OCR
Oxford Cambridge and RSA

GCSE

Biology A / Additional Science A

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

General Certificate of Secondary Education

Mark Scheme for June 2017

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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 RM Assessor 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 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	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 RM Assessor 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)	(i)	storage of information (1) (and) retrieval/recall of information (1)	2	**accept idea** of information **accept** get **back** **ignore** memory/remember **ignore** short/long term memory **ignore** reuse of information
		(ii)	(cerebral) cortex	1	**accept** temporal lobe/parietal lobe/occipital lobe/frontal lobe/auditory cortex/visual cortex/Wernicke's area /Broca's area **accept** frontal cortex / pre-frontal cortex **ignore** left/right hemisphere/sides of the brain **ignore** pre-frontal lobe
		(iii)	*Any two from:* *Consequences of not having the biopsy* tumour may grow/spread (1) (secondary) tumours may form (1) he could die (1) *Reasons to have the biopsy* chance of memory loss may be low (1) idea that memory may come back/John can re-learn the words (1) idea that benefits (of having the biopsy) outweigh risks (of having the biopsy) (1) idea that tumour causes more harm than the biopsy ORA (1)	2	**ignore** 'may have a tumour'

	(b)		*any three from:* billions/large number of neurons in the brain (1) (when Judith plays the piano) new **neuron/neural/nervous pathways** /synapses form (1) (With) practice/repetition/rehearsal (1) **neuron/neural/nervous pathways** become active/transmit the impulses/strengthen/are reinforced (1) (so) more likely to transmit impulses (1)	3	**accept** nerve pathways
			Total	**8**	

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>(2)</td><td>(a)</td><td></td><td>
<table>
<tr><th>Statement</th><th>Aerobic respiration</th><th>Anaerobic respiration</th><th>Both types of respiration</th></tr>
<tr><td>uses oxygen</td><td>√</td><td></td><td></td></tr>
<tr><td>produces lactic acid</td><td></td><td>√</td><td></td></tr>
<tr><td>uses glucose</td><td></td><td></td><td>√</td></tr>
<tr><td>produces carbon dioxide</td><td>√</td><td></td><td></td></tr>
<tr><td>occurs in the mitochondria</td><td>√</td><td></td><td></td></tr>
</table>
</td><td>3</td><td>Mark by row:

5 rows correct 3 marks
4 rows correct 2 marks
3 rows correct 1 mark

A row does not score if it contains an additional incorrect tick.

For ‘uses glucose’ row:
- accept three ticks.
- accept two ticks, but only if they appear in ‘aerobic respiration’ and ‘anaerobic respiration’ columns</td></tr>
<tr><td></td><td>(b)</td><td></td><td>yeast needs to respire anaerobically to produce alcohol/for the fermentation process / ensures anaerobic respiration takes place (1)

(layer of oil) prevents contact (between yeast/glucose) with air/oxygen / prevents aerobic respiration (1)</td><td>2</td><td></td></tr>
</table>

	(c)	(i)	*Conclusion 1* Idea that temperature affects the reaction (1) *Explanation 1* (as temperature increases) **enzymes** and **substrates** have more (kinetic) energy/ (as temperature increases) more collisions between **enzyme** and **substrates/** as temperature increases/at optimum temperature, enzymes will work better/faster ORA (1) *Conclusion 2* at 45(^{o}C), idea that as time increases, the **rate** of reaction decreases/is low (1) *Explanation 2* the glucose is used in the reaction/less glucose is available for respiration (1)	4	**accept** conclusions in any order **accept** glucose for substrate **accept** more **enzyme-substrate** complexes **accept** temperature is a limiting factor to **enzyme** action **ignore** references to denaturation **accept** build-up of alcohol poisons yeast
		(ii)	*Any one from:* Idea that each bubble may be different (in size) (1) Idea that bubbles are difficult to count (1)	1	**accept** difficult to count accurately/human error
		(iii)	any method which allows gas to be collected (to measure its volume) e.g. use a burette/use a (gas) syringe	1	**accept** measure mass-loss **accept** over-water; **ignore** under water **ignore** references to a balloon
	(d)		Idea of vigorous exercise	1	**accept** named exercise e.g. running/swimming etc. **accept** swimming underwater
			Total	**12**	

Question			Answer	Marks	Guidance
3	(a)		**Level 3 (5-6 marks)** Correctly identifies 2 or more pieces of equipment/techniques that could be used and gives some details about how to use them. Quality of written communication does not impede communication of science at this level. **Level 2 (3-4 marks)** Correctly identifies a piece of equipment/technique that could be used and gives some details about how to use it. Quality of written communication partly impedes communication of science at this level. **Level 1 (1-2 marks)** Makes appropriate suggestions about how to carry out the investigation. 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:** • **transect** • line/belt • stretching from beach through the dunes/between two points • marks out where samples will be taken • **quadrat** • point or square • take several samples • samples taken in different places/at regular intervals • (to define) the area where observations will be made • record/photograph the number of plants/type of plant/% cover • **(identification) key** • (used to) identify the different plants • series of questions • with yes/no answers
	(b)	(i)	osmosis	1	
		(ii)	carbon dioxide (1) temperature (1)	2	**deduct** one mark for each additional tick

		(iii)	X placed anywhere on horizontal line of the graph, level with or to the right of the second 'i' on 'intensity'	1	
	(c)	(i)	(positive) phototropism	1	**do not accept** negative phototropism
		(ii)	*any one from:* increases chances of survival (1) increases the amount of (sun)light (energy) received (for photosynthesis) (1) to increase (rate of) photosynthesis (1)	1	**ignore** to find the sun/grow towards the sun/get closer to the light **accept** increases light intensity/get maximum light/get lots of light/optimal light
	(d)	(i)	glucose (1) nitrate (1)	2	**deduct** one mark for each additional tick
		(ii)	protein	1	**deduct** one mark for each additional tick
			Total	**15**	

Question			Answer	Marks	Guidance
(4)			**Level 3 (5-6 marks)** States similarities AND differences between human nervous system and starfish nervous system Quality of written communication does not impede communication of science at this level. **Level 2 (3-4 marks)** States similarities OR differences between human nervous system and starfish nervous system Quality of written communication partly impedes communication of science at this level. **Level 1 (1-2 marks)** Describes human nervous system. 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:** **Structure of human nervous system** • consists of PNS and CNS • CNS consists of brain and spinal cord • PNS consists of neurons • Different types of neuron (e.g. relay, sensory, motor) • Transfer messages as electrical/nervous impulses • Synapses allow messages to be relayed from neuron to neuron • Receptors (named examples) • Receptors detect/sensitive to stimuli • Effectors • (effectors) produce response • Effectors are muscles/glands **Similarities with starfish nervous system** • neurones/nerves indicated as present in starfish and humans • receptor/named receptor indicated as present in starfish and humans • Starfish have receptors/eyespot which detect light, and humans have receptors/eye which detects light. • electrical impulses in starfish and humans. **Differences with starfish nervous system** • No CNS • No brain/processing centre • No spinal cord • No motor/sensory/relay neurone • No effectors • Only one type of receptor
			Total	**6**	

Question			Answer	Marks	Guidance
(5)	(a)		**Level 3 (5-6 marks)** A description of the structure of DNA, AND an understanding of the genetic code AND the effect on protein formation Quality of written communication does not impede communication of science at this level. **Level 2 (3-4 marks)** A description of the structure of DNA, AND an understanding of the genetic code OR the effect on protein formation Quality of written communication partly impedes communication of science at this level. **Level 1 (1-2 marks)** A description of the structure of DNA OR the genetic code OR the effect on protein formation. 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:** **DNA Structure** • 2 Strands • double helix • **Four** bases • A,C,T,G • A pairs with T, G pairs with C / complementary base pairing **accept** higher level information about • Nucleotides/phosphates/sugars • H bonds **Genetic Code** • **order** of bases is the (genetic) **code** for proteins • triplet/codon • Idea that 3 bases/triplet/codon determines 1 amino acid • **order** of bases determines the **order** of amino acids **Effect on protein formation** • change in the codon / change in triplet code / change in 3 bases • means the amino acid will change • so **order** of amino acids (in the protein) is different **ignore** reference to the following, because the question is not asking for details of protein synthesis: • Transcription / mRNA • Translation /ribosomes/tRNA **do not accept** idea of 'makes amino acids' **do not accept** 'base pairs' for bases

	(b)		*any two from:* no build-up of (chloride) ions on the opposite side of membrane (1) solute concentration (on opposite side of membrane) does not increase (1) osmosis does not occur (1) no (net) movement of water across the membrane (1) less water/concentration of water in mucus (so it is stickier) (1)	2	**ignore** chlorine
	(c)	(i)	0.0012 /1.2 x 10^{-3} (2)	2	3 ÷ 250,000 X 100 / 0.000012%/1.2 x 10^{-5} (1)
		(ii)	9,000	1	
	(d)	(i)	unlikely to have CF/mutation	1	
		(ii)	repeat the test	1	**accept** do more**/**different/further/genetic tests **ignore** genetic tests of parents
			Total	**13**	

Question			Answer	Marks	Guidance
(6)	(a)		(C) A E B D	3	A anywhere before E (1) E anywhere before B (1) B anywhere before D (1)
	(b)	(i)	*Any one from:* Idea that use of ecstasy (along with psychotherapy) is **more** effective than just psychotherapy ORA (1) Idea that use of ecstasy (along with psychotherapy) reduces the number of people with diagnosed PTSD (1)	1	
		(ii)	*Any two from:* If the journal is peer reviewed (1) If the **findings/results** are repeatable (by the same scientists) (1) If the **findings/results** are reproducible (by other scientists) (1)	2	
			Total	**6**	

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