Rewarding Learning

ADVANCED
General Certificate of Education
2017

Biology

Assessment Unit A2 1

assessing

Physiology and Ecosystems

[AB211]

MONDAY 12 JUNE, 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)**	Deaths, immigration; (both required in this order)	[1]	
	(b)	Any **two** from: • decreased food availability • reference to breeding cycle/decreased availability of mates • decreased temperature • decreased nesting sites • increased predation/disease • other appropriate response	[2]	
	(c)	Immigration/emigration;	[1]	4
2	**(a)**	Calcium; allows actin binding site to become available to myosin head;	[2]	
	(b)	Contracted = 80 mm; (2.2 ÷ 10 = 0.22) 0.22 × 8 = 1.76; 1.76 × 10 000; 17 600 ÷ 1000 = 17.6 mm; **or** 8 ÷ 10 × 2.2; (by ratio) 1.76 ÷ 1000; 0.00176 × 10 000 = 17.6 mm	[3]	5

AVAILABLE MARKS

3 **(a)** **(i)**

	Flowering response	
	LDP	SDP
2	✓	✗
3	✓	✗
4	✗	✓
5	✓	✗

;;

(all correct = [2], 3 rows correct = [1]) [2]

(ii) During light period P_{660} is converted to P_{730}/
during dark period P_{730} is converted to P_{660} slowly;

Period of red light reconverts P_{660} to P_{730} but this is reversed by period of far red light resulting in relatively high concentration of P_{660}/ low concentration of P_{730}
(equivalent of long dark period);

Relatively lower concentration of P_{730} breaks inhibition of flowering in SDP (SDP flowers)/promotion of flowering in LDP does not occur (LDP does not flower); [3]

(b) Surface of tendril in contact with (host) plant (stem/support) has a relatively lower concentration of auxin compared to non-contact surface/auxin moves away from contact surface to non-contact surface;
auxin promotes cell elongation/differentially greater elongation in non-contact surface and therefore shoot grows around stem of host plant or other support; [2] 7

4 **(a)** Arrow placed precisely on x-axis at point at which oxygen level decreases rapidly/stonefly larvae decrease rapidly; [1]

(b) Introduction of organic pollutant results in a rapid increase in microbial population in river;
microbial respiration/aerobic respiration by bacteria requires a lot of oxygen/reduces oxygen in water; [2]

(c) *Tubifex* worms have (a high concentration of) haemoglobin;
allowing them to absorb maximum amounts of oxygen in water that has very low oxygen concentrations; [2] 5

AVAILABLE MARKS

5 **(a)** **A** Nitrification;
B Ammonification/decomposition;
C Denitrification; [3]

(b) **(i)** Prokaryotae; [1]

(ii) Well aerated/soil air spaces/large crumb resulting in well drained/ not water logged soil; [1]

(iii) Any **two** from:
- ploughing
- use of organic fertiliser
- drainage scheme
- other appropriate response [2]

(c) **(i)** Nitrogen gas converted to ammonia;
ammonia is used to produce organic nitrogen containing compounds/ amino acids; [2]

(ii) As fertiliser concentration increases the number of root nodules decreases; [1]

(iii) Any **two** from:
- O acts as a control (or by description)
- providing enough data to enable trend identification
- cost of experimental treatment
- range decision is related to ability to measure noticable difference in dependent variable
- apparatus available
- research indicates the range includes that naturally found in fields
- other appropriate response [2]

(iv) As nitrate concentration increases the number of root nodules decrease; [1]

(v) Any **two** from:
- genetic differences in the clover plants
- sampling procedures may be flawed/biased
- reference to distribution of nitrate throughout medium
- root nodules vary in size (so number may not be a true representation of extent) [2]

15

				AVAILABLE MARKS
6	(a)	(i)	Any **two** from: • opening of channels/gates • influx of positive ions • positive feedback (or by description) [2]	
		(ii)	Refractory period; allowing separation of action potentials/unidirectionality/sets an upper limit on frequency of impulses; [2]	
	(b)	(i)	Any **two** from: • A sub-threshold stimulus will not result in an action potential (AP)/ stimulus above threshold will result in action potential • increased stimulus (strength) increases the action potential frequency/number of action potentials per unit time • further increase in stimulus results in no further increase in AP frequency/number per unit time [2]	
		(ii)	There are a maximum number of action potentials that can be generated in a particular time (must have reference to time or frequency); due to time for repolarisation/recovery; [2]	
		(iii)	Any **two** from: • temperature • myelinated • same neurone • same bathing solution • diameter [2]	10

				AVAILABLE MARKS
7	(a)	(i)	Secondary succession; [1]	
		(ii)	Soil already formed/nutrients present/containing bank of seeds, spores/vegetative structures/tubers/rhizomes; [1]	
		(iii)	Any pair from: Reduction in water availability; due to intercept by leaves; or change in temperature; due to reduced energy penetration; or change in named edaphic factor, e.g. humus; due to reduced decomposition of pine needles; or increased humidity; due to transpiration; other appropriate response; [2]	
	(b)	(i)	The graph represents a number of populations in the same area; [1]	
		(ii)	Better early competitor; outcompeted in later years by better adapted species (named); [2]	
	(c)		Any **three** from: • heat melts 'glue' facilitating seed release • fire clears large vegetation that would shade young plants/light available for growth of young plant • reduced competition • fire creates mineral-type soil suitable for seed germination [3]	10

				AVAILABLE MARKS
8	(a)	(i)	Cuboidal epithelium;	
		(ii)	Any pair from: microvilli; to increase surface area; or numerous mitochondria; to provide ATP for active transport; or basal invaginations of membrane; to increase the surface area; [3]	
	(b)	(i)	Drug is complementary in shape to site (**not active site**) on the protein; thus preventing successful binding/transport of glucose; [2]	
		(ii)	Drug blocks more transporters/have reduced activity (since SLGT2 is responsible for 90% of transport); therefore much less glucose is reabsorbed into the blood; [2]	
		(iii)	The solute potential of the urine will decrease/become more negative; due to increased concentration of glucose present; [2]	
	(c)	(i)	Much higher concentration of protein in the glomerular filtrate relative to the blood plasma (*not just values quoted*); normal function of the basement membrane would prevent this; [2]	
		(ii)	Any **three** from: • B lymphoctyes divide to form plasma cells • secretion of specific/complementary antibodies • antibodies bind to antigen/form antigen-antibody complex • destruction/damage to structural integrity of membrane due to loss of protein/large pores created in membrane [3]	
		(iii)	Any **two** from: • drug prevents mitosis • prevents cell proliferation/production of plasma cell population • reduces antibody production [2]	16
			Section A	**72**

Section B

AVAILABLE MARKS

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

- light strikes the cornea, most refraction occurs here
- fine focus occurs at the lens
- if object is far away (light rays parallel) less refraction is required
- ciliary body relaxes allowing tension in wall of eyeball to be transmitted via suspensory ligaments (taut) to lens
- lens is pulled thin
- if object is close (light rays divergent) more refraction is required
- ciliary body contracts so suspensory ligaments are not under tension
- lens becomes thicker (due to its elasticity)
- this change in lens shape is termed accommodation
- light rays are focused on retina at fovea centralis
- cones on retina are of three types
- sensitive to red, green and blue wavelengths of light
- light of high enough intensity striking a cone bleaches iodopsin
- a generator potential is induced if this exceeds threshold (then an action potential will pass along the optic nerve to the visual centre of brain) [9]

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

Acuity

- achieved by cones
- requires high light intensity
- monosynaptic with single bipolar neurone
- stimulation of each cone can be distinguished as a separate point

Sensitivity

- achieved by rods
- stimulated at low light intensity
- several rods synapse with single bipolar neurone (by description)
- shows retinal convergence
- provides spatial summation
- allowing addition of generator potentials to exceed threshold and induce action potential [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. [2]

AVAILABLE MARKS
18
18
90

Section B

Total