



Rewarding Learning

**ADVANCED SUBSIDIARY (AS)
General Certificate of Education
January 2012**

Biology

Assessment Unit AS 2

assessing

Module 2: Organisms and Biodiversity

[AB121]

WEDNESDAY 18 JANUARY, AFTERNOON

MARK SCHEME

/ denotes alternative points
 ; denotes separate points
Comments on mark values are given in bold
Comments on marking points are given in italics

Section A

<p>1 Simpson's index; species; ecological niche; edaphic factors;</p>	[4]	4
<p>2 (a) Hydrophyte;</p>	[1]	
<p>(b) Air spaces aid flotation/facilitates gaseous diffusion through plant;</p>	[1]	
<p>(c) On the upper surface; Any two from</p> <ul style="list-style-type: none"> • allow gases to diffuse in from the air; • as gases are not very soluble in water • prevent water entering the large airspaces (which would cause the leaf to sink); 	[3]	5
<p>3 (a) To provide carbon dioxide to the plant/so that carbon dioxide is not a limiting factor;</p>	[1]	
<p>(b) Temperature/pH;</p>	[1]	
<p>(c) Any three from</p> <ul style="list-style-type: none"> • (at lower light intensities) as light intensity increases, the volume of oxygen produced increases • because light is the limiting factor • at higher light intensities there is little increase in oxygen production/the curve levels off • the pondweed is light-saturated/another factor becomes limiting 	[3]	5

- 4 (a) **Any two from**
- Prokaryotae have no nuclear membrane/nucleus, eukaryotae have a true nucleus
 - Prokaryotae have no other membrane-bound organelles/any named example but eukaryotae do
 - Prokaryotae have naked DNA/DNA not organised into true chromosomes/not wound round histones
 - Prokaryotae have plasmids but eukaryotae do not
 - Prokaryotae have smaller ribosomes
 - Prokaryotae divide by binary fission instead of by mitosis (meiosis) [2]
- (b) *Agaricus campestris/campestris;* [1]
- (c) Exocytosis secretion of hydrolytic enzymes;
extracellular digestion of dead organisms;
absorption of soluble products into fungus/release of nutrients into soil; [3]
- (d) **Any two from**
- lysotrophic feeding instead of autotrophic
 - cell walls made of chitin instead of cellulose
 - glycogen is storage carbohydrate, not starch
- [Both parts required to gain mark in each bullet]* [2]
- (e) (i) Both algae and plants are autotrophic/feed by photosynthesis/have cellulose cell walls; [1]
- (ii) Algae have tissues with limited differentiation/plants have well differentiated tissues; [1]

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- 5 (a) $9.84 - 9.42 = 0.42$;
 $0.42/9.42 \times 100 = 4.46\%$; [2]
- (b) The extent to which an organism shows adaptations to its environment/
 indication of an organism's competitiveness/selective advantage; [1]
- (c) **Any four from**
- beak depth is variable in population
 - finches with larger beaks can exploit more food sources/can compete more successfully for food (converse for smaller beaks)
 - and so are more likely to survive than those with smaller beaks (allow converse)
 - higher chance of reproduction/more likely to mate with other large-beaked finches
 - genes for larger beaks passed on to next generation
 - higher percentage of birds will have larger beaks in next generation [4]
- (d) Directional selection; [1]
- (e) **Any two from**
- external features (morphological)
 - internal features (anatomical)
 - behavioural features
 - DNA analysis/DNA hybridisation
 - protein structure
 - RNA/ribosomal analysis
 - biochemical analysis [2]
- (f) (i) *Geospiza fuliginosa*; [1]
- (ii) *Vidua macroura*; [1]

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6 (a) Any four from

- platelets/damaged blood vessels release thrombokinase (thromboplastin)
- thrombokinase catalyses the conversion of prothrombin to thrombin
- in the presence of calcium ions/vitamin K/clotting factors
- thrombin catalyses the conversion of fibrinogen to fibrin
- fibrin forms a network/mesh of insoluble fibres
- erythrocytes become trapped in the meshwork [4]

[Accept above points presented diagrammatically. Sequence of points is important]

(b) (i) Any three from

- heat generated by respiration/exercising muscle
- dissociation occurs at a higher ppO_2 /oxygen more readily released from haemoglobin/haemoglobin has lower affinity for oxygen
- exercising muscles have a higher oxygen demand/increased respiration
- more oxygen for aerobic respiration/delaying the onset of anaerobic respiration [3]

(ii) 4.4 kPa; [2]
5.0 kPa;

(iii) Foetus must absorb oxygen from maternal blood; hence foetal haemoglobin must have a higher affinity for oxygen than maternal haemoglobin/at any one partial pressure foetal haemoglobin is more saturated; [2]

(c) Any two from

- haemoglobin can bind to four molecules of oxygen/each of four haems can bind to an oxygen molecule
- (when one oxygen has been taken up) there is a conformational change in haemoglobin
- resulting in a faster (easier) uptake of the remaining three molecules/cooperative binding [2]

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- 7 (a) Caption;
sample sites 1–6;
species names;
ticks to show presence of each species;

Example of table:

Presence of (six) plant species at six sample sites along a woodland transect

Species	Sample site					
	1	2	3	4	5	6
Mosses	✓	✓	✓		✓	
Bluebells		✓	✓	✓	✓	
Wood anemone		✓	✓		✓	
Lesser celandine	✓	✓	✓			
Grasses	✓	✓	✓	✓	✓	✓
Primroses				✓		✓

[4]

- (b) Mosses favour very shaded and wet conditions;
bluebells favour shaded and moist conditions;
primroses favour drier conditions, with only light shading;

[3]

- (c) There is a gradation of conditions from the centre to the edge of the woodland;

[1]

(d) **Any three from**

- record the percentage cover/density/abundance (in each quadrat)
- measure light intensity/soil moisture/pH/nutrient levels
- appropriate method of measuring
- use more than one quadrat at each site/repeat transects for reliability
[insist on reference to reliability]

[3]

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Section A

60

Section B

8 (a) Any five points

- the volume of a body represents the bulk of its metabolically active tissue
- the greater the volume, the greater the need for metabolites/the greater the production of wastes (allow converse)
- metabolites are usually supplied by the surrounding environment
- the surface of a body is the interface with its surrounding environment
- the greater the surface area of a body the more metabolites can be absorbed/wastes can be excreted
- as an organism increases in size its volume increases proportionally more than its surface area/its SA to vol. ratios decreases (allow converse)
- illustration of this with 'cube measurements'
- for a larger organism, the absorptive ability needs to be increased to meet the increased demand

[5]

(b) Eight points (with a maximum five points from each area)

Maximising absorption in lungs

- in the lungs the bronchi subdivide repeatedly into smaller bronchioles (each ending in a cluster of alveoli)
- the alveoli provide a large surface area for gas exchange
- the alveolar walls/capillary walls are composed of squamous epithelium
- which makes a short diffusion distance
- capillary walls are closely associated with alveolar walls
- ventilation/blood flow ensures there is always a diffusion gradient
- moisture inside the alveoli allows oxygen to dissolve prior to diffusion
- a dense network (large surface) of blood capillaries (surrounding each alveolus) provides a large surface area

Maximising delivery to tissues

- arteries deliver blood carrying oxygen/nutrients to the metabolically active cells
- arteries divide into a dense network of blood capillaries that permeate all tissues
- so that no body cell is more than a couple of cells away from a capillary
- capillary walls are very thin so that diffusion is easy
- there is a large surface area over which metabolites can diffuse rapidly into all cells/over which wastes can be removed from tissues
- red blood cells are biconcave discs increasing surface area (exposed to haemoglobin)
- haemoglobin is an efficient carrier of oxygen/has a high affinity for O₂
- the heart pumps blood to all tissues (parts of body)
- benefits of double circulation
- vasoconstriction/vasodilation controls blood flow to different organs

[8]

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 account. [2]

	15
Section B	15
Total	75