



Rewarding Learning

**ADVANCED SUBSIDIARY (AS)
General Certificate of Education
2023**

Biology

Assessment Unit AS 2

assessing

Organisms and Biodiversity

[SBY21]

THURSDAY 25 MAY, MORNING

**MARK
SCHEME**

General Marking Instructions

Introduction

The main purpose of the mark scheme is to ensure that examinations are marked accurately, consistently and fairly. The mark scheme provides examiners with an indication of the nature and range of candidates' responses likely to be worthy of credit. It also sets out the criteria which they should apply in allocating marks to candidates' responses.

Assessment objectives

Below are the assessment objectives for Biology.

Candidates should be able to demonstrate:

- AO1** Knowledge and understanding of scientific ideas, processes, techniques and procedures.
- AO2** Apply knowledge and understanding of scientific ideas, processes, techniques and procedures:
- in a theoretical context
 - in a practical context
 - when handling qualitative data
 - when handling quantitative data.
- AO3** Analyse, interpret and evaluate scientific information, ideas and evidence, including in relation to issues, to:
- make judgements and reach conclusions
 - develop and refine practical design and procedures.

Quality of candidates' responses

In marking the examination papers, examiners should be looking for a quality of response reflecting the level of maturity which may reasonably be expected of a 17 or 18-year-old which is the age at which the majority of candidates sit their GCE examinations.

Flexibility in marking

Mark schemes are not intended to be totally prescriptive. No mark scheme can cover all the responses which candidates may produce. In the event of unanticipated answers, examiners are expected to use their professional judgement to assess the validity of answers. If an answer is particularly problematic, then examiners should seek the guidance of the Supervising Examiner.

Positive marking

Examiners are encouraged to be positive in their marking, giving appropriate credit for what candidates know, understand and can do rather than penalising candidates for errors or omissions. Examiners should make use of the whole of the available mark range for any particular question and be prepared to award full marks for a response which is as good as might reasonably be expected of a 17 or 18-year-old GCE candidate.

Awarding zero marks

Marks should only be awarded for valid responses and no marks should be awarded for an answer which is completely incorrect or inappropriate.

Marking Calculations

In marking answers involving calculations, examiners should apply the 'own figure rule' so that candidates are not penalised more than once for a computational error. To avoid a candidate being penalised, marks can be awarded where correct conclusions or inferences are made from their incorrect calculations.

/ 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)

Kingdom	Feature		
	Cells may contain chloroplasts	Always unicellular	Cell walls made of chitin
Plantae	✓	×	×
Prokaryotae	×	✓	×
Protoctista	✓	×	×

[1] mark per row

[3]

(b) Prokaryotae;

[1]

4

2 (a) Liver and small intestine/ileum;
both needed for mark

[1]

(b) Reduces friction/enables unrestricted movement of blood
 provides protection/structural support;

[2]

(c) Elastic (tissue);
 maintains blood pressure/smooths out blood flow;

[2]

5

3 (a) The total (number of cells)/(surface) area in (direct) contact with the surrounding environment; [1]

(b) (i) $(4 \times 8) + (2 \times 1) = 34$;
 $34 \div 8 = 4.25$;

Model	Surface area/cm ²	Volume/cm ³	Surface area ÷ Volume
A			
B			
C	34		4.25

Apply ECF for correct calculation of ratio if surface area is incorrect. [2]

(ii) A;
 lowest value for surface area ÷ volume/surface area : volume; [2]

(c) (Thin cells) provide a short diffusion distance; [1]

(d) TLC decreases with age in males/remains similar in females (regardless of age)/has a smaller range in females;
 males have a larger TLC; [2]

(e) Any **three** from:
 • lower blood oxygen level due to reduced alveolar surface area
 • and reduced oxygen diffusion gradient (due to 'stale air' not being expelled from the lungs)
 • raised TLC due to fewer alveoli
 • creates greater volume for air within lungs [3]

4 (a) Differences in pressure; [1]

(b) (i) Stem;
 sieve tube (element)/companion cell; [2]

(ii) It is an active/energy requiring process; [1]

(c) (i) Ventricular systole/contraction increases pressure in the (left) ventricle;
 above that in the (left) atrium; [2]

(ii) Lower volume/pressure of oxygenated blood is exiting the heart;
 brain is receiving less oxygen; [2]

AVAILABLE MARKS
11
8

			AVAILABLE MARKS			
5	(a)	(i) Very numerous; high SA : Vol/biconcave shape;	[2]	11		
		(ii) Monocytes; polymorphs;	[2]			
		(iii) Lobed nucleus/granular cytoplasm; these are internal features (therefore not visible on SEM image);	[2]			
	(b)	(i) Oxygen/glucose/amino acids/OAR;	[1]			
		(ii) $2.1 + (-3.3) = -1.2$;	[1]			
		(iii) (Total) pressure potential/hydrostatic pressure of the tissue fluid is greater than that of the venule end of the capillary (<i>or converse</i>);	[1]			
		(iv) Any two from: <ul style="list-style-type: none"> • increased formation of tissue fluid at arteriole end • reduced removal of tissue fluid at venule end • hydrostatic pressure/total pressure potential of the blood/in the capillary will increase 	[2]			
	6	(a)	(i) Lough Melvin is the only known habitat for sonaghen;		[1]	13
			(ii) Different types of food; different spawning areas;		[2]	
		(b)	Comparison of DNA/RNA/genome;		[1]	
(c)		(i) Buoyancy/flotation to maximise light absorption (photosynthesis);	[1]			
		(ii) Terrestrial plants are adapted to reduce water loss (<i>or converse</i>);	[1]			
(iii)		Thinner vessels; reduced lignification/less transpiration/less support needed; OR Reduced lignification in pondweed xylem; water provides whole plant support/lower tension created in vessels due to low levels of transpiration//waterproofing role of lignin less important;	[2]			
(d)		(i) (Fertilisers applied to fields) could enter waterways/leach out of soil (some distance from the lake); carried to the lake by rivers;	[2]			
		(ii) Artificial fertilisers would increase the nitrate/phosphate/mineral level in the lake;	[1]			
		(iii) Any two from: <ul style="list-style-type: none"> • rich in decomposable material/contains many (decomposing) bacteria (saprophytes) • BOD rises/oxygen level declines more rapidly (with slurry) • oxygen depletion arising from eutrophication involves more stages 	[2]			

- 7 (a) (i) $4.9 \div 0.7$;
7; [2]
- (ii) Higher level of iron in wild duck breast meat than farmed turkey breast meat; [1]
- (iii) Wild birds fly more than farmed birds;
higher levels of myoglobin in wild bird muscles to delay the onset of anaerobic respiration during flight; [2]
- (b) (i) The higher the myoglobin concentration in muscle, the greater its affinity for oxygen/positive correlation; [1]
- (ii) Emperor penguin has significantly higher concentration of myoglobin/lower P_{50} value/higher affinity for oxygen;
aerobic respiration prolonged/anaerobic respiration delayed/'reserve' oxygen released when ppO_2 is very low; [2]

Section A

**AVAILABLE
MARKS**

8

60

Section B

AVAILABLE
MARKS

8 Indicative content

- water taken into the root (epidermis) by osmosis/due to water potential gradient
- through root hair cells
- passes by symplast pathway via cytoplasm/through protoplasts
- facilitated by plasmodesmata
- passes by apoplast pathway via cell walls
- at the endodermis, the apoplast pathway is blocked/symplast pathway forced
- by Casparian strip/suberin
- water enters the xylem vessels
- ions are pumped into the xylem to produce a water potential gradient/
metabolic control over water uptake
- root pressure created by endodermis forces some water up the xylem
- negative pressure within the xylem vessels creates tension/‘pulling’ force
- cohesive forces between the water molecules sustain continuous water column
- adhesive forces between the water molecules and xylem vessel walls/
capillary action
- incomplete lignification/pits allow lateral movement of water from xylem (in
the leaf)
- travels through leaf cells by apoplast/symplast pathways
- evaporation of water from spongy mesophyll cells
- increases water vapour in intracellular air spaces
- creates concentration gradient (with external air)
- water vapour diffuses out of the leaf via stomata
- a small amount of water will be lost by cuticular transpiration
- the movement of water through the plant is the transpiration stream

Band	Response	Mark
3	Candidates use appropriate specialist terms to fully describe the pathway and mechanisms of movement using a minimum of eleven 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.	[11]–[15]
2	Candidates sometimes use appropriate specialist terms to fully describe the pathway and mechanisms of movement using a minimum of six points of indicative content. They must use satisfactory spelling, punctuation and grammar and the form and style are of a good standard.	[6]–[10]
1	Candidates partially describe the pathway and mechanisms of movement 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]–[5]
0	Response not worthy of credit	[0]

[15]

15

Section B

15

Total

75