



Rewarding Learning

ADVANCED
General Certificate of Education
2014

Biology

Assessment Unit A2 1

assessing

Physiology and Ecosystems

[AB211]

WEDNESDAY 21 MAY, MORNING

**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) X – myosin;
 Y – M-line; [2]

(b)

Feature	Increase in length	Decrease in length	No change in length
A-band			✓
I-band		✓	
H-zone		✓	
Sarcomere		✓	

[half mark each: round down] [2] 4

- 2 (a) Biotic potential is the maximum reproductive potential of a population (under optimum environmental conditions with unlimited resources); [1]

- (b) (i) Numbers of species B continue to increase over time but species A increases initially then dies out (goes into decline);

Any two from

- neither species does as well as when cultured separately
- Species A dies out due to competition for food
- consequence of competitive exclusion (or explained) [3]

- (ii) *Paramecium* are mobile/can move across the haemocytometer; [1]

(c) **Any three from**

- rapid growth rate in spring due to increasing light levels/higher temperatures
- and high nutrient supply
- crash due to shortage of nutrients/shading
- or increase in zooplankton (herbivores) [3] 8

- 3 (a) (i) **Any three from**
- concentration of P_{730} increases between March and May
 - variability increases with time [*not concentration levels off with time*]
 - in daylight P_{660} is converted to P_{730}
 - shorter nights allows less P_{730} to be converted back to P_{660} (therefore increasing levels of P_{730}) [3]

- (ii) Differences in leaf shading/age/other appropriate response; [1]

- (b) (i) Gibberellin; [1]

- (ii) Cytokinin increases the rate of cell division; more cells produced for gibberellin to act on; [2] 7

- 4 (a) (i) The trees are regularly arranged/similar ages/same species; [1]
- (ii) **Any two from**
- low light levels
 - trees of one species only
 - conifer (softwood) needles are slow to decompose/prevents plants becoming established
 - few shrubs [2]
- (iii) Rapid growth/economic gain; [1]
- (b) (i) Presence of ground layer (mosses/grass); [1]
- (ii) Secondary; [1]
- (iii) **Any four from**
- ground layer will (continue to) be colonised by rapidly-growing plants
 - decay of dead/burned trees provides nutrients
 - there is plenty of light
 - (eventually) shrub/tree layer will develop
 - colonising from adjacent areas/seeds buried in ground
 - as these grow reduced light reaches ground layer
 - reducing species diversity of ground/shrub layer
 - eventually climax community develops [4]
- 5 (a) Basement membrane; [1]
- (b) (i) **Any three from**
- glucose, amino acids and urea are filtered in proportion (into the Bowman's capsule)
 - as these are small molecules
 - only a very small amount of protein is filtered as normally too big to filter through the basement membrane
 - many more small proteins are filtered than medium-sized proteins due to smaller size [3]
- (ii) **Any two from**
- the glucose is selectively reabsorbed by active transport;
 - the glucose diffuses back by facilitated diffusion;
 - description of mitochondria or microvilli or basal invagination (as adaptation of proximal tubule cells) [2]
- (c) (i) ADH receptor molecule accurately labelled;
channel protein accurately labelled; [2]
- (ii) More negative blood solute potential causes more ADH to be released;
ADH binds to receptors/leading to more aquaporins;
consequently more water is reabsorbed from the collecting duct into the blood; [3]

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10

11

		AVAILABLE MARKS
6	<p>(a) The increasing levels of oxygen/loss of hydrogen ions in the compounds nitrite and nitrate (compared to ammonia); [1]</p> <p>(b) (i) A relationship between organisms of different species in which both members benefit (a +/+ interaction); [1]</p> <p>(ii) As soil nitrogen content increases mean nodule length decreases (or converse); larger nodules suggest increasing ability to fix nitrogen (or converse); in nitrogen-rich soils large root nodules are less advantageous/have less of an advantage as nitrogen levels less likely to be limiting (or converse); [3]</p> <p>(iii) Any two from</p> <ul style="list-style-type: none"> • plants sampled from a range of areas/fields (where soil nitrogen content would be expected to be different) • the nodules were measured in the same plane/consistency in nodule measurement • nodules were randomly selected/selected using objective sampling (e.g. the 10 nodules closest to the base of the root were sampled) • soil collected for nitrogen testing obtained from same proximity to pea root • stored for same length of time/stored in same conditions (e.g. storage in plastic bags will encourage denitrification therefore reducing nitrogen content) • other appropriate response [2] 	7
7	<p>(a) The external parts will be below normal body temperature/closer to <i>M. leprae</i>'s optimum temperature; [1]</p> <p>(b) Any three from</p> <ul style="list-style-type: none"> • Schwann cells form the myelin sheath/provide insulation around axons • if damaged nervous conduction will be slower • as saltatory conduction is affected (or explained) • insulation around adjacent neurones could be broken down with impulses not always going where intended [3] <p>(c) (i) Cell-mediated as bacteria are within cells/not free in body fluids; [1]</p> <p>(ii) (activated) T-lymphocytes; [1]</p> <p>attach to antigens on cell-surface membrane of infected cells; produce chemicals (e.g. perforins) which destroy the cell-surface membrane of infected cells; [2]</p> <p>(d) (i) Use of drugs to inhibit DNA replication (and therefore the cloning of lymphocytes); X-rays to destroy lymphocytes; [2]</p> <p>(ii) If too much suppression body prone to picking up infection; if too little suppression risk of rejection is high therefore may need new transplant/condition not treated; [2]</p>	12

			AVAILABLE MARKS
8	(a) (i)	Arrow going up;	[1]
	(ii)	Produce ATP for the regeneration of rhodopsin;	[1]
	(b)	Conversion of light to electrical energy;	[1]
	(c) (i)	Similarity – Neurotransmitter involved/affects electrochemical balance in adjacent neurone; Difference – different neurotransmitter/reduction in neurotransmitter produces depolarisation in adjacent neurone;	[2]
	(ii)	Ensures impulse is unidirectional/provides integration (or by explanation)/prevents overstimulation/filters out low-level stimuli;	[1]
	(d) (i)	Values from graph = 42.5 and 90; Percentage change = 111.8; [one incorrect reading from graph and correct calculation = 1]	[2]
	(ii)	Any two from <ul style="list-style-type: none"> • in the bright light all the rhodopsin was broken down/bleached • when entering darkness no sensitivity as no functional rods/ rhodopsin • over time rhodopsin is reformed so sensitivity increases with time 	[2]
	(iii)	Differences in diet (individual A has more vitamin A)/genetic differences/other appropriate response;	[1]
	(e)	If viewing at a slight angle light rays will focus on periphery of eye/not on fovea/not on cones/on rods; rods are the photoreceptor for night vision;	[2]
Section A			13
			72

Section B

AVAILABLE
MARKS

9 (a) Any eight from

- maintaining hedgerows protects against soil erosion
- through roots binding soil particles together
- protection against wind/rain
- ploughing/terracing across slopes reduces soil erosion/prevents run-off
- polyculture/crop rotation/intercropping reduces risk of development of mineral-deficient soils
- as different crops have different mineral requirements
- use of nitrogen-fixing plants promotes soil fertility
- increased use of organic fertiliser (or appropriate example)
- improves soil crumb structure/releases nutrients slowly
- improved aeration/drainage
- reduces denitrification/promotes nitrification/promotes nitrogen fixation
- mixed livestock reduces demands on soil
- other appropriate response

[8]

(b) Any eight from

- maintaining hedgerows provides range of species/habitats/food/shelter/ act as wildlife corridors
- low stocking rates protect hedgerows/pasture
- polyculture/crop rotation encourage more complex food webs/creates more habitats
- decrease build-up of pests
- integrated pest management schemes to reduce harm due to pesticides (explanation of how pesticides cause harm which reduces biodiversity (e.g. killing non-pest insects/build-up in food chains/bioaccumulation)
- example of IPM (e.g. natural predator/non-persistent pesticides/sterile males of pest species)
- predator strips promote the numbers of natural predators of pests
- selective breeding/genetically modified varieties of crops with improved pest resistance
- reducing herbicides conserves farmland plant species
- decreased use of fertiliser
- set-aside areas create a range of habitats
- example of government initiative to promote biodiversity (e.g. Biodiversity Action Plans)
- other appropriate response

[8]

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]

Section B

Total

**AVAILABLE
MARKS**

18

18

90