Rewarding Learning

ADVANCED
General Certificate of Education
2018

Biology

Assessment Unit A2 1

assessing

Physiology and Ecosystems

[AB211]

THURSDAY 7 JUNE, 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)** Phytochrome(s); [1]

(b) In the leaf; [1]

(c) Red;
P_{730};
far red; [3] 5

2 **(a)** 1. Rough endoplasmic reticulum
2. Golgi apparatus; [1]

(b) Any **three** from:
- 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] 4

3 **(a)** A group of organisms of the same species (by description) living in a particular area (at the same time); [1]

(b) Appropriate J-shaped curve; [1]

(c) Any **three** from:
- 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] 5

				AVAILABLE MARKS
4	**(a)**	**(i)**	Hypothalamus; [1]	
		(ii)	(Posterior) pituitary gland; [1]	
	(b)	**(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]	7
5	**(a)**	**(i)**	P = C-(R+F+U) or C-R-F-U; [1]	
		(ii)	91.78 – 89.15 (34.68 + 54.39 + 0.08) = 2.63; [1]	
		(iii)	22 275 × 9500; $1.6 \times 10^6 / 22275 \times 9500 \times 100 = 0.76\%$ [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** nutrients 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]	10

				AVAILABLE MARKS
6	(a)	(i)	Lay out grid/transect line; random positions generated by suitable method, e.g. calculator, random number generator; *Do not allow a method which involves throwing a quadrat* [2]	
		(ii)	Any **two** from: • allows calculation of a mean (providing an indication of trend) • enough quadrats result in little change in mean as more data is added increasing accuracy/reduces effect of anomalies/allow reliability • provides enough data for statistical analysis [2]	
	(b)	(i)	Divide the woodland into several areas (by description)/coppice each area at different times; at any one time there will be a section 4–5 years post coppice; [2]	
		(ii)	Any **two** from: • provides areas of high light intensity • encouraging greater variety of plant species • providing food/shelter/nesting sites etc./other appropriate response for greater range of animal species [2]	
	(c)	(i)	sample 1 number × sample 2 number/number marked in sample 2/ 25 × 18/3; 150; [2]	
		(ii)	Any **three** from: • no significant population change due to birth/death • no significant population change due to immigration/emigration • trapping and marking will not adversely affect chance of retrapping • marking will not increase likelihood of predation • marked animals will have time to become well distributed through remaining population [3]	13

				AVAILABLE MARKS
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]	10

				AVAILABLE MARKS
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 ml = 10000 µl 10000/500; 20; [2]	
		(iv)	Any **four** from: • Cell-mediated response/antibody-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]	18
			Section A	**72**

Section B

AVAILABLE MARKS

9 (a) Any **nine** of the following:

- light from a unidirectional source will induce bending in a normal shoot
- the control allows comparison with experimental treatments
- removal of shoot tip stops growth
- auxin produced in shoot tip
- removal of auxin prevents cell elongation
- covering the shoot tip with an opaque cover means light/stimulus is not perceived
- this indicates that absence of shading prevents differential growth (bending) but allows general elongation to continue
- this is due to the lack of lateral movement of auxin to the shaded side of shoot/moves equally down all sides
- a transparent cap allows bending (control for opaque cap)
- suggesting the stimulus is perceived by the shoot tip
- action of auxin in elongation explained
- when base is covered positive response still occurs
- so, perception of stimulus/detection of light and consequent elongation do not occur here [9]

(b) Any **seven** of the following:

- place an excised shoot tip on to an agar block
- illuminate (from above)
- for varying periods of time/with different light intensities

or

- place varying numbers of shoot tips on to agar blocks
- illuminate (from above)
- for same period of time

- auxin will diffuse into the agar blocks
- this will provide agar blocks with different concentrations of auxin
- alternatively different numbers of blocks may be placed on the cut shoots (assuming blocks have equal concentrations of auxin)
- control 1
- control 2 [7]

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. Points are generally relevant and well structured. 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.

AVAILABLE MARKS
16 + 2

Section B **18**

Total **90**