OCR
RECOGNISING ACHIEVEMENT

GCSE

Biology A

General Certificate of Secondary Education

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

Mark Scheme for January 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.

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:

	indicate uncertainty or ambiguity
BOD	benefit of doubt
CON	contradiction
	incorrect response
ECF	error carried forward
	draw attention to particular part of candidate's response
NBOD	no benefit of doubt
R	reject
	correct response

L1 , L2 , L3	indicate level awarded for a question marked by level of response
^	information omitted

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 and 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 <u>should be blank</u> (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	Award 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)		$6CO_2 + 6H_2O$ (1) $C_6H_{12}O_6 + 6O_2$ (1)	2	**allow any order** formulae must be correct including correct use of subscripts **allow** an unbalanced equation as long as all four compound formulae are correct = 1 mark
	(b)	(i)	C (1)	1	
		(ii)	***(confident because):*** the (mean) values are the same/similar/very close/closest (1) the results were repeated (ten times) (1) (repeats mean) results are repeatable/reliable/valid (1) ***(not confident because):*** size of bubbles vary (1) difficulty counting bubbles (1) size of pondweed might be different (in the two tubes) (1) the temperature might be different (in the two tubes) (1) need more data/tests (to be sure) (1)	2	**mark whole answer crediting any two points** must imply both values **ignore** accurate **ignore** ref to different species of pondweed (as given in the question) **allow** any other reasonable difference in variables **ignore** idea of human error **ignore** idea that data is wrong/inaccurate

Question			Answer	Marks	Guidance
		(iii)	***any TWO from:*** control/measure the (water) temperature in the test tubes; control pH; control length/mass/amount/size of pondweed / number of leaves; control carbon dioxide levels; control volume/amount of water; control distance from light source; use more light intensities / measure the light intensity ; leave experiment for a longer time; allow plant to equilibrate before measuring bubbles; collect the (oxygen) bubbles in a measuring cylinder / gas syringe / ref to measuring volume of oxygen (as more accurate than bubbles);	1	**two points required for one mark** **ignore** ref to repeats / using more species of pondweed (both given in question) **do not allow** extensions to the investigation, i.e. where a new variable is changed **do not allow** use different light intensities
	(c)		**role in photosynthesis** / **cell structure** contains the genetic code for making the enzymes needed — nucleus allows oxygen to pass out of the cell — (cell) membrane/(cell) wall contains chlorophyll and enzymes — chloroplast(s)	1	**both answers required for one mark**

Question			Answer	Marks	Guidance
	(d)	(i)	(cell) membrane; respiration;	1	**both answers required for one mark**
		(ii)	***(link between respiration and energy):*** anaerobic respiration/less aerobic respiration so less energy/ATP released (1) no/less energy for active transport/active uptake (1)	2	**do not allow** 'no energy' **allow** 'produced'
			Total	**10**	

Question			Answer	Marks	Guidance
2	(a)		carbon dioxide + ethanol (1)	1	**both answers required for one mark** **allow any order** **allow** correct formula for carbon dioxide (CO_2)
	(b)		(animal cells) produce lactic acid (1)	1	**do not allow** lactic acid **if** given with carbon dioxide/oxygen **ignore** references to lack of oxygen / use of glucose as the substrate / ref to energy/ATP released
	(c)	(i)	1500(%) (1)	1	**if no response in the table, check whole page for the answer**
		(ii)	***(link between oxygen and respiration):*** more oxygen means more aerobic respiration in B / less oxygen means anaerobic respiration/less aerobic respiration in A (1) ***(link between energy and cell division):*** more energy in B means more cell division/growth / less energy in A means less cell division/growth (1)	2	'B has oxygen and is aerobic respiration' = 0 marks 'B has oxygen and is aerobic respiration. A does not have oxygen and is anaerobic respiration' = 1 mark **do not allow** 'reproduction' (as given in the question)

Question			Answer	Marks	Guidance
		(iii)	**(Level 3)** Answer describes the effect of adriamycin on the cell cycle and includes a detailed explanation of this effect. Explanation is logically sequenced and includes most key points. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **(Level 2)** Answer describes the effect of adriamycin on the cell cycle and includes some explanation of this effect. Explanation may not be logically sequenced or may be missing some key points. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **(Level 1)** Answer may describe the effect of adriamycin on the cell cycle and includes some attempt at an explanation of this effect. Quality of written communication impedes communication of the science at this level. (1 – 2 marks) **(Level 0)** Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)	6	**This question is targeted at grades up to A*** **do not allow** idea that adriamycin stops the chromosomes copying (this is given in the stem) **Indicative scientific points include:** **description:** • rate of growth/reproduction/number of new yeast cells produced will stop/be reduced/stay the same • more cells will die than be produced • this will happen quickly/immediately **explanation:** • (copying of chromosomes) is part of the cell cycle • it takes place during the phase of cell growth • chromosome replication / DNA copying • two strands of DNA / chromosomes separate • nucleus divides • new (daughter) cells are formed • mitosis • adriamycin prevents this happening • cell division/mitosis can not take place **ignore** ref to individual cell growth **ignore** ref to meiosis
	(d)		oxygen; methane; fuel;	2	3 correct responses = 2 marks 2 correct responses = 1 mark 1 or 0 correct responses = 0 marks
			Total	**13**	

Question			Answer	Marks	Guidance
3	(a)		1, 5, (2), 15, 11	2	4 correct responses = 2 marks 3 correct responses = 1 mark 2 or fewer correct responses = 0 marks
	(b)	(i)	36% (1) C pairs with G / if G is 36%, C must be the same (1)	2	**allow** bonds/joins/goes together/matches
		(ii)	different genes code for/make different proteins / this (second) gene codes for a different protein/AW **(2)**	2	**allow** genes code for/make proteins = 1 mark
	(c)		messenger RNA/mRNA (1)	1	**allow** upper or lower case letters
	(d)		base sequence/triplet code changes so different <u>amino acids</u> are coded for (1) different sequence of amino acids means a different protein is made (1)	2	**do not allow** the idea that amino acids are '**made'** **allow** frameshift mutation / 'it would have been 1 and 5 and is now 9 and 7' / 'code is now ATC TGC' **as long as** it is clear that this will lead to different <u>amino acids</u>

Question			Answer	Marks	Guidance
	(e)		**(Level 3)** Answer gives a good description of the processes taking place and attempts to explain how they are controlled by genes. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **(Level 2)** Answer gives a description of the processes taking place, and includes some scientific details not shown on the diagram. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **(Level 1)** Answer gives a simple description of the processes taking place, but only includes points shown on the diagram. Quality of written communication impedes communication of the science at this level. (1 – 2 marks) **(Level 0)** Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)	6	**This question is targeted at grades up to C** **Indicative scientific points at Level 1 include:** process A: • produces specialised cells • these cells can be used for tissue replacement process B: • produces unspecialised cells • these form a new cell culture **Indicative scientific points at Level 2 include:** • embryonic stem cells can be used to produce any other type of cell • differentiation • cells are replicating / dividing / mitosis • identical copies / cloning • example of tissue replacement • examples of a specialised cell **Indicative scientific points at Level 3 include:** • stem cells remain unspecialised until 8-cell stage • embryonic stem cells have the potential to switch on / off genes • switching on/off of specific genes leads to cell specialisation • genes that are switched on code for the proteins that the cell needs • different types of cell require different types of protein
			Total	**15**	

Question			Answer	Marks	Guidance
4	(a)		***any two from:*** involuntary/automatic/without thinking; rapid/fast/quick/immediate; short-lived/doesn't last long;	1	**two answers required for one mark**
	(b)	(i)	A – receptor; B – sensory neuron; C – relay/intermediate neuron; D – motor neuron; E – effector/muscle;	3	5 correct responses = 3 marks 3 or 4 correct responses = 2 mark 2 correct responses = 1 marks 0 or 1 correct responses = 0 marks if 'neuron' is missing throughout, deduct one mark **allow** nerve/nerve cell for neuron throughout ignore CNS **allow** effector neuron
		(ii)	… no processing of information is required. ✓ [ ] [ ] [ ]	1	**if more than one box is ticked = 0 marks**
	(c)		***max 2 for identifying:*** reflex/response = crying / fear (1) primary stimulus = (loud) noise (1) secondary stimulus = rat (1) the (reflex) response becomes associated with secondary stimulus/rat (regardless of presence of primary stimulus) (1)	3	
			Total	**8**	

Question			Answer	Marks	Guidance
5	(a)		only one/the first neuron releases the chemical/transmitter substance (1) only one/the second/next neuron has the <u>receptor</u> (sites/molecules) (1)	2	must be clear that there are two separate neurons – one releasing the chemical and one with receptors **allow** pre-synaptic neuron **allow** one side of the synapse releases the chemical **allow** post-synaptic neuron **allow** one side of the synapse has receptors **ignore** nerve **ignore** sensory/motor **ignore** ref to reuptake
	(b)		blocks; removed; increases; increases;	2	4 correct responses = 2 marks 3 or 2 correct responses = 1 mark 1 correct response = 0 marks
	(c)		cerebral cortex/cerebral hemisphere/cerebrum/frontal lobe (1)	1	
	(d)		***(support / reasons why there IS NOT a correlation):*** not enough data (1) only small range of noise levels used (1) noise levels are not measured accurately/quantitatively (1) not all data fits the pattern /specific example of this (1) results are similar in all rooms (1) ***(challenge / reasons why there IS a correlation):*** quiet rooms are better (at remembering the numbers) / noisy rooms are worse (at remembering the numbers) (1) as rooms get quieter, performance gets better (1)	3	max 2 for either support or challenge needs to be clear whether the point is support or challenge need to see this stated explicitly need a description of the pattern/trend 'in the quiet rooms they do better, in the noisy room they do less well and in the very noisy room they do worst' = 2 marks

Question	Answer	Marks	Guidance
(e)	**(Level 3)** Answer includes a detailed description of the model with **well-described** links to the way it relates to the investigation. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **(Level 2)** Answer includes a detailed description of model. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **(Level 1)** Answer includes a basic description of the model with some features of the model missing. Quality of written communication impedes communication of the science at this level. (1 – 2 marks) **(Level 0)** Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)	6	**This question is targeted at grades up to A*** **Indicative scientific points include:** **features of model:** • memory is the storage and retrieval of information • information held in short term memory • information can be moved to long term memory/stored by repetition / reinforcement • recalling the information is called retrieval • lack of reinforcement means information can be forgotten • this represents as an 'exit route' within models for memory **allow** any clear reference to the points above shown in a labelled diagram **link to investigation:** • the sequence of numbers represented the information • models are limited in explaining how memory works • more likely to remember the sequence if there is a pattern, e.g. 5, 10, 15 at the start • credit any valid link between noise and results in the experiment, e.g. in quiet room it is easier to repeat sequence so more likely to remember, in loud room more distractions/stimuli
	Total	**14**	
	Paper total	**60**	

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