



*Rewarding Learning*

ADVANCED SUBSIDIARY (AS)  
General Certificate of Education  
2016

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## **Biology**

Assessment Unit AS 2

*assessing*

Organisms and Biodiversity

**[AB121]**

THURSDAY 23 JUNE, MORNING

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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 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 **two** from:
- anatomy
  - cell structure
  - biochemistry
- [2]
- (b)** Family; [1]
- (c)** Phylogenetic; [1]
- 2 (a) (i)** In mammals gas exchange involves an active ventilation process/  
in mammals gas exchange only linked to one process (respiration), in  
plants no active ventilation process/both respiration and photosynthesis  
involved; [1]
- (ii)** Ventilation bringing in air rich in oxygen/removing air with higher  
levels of carbon dioxide/blood flow ensures concentration gradient  
maintained by removing oxygen/returning carbon dioxide (to lungs); [1]
- (b) (i)** A – yellow, B – purple; [1]
- (ii)** Rate of photosynthesis exceeds the rate of respiration;  
reduction of carbon dioxide in the water/liquid (causes the indicator to  
turn purple); [2]
- (c)** Move lamp/use lamp with dimmer switch to adjust light intensities/use  
different layers of muslin;  
increase (or decrease) light intensities until bicarbonate indicator remains  
red/shows no change after a period of time;  
control other variables, e.g. room temperature, use same pondweed each  
time [3]
- 3 (a) (i)** No disturbance on vertical rock face/ other plants are unable to get  
established; [1]
- (ii)** Space (to grow); [1]
- (iii)** Boundary between different lichens/colonies of lichen **[not different  
species]**; [1]
- (b) (i)** Succulent leaves/leaves with small surface areas; [1]
- (ii)** Thick cuticles/leaf hairs/sunken or reduced numbers of stomata/other  
appropriate response; [1]

4

8

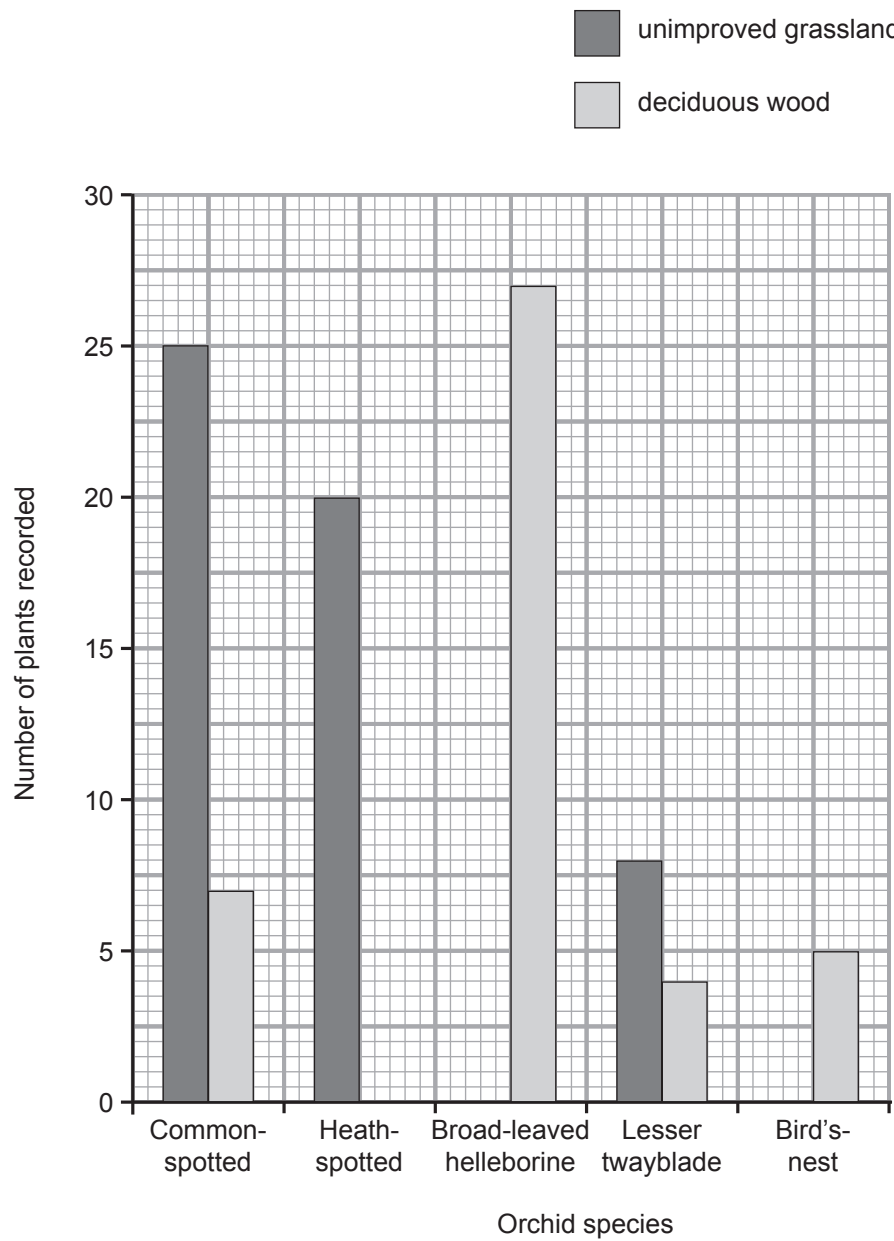
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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | AVAILABLE MARKS |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| <p>4 (a) Enzymes are secreted by the fungus into the soil/substratum; extracellular digestion takes place; products of digestion are absorbed into fungus; [3]</p> <p>(b) (i) High levels of toxin will discourage/stop animals from eating the fruiting body/allows colour to be associated with toxin; thereby allowing spores to be dispersed/reproduction is not affected; [2]</p> <p>(ii) Any <b>four</b> from:</p> <ul style="list-style-type: none"> <li>initially some individuals had toxin in fruiting bodies/variation in toxin levels/toxins developed due to mutations</li> <li>individuals with toxins more likely to disperse spores/reproduce (as fruiting bodies without toxins more likely to be eaten)</li> <li>therefore more likely to pass 'toxin' genes/alleles on to next generation</li> <li>proportion of alleles/organisms producing toxins increases over time</li> <li>directional selection [4]</li> </ul> <p>(c) Too difficult to tell where one organism ended/another one started; due to microscopic nature of hyphae/difficulty of locating hyphae in soil; [2]</p> | 11              |
| <p>5 (a) (i) 0.8 s [1]</p> <p>(ii) Closing of atrio-ventricular valve – A; opening of aortic valve - B; [2]</p> <p>(iii) Closing of aortic (semi-lunar) valve; [1]</p> <p>(iv) Relaxation of atrial walls/expansion of atrial chamber; [1]</p> <p>(b) Increase in wall thickness/more elastic tissue relative to muscle (in aorta); greater pressure in aorta/stronger pulse effect (or converse); [2]</p> <p>(c) (i) To bypass pulmonary circulation; no air in uterus/lungs cannot function in uterus/gains oxygen by diffusion from mother's blood/other appropriate response; [2]</p> <p>(ii) Deoxygenated blood (from right atrium) mixes with oxygenated blood (in left atrium); blood pumped by left ventricle/around body has reduced oxygen content; [2]</p>                                                                                                                                                                                                                                                                                                                                  | 11              |

|                                                                                                                                                                                                                                                                                                                                                                                           |                            |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|
| <p>6 (a) (i) A – symplast;<br/>B – apoplast; [2]</p>                                                                                                                                                                                                                                                                                                                                      | <p>AVAILABLE<br/>MARKS</p> |
| <p>(ii) Endodermis; [1]</p>                                                                                                                                                                                                                                                                                                                                                               |                            |
| <p>(iii) Casparian strip is impermeable to water/water in apoplast pathway deflected into cytoplasm/symplast pathway;<br/>water entering xylem is under metabolic control/passes through a selective membrane/allows water entering xylem to be subject to root pressure; [2]</p>                                                                                                         |                            |
| <p>(b) (i) No end walls/cell contents;<br/>allows water to be pulled as continuous column (transpiration stream)/no resistance to water flow;<br/><b>or</b><br/>lignin is waterproof/strong/pitted;<br/>stops water escaping from xylem vessels/provides strength to prevent vessels collapsing when under pressure due to the transpiration stream/allows lateral flow of water; [2]</p> |                            |
| <p>(ii) Any <b>three</b> from:<br/>• when transpiration is highest, diameter of xylem vessels is lowest<br/>• relationship is proportional, e.g. small increase in transpiration leads to small decrease in xylem vessel diameter<br/>• high levels of transpiration cause xylem vessel to contract/narrow due to negative pressure/tension/suction [3]</p>                               | <p>10</p>                  |

|   |         |                                                                                                                                                                                                                                                                                                                                                                                     |     |                    |
|---|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|--------------------|
| 7 | (a) (i) | The flowering periods of all the orchids do not overlap/to ensure that all the flowering periods are covered;                                                                                                                                                                                                                                                                       | [1] | AVAILABLE<br>MARKS |
|   | (ii)    | 776/1806;<br>0.43;<br><b>[2 marks for correct answer]</b>                                                                                                                                                                                                                                                                                                                           | [2] |                    |
|   | (iii)   | The woodland contains the Bird's-nest orchid which is rare and declining;                                                                                                                                                                                                                                                                                                           | [1] |                    |
|   | (iv)    | The D value would increase;<br>as the number of orchids would decrease due to competition;                                                                                                                                                                                                                                                                                          | [2] |                    |
|   | (b) (i) | Caption (the number of orchids from a range of different species in an upland unimproved grassland and a woodland);<br>bar chart with gaps between bars (for different orchid species);<br>scale selected to make best use of grid (must cover at least half of the grid in both dimensions) and axes labels appropriate;<br>data accurately plotted, with key/label for each area; | [4] |                    |
|   | (ii)    | Broad-leaved helleborine;                                                                                                                                                                                                                                                                                                                                                           | [1] | 11                 |

Number of orchids, of different species, recorded in two Northern Ireland habitats (unimproved grassland and a deciduous wood).



## Section B

AVAILABLE  
MARKS

- 8 (a) Any **six** from:
- haemoglobin is a conjugated protein/consists of four polypeptide chains
  - contains prosthetic group haem
  - with  $\text{Fe}^{2+}$  at centre
  - each haemoglobin molecule contains four haem groups/is tetrameric
  - therefore each haemoglobin molecule normally carries four oxygen molecules
  - when one oxygen molecule is taken up, conformational change results in faster uptake of the remaining three oxygen molecules/cooperative binding
  - haemoglobin loads with oxygen at high partial pressures (the lungs)
  - and releases oxygen at low partial pressures (the tissues)
  - due to conformational change
  - reference to the S-shaped dissociation curve (significant unloading over a small drop in oxygen partial pressures) [6]
- (b) Any **seven** from:
- strenuous exercise causes increased temperature/carbon dioxide/ a lower pH
  - due to increased rates of respiration
  - shifts the oxygen dissociation curve to the right/causes Bohr Effect
  - increases the dissociation of oxygen from haemoglobin
  - therefore making more oxygen available to the tissues
  - enabling aerobic respiration to continue for longer
  - the partial pressure of oxygen is lower at altitude
  - haemoglobin of high altitude dwellers saturates at lower oxygen partial pressures (has a higher affinity for oxygen) than does the haemoglobin of lower altitude dwellers
  - high altitude dwellers/athletes training at high altitude have increased red blood cell production
  - therefore increased levels of haemoglobin in the body [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 account. [2]

Total

15

75