OCR
RECOGNISING ACHIEVEMENT

GCE

Biology

Advanced GCE

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

Mark Scheme for January 2012

Oxford Cambridge and RSA Examinations

OCR (Oxford Cambridge and RSA) is a leading UK awarding body, providing a wide range of qualifications to meet the needs of candidates of all ages and abilities. OCR qualifications include AS/A Levels, Diplomas, GCSEs, OCR Nationals, Functional Skills, Key Skills, Entry Level qualifications, NVQs and vocational qualifications in areas such as IT, business, languages, teaching/training, administration and secretarial skills.

It is also responsible for developing new specifications to meet national requirements and the needs of students and teachers. OCR is a not-for-profit organisation; any surplus made is invested back into the establishment to help towards the development of qualifications and support, which keep pace with the changing needs of today's society.

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.

© OCR 2012

Any enquiries about publications should be addressed to:

OCR Publications
PO Box 5050
Annesley
NOTTINGHAM
NG15 0DL

Telephone: 0870 770 6622
Facsimile: 01223 552610
E-mail: publications@ocr.org.uk

Annotations

Annotation	Meaning
	Correct answer
	Incorrect response
	Benefit of Doubt
	Not 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

**Quality of Written Communication*

Question			Answer	Marks	Guidance
1	(a)	(i)	**1** *idea of* maintaining (relatively) stable internal **,** environment / state **;** **2** within (narrow) limits / within (narrow) range / about a set point **;** **3** even though environment is changing **;**	**2 max**	**1** Need the idea of 'constant' or 'steady' **and** 'regulation' or 'keeping' **and** in the body **2 ACCEPT** about the 'norm' **IGNORE** ref to negative feedback (as mechanism rather than definition) / optimum conditions **CREDIT** mps 2 & 3 (only) if response is in terms of example(s) e.g. temperature / blood glucose ***Note*** 'maintaining a stable body temperature' = 0 'keeping your body temperature at 37^{o}C' = 1 (mp 2) 'even though it is getting cold' = 1 (mp 3)

Question			Answer	Marks	Guidance
1	(a)	(ii)	**1** β cells / α cells / **receptor**s , detect , change / increased / decreased , in blood glucose (concentration) ; **2** if high(er) glucose (concentration) , **beta** / β , cells (in pancreas) release **insulin** ; **3** (increased) uptake / absorption , of glucose by , liver / muscle / **effector** , cells ; **4** enters through glucose transport proteins (in cell surface membrane) ; **5** glucose converted to **glycogen** / **glycogenesis** ; **6** increased (use of glucose in) , respiration / ATP production ; **7** if low(er) glucose (concentration) , **alpha** / α , (in pancreas) cells release **glucagon** ; **8** (increased) conversion of glycogen to glucose / **glycogenolysis** ; **9** (increased) conversion of other compounds (amino acids / lipids) to glucose / **gluconeogenesis** ; **10** glucose leaves cells , by **facilitated diffusion** / through glucose channels ; **11** AVP ;	**5 max**	**1** **CREDIT** correct ref to detection by α/a (low) or β/b (high) **IGNORE** monitor / stimulate / figures quoted **2** **ACCEPT** 'produce' rather than release **DO NOT CREDIT** B cells **3** **CREDIT** increased permeability of named cell to glucose **IGNORE** 'use' / target cell **4** **CREDIT** GLUT channels **5** unambiguous spelling only of glycogen and glycogenesis **6** **DO NOT CREDIT** in context of α and β cells **ACCEPT** 'increased respiration by body' **7** unambiguous spelling only of glucagon **ACCEPT** 'produce' rather than release **8** unambiguous spelling only of glycogen and glycogenolysis **9** unambiguous spelling only of gluconeogenesis **11** e.g. correct cellular detail for insulin release or in effector cells … ● insulin binds to receptor on plasma membrane of hepatocytes ● correct ref to secondary messenger (cAMP) e.g. ref to inhibitory effect(s) of hormone … ● conversion in cells / secretion of antagonist
			QWC – technical terms used appropriately and spelt correctly ;	**1**	Use of **three** terms from: **receptor**, **effector**, **alpha**, **gluconeogenesis**, **beta**, **glycogen**, **glucagon**, **facilitated diffusion**, **insulin**, **glycogenesis**, **glycogenolysis**, **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
1	(b)	(i)	requires (daily) **,** insulin / hormone **,** injections **;** is not affected by dietary changes **;**	**1 max**	**ACCEPT** insulin is not being produced in sufficient quantities
1	(b)	(ii)	*idea that* has developed in **,** an old(er) person / middle age / a 55 year old **;**	**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** references to diet, as this was ineffective **but use NBOD icon to indicate this**
			Total	**10**	

Question			Answer	Marks	Guidance
2	(a)	(i)	liver ;	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**
2	(a)	(ii)	**1** (high intake of protein) leads to a large amount of amino acids ; **2** (excess) amino acids cannot be stored ; **3** amino acids deaminated **or** amine group / NH_2 , removed / converted to ammonia ; **4** (large amount of) ammonia enters ornithine cycle (for conversion to urea) ; **5** increased , blood / plasma , concentration of urea (leads to more urea in , filtrate / urine) ; **6** high concentration of , amino acids / urea , in blood increases water absorption from urine ;	3 max	**1** Must emphasise the idea of *leading to* , more / too many / lots of , amino acids **3 DO NOT CREDIT** deamination of protein **IGNORE** amino group **4 ACCEPT** ref to urea cycle instead of ornithine cycle correct diagram of the cycle
2	(b)		diabetes (mellitus) ;	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** kidney disease / nephritis / kidney failure / pregnancy **IGNORE** type 1 or 2

Question			Answer	Marks	Guidance
2	(c)	(i)	(human) chorionic gonadotrop(h)in / hCG**;**	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** phonetic spelling (a vowel between the ch and r) **DO NOT CREDIT** chronic **ACCEPT** combinations of lower and upper case letters **DO NOT CREDIT** letters in the incorrect order (eg hGC)

Question			Answer	Marks	Guidance
2	(c)	(ii)			**ACCEPT** joins / attaches **,** for 'bind' throughout **IGNORE** **'**reacts with' **DO NOT CREDIT** active site / enzyme references instead of antibodies **If a candidate's <u>whole</u> answer is in terms of pregnancy testing, DO NOT CREDIT mps 1, 2 & 3**
			1 LH binds to **,** anti-LH / its complementary (free / mobile / with dye) **,** antibodies **;**		**1** **ACCEPT** hormone for LH 'specific' for 'complementary'
			2 this (LH-anti-LH) antibody complex moves along (test stick together with urine) **;**		**2** **IGNORE** urine moving along the stick on its own
			3 this (LH-anti-LH) antibody complex binds (only) with **,** immobilised antibodies specific to them / lower band of immobilised antibodies **;**		
			4 (only) control antibodies bind with **,** immobilised antibodies specific to them / upper band of immobilised antibodies **;**		
			5 *idea that* binding of antibody (with dye to its immobilised anti-antibody) produces coloured line **;**		**5** **Award** in context of either LH or control line
			6 2 lines indicates **,** positive result / presence of LH **or** darker line = more LH **or** 'control' / top **,** line indicates the strip is working (correctly) **or** 'control' / top **,** line alone indicates no LH **;**	**3 max**	**6** **DO NOT CREDIT** this alternative in context of positive pregnancy result
			Total	**9**	

Question			Answer	Marks	Guidance
3	(a)	(i)	**W** (chloroplast outer) membrane / envelope ; **X** granum / grana ; **Y** <u>stroma</u> ; **Z** thylakoid(s) / (intergranal) lamella(e) ;	**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** **W DO NOT CREDIT** cell / plasma , membrane **DO NOT CREDIT** inner membrane alone but **IGNORE** if stated together with outer **X ACCEPT** granal stack / thylakoid stack **Y DO NOT CREDIT** stoma / matrix / cytoplasm
3	(a)	(ii)	**1** (DNA) coding for , gene(s) / protein / enzyme **or** (ribosome) protein / enzyme , synthesis ; **2** (enzymes for production of / proteins for) chlorophyll synthesis / pigment synthesis / photosystem ; **3** (protein for) electron , acceptor(s) / carrier(s) ; **4** ATP synth(et)ase ; **5** (enzyme / PSII) for , photolysis / splitting of water ; **6** (enzymes for) Calvin cycle / light independent reaction ;	**2 max**	**DO NOT CREDIT any** mps in context of respiration **1 IGNORE** 'information' **/** ref to replication **DO NOT CREDIT** making amino acids **3 CREDIT** named acceptor / carrier (e.g. NADP / cytochrome) **6 CREDIT** Rubisco

Question			Answer	Marks	Guidance
3	(b)		<table><tr><th>statement</th><th>letter</th></tr><tr><td>ATP is produced</td><td>B</td></tr><tr><td>an electron leaves photosystem I</td><td>B ;</td></tr><tr><td>electrons are passed along an electron carrier chain</td><td>B ;</td></tr><tr><td>electrons leave both photosystem I and photosystem II</td><td>N ;</td></tr><tr><td>an electron from a water molecule replaces the electron lost from the photosystem</td><td>N ;</td></tr><tr><td>the same electron returns to the photosystem</td><td>C ;</td></tr></table>	5	**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 **ACCEPT** lower case letters **DO NOT CREDIT** 'N and C' *instead of* B, as they have been asked to use B **IGNORE** 'N and C' if stated *in addition to B* in rows 1 and 2 **ACCEPT B** for this row
			Total	**11**	

Question			Answer	Marks	Guidance
4	(a)	(i)	link reaction **and** Krebs cycle **;**	1	**Mark the first 2 answers.** If they are correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks**
4	(a)	(ii)	oxidative phosphorylation **;**	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** electron transport chain / electron transport system / electron carrier chain **IGNORE** chemiosmosis **DO NOT CREDIT** photorespiration
4	(b)	(i)	**1** to make the volume of **,** contents / 'peas' **,** the same (in the respirometers) **;** **2** *idea that because* the volume of peas in **A** is greater than the volume of peas in **B** **or** the peas in **A ,** are bigger / take up more space **or** the peas in **A** have absorbed water **or** the peas in **B ,** are smaller / take up less space **;** **3** as without the beads there would be more **,** air / gas / oxygen **,** in **B** than in **A ;**	2 max	**1 IGNORE** ref to mass / weight **2 IGNORE** ref to mass / weight must refer to A / soaked / germinating **and/or** B / dry / dormant **3 CREDIT** idea that with the presence of beads the volume of gas would be the same

Question			Answer	Marks	Guidance
4	(b)	(ii)	**1** (determined by) finding difference in volume between (30) soaked **,** seeds / peas and (30) dry **,** seeds / peas **;** **2** the difference represents the volume of glass beads required **or** add the quantity of glass beads necessary to make the volumes (of respirometer contents) equal **;** **3** calculate / knowing **,** volume of 1 bead to determine number of beads equivalent to volume required **;**	**2 max**	**ACCEPT** ref to mass/weight instead of volume throughout **(ii)** as an error carried forward (ecf) **3** **CREDIT** any suitable *method* of determining the volume of beads required e.g. ● displacement ● put soaked peas in tube and measure volume; mark; then put dry peas in and add glass beads into tube and top up to mark
4	(c)	(i)	0.014 **; ;**	**2**	Correct answer = 2 marks, even if no working If answer incorrect **,** not rounded correctly or given to more than 3 dp then **ALLOW** 1 mark for seeing • $\frac{0.27}{20}$ **or** • 0.0135 Only if there is no answer on the dotted answer line, should you look for the answer in the working or in the appropriate place in the table.

Question			Answer	Marks	Guidance
4	(c)	(ii)	*at, higher temperature / 25^{0}C* increased <u>kinetic</u> energy **;** (named respiratory) enzymes / decarboxylases / dehydrogenases **,** involved **;**	2	**CREDIT** ora for lower temperature **IGNORE** more collisions / ESCs Needs a clear statement that they are involved in <u>respiration</u> **IGNORE** (named) co-enzymes
4	(c)	(iii)	**1** reactions require aqueous medium / reactions need to take place in water / reactions need to take place in solution **;** **2** enzymes and substrates can move (to collide) in soaked seeds **or** movement (of reactants) **,** prevented / limited **,** in dry seeds **;** **3** soaked seeds need more **,** ATP / energy **or** dry seeds need less **,** ATP / energy **;** **4** for **,** protein synthesis / mitosis / other (named) metabolic reaction **;**	2 max	**ACCEPT** **'**germinating' for 'soaked', 'peas' for 'seeds', 'dormant' for 'dry' throughout **1** **IGNORE** ref to reactants dissolving **2** **IGNORE** ref to ESC as the mp is for the idea of mobility **3** **DO NOT CREDIT** 'no' ATP / energy **4** **CREDIT** soaked peas have increased metabolism **IGNORE** growth / respiration **DO NOT CREDIT** ref to photosynthesis
			Total	12	

Question			Answer	Marks	Guidance
5	(a)		**E** (proximal / first / distal / second) convoluted tubule / PCT / DCT **;** **F** (lumen of) Bowman's / renal **,** capsule **;**	**2**	**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** **E ACCEPT** collecting duct **DO NOT CREDIT** loop of Henle (as not in cortex) **DO NOT CREDIT** 'cells of …' / tube **IGNORE** 'nephron tubule' / nephron

Question			Answer	Marks	Guidance
5	(b)	(i)	**1** **afferent** arteriole **,** has diameter greater than that of / is wider than **,** **efferent arteriole ;** **2** build up of / high **, hydrostatic** / blood **,** pressure **;** **3** **endothelium** / wall **,** of **,** capillary / glomerulus **,** has **,** (small) pores / **fenestrations ;** **4** (these allow) **ultrafiltration ;**	**2 max**	**1** **IGNORE** different / larger / smaller**,** without suitable qualification **IGNORE** thicker / thinner **3** **ACCEPT** holes / gaps instead of pores **IGNORE** epithelium **DO NOT CREDIT** cell wall **DO NOT CREDIT** podocytes / basement membrane if linked to capillary structure **IGNORE** podocytes / basement membrane if linked to the Bowmans capsule
			QWC – technical terms used appropriately and spelt correctly **;**	**1**	Use of **three** terms from: **afferent**, **efferent**, **arteriole**, **hydrostatic**, **endothelium**, **fenestrations**, **ultrafiltration** (or derived term) **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)	(ii)	podocyte(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**

Question			Answer	Marks	Guidance
5	(c)	(i)	*if kidney cannot filter so substances remain in blood* **1** increase / high **,** in urea **;** **2** increase / high **,** in **,** (named) ions / (named) salts **;** **3** increase / high **,** in water **;** **4** AVP **;** **OR** *if problems cause substances to be lost indiscriminately* **5** decrease / low **,** in **,** protein / blood cells **;** **6** decrease / low **,** in **,** (named) ions / (named) salts **;** **7** decrease / low **,** in **,** glucose / amino acids / vitamins **;** **8** decrease / low **,** in water **;**	**2 max**	**Candidate's answer can only come from one section of the mark scheme if type of failure not specified. However, all marks are available if clearly linked to the type of failure.** **3 IGNORE** ref to water potential **4** e.g. • high(er) levels of **,** creatinine / (named) hormone • high(er) levels of **,** metabolite / toxin **,** breakdown **for mps 5-8 DO NOT CREDIT** 'no' / 'none' / 'zero' **7 IGNORE** sugar **8 IGNORE** ref to water potential ***Note*** 'increase in urea' = 1 (mp 1) 'increase in salt and water' = 2 (mps 2 & 3) 'low in protein but high in urea' = 1 (mp 5, but not mp 1 as different type of failure and has not been specified)

Question			Answer	Marks	Guidance
5	(c)	(ii)	*if not closely matched* **1** donated kidney will be recognised as **,** foreign / non-self **;** **2** antigens / glycoproteins **,** (on donated kidney) will be different **;** **3** causing rejection **;** **4** (response) by immune system **;** **5** use of immuno-suppressant drugs **;** **6** ref to need for suitable size in specific case (e.g. if recipient is a small child) **;**	**3 max**	**CREDIT** ora **for all mark points** **1** Needs the idea of the body *recognising* the foreign nature **4** **CREDIT** a description of immune response **DO NOT CREDIT** ref to <u>auto</u>immunity
			Total	**11**	

Question			Answer	Marks	Guidance
6	(a)		**1** receptors **;** **2** intensity **;** **3** chemical **;** **4** potential / value **;** **5** impulse **;**	**5**	**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** **1 ACCEPT** receptor cells **DO NOT CREDIT** neurones / organs **2 IGNORE** brightness **DO NOT CREDIT** frequency **3 IGNORE** volatile / soluble **4 ACCEPT** 'level' / '(needed) for depolarisation' **IGNORE** numerical value quoted / 'receptor' **DO NOT CREDIT** action potential **5 ACCEPT** action potential **DO NOT CREDIT** message / signal / information / stimulus

Question			Answer	Marks	Guidance
6	(b)	(i)	*the motor neurone - structure* the cell body is at (one) end of the , neurone / cell **or** the cell body is in , brain / spinal cord / CNS **or** dendrites connected (directly) to cell body **or** long(er) axon **or** no dendron **or** axon , connects to / ends at , effector / motor end plate ;	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** ref to cell size / myelin(ation) **DO NOT CREDIT** at end of axon / nerve **IGNORE** reference to dendrite length **CREDIT ora for sensory** i.e. cell body is at centre of cell **or** cell body is in PNS **or** dendrites at the end(s) of , axon / dendron **or** short(er) axon **or** dendron present **or** connects to / starts at , receptor

Question			Answer	Marks	Guidance
6	(b)	(ii)	*the motor* neurone - *function* carries , impulse(s) / action potential(s) , from , brain / spinal cord / CNS / relay neurone **or** carries , impulse(s) / action potential(s) , to , effector / muscle / gland ;	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** refs to 'connects …' **DO NOT CREDIT** message / signal / information / stimulus **DO NOT CREDIT** message / signal / information / stimulus **CREDIT ora for sensory** i.e. carries , impulse(s) / action potential(s) , to , brain / spinal cord / CNS / relay neurone **or** carries , impulse(s) / action potential(s) , from receptor
			Total	7	

OCR (Oxford Cambridge and RSA Examinations)
1 Hills Road
Cambridge
CB1 2EU

OCR Customer Contact Centre

Education and Learning
Telephone: 01223 553998
Facsimile: 01223 552627
Email: general.qualifications@ocr.org.uk

www.ocr.org.uk

For staff training purposes and as part of our quality assurance programme your call may be recorded or monitored

Oxford Cambridge and RSA Examinations
is a Company Limited by Guarantee
Registered in England
Registered Office; 1 Hills Road, Cambridge, CB1 2EU
Registered Company Number: 3484466
OCR is an exempt Charity

OCR (Oxford Cambridge and RSA Examinations)
Head office
Telephone: 01223 552552
Facsimile: 01223 552553

© OCR 2012