

New
Specification



Rewarding Learning

ADVANCED
General Certificate of Education
2018

Biology

Assessment Unit A2 1

assessing

**Physiology, Coordination and Control,
and Ecosystems**

[ABY11]

THURSDAY 7 JUNE, MORNING

**MARK
SCHEME**

General Marking Instructions

Introduction

The main purpose of the mark scheme is to ensure that examinations are marked accurately, consistently and fairly. The mark scheme provides examiners with an indication of the nature and range of candidates' responses likely to be worthy of credit. It also sets out the criteria which they should apply in allocating marks to candidates' responses.

Assessment objectives

Below are the assessment objectives for Biology.

Candidates should be able to demonstrate:

- AO1** Knowledge and understanding of scientific ideas, processes, techniques and procedures.
- AO2** Apply knowledge and understanding of scientific ideas, processes, techniques and procedures:
- in a theoretical context
 - in a practical context
 - when handling qualitative data
 - when handling quantitative data.
- AO3** Analyse, interpret and evaluate scientific information, ideas and evidence, including in relation to issues, to:
- make judgements and reach conclusions
 - develop and refine practical design and procedures.

Quality of candidates' responses

In marking the examination papers, examiners should be looking for a quality of response reflecting the level of maturity which may reasonably be expected of a 17 or 18-year-old which is the age at which the majority of candidates sit their GCE examinations.

Flexibility in marking

Mark schemes are not intended to be totally prescriptive. No mark scheme can cover all the responses which candidates may produce. In the event of unanticipated answers, examiners are expected to use their professional judgement to assess the validity of answers. If an answer is particularly problematic, then examiners should seek the guidance of the Supervising Examiner.

Positive marking

Examiners are encouraged to be positive in their marking, giving appropriate credit for what candidates know, understand and can do rather than penalising candidates for errors or omissions. Examiners should make use of the whole of the available mark range for any particular question and be prepared to award full marks for a response which is as good as might reasonably be expected of a 17 or 18-year-old GCE candidate.

Awarding zero marks

Marks should only be awarded for valid responses and no marks should be awarded for an answer which is completely incorrect or inappropriate.

Marking Calculations

In marking answers involving calculations, examiners should apply the 'own figure rule' so that candidates are not penalised more than once for a computational error. To avoid a candidate being penalised, marks can be awarded where correct conclusions or inferences are made from their incorrect calculations.

Types of mark schemes

Mark schemes for tasks or questions which require candidates to respond in extended written form are marked on the basis of levels of response which take account of the quality of written communication.

Other questions which require only short answers are marked on a point for point basis with marks awarded for each valid piece of information provided.

Levels of response

In deciding which level of response to award, examiners should look for the 'best fit' bearing in mind that weakness in one area may be compensated for by strength in another. In deciding which mark within a particular level to award to any response, examiners are expected to use their professional judgement.

The following guidance is provided to assist examiners.

- **Threshold performance:** Response which just merits inclusion in the level and should be awarded a mark at or near the bottom of the range.
- **Intermediate performance:** Response which clearly merits inclusion in the level and should be awarded a mark at or near the middle of the range.
- **High performance:** Response which fully satisfies the level description and should be awarded a mark at or near the top of the range.

Quality of written communication

Quality of written communication is taken into account in assessing candidates' responses to all tasks and questions that require them to respond in extended written form. These tasks and questions are marked on the basis of levels of response. The description for each level of response includes reference to the quality of written communication.

For conciseness, quality of written communication is distinguished within levels of response as follows:

Level 1: Quality of written communication is basic.

Level 2: Quality of written communication is good.

Level 3: Quality of written communication is excellent.

In interpreting these level descriptions, examiners should refer to the more detailed guidance provided below:

Level 1 (Basic): The candidate makes only a limited selection and use of an appropriate form and style of writing. The organisation of material may lack clarity and coherence. There is little use of specialist vocabulary. Presentation, spelling, punctuation and grammar may be such that intended meaning is not clear.

Level 2 (Good): The candidate makes a reasonable selection and use of an appropriate form and style of writing. Relevant material is organised with some clarity and coherence. There is some use of appropriate specialist vocabulary. Presentation, spelling, punctuation and grammar are sufficiently competent to make meaning clear.

Level 3 (Excellent): The candidate successfully selects and uses the most appropriate form and style of writing. Relevant material is organised with a high degree of clarity and coherence. There is widespread and accurate use of appropriate specialist vocabulary. Presentation, spelling, punctuation and grammar are of a sufficiently high standard to make meaning clear.

/ denotes alternative points

; denotes separate points

Comments on mark values are given in bold

Comments on marking points are given in italics

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Section A

- | | | | |
|----------|--|-----|---|
| 1 | (a) Phytochrome(s); | [1] | 5 |
| | (b) In the leaf; | [1] | |
| | (c) Red;
P ₇₃₀ ;
far red; | [3] | |
| 2 | (a) 1 Rough endoplasmic reticulum
2 Golgi apparatus; | [1] | 4 |
| | (b) Any three from: <ul style="list-style-type: none">• discs provide large surface area allowing (maximal) light absorption• mitochondria providing ATP for named metabolic activity, e.g. protein (opsin) synthesis/neurotransmitter synthesis• vesicles containing neurotransmitter allowing for transmission• branches in cell body enable connection with bipolar neurone• iodopsin, e.g. high light intensity/different pigments (qualified) | [3] | |
| | | | |
| 3 | (a) A group of organisms of the same species (by description) living in a particular area (at the same time); | [1] | 5 |
| | (b) Appropriate J-shaped curve; | [1] | |
| | (c) Any three from: <ul style="list-style-type: none">• small body size• short lived• reproduce rapidly• many offspring• little parental care• rapid dispersal• colonise new (unstable) habitats/pioneer species• variable population densities• poor competitors/not specialised• evolve rapidly | [3] | |

- 4 (a) A Cortex
 B Renal vein (**not** just vein)
 C Medulla
 D Ureter
 E Bladder
([3] for 5 correct, [2] for 4 correct and [1] for 3 correct) [3]
- (b) (i) Glucose concentration decreases along PCT;
 it is (selectively) reabsorbed by active transport (in the PCT); [2]
- (ii) Descending limb of loop is permeable to water and the ascending limb
 of loop is impermeable to water;
 ion concentration increases by removal of water from descending limb/
 ions are absorbed;
 osmotic extraction is dependent on lower water potential of interstitial
 fluid/medulla;
 this is achieved by actively pumping ions out of ascending limb so
 decreasing the concentration of ions (in the ascending limb); [4]
- (c) (i) Hypothalamus; [1]
- (ii) (Posterior) pituitary gland; [1]
- (d) (i) Subjects same sex/mass/fitness/other appropriate response; [1]
- (ii) At low intensity exercise, plasma ADH concentration remains relatively
 constant and increases at higher exercise intensity;
 at higher intensity, more water is lost from body due to sweating;
 at higher intensity, water loss results in lower water potential of blood
 plasma (so more ADH is released into the blood);
 increased ADH increases permeability of (distal convoluted tubule and)
 collecting duct, so more water is reabsorbed (into the blood); [4]

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5	(a) (i) $P = C - (R + F + U)$ or $C - R - F - U$;	[1]	AVAILABLE MARKS 10 14
	(ii) $91.78 - 89.15 (34.68 + 54.39 + 0.08) = 2.63$;	[1]	
	(iii) $22\,275 \times 9500$; $1.6 \times 10^6 / 22\,275 \times 9500 \times 100 = 0.76\%$	[2]	
	(b) (i) More nitrate (available for uptake by crop plant); more (nitrogen for) protein synthesis;	[2]	
	(ii) Field A has more nutrients/field B has fewer nutrients; in field A nutrient replaced by decomposition of faeces/urine/not removed by crop/in field B the crop removes nutrients/less decomposable material left behind;	[2]	
	(iii) Advantage: easy to store/soluble/does not need to decompose before ions become available/easy to spread/easy to calculate exact composition/other appropriate response; [1] Disadvantage: reduces soil quality/reduces crumb structure/ increases soil erosion/likely to leach/cost/reduces biodiversity explained/other appropriate response; [1]	[2]	
6	(a) (i) Prokaryotae;	[1]	
	(ii) Plasmids;	[1]	
	(b) General decrease in deaths (after 2008) to 2013 followed by an increase; better hygiene in hospital or by example/more effective treatments (from 2014); better treatment in hospital or by example; due to new strains of MRSA/OAR;	[3]	
	(c) (i) Disease outbreaks have all been located within the boundaries of the bat range;	[1]	
	(ii) Any two from: • have similar physiology to humans • fly which gives them a large range • social animals/have contact with large numbers of other bats and therefore a large pool is infected • carrier animal/bushmeat • encroachment/urbanisation so contact more likely	[2]	
	(d) (i) Disease that affects many thousands of people; or several countries/large geographical range (at the same time);	[2]	
	(ii) RNA; reverse transcriptase allows conversion of (single stranded) RNA into (double stranded) DNA; allowing incorporation into host genome;	[3]	
	(iii) Will stop production/reduce rate of formation of new viral particles (reducing the spread);	[1]	

7	(a) (i) Binds to receptors resulting in (greater) permeability (to positive ions); (rapid) influx of positive ions; [2] (ii) Internal neurone charge becomes more negative; consequently depolarisation becomes more difficult; [2] (iii) Acetylcholinesterase hydrolyses acetylcholine/transmitter resulting in release from receptor (on post-synaptic membrane); this prevents the neurone from remaining in the excited state/ allows repolarisation to begin/impulses to be separated; [2] (b) (i) Blocking the active site of the enzyme and prevents formation of the enzyme-substrate complex; so acetylcholine remains bound to receptor and neurone cannot repolarise; [2] (ii) Some organisms within the population are naturally resistant to/possess a mutation or gene conferring resistance/can survive treatment with pesticide; (reduced competition) allows successful breeding/passing on 'resistance' gene into successive generations; [2]	<table> <tr> <th>AVAILABLE MARKS</th> </tr> <tr> <td>10</td> </tr> </table>	AVAILABLE MARKS	10
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10				

- 8 (a) (i) Antibody acquired by young mouse by placental/colostral transfer; [1]
- (ii) Immune response in mice is similar to that in rabbit/mice are (smaller and therefore) easier to keep in large numbers in the lab; [1]
- (b) (i) Low level expression of/lower number of molecule (on cells of respiratory/digestive tract); consequently reducing successful binding events for virus with host cells/reducing chance of virus entering cell; [2]
- (ii) Liver cells do not possess the molecule (on the plasma membrane); since these cells are major targets there must be another molecule/pathway to allow viral entry to host cell; [2]
- (c) (i) Substance capable of stimulating the production of a specific immune response/and complementary antibodies; [1]
- (ii) No colour change/no coloured product released; lack of RHD antibody in serum (results in no binding to antigen); consequently antibody with attached enzyme cannot bind/enzyme substrate-complex (needed for colour change) will not form; [3]
- (iii) $10\text{ ml} = 10\,000\ \mu\text{l}$
 $10\,000 \div 500$;
 20; [2]
- (iv) Any **four** from:
- Cell-mediated response/anti-mediated response
 - T-lymphocytes B-lymphocytes become sensitised by viral antigens (binding to specific receptors on cell surface)
 - division by mitosis to produce T-helper/T-killer/plasma cells
 - these secrete complementary antibody/stimulate action of B-cells/kill virus-infected cells by secreting perforins
 - B-/T-memory cells provide long term immunity [4]
- (d) Select rabbits that are resistant to the virus;
 use these as a breeding stock/to produce resistant offspring;
or
 Vaccination;
 allowing active (long term) immunity/memory cell production;
or
 Reduce crowding;
 reduce transmission;
(second point must agree with first) [2]

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Section A

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Section B

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- 9 (a) • **A shows competition**
- interspecific
 - for a named example of resource/species that is in short supply
 - –/– interaction/both populations grow better separately
 - plateau (by description) indicates the carrying capacity for the population
 - organism 1 is the better competitor (wins competition)/organism 2 is a poorer competitor
 - and may become competitively excluded
 - **B shows mutualism**
 - +/+ interaction/both organisms benefit
 - both populations grow better together/grown separately neither do as well
 - appropriate named example, e.g. lichens/nitrogen fixers and legumes cellulose producers in herbivore gut with brief indication of the benefit

Band	Response	Mark
A	Candidates use appropriate specialist scientific terms to identify the population interactions and explain fully the reasons for the choices using a minimum of seven points of indicative content. They must use good spelling, punctuation and grammar and the form and style are of a very good or better standard.	[7]–[9]
B	Candidates sometimes use appropriate specialist scientific terms to identify the population interactions and explain fully the reasons for the choices using a minimum of four points of indicative content. They must use satisfactory spelling, punctuation and grammar and the form and style are of a good standard.	[4]–[6]
C	Candidates correctly identify the population interactions and partially explain the reasons for the choices using a minimum of one point of indicative content. They must use limited spelling, punctuation and grammar and the form and style are of a basic standard.	[1]–[3]
D	Response not worthy of credit.	[0]

[9]

- (b) • **+/– interaction**
- ref to increase in moose numbers resulting in increase in wolf numbers
 - ref to food availability
 - more moose eaten by wolves causing decrease in moose numbers
 - this increases competition amongst wolves
 - a time lag exists between increase in prey number and increase in predator number
 - oscillations of regular period

- grazing involves herbivores feeding on plant
- greater biomass of plant material will support greater numbers of herbivores/carnivores more efficient at obtaining energy so supported by smaller prey numbers/carnivores require strategies to capture prey/ have to hunt
- parasitism is generally over much longer time frame/oscillation not as obvious
- parasites are usually smaller than the host/live in or on host
- rarely kills host
- often require a vector

Band	Response	Mark
A	Candidates use appropriate specialist scientific terms to comment fully on the interactions and explain the important points relating to each using a minimum of seven points of indicative content. They must use good spelling, punctuation and grammar and the form and style are of a very good or better standard.	[7]–[9]
B	Candidates use appropriate specialist scientific terms to comment fully on the interactions and explain the important points relating to each using a minimum of four points of indicative content. They must use satisfactory spelling, punctuation and grammar and the form and style are of a good standard.	[4]–[6]
C	Candidates partially comment on the interactions and explain some of the points relating to each using a minimum of one point of indicative content. They must use limited spelling, punctuation and grammar and the form and style are of a basic standard.	[1]–[3]
D	Response not worthy of credit.	[0]

[9]

Section B

Total

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100