



*Rewarding Learning*

**ADVANCED SUBSIDIARY (AS)  
General Certificate of Education  
2013**

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**Biology**

**Assessment Unit AS 2**

*assessing*

**Organisms and Biodiversity**

**[AB121]**

**MONDAY 17 JUNE, AFTERNOON**

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

### Section A

1

Description	Identification	Function
Cells located in the root, which contain deposits of suberin in their cell walls.	Endodermis;	controls uptake into stele/ interrupts apoplast pathway/ ensures symplast pathway;
Nucleated cells with dense cytoplasm located in phloem tissue.	Companion (cells);	provide energy/undertake metabolism for sieve tubes;
Specialised root epidermal cells with an extension into the soil.	Root hair (cells);	provide a large surface area/ uptake of water/ions;

[6]

6

- 2 (a) Water vapour will be present in the incoming air; calcium chloride at the end will be absorbing water vapour other than that lost by the plant/there will be an overestimate of water lost; [2]

- (b) (i) **Any two from**
- at these times it is dark
  - stomata will be closed
  - no water vapour will diffuse out of the leaves
  - recovering of tissue turgidity
- [2]

- (ii) **Any three from**
- light intensity is at its highest (at 1600) so all stomata are open
  - external temperatures will be high
  - evaporation/diffusion rate will be high
  - high tension in leaf (xylem) causes more water to be absorbed
- [3]

7

- 3 (a) Grenadier fish are slower moving and therefore have a lower demand for oxygen/live at great depths where there is less oxygen available to carry **[accept converse statement for herring]**; [1]

- (b) When the first molecule of oxygen binds with haemoglobin the haemoglobin's shape is altered; subsequent molecules of oxygen combine with the haemoglobin more readily; **[accept converse references to unloading of oxygen]** [2]

- (c) Saturation at 1.0 kPa = 12% and saturation at 2.5 kPa = 52%; 52–12 = 40% **[consequential to figures above]**; [2]

- (d) Grenadier haemoglobin is loaded at lower partial pressures of oxygen than that of herring/has a higher affinity for oxygen *[do not allow references to rate]*; grenadier is found in a habitat where there is less oxygen **[accept converse statements for herring]**; [2]

7

			AVAILABLE MARKS	
4	(a)	Directional selection; an 'extreme' phenotype is favoured/the modal neck length for the population is increased (changed);	[2]	5
	(b)	<b>Any two from</b> <ul style="list-style-type: none"> <li>• In Lamarck's theory, evolution operates in a short time frame/present theory requires a long time</li> <li>• In Lamarck's theory, acquired characteristic is passed on/in present theory gene is passed on</li> <li>• Lamarck's theory takes no account of genetic variability (mutations)/ present theory relies on genetic variability (mutations)</li> <li>• In Lamarck's theory the environment causes the initial change/in present theory the environment selects the best adapted (fittest)</li> <li>• Lamarck's theory operates on an individual level/present theory operates at a population level</li> </ul>	[2]	
	(c)	Theories change over time as new scientific knowledge is obtained/one theory is replaced by another when new evidence is considered;	[1]	
5	(a)	(i) A: transport of dissolved nutrients/carbon dioxide/hormones; B: initiate clotting of blood; C: act as microphages/phagocytosis;	[3]	8
	(ii)	The prosthetic group/haem;	[1]	
	(b)	(i) Capillary;	[1]	
		lumen is small/cells large relative to the size of lumen; wall is one cell thick/wall composed of squamous endothelium/wall not containing outer layers <i>[not cell wall]</i> ;	[2]	
	(ii)	Biconcave disc shape to provide a large surface area (for oxygen absorption)/packed with haemoglobin to carry maximum oxygen/ small size provides a large surface to volume ratio/small size facilitates movement through capillaries/lack of nucleus provides more room for haemoglobin (results in small size);	[1]	

- 6 (a) (i) **Any two from**
- replace/plant/avoid cutting hedgerow trees
  - keep stocking rates low (to avoid damage to hedgerows)
  - avoid cutting hedgerow during bird nesting season/from 1st March to 31st August/while berries and fruit are on the hedge
  - cut biennially/every three years/maintain variety of hedgerow heights and widths
- [2]
- (ii) **Any two from**
- acts as a predator strip/encourages natural predators
  - reduces the need for chemical pesticides
  - allows the growth of non-crop plants
  - provides sites for ground nesting birds
  - other appropriate response
- [2]
- (b) There is an environmental gradient leading away from the pond/there is evidence of zonation;
- [1]
- (c) (i) “Distance from pond/m” as a column heading/row title;  
independent variable in first column/row;  
logical construction either reading across columns or down rows, with all correct data included;  
row/column headings explanatory and concise;

Distance from pond/m	Number of plant species		
	Transect A	Transect B	Transect C
0	2	1	2
1	12	11	11
2	4	6	10
3	3	2	6
4	3	2	3

[4]

- (ii) As distance from the pond increases, the number of plant species increases and then decreases;

**Any two from**

- small number initially is due to few species of highly adapted/specialised marsh plants
- rise in species number is due to the uncultivated strip
- subsequent fall in species number is due to impact of grazing/cultivation/pesticides

[3]

12

- 7 (a) (i) Starwort/*C. palustris*;  
more stomata on upper surface than lower surface enables gas exchange with air/lower surface would therefore not be available for gas exchange;  
thin cuticle/epidermis suggests no risk of desiccation; [3]
- (ii) **Any one from**
- curvature/hairs present/sunken stomata reduce water diffusion gradient
  - reduced surface area/spines lowers the number of stomata
  - succulence stores water for times of shortage
  - highly reflective surface reduces evaporation
- [1] for correct feature and [1] for explanation** [2]
- (b) (i) Kingdom (Plantae) and phylum/division (Magnoliophyta); [1]
- (ii) Swamp stonecrop/*C helmsii*;  
it shares the same genus; [2]
- (iii) Similar DNA/RNA/primary protein structure; [1]
- (c) (i) Change the distance between the lamp and the experimental beaker; [1]
- (ii) With a fluorescent lamp the temperature of the water in the experimental beaker will not be affected;  
only one variable (light intensity) will be changed during the course of the investigation;  
**[accept converse references to incandescent lamp]** [2]
- (iii) As light intensity rises, oxygen levels rise due to increasing photosynthesis;  
at low light intensity, the oxygen levels are below the control beaker due to the respiration rate exceeding photosynthetic rate/at high light intensity, the oxygen levels in the beaker are higher than the control beaker, due to rate of photosynthesis exceeding respiration rate;  
at 375 lux compensation point is reached/rate of respiration and photosynthesis are equal; [3]

**Section A**AVAILABLE  
MARKS

15

60

## Section B

- 8 (a) **Any three points**
- diaphragm muscles contract and diaphragm moves down
  - intercostal muscles contract pulling rib cage up/out
  - causing volume of thorax to increase
  - resulting in thoracic/lung pressure decreasing below atmospheric pressure
- [3]
- (b) **Any ten points**
- impulse originates from the sino-atrial node (SAN)/pacemaker
  - wave of excitation reaches left atrium
  - atrial systole occurs causing increasing pressure
  - blood is pushed into left ventricle via the bicuspid valve
  - ventricular pressure rises due to infilling of blood
  - left ventricle not stimulated by an impulse direct from the atrium
  - results in a time delay to allow complete atrial emptying
  - wave of excitation reaches atrio-ventricular node (AVN)
  - spreads down the bundle of His into Purkyne fibres
  - ventricular systole occurs
  - from the apex of the heart
  - ventricular pressure exceeds atrial pressure so bicuspid valve closes
  - ventricular pressure exceeds aortic pressure so semi-lunar valve opens
  - blood flows into aorta causing an increase in pressure
  - semi-lunar valves close as aortic pressure now exceeds ventricular pressure
- [10]

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]

**Section B**

**Total**

AVAILABLE  
MARKS

15

**15**

**75**