Rewarding Learning

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
2019

Biology

Assessment Unit AS 2

assessing

Organisms and Biodiversity

[SBY21]

FRIDAY 24 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) Any **three** from:
- no membrane-bound organelles
- peptidoglycan cell wall/non-cellulose cell wall
- reproduction by division/fission
- unicellular
- 70s/small ribosomes
- possess plasmids
- may possess a slime layer/capsule [3]

(b) Genus [1]

(c) (i) Any **two** from:
- morphology/external features
- anatomy/internal features
- biochemistry/DNA/RNA/protein/genetic make-up [2]

(ii) Advances in technology/scientific knowledge required to distinguish between very similar organisms, e.g. sequencing technology/new organisms/fossils discovered/other appropriate response; [1]

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2 (a) (i) C; [1]

(ii) Any **two** from:
- leaf curvature
- hairs (surrounding stomata)
- cuticular thickening
- greater proportion of vascular tissue [2]

(iii) Leaf curvature traps moist air in proximity to stomata, decreasing diffusion gradient/hairs surrounding stomata traps moist air in proximity to stomata, decreasing diffusion gradient/cuticular thickening decreases evaporation from leaf surface/needles reduce area over which transpiration can take place; [1]

(b) Any appropriate behavioural adaptation with suitable explanation. For example:
hibernation; prevents energy expenditure when there is a scarcity of food;
or
basking in sunlight; maintains optimum body temperature for enzymatic reactions;
or
burrowing; prevents animal from overheating in very hot conditions/shelter for exposure to environmental conditions;
or
swarming; protection from predators;
or
nocturnal; prevents exposure to very hot environmental conditions; [2]

6

				AVAILABLE MARKS
3	(a)	(i)	A; B; [2]	
		(ii)	• Ventricular systole/contraction; [1] • (increased pressure of the contracting ventricle) causing back pressure of the blood on the (atrioventricular) valve/pressure from ventricles on the atrium; [1]	
	(b)		(To ensure contraction of the ventricles from the apex) forces the blood upwards/into the arteries/forces all blood out; [1]	5
4	(a)	(i)	An organism's role within the environment/ecosystem/interaction with biotic and abiotic factors; [1]	
		(ii)	Protection of the rare blanket bog; [1]	
	(b)		Any **one** from: • Area of special scientific interest (ASSI) • Special area of conservation (SAC) • Biodiversity action plan • NI priority habitat and species lists [1]	
	(c)	(i)	Any **two** from: • (soil) water/drainage/moisture content • aeration/crumb structure • pH • mineral content/humus content/nutrient content • (soil) temperature [2]	
		(ii)	Low oxygen availability reduced aerobic respiration/low nitrogen availability/need for symbiotic N fixing bacteria/reduced active uptake of ions (due to reduced respiration); only those species showing adaptations (or by example) will survive in the blanket bog habitat (or converse); [2]	
	(d)	(i)	12 – 4; (8 ÷ 12) × 100 = 66.67/66.7; [2]	
		(ii)	Decrease 1995–2006 followed by increase between 2006–2017; decrease due to nests/habitats destroyed by walkers/as nests are built on the ground/in vegetation and are not easily visible; increase due to board walk as habitats were protected/allowing nesting/ safer environment for breeding; [3]	
		(iii)	Too few time points of data collection/only two years/one data point since 2015/numbers could have increased before the boardwalk; [1]	13

				AVAILABLE MARKS
5	**(a)**	**(i)**	Provides ATP/energy for the sieve tubes/uploading (as cell contents have been removed)/carry out metabolic activities for sieve tube; [1]	
		(ii)	Any **two** from: • Transport in the phloem can be a two-way flow whereas flow in the xylem is one-way • transport in the xylem does not require energy, whereas transport in the phloem requires energy • transport in the xylem is by negative pressure (tension)/'pull' and in phloem by hydrostatic pressure/'push' [2]	
	(b)		Advantage: prevents loss of (sugar-rich) phloem contents/prevents movement of harmful substances; Disadvantage: reduces/stops flow of phloem contents to other parts of the plant/no further movement of organic solutes from damaged area; [2]	
	(c)	**(i)**	200 ÷ 300; 0.67; [2]	
		(ii)	*R. communis* has many more pores per sieve plate than *P. vulgaris*; Sieve plates of *R. communis* are longer than *P. vulgaris*; [2]	9
6	**(a)**		(Increased spring rainfall) may reduce kestrel population; Any **two** from: • fewer young survive storm season as they are less developed • food sources may be reduced by increased rainfall • habitats may be destroyed by increased rainfall/migration to a more suitable habitat [3]	
	(b)		**Evidence that human activity is the cause:** Carbon dioxide was stable for millions of years but increased by 0.7 ppm 1960–1970 with dramatic increase of 2.0 ppm between 2015–2016; **Evidence that increased CO_2 levels are a natural occurrence:** CO_2 levels were at an equivalent level 3–5 million years ago; [2]	
	(c)		Species which are not able to survive at lower temperatures may expand their range/species which have lived in an area may no longer be able to survive in warmer temperatures/local extinctions with reference to increased temperature/reduction in prey which are not adapted to higher temperatures may cause species to expand range/or become extinct; [1]	6

				AVAILABLE MARKS
7	(a)	(i)	A – Lumen; B – (Smooth) muscle and elastic fibres; C – Fibrous outer layer; [3]	
		(ii)	(Smooth) muscle relaxes; widening of the lumen of the aorta/artery; increasing blood flow; [3]	
	(b)	(i)	Buffer/maintains pH; [1]	
		(ii)	Rat's aorta is larger than in mouse (and so easier to measure); [1]	
		(iii)	Any **four** from: • increasing histamine levels increase vasodilation • more vasodilation with the endothelium/little or no vasodilation without endothelium/higher concentration of histamine required for any vasodilation without endothelium • with stiumulus A, increasing concentration of histamine beyond 10^{-5}/75 AU results in no further vasodilation/vasodilation levels off **or** stimulus B requires higher concentration of histamine (10^{-6}) before vasodilation begins and continues to increase/doesn't level off • stimulus A results in the higher level of vasodilation/stiumulus B results in a lower level of vasodilation • stimulus A results in a smaller difference in total vasodilation/ stimulus B results in a greater total difference of vasodilation [4]	
	(c)	(i)	As histamine concentration increases, average vasodilation increases; [1]	
		(ii)	H2 receptors bind histamine to cause vasodilation/H1 receptors are not involved in histamine induced vasodilation [1]	14

Section B

AVAILABLE MARKS

8 Indicative content

- diffusion rate is proportional to the surface area of membranes multiplied by the difference in concentration across the membrane divided by thickness of the membrane.

$$\text{Diffusion rate } \alpha = \frac{\text{surface area of membrane} \times \text{difference in concentration across membrane}}{\text{thickness of the membrane}}$$

- spongy mesophyll surface provides a large surface area across which the gases can diffuse
- intercellular air spaces facilitate diffusion of gases
- mesophyll surface is moist to allow gases to dissolve
- leaves are thin, reducing the diffusion distance for gases
- (during the day) photosynthetic activity maintains a concentration gradient of gases/decreases carbon dioxide concentration in the spongy layer
- stomata open (during the day) allowing gas exchange
- mammalian lungs have millions of alveoli
- which are spherical in shape increasing the surface area of the gas exchange surface
- surface of alveoli are moist to allow gases to dissolve (allow once)/surfactant prevents alveoli from collapsing maintaining a high surface area
- dense network of capillaries surrounding each alveolus reduces the diffusion distance/increases surface area
- squamous epithelial cells lining alveoli/squamous endothelial lining of capillaries are very thin/one cell thick/reduce the diffusion distance for gases
- red blood cells are in close contact with capillary wall further reducing the diffusion distance/red blood cells travel slowly increasing time for diffusion
- flow of blood in the capillaries maintains a concentration gradient of gases/oxygen/carbon dioxide (between alveoli and red blood cells)
- carbon dioxide-rich/oxygen deficient blood is brought to the alveoli via ventilation providing concentration gradient
- any **three** of: cilia damage/emphysema/cancer tumour/bronchitis
- tar contains cancer-causing agents/carcinogens/can cause a tumour/uncontrolled cell growth
- a tumour can block airways/damage alveoli reducing the area over which gas exchange can occur
- bronchitis results in the narrowing (due to inflammation) of bronchi airways (reducing air flow to the alveoli)
- decreasing the concentration of oxygen availability/reducing the concentration gradient
- (bronchitis) increases mucus (in the bronchi) reducing air flow to the alveoli/decreasing oxygen availability/reducing the concentration gradient
- (tar) reduces/damages the wafting activity of cilia increasing mucus build-up/reducing air flow to the alveoli/decreasing the concentration of oxygen availability/reducing the concentration gradient
- emphysema results in the breakdown of alveolar walls reducing the surface area for gas exchange
- elastic tissue in the alveoli can be broken down preventing recoil during expiration/reducing expiratory effectiveness

Band	Response	Mark
3	Candidates use appropriate specialist terms to fully describe Fick's law and how the surfaces of plants and mammals are adapted for gas exchange including the effects of smoking using a minimum of **ten** points of indicative content. They must use good spelling, punctuation and grammar and the form and style are of a very good or better standard.	[9]–[15]
2	Candidates sometimes use appropriate specialist terms to describe Fick's law and how the surfaces of plants and mammals are adapted for gas exchange including the effects of smoking using a minimum of **five** points of indicative content. They must use satisfactory spelling, punctuation and grammar and the form and style are of a good standard.	[4]–[8]
1	Candidates partially describe Fick's law and how the surfaces of plants and mammals are adapted for gas exchange and/or the effects of smoking using a minimum of **one** point of indicative content. They must use limited correct spelling, punctuation and grammar and the form and style are of a basic standard.	[1]–[3]
0	Response not worthy of credit.	[0]

[15] 15

Total **75**

AVAILABLE MARKS