



Rewarding Learning

ADVANCED
General Certificate of Education
2016

Biology

Assessment Unit A2 1

assessing

Physiology and Ecosystems

[AB211]

THURSDAY 26 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 myosin;
sliding filament (theory);
calcium/ Ca^{2+} ;
A-band;
smooth (muscle); [5] 5
- 2 (a) (i) Using natural **predators/parasites/competitors** to control pest populations; [1]
- (ii) Causes **economic/commercial** damage to the farmers/less land to farm/land not used for crops/competes with (commercial) crop; [1]
- (b) Any **two** from:
- ensure they can survive/thrive/self-sufficient in the environment
 - reproduce in sufficient numbers to be effective/ensure there isn't a predator that would remove moth
 - ensure they do not eat other native organisms/may disrupt the food chain/carries disease
 - may outcompete native species [2]
- (c) (i) The population dramatically declines in April then rises to beyond its initial population in May;
population dramatically declined as the pest was killed/eliminated by the chemical;
natural predators of the pest killed by chemical control/the population sharply increased/pest resurgence due to chemical control broken down so population rises dramatically due to higher temperatures/
increased growth of host plant so more food; [3]
- (ii) The biological control remains continually keeping pest levels low/
biological control doesn't affect natural predators; [1] 8

			AVAILABLE MARKS	
3	(a)	Promote/causes cell elongation of internodal regions; increased/promotes/stimulates cell division (in apical meristems);	[2]	
	(b)	Amount of curve/degree of curvature;	[1]	
		Any four from:		
		<ul style="list-style-type: none"> • place shoots in an opaque container with hole on one side/shoots given unidirectional light • place lamp producing white light at a set distance from the container • leave for a period of time minimum of 24 hours • suggest how to measure the curvature of shoots • repeat with different colours of light/filters/wavelengths • any controlled variable – time/distance/intensity/type/age of plant/shoot/temperature/turn shoot 	[4]	7
4	(a)	(i) Any three from:		
		<ul style="list-style-type: none"> • mix/agitate/shake the cell suspension • sample from the same depth • carefully place a drop of the suspension at the edge of a coverslip • ensure no suspension is on the surface of the coverslip • ensure no suspension fills either groove of the haemocytometer • use separate capillary tubes/other precaution to avoid contamination 	[3]	
		(ii) 6 cells; × 10 (dilution factor); ÷ 0.00025/× 4000; (= 240 000)	[3]	
		(iii) Population density would be lower at 60 °C; metabolic activities would have stopped/slowed as enzymes have been denatured ;	[2]	
		(iv) Any two from:		
		<ul style="list-style-type: none"> • initial yeast inoculation • pH/pH buffer • species/strain of yeast • volume of suspension • size/shape of flask/O₂ availability/depth within flask • same amount of stirring 	[2]	
	(b)	Cell membrane prevents dye entering living cells/can expel dye; allowing only living cells to be counted/dead cells not counted;	[2]	12

		AVAILABLE MARKS
5	<p>(a) (i) As axon diameter increases the rate of transmission increases/ positive correlation between rate of transmission and axon diameter; there is a greater rate of transmission in myelinated than unmyelinated; the rate of transmission is faster in myelinated rabbit neurones than in myelinated frog neurones; [3]</p> <p>(ii) Myelin acts as an electrical insulator/prevents depolarisation/ depolarisation can only occur at the nodes of Ranvier; allows saltatory conduction/action potential jumps from node to node; [2]</p> <p>(b) Rods are stimulated in dim light, cones in bright light; cones give higher visual acuity as cones synapse individually with a bipolar neurone; Rods reduced visual acuity as they have retinal convergence; [3]</p>	8
6	<p>(a) (i) Root nodule; convert nitrogen gas into named nitrogen compounds, e.g. nitrates, ammonium (ions), amino acids; [2]</p> <p>(ii) Symbiotic/mutualistic; [1]</p> <p>(b) (i) There is no advantage in having root nodules/nitrogen-fixing bacteria; as there is now a higher nitrate/ammonium content in the soil the plant doesn't expend energy creating the nodules; [2]</p> <p>(ii) Any three from:</p> <ul style="list-style-type: none"> • calculate application levels/so supply doesn't exceed demand/ leave time between applications • apply during periods of growth/not in winter/not in closed season • don't apply when rain is forecast/waterlogged soil/frozen fields • don't apply near water bodies/sloping fields • use organic/natural fertiliser/manure/less soluble fertiliser [3] 	8

- 7 (a) (i) **A** – cortex;
B – pelvis;
C – medulla; [3]
- (ii) **C**/medulla; [1]
A/cortex; [1]
- (b) **D** – glomerulus;
E – Bowman’s capsule/capsular space; [2]
- Any **two** from:
- glomerular capillaries (**D**) possess a single layer of squamous endothelium providing little resistance to flow of filtrate/pores in endothelium
 - high hydrostatic pressure of blood in glomerulus (**D**) due to coiling/narrow/close to heart/afferent arteriole wider than efferent arteriole
 - the basement membrane (of glomerular capillaries /(**D**) is the effective filter/basement membrane allows small molecules to pass through [2]
- (c) Any **two** from:
- the loop of Henlé in the beaver will be shorter than the kangaroo rat
 - beaver doesn’t need to conserve as much water/water retention not as important as water is in plentiful supply
 - loop of Henlé is shorter so fewer salts will be actively transported into the medulla/the medulla will have a less negative water potential/higher water potential
 - less water will be reabsorbed from the collecting ducts by osmosis [3]
- [allow converse]

AVAILABLE
MARKS

12

- 8 (a) (i) $5.0 \times 10^4 / 1.0 \times 10^6$;
 $0.05 (5 \times 10^{-2}) \times 100 = 5\%$; [2]
- (ii) Any **two** from:
- respiration by plants
 - indigestibility of the cellulose cell wall
 - parts of the plant not eaten/are inaccessible
 - some enters the detritivores/decomposers chain [2]
- (b) (i) (A community is) the biotic component of an ecosystem which involves both autotrophic and heterotrophic interactions; [1]
- (ii) Phytoplankton reproduce rapidly and therefore biomass will be high at other times of the year/has a high reproductive rate/standing crop biomass only has been measured/biomass can be quickly replenished to keep food chain sustainable; [1]
- (iii) Any **three** from:
- the *H. anomala* feeds on the plankton so numbers of these will reduce
 - if there is less zooplankton, more phytoplankton as less consumed/less phytoplankton so less zooplankton as lack of food
 - the numbers of small fish will increase
 - numbers of large fish will increase
 - numbers of *H. anomala* may then start to decrease due to increased predation/reduced amounts of plankton [3]
- (c) (i) As total prey biomass increases, the size of the predator population increases;
larger prey biomass results in less intraspecific competition/more prey biomass results in more energy available to support a large predator population/more food/biomass available to predators; [2]
- (ii) When prey biomass is at its lowest more small predators are found/
when prey biomass is high large predators are found [1]

AVAILABLE
MARKS

12

Section A

72

Section B

AVAILABLE
MARKS

9 (a) Any **nine** from:

- this is an example of active immunity/active immunity provides long term immunity
- antibody-mediated immunity
- antigens (of the Meningococcal B bacterium) present in the vaccine
- B-lymphocytes are sensitised
- B-lymphocytes divide rapidly by mitosis/clones form
- plasma cells and memory cells are formed
- plasma cells produce antibodies
- the antibodies are complementary to the antigens/attach to the antigens/an antigen–antibody complex is formed causing clumping/agglutination
- memory cells will only be activated in the presence of the specific (Meningococcal B bacterium) antigen/bacterium/pathogen
- if stimulated they will divide rapidly producing large numbers of plasma cells
- these plasma cells produce antibodies very quickly/secondary immune response is much quicker
- appropriate reference to phagocytosis with regards the clump being engulfed

[9]

(b) Any **seven** from:

- rhesus negative mothers do not have the rhesus antigen/antigen D on their red blood cells/erythrocytes
- a rhesus negative mother is pregnant with a rhesus positive baby
- during/before birth some foetal red blood cells/cell fragments/antigen D can be transferred to the mother
- mother's immune system will produce anti-D/antibodies
- the baby will be born before these antibodies are produced in large number/antibodies produced slowly so will not be affected
- subsequent pregnancies may be affected as memory cells have remained in the mother's blood
- antibodies may be produced immediately and cross the placenta/transfer to foetus causing agglutination/clumping of the foetal red blood cells/haemolytic disease (of the newborn)
- anti-D antibodies (present in injection) attach to any antigen-D foetal red blood cells which cross the placenta/transferred to the mother
- before the B-lymphocytes are stimulated
- (as B-lymphocytes aren't stimulated) no plasma or memory cells are produced/no immune response

[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. 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 content.

[2]

18

Section B

18

Total

90

**AVAILABLE
MARKS**