



ADVANCED
General Certificate of Education
2015

Biology

Assessment Unit A2 1

assessing

Physiology and Ecosystems

[AB211]

THURSDAY 21 MAY, AFTERNOON

**MARK
SCHEME**

General Marking Instructions

Introduction

Mark schemes are published to assist teachers and students in their preparation for examinations. Through the mark schemes teachers and students will be able to see what examiners are looking for in response to questions and exactly where the marks have been awarded. The publishing of the mark schemes may help to show that examiners are not concerned about finding out what a student does not know but rather with rewarding students for what they do know.

The Purpose of Mark Schemes

Examination papers are set and revised by teams of examiners and revisers appointed by the Council. The teams of examiners and revisers include experienced teachers who are familiar with the level and standards expected of students in schools and colleges.

The job of the examiners is to set the questions and the mark schemes; and the job of the revisers is to review the questions and mark schemes commenting on a large range of issues about which they must be satisfied before the question papers and mark schemes are finalised.

The questions and the mark schemes are developed in association with each other so that the issues of differentiation and positive achievement can be addressed right from the start. Mark schemes, therefore, are regarded as part of an integral process which begins with the setting of questions and ends with the marking of the examination.

The main purpose of the mark scheme is to provide a uniform basis for the marking process so that all the markers are following exactly the same instructions and making the same judgements in so far as this is possible. Before marking begins a standardising meeting is held where all the markers are briefed using the mark scheme and samples of the students' work in the form of scripts. Consideration is also given at this stage to any comments on the operational papers received from teachers and their organisations. During this meeting, and up to and including the end of the marking, there is provision for amendments to be made to the mark scheme. What is published represents this final form of the mark scheme.

It is important to recognise that in some cases there may well be other correct responses which are equally acceptable to those published: the mark scheme can only cover those responses which emerged in the examination. There may also be instances where certain judgements may have to be left to the experience of the examiner, for example, where there is no absolute correct response – all teachers will be familiar with making such judgements.

/ denotes alternative points
 ; denotes separate points
Comments on mark values are given in bold
Comments on marking points are given in italics

AVAILABLE
MARKS

Section A

- | | | | | |
|---|-----|--|-----|---|
| 1 | (a) | Cataracts;
sulfur dioxide/nitric oxide/nitrogen dioxide/NO _x ; | [2] | 4 |
| | (b) | Replacing CFCs in refrigerators/aerosols/air conditioning;
using filters/low-sulfur fuels/catalytic converters/alternative fuels; | [2] | |
| 2 | (a) | (i) Light missing chloroplasts/chlorophyll (and passing through leaves); | [1] | 6 |
| | | (ii) $GPP = A - (B + C + D + E + F)$; | [1] | |
| | | (iii) Regular and wide spacing of crops/use varieties with large leaves/
varieties with leaves orientated to gain maximum sunlight/weed
reduction; | [1] | |
| | (b) | (i) Growing the same crop in the same field (year after year) | [1] | |
| | | (ii) Soil quality – by depleting the same minerals in the soil (year after year);

Animal biodiversity – reduced range of plants for (primary) consumers/
reduced number of food chains/webs/reduction of habitats/ecological
niches; | [2] | |
| | | | | |
| 3 | (a) | (i) Flowering is initiated as length of light period increases above a critical
length/dark period decreases below a critical length/the plant only
flowers when period of darkness is 10 hours or less/light period 14
hours or more; | [1] | 9 |
| | | (ii) Difficulty of controlling light conditions in the field (or by example,
e.g. moonlight)/easier to control other named variables
(e.g. soil fertility) in the laboratory); | [1] | |
| | | (iii) Carry out additional investigations between 12–14 hours continuous
light/12–10 hours continuous darkness; | [1] | |
| | (b) | (i) (Short) light period within darkness rapidly converts P ₆₆₀ to P ₇₃₀ /
converts all P ₆₆₀ to P ₇₃₀ ;
therefore prevents P ₇₃₀ reaching low enough level to stimulate
flowering/P ₇₃₀ level remains inhibitory/second period of darkness not
long enough to convert sufficient P ₇₃₀ to P ₆₆₀ ; | [2] | |
| | | (ii) Period of far-red light rapidly converts P ₇₃₀ to P ₆₆₀ ;
so removal of P ₇₃₀ is sufficient to stimulate flowering (despite short
dark period)/inhibitory effect of P ₇₃₀ is removed;
in regime 1 period of darkness is too short (to allow P ₇₃₀ to fall to
critical level); | [3] | |
| | (c) | Either red or green cones not functioning; | [1] | |

	AVAILABLE MARKS
<p>4 (a) (i) A – microvilli; B – nucleus; [2]</p> <p>(ii) Increase surface area/more (protein) carriers; for the reabsorption of glucose/amino acids; [2]</p>	
<p>(b) (i) Cuboidal (epithelial); [1]</p> <p>(ii) Any two from</p> <ul style="list-style-type: none"> glomerular endothelial cells are squamous/pavement/flattened/thinner possess pores no microvilli present/no basal invaginations contain fewer mitochondria/carrier proteins (converse re cuboidal epithelial) <p>[2]</p>	7
<p>5 (a) (i) Slurry is rich in organic/decomposable material; causes population explosion of bacteria; aerobic respiration (by bacteria) increases BOD; [3]</p> <p>(ii) Similarity – both increase BOD; Differences – timescales with artificial fertiliser/eutrophication are longer (allow converse for slurry); with eutrophication source of decomposable matter is algae/with slurry, source is animal waste; [3]</p>	
<p>(b) Any two from</p> <ul style="list-style-type: none"> greater numbers therefore quantitative data more meaningful easier to trap/monitor/count reference to bioaccumulation affects invertebrates more/ invertebrates more sensitive/invertebrates have a greater range of sensitivity other appropriate response <p>[2]</p>	
<p>(c) (i) Coppicing involves cutting trees at ground level; causing growth of number of new stems; [2]</p> <p>(ii) Increases light penetration to woodland floor; allowing development of woodland floor plants;</p> <p>or</p> <p>Provides rich source of (commercial) wood; thus preserving native woodland/maintains more habitats;</p> <p>or</p> <p>Rotation of coppicing provides range of tree sizes/maturity; creates range of habitats;</p> <p>or</p> <p>Other appropriate description; with appropriate explanation; [2]</p>	
	12

6 (a) (i) Actin;	[1]	AVAILABLE MARKS
(ii) The calcium ions enable the myosin heads to link with the actin binding sites (forming actomyosin bridges); once attached, the myosin heads rotate or 'rock' back and pull the actin filaments over the adjacent myosin filaments; hydrolysis of an ATP molecule enables the myosin head to detach from the actin binding site and return to its original position; the detached myosin heads repeat the process so that the cycle of attachment, rotation and release is repeated;	[4]	
(b) (i) Anywhere on downward slope of trace;	[1]	
(ii) Any two from: • larger/greater contraction • contraction lasts for longer period of time • time taken to return to relaxed state is shorter after repeated stimuli	[2]	
(iii) Example of body/part of body being held in same position for a period of time;	[1]	
(c) Any two from • same concentration of saline solution • same temperature • same muscle • lever in same position/same tension of pen on drum/drum moving at same speed • other appropriate response	[2]	11
7 (a) Lymphocytes are destroyed (are prevented from dividing) due to immunosuppressive drugs/X-rays/immunosuppression;	[1]	
(b) Fewer hospital admissions/drugs/prescriptions/GP visits required to treat shingles;	[1]	
(c) (i) Memory cells already present due to earlier infection by <i>varicella zoster</i> /chickenpox (virus); form plasma cells/antibodies more quickly;	[2]	
(ii) Antibody mediated response targets virus in body fluids/free cells; cell mediated response targets virus infected cells; T-helper cells promote antibody mediated activity (or by description, e.g. promoting B-cell division);	[3]	7

- 8 (a) (i) Prey numbers are larger/prey peaks (and troughs) occur before those of predator; [1]
- (ii) Pest numbers fall rapidly then increase (and remain) above initial values; insecticide (pesticide) kills both pest and predator; pest numbers increase/pest resurgence due to fewer predators; some pest survive as have insecticide resistance/are shaded from insecticide/numbers increase due to immigration; [4]
- (b) (i) Sweep net/pooter (if feeding on leaves); [1]
- (ii) Insects restricted to small ranges/recaptured insects only obtained close to point of release; [1]
- (iii) $242 \times 166/84$ (i.e. correct formula); 478; [2]
- (c) Species A largest of three trophic levels; correct order with labels; [2]
- (d) (i) Single celled (or not true multicellular) eukaryote; [1]
- (ii) Sterile flies 'mate' with females resulting in reduced number of offspring; fewer tsetse flies to transmit parasite; [2]
- (iii) **Any two from**
- sterile males actively seek out female flies
 - flies have wider range/can reach isolated areas
 - sheltering effect of vegetation/unevenness of spraying avoided/pesticides could be washed away
 - no pesticide resistance/pest resurgence [2]

Section A**AVAILABLE MARKS**

16

72

Section B

AVAILABLE
MARKS

9 (a) Any twelve from

- neurones/axons are long therefore reducing number of synapses
- numerous dendrites/dendrons form effective links with other neurones/receptors/effectors
- have cell-surface membranes that are polarised/have electrochemical gradients
- when not conducting impulses have a resting potential
- detail re nature of resting potential (e.g. outside of membrane positive relative to inside)
- when depolarised (reaching a threshold level) develop an action potential
- refractory period is recovery of resting potential/provides a gap between impulses/prevents impulses going backwards
- nerve impulse is propagation of action potential along axon by a flow of current in a series of localised circuits
- neurones with larger diameters conduct impulses faster
- myelination of axon also leads to faster conduction
- due to the myelin acting as an insulator
- impulses 'jump' between adjacent nodes of Ranvier/saltatory conduction
- neurones terminate in synaptic bulbs
- with synaptic vesicles containing neurotransmitter chemical
- exocytosis of neurotransmitter from pre-synaptic membrane on arrival of impulse
- presence of specific receptors in post-synaptic membrane [12]

(b) Any four from

- synapses allow nerve impulses to pass from neurone to neurone
- synapses ensure unidirectionality
- explanation of how unidirectionality achieved
- they prevent overstimulation/filter out low level stimuli
- explanation of how to prevent overstimulation
- they provide integration/flexibility
- explanation of integration/flexibility, e.g. reference to summation/inhibitory neurones/numerous connections (synapse) [4]

Quality of written communication

- 2 marks: The candidate expresses ideas clearly and fluently through well-linked sentences, which present relationships and not merely list features. Points are generally relevant and well-structured. There are few errors of grammar, punctuation and spelling.
- 1 mark: The candidate expresses ideas clearly, if not always fluently. The account may stray from the point or may not indicate relationships. There are some errors of grammar, punctuation and spelling.
- 0 marks: The candidate produces an account that is of doubtful relevance or obscurely presented with little evidence of linking ideas. Errors in grammar, punctuation and spelling are sufficiently intrusive to disrupt the understanding of the account. [2]

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Section B

18

Total

90