OCR
RECOGNISING ACHIEVEMENT

GCSE

Biology A

General Certificate of Secondary Education

Unit **A162/02:** Modules B4, B5, B6 (Higher Tier)

Mark Scheme for June 2013

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, Cambridge Nationals, Cambridge Technicals, Functional Skills, Key Skills, Entry Level qualifications, NVQs and vocational qualifications in areas such as IT, business, languages, teaching/training, administration and secretarial skills.

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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.

1. Contradictory Responses:

When a candidate provides contradictory responses, then no mark should be awarded, even if one of the answers is correct.

2. **Annotations**

Used in the detailed Mark Scheme:

Annotation Meaning	
/	alternative and acceptable answers for the same marking point
(1)	separates marking points
not/reject	answers which are not worthy of credit
ignore	statements which are irrelevant - applies to neutral answers
allow/accept	answers that can be accepted
(words)	words which are not essential to gain credit
words	underlined words must be present in answer to score a mark
ecf	error carried forward
AW/owtte	credit alternative wording/or words to that effect
ORA	or reverse argument

Available in scoris to annotate scripts:

	correct response
	incorrect response
BOD	benefit of doubt
NBOD	no benefit of doubt
ECF	error carried forward
0 , L1 , L2 , L3	indicate level awarded for a question marked by level of response
^	information omitted

CON	contradiction
R	reject
	indicate uncertainty or ambiguity
	draw attention to particular part of candidate's response

3. **ADDITIONAL OBJ ECTS:** You **must** assess and annotate the additional object s for each script you mark. Where credit is awarded, appropriate annotation must be used. If no credit is to be awarded for the additional object, please use annotation as agreed at the SSU.

4. Subject-specific Marking Instructions

a. Accept any clear, unambiguous response (including mis-spellings of scientific terms if they are *phonetically* correct, but always check the guidance column for exclusions).

b. Crossed out answers should be considered only if no other response has been made. When marking crossed out responses, accept correct answers which are clear and unambiguous.

e.g. for a one-mark question where ticks in the third <u>and</u> fourth boxes are required for the mark:

This would be worth 1 mark.

This would be worth 0 marks.

This would be worth 1 mark.

c. The list principle:
If a list of responses greater than the number requested is given, work through the list from the beginning. Award one mark for each correct response, ignore any neutral response, and deduct one mark for any incorrect response, e.g. one which has an error of science. If the number of incorrect responses is equal to or greater than the number of correct responses, no marks are awarded. A neutral response is correct but irrelevant to the question.

d. Marking method for tick-box questions:

If there is a set of boxes, some of which should be ticked and others left empty, then judge the entire set of boxes.
If there is at least one tick, ignore crosses and other markings. If there are no ticks, accept clear, unambiguous indications, e.g. shading or crosses. Credit should be given according to the instructions given in the guidance column for the question. If more boxes are ticked than there are correct answers, then deduct one mark for each additional tick. Candidates cannot score less than zero marks.

e.g. if a question requires candidates to identify cities in England:

Edinburgh	
Manchester	
Paris	
Southampton	

the second and fourth boxes should have ticks (or other clear indication of choice) and the first and third should be blank (or have indication of choice crossed out).

Edinburgh			✓			✓	✓	✓	✓	
Manchester	✓	×	✓	✓	✓				✓	
Paris				✓	✓		✓	✓	✓	
Southampton	✓	×		✓		✓	✓		✓	
Score:	**2**	**2**	**1**	**1**	**1**	**1**	**0**	**0**	**0**	**NR**

e. For answers marked by levels of response:
i. **Read through the whole answer from start to finish**
ii. **Decide the level** that **best fits** the answer – match the quality of the answer to the closest level descriptor
iii. **To determine the mark within the level**, consider the following:

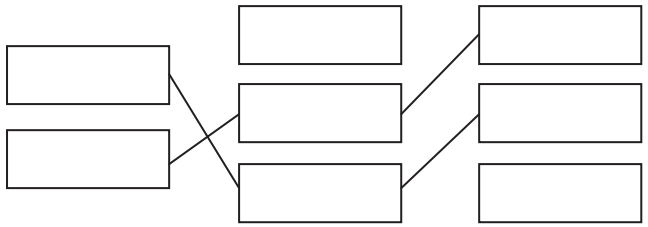
Descriptor Aw	ard mark
A good match to the level descriptor	The higher mark in the level

Just matches the level descriptor	The lower mark in the level

iv. Use the **L1**, **L2**, **L3** annotations in Scoris to show your decision; do not use ticks.

Quality of Written Communication skills assessed in 6-mark extended writing questions include:

- appropriate use of correct scientific terms
- spelling, punctuation and grammar
- developing a structured, persuasive argument
- selecting and using evidence to support an argument
- considering different sides of a debate in a balanced way
- logical sequencing.

Question	Answer	Marks	Guidance
1 (a)		2	3 or 4 lines correct = 2 marks 2 lines correct = 1 mark 5 lines = 1 mark max. 6 or more lines = 0 marks
(b)	phytoplankton 1		**accept** phonetic spellings **accept** named phytoplankton or photosynthetic bacteria **accept** idea of the micro-organism with chlorophyll **accept** plankton (unqualified) **reject** yeast **ignore** ref. to green/unqualified algae
(c)	**any two from** enzyme/substrate has a certain **shape**/enzyme has an **active site** ; substrate/molecule **fits into** the shape/lock and key model ; other substrates **will not fit**	2	 **ignore** molecule/substrate has an active site **accept** correct ref. to complementary (shapes)
(d) (i)	66.67 (%) (2) 50 – 30 **OR** 20 within the working (1)	2	**accept** range 66 – 67 (2)
(ii)	**any two from** **increased** amount of light/higher light intensity ; **more**/increased (rate) **photosynthesis**/increased **reaction rate** ; light is a limiting factor	2	**accept** increased temperature/heat **accept** increased enzyme activity/increased reaction rate **accept** sunlight = light **ignore** unqualified ref. to energy/sun **ignore** making more food/glucose/sugar **ignore** references to values

Question	Answer	Marks	Guidance
1 (d) (iii)	**description** amount produced = amount used/ it is the same (1) **explanation** respiration releases carbon dioxide which is used by photosynthesis (1)	2	**accept** compensation point **accept** amount/rate of respiration = photosynthesis (1)
(e) (i)	the higher the temperature the greater the rate of reaction/positive	1	**reject** heat **ignore** references to values
(ii)	**any two from** use more replicates/repeats ; plot more temperature values/obtain data across more temperatures/intermediate temperatures ; reproducibility/others do **same** experiment ; check/improve accuracy of equipment	2	 **ignore** 'do more experiments'/excluding outliers/use of control **accept** compare the experiment with others/ look at secondary data **ignore** reference to peer assessment
(iii)	**any two from** increasing/getting higher/faster ; active site ; permanent/irreversible/fixed ; denatured/broken down/destroyed	2	3 or 4 correct responses (2) 2 correct responses (1) 1 or 0 correct responses (0) **accept** inactive/deformed **reject** killed
(iv)	lock and key	1	**accept** induced fit
	Total	**17**	

Question	Answer	Marks	Guidance
2 (a) (i)	Concentration of solution in arbitrary units / Potato chip 0.0 **D** 0.3 **B** 0.6 **A** 0.9 **C**	2	4 correct = 2 marks 2 or 3 correct = 1 mark 1 or 0 correct = 0 marks
(ii)	answer between 0.01 – 0.29 (2) between D and B **OR** close to D (1)	2	**ignore** ref. to units **ecf** accept correct value between D and B – based on the values presented in 2(a)(i) = 1 mark max.
(b)	amino acids (1) enzymes (1)	2	
(c)	membrane energy/ATP (1)	1	**both correct responses needed for 1 mark** **ignore** descriptions of membrane eg. permeable **ignore** oxygen
(d)	**any two from** water-logged soils are low in oxygen ; anaerobic respiration takes place/**less** (aerobic) respiration ; **less** energy/ active transport	2 OWTTE	**ignore** general reference to active transport needs energy **reject** no respiration **ignore** leaching/dilution of nitrates
	Total	**9**	

Question	Answer	Marks	Guidance
3	**Level 3 (5–6 marks)** A good description of **all three** pieces of equipment. Quality of written communication does not impede communication of the science at this level. **Level 2 (3–4 marks)** A good description of **two** pieces of equipment **OR** a basic description of **all three** pieces of equipment. Quality of written communication partly impedes communication of the science at this level. **Level 1 (1–2 marks)** A good description of **one** piece of equipment **OR** a basic description of **two** pieces of equipment. Quality of written communication impedes communication of the science at this level. **Level 0 (0 marks)** Insufficient or irrelevant science. Answer not worthy of credit.	6	**This question is targeted at grades up to C** **Indicative scientific points may include:** **Quadrats** • a quadrat is a square frame/defined area • put quadrat on ground • plant counts in quadrat • random/grid distribution of quadrats • use of a transect line • estimate % plant cover • take several readings in/across the two areas **Light meter** • measures light levels/intensities • hold equipment at ground level • take a reading • take several readings in/across the two areas **Identification key** • compare plants seen to description/image in key • use to find names/species of plants • in each quadrat • compare plant types/species between the two areas • binary/dichotomous choices within key **Additional scientific point** • use a statistical test to support differences • data processing/graphs/mean values **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**
	Total	**6**	

Question			Answer	Marks	Guidance
4 (a)		(i)	**A** meiosis **B** mitosis **C** mitosis	1	**all correct responses needed for 1 mark** **reject** meitosis/miosis
		(ii)	**any three from** zygote contains chromosomes/gene/DNA/alleles from both parents ; **zygote** is split in 2/undergoes mitosis (to give 2 embryos/piglets) ; piglets have **identical/same** DNA/genes/alleles/are clones/same genotype ; embryos/piglets have different DNA/genes/chromosomes/alleles from parents	3	**accept** correct references to the letters/stages in the diagram **accept** piglets/embryos come from the same zygote **ignore** similar genes answers with correct descriptions of meiosis/mitosis but without reference to the diagram/scenario = 2 marks
(b)		(i)	☐ ☐ ✓ ✓ ☐	2	**accept** any clear response eg. crosses (without ticks), shaded boxes three ticks = 1 mark max. four or more ticks = 0 marks
		(ii)	**any two from** cells still unspecialised/undifferentiated/stem cells **AND** can become any type (of cell) ; any gene (at this stage) can be switched on/off ; before 8 cell stage	2	**ignore** 'not fully developed' **accept** genes are activated/inactivated
		(iii)	**any one from** embryo may be destroyed/killed/harmed ; embryo does not have a choice	1	**accept** embryo could have grown to form a baby/person **ignore** playing God/it is immoral/not natural/cause a miscarriage
			Total	**9**	

Question	Answer	Marks	Guidance
5	**Level 3 (5–6 marks)** Good **explanation** of the effect of hormone on **growth** of shoots A, B and C. Quality of written communication does not impede communication of the science at this level. **Level 2 (3–4 marks)** Good account of the **mechanism** involved. Quality of written communication partly impedes communication of the science at this level. **Level 1 (1–2 marks)** Good **description** of the appearance of the shoots. Quality of written communication impedes communication of the science at this level. **Level 0 (0 marks)** Insufficient or irrelevant science. Answer not worthy of credit.	6	**This question is targeted at grades up to A*** **Indicative scientific points may include:** **Explanation** • link between **hormones** and cell elongation/growth • **more** growth beneath the block • **more** growth on one side in shoot A/B and so curves • **equal** growth across shoot C **Mechanism** • the hormone is an auxin • the hormone leaves/diffuses out of the agar block • shoot A receives more hormones on the right side • shoot B receives more hormones on the left side • shoot C receives an even distribution of hormones **Description** • shoot A bends/curves/grows to the left • shoot B bends/curves/grows to the right • shoot C appears/grows straight • shoot A/B bends/curves/grows away from block **ignore** references to **light** up to and including L2 but candidates at L3 must not refer to light as a basis of their explanation **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**
	Total	**6**	

Question	Answer	Marks	Guidance
6 (a)	effector – produces/creates the **response** processing centre – receive information/coordinate responses receptor – to detect stimuli	2	**3 correct responses = 2 marks** **1 or 2 correct responses = 1 mark** **accept** named example – muscle contraction/ gland secretion/ creates action **reject** reference to stimulus **ignore** causes a change **ignore** spinal cord/ CNS but **reject** brain/ decides **accept** 'tells effector what to do' **ignore** processing **accept** reacts to stimulus
(b) (i)	**any three from** neuron B has highest (mean) value/neuron B has two highest values (104 & 91)/neuron C has lowest result and so it is not C ; idea of outlier/value 104/ 4th result in data for neuron B ; outlier increased mean for neuron B/correct recalculation of the mean for neuron B (79) ; range of B is large/much more variation in data for B (compared to A) ; the value of B is only slightly above A/the two ranges overlap/idea of no real difference ; a number of values in A are greater than some in B	3	if arguments **only** in support of **neuron A** = 2 marks **accept** reverse argument
(ii)	prevents **impulses leaving** the neuron (1) prevent **impulses entering** from an adjacent neuron (1)	2	**reject** messages/ electricity/ signals **ignore** mixed up/speeding up **accept** 'interfering' with other neuron = 1 max.

Question	Answer	Marks	Guidance
6 (c)	**Level 3 (5–6 marks)** Good suggested **explanation** of why impulse is one-directional AND **linked** to description of events at the synapse. Quality of written communication does not impede communication of the science at this level. **Level 2 (3–4 marks)** Good **detailed description** of events at the synapse. Quality of written communication partly impedes communication of the science at this level. **Level 1 (1–2 marks)** Good **basic description** of events at the synapse. Quality of written communication impedes communication of the science at this level. **Level 0 (0 marks)** Insufficient or irrelevant science. Answer not worthy of credit.	6	**This question is targeted at grades up to A*** **Indicative scientific points may include:** **Explanation of one-way transmission** • only the sensory neuron (not the relay neuron) can produce/release the chemicals/transmitter substances • only the relay neuron (not the sensory neuron) membrane contains the receptor molecules needed to trigger an impulse. • only the sensory/first neuron has reuptake channels/sites for (breakdown products of) chemicals/transmitter substances **Description of events at synapse** ***Detailed*** • impulse causes release of chemicals/transmitter substances • chemicals/transmitter substances diffuse across the gap • chemicals/transmitter substances bind to receptor molecules on the membrane of the relay neuron • only specific chemicals can bind to the receptor molecules • when bound to the receptor molecules the chemicals trigger/initiate a nerve impulse at the membrane of the relay neuron • chemicals/transmitter substances broken down/reabsorbed (into sensory/first neuron) ***Basic*** • synapse is a gap between adjacent neurons/between the sensory and relay neuron • sensory/first neuron releases chemicals into gap • impulse carried across the synapse/gap • chemicals cause an impulse at relay/second neuron **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**
	Total	**13**	

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