiting (factor) **;**	**3 max**	'it' = rate of photosynthesis 1 **IGNORE** no photosynthesis 3 **CREDIT** less rubisco to catalyse the reaction between CO_2 and RuBP 4 **CREDIT** build up of red NADP less **,** triose phosphate / TP / etc **,** made less glucose made light independent stage takes place at a slower rate **Note:** 'less photosynthesis because there is less rubisco which is needed to fix CO_2 in the Calvin cycle' **= 3 marks (mps 1, 3 and 4)**
			Total	**11**	

Question			Answer	Mark	Guidance
5	(a)	(i)	(B and) C **;**	1	**Mark the first answer(s).** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks**
5	(a)	(ii)	D **and** E **;**	1	**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** **IGNORE** F
5	(a)	(iii)	**all** individual letters A to G / A to G / A - G **;**	1	as the pump runs continuously **CREDIT** F **and/or** A **and** G as these are the places where the pump has greatest effect **IGNORE** B if given as an additional answer to an otherwise correct answer
5	(b)	(i)	False / F True / T True / T **; ;**	2	**All 3 answers correct = 2 marks** **Any 2 answers correct = 1 mark** **1 or 0 answers correct = 0 marks** **Mark incorrect cells first** **1 ✕ = 1 max** **2 ✕ = 0 marks**

Question			Answer	Mark	Guidance
5	(b)	(ii)	1 *idea that* (hormonal) stimulation of individual muscle cells would result in uncoordinated response **or** (hormonal) stimulation of SAN results in coordinated action of the cardiac muscle **;** 2 *idea that* (hormonal) stimulation of individual muscle cells will not result in a change in heart rate **or** (hormonal) stimulation of SAN results in a change in heart rate **;** 3 (as) (hormone) receptors only present on the SAN / individual cells do not have (hormone) receptors **;**	**2 max**	hormone binds to / hormone acts on = stimulation e.g. coordinated action = both atria contract together
5	(b)	(iii)	1 adrenaline / first messenger / it **,** binds to receptor(s) on cell **surface** membrane (of SAN cell(s)) **;** 2 activates adenyl(yl) cyclase **;** 3 ATP converted to **,** cyclic AMP / cAMP **or** cyclic AMP / cAMP / second messenger **,** synthesised **;** 4 results in depolarisation (of SAN cell membrane) **;**	**2 max**	**IGNORE** ref to synthesis of glucose 1 **CREDIT** 'plasma membrane' or 'plasmalemma' for 'cell surface membrane' 2 **CREDIT** ref to adenylate cyclase 3 **DO NOT CREDIT** in context of 'wave of depolarisation'
			Total	**9**	

Question			Answer	Mark	Guidance
6	(a)	(i)	deamination ;	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** deanimation
6	(a)	(ii)	ammonia / NH_3 ;	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** ammonium / NH_4^+
6	(b)		ornithine ; carbon dioxide / CO_2 ; urea / $CO(NH_2)_2$; kidney / nephron / renal tubule / glomerulus ; bladder ; urine ;	6	**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** If formula used, must be correct **IGNORE** water / H_2O / ATP **IGNORE** other named part of the nephron e.g. Bowmans capsule / loop of Henle / etc **DO NOT CREDIT** gall bladder

Question			Answer	Mark	Guidance
6	(c)				**IGNORE** ref to protein synthesis (as in Q) used in the regeneration / repair of liver cells
			1 in respiration / in Krebs cycle / as a respiratory substrate **;**		1 **DO NOT CREDIT** for anaerobic respiration / glycolysis
			2 gluconeogenesis **;**		2 **CREDIT** conversion to glucose
			3 conversion to **,** lipid / fatty acid **;**		3 **ACCEPT** conversion to **,** steroid / bile salts **IGNORE** glycerol
			4 transamination **;**	**1 max**	
			Total	**9**	

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