Rewarding Learning

Centre Number

71	

Candidate Number

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
January 2012

Biology

Assessment Unit AS 2

assessing

Organisms and Biodiversity

[AB121]

AB121

WEDNESDAY 18 JANUARY, AFTERNOON

TIME

1 hour 30 minutes.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
Write your answers in the spaces provided in this question paper.
There is an extra lined page at the end of the paper if required.
Answer **all eight** questions.
You are provided with **Photograph 2.2** for use with **Question 2** in this paper. Do not write your answers on this photograph.

INFORMATION FOR CANDIDATES

The total mark for this paper is 75.
Section A carries 60 marks. Section B carries 15 marks.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
You are reminded of the need for good English and clear presentation in your answers.
Use accurate scientific terminology in all answers.
You should spend approximately **20 minutes** on Section B.
You are expected to answer Section B in continuous prose.
Quality of written communication will be assessed in **Section B**, and awarded a maximum of 2 marks.

For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
Total Marks	

Section A

Examiner Only	
Marks	Remark

1 Identify the terms described by each of the following statements.

- An index used to measure species diversity.

_____

- A group of individuals that closely resemble each other and are capable of interbreeding to produce fertile offspring.

_____

- The role of an organism in its environment.

_____

- Ecological factors in soil, such as pH, aeration of soil and nutrient availability, that influence the distribution of organisms.

_____

[4]

Examiner Only	
Marks	Remark

2 **Photograph 2.2** shows a section through a leaf of a water lily.

(a) State the term that is used to describe plants, such as water lilies, that are adapted to grow in water.

_____ [1]

(b) Explain the role of the spaces labelled **X** that are evident in the photograph.

_____

_____ [1]

(c) State where you would expect to find stomata on a water lily leaf. Explain the importance of this location.

Location _____

Explanation _____

_____

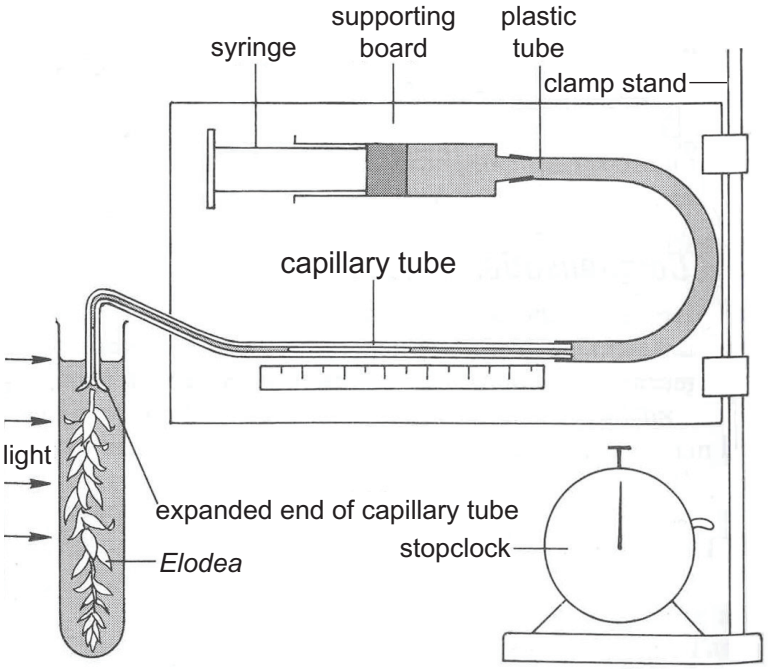
_____

_____

_____ [3]

Examiner Only	
Marks	Remark

3 The diagram below shows the Audus apparatus. This is used to measure the rate of photosynthesis in a water plant like Canadian pondweed (*Elodea canadensis*). The volume of oxygen produced is used as a measure of the rate of photosynthesis.



© Advanced Biology Principles and Applications by C J Clegg with D G MacKeen, P H Openshaw and R C Reynolds, published by Hodder Murray, 1996

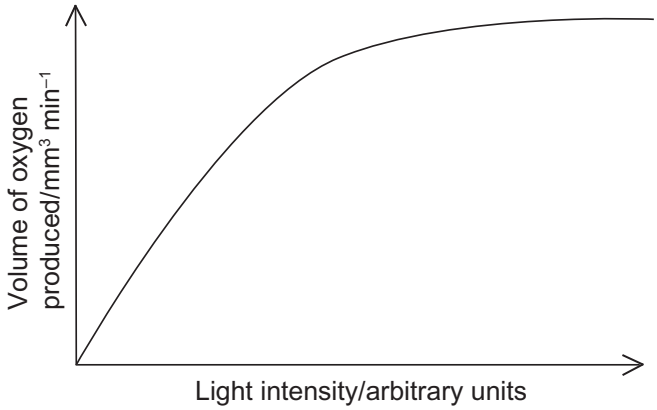
(a) The pondweed is placed in a solution of sodium hydrogen carbonate during the experiment. Explain the reason for this.

_____ [1]

(b) A lamp was placed known distances from the pondweed to investigate the effect of light intensity on the rate of photosynthesis. State **one** factor which should have been monitored in order to ensure the validity of the experiment.

_____ [1]

(c) The graph below shows the trend line for the experimental results.



Describe and explain the trend line shown.

_____

_____

_____

_____

_____

_____

_____

_____ [3]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

4 Kingdom Fungi includes edible mushrooms such as *Agaricus bisporus* (common mushroom) and *Agaricus campestris* (field mushroom) as well as a variety of moulds such as *Mucor mucedo* and *Penicillium* species. Their cells are described as eukaryotic.

Bacteria belong to the kingdom Prokaryotae whose cells are described as prokaryotic.

(a) State **two** differences between prokaryotic and eukaryotic cells.

1. _____

_____

2. _____

_____ [2]

(b) Identify the species name of the field mushroom.

_____ [1]

Members of both kingdoms are involved in the decomposition of dead organisms with the resultant recycling of nutrients.

(c) Describe how the fungi carry out decomposition of dead or waste organic materials.

_____

_____

_____

_____

_____

_____ [3]

Early classification systems, such as that used by Carl Linnaeus, divided all organisms into two kingdoms, Plantae and Animalia. Bacteria, fungi, protozoans and algae were all included in the Plantae.

Since the middle of the twentieth century various scientists have suggested more appropriate divisions of organisms, such as the 'five kingdom' system: Prokaryotae, Protoctista, Fungi, Plantae and Animalia.

(d) Suggest **two** reasons why it is inappropriate to classify fungi in the Plantae.

1. _____

_____

2. _____

_____ [2]

Seaweeds are algae which are autotrophic. They contain eukaryotic cells, with cellulose cell walls, which are aggregated into tissues showing limited differentiation.

(e) Algae are now classified as the Protoctista instead of the Plantae, but not all scientists agree with this.

(i) Suggest **one** reason why some scientists might think it is more appropriate to include the algae in the Plantae.

_____

_____ [1]

(ii) Suggest **one** reason why many scientists think it is not appropriate to include algae in the Plantae.

_____

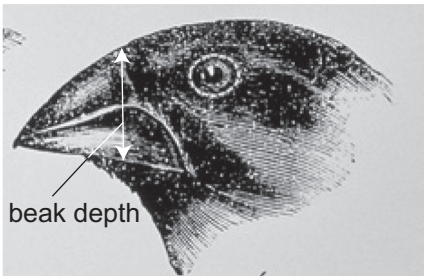
_____ [1]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

5 The medium ground finch, *Geospiza fortis*, is found on the island of Daphne Major in the Galapagos Islands, off the coast of Ecuador. The species was one of many noted by Charles Darwin, when he visited the islands in 1835.

Since 1973, other scientists have been studying this finch in relation to natural selection. One characteristic they have studied is the depth of the finches' beaks.



© Dr Jeremy Burgess/Science Photo Library

In 1975, the mean beak depth in the *G. fortis* population on Daphne Major was 9.42 mm. In 1978, when a new generation of birds had reached maturity, it was 9.84 mm.

(a) Calculate the percentage increase in beak depth between 1975 and 1978. (Show your working.)

[2]

Some scientists have suggested an explanation for the increase in beak depth.

They knew that a severe drought in 1976 affected Daphne Major, significantly limiting plant growth on the island. As a result, the availability of seeds became very low. Those birds with a greater beak depth were able to crack open and eat larger seeds than those with smaller beaks. These scientists argued that the larger beak size was selected for, since it represented increased fitness.

(b) Explain what is meant by the term 'fitness'.

[1]

(c) Suggest how the mean beak depth in the population might have increased between 1975 and 1978.

[4]

(d) State the type of selection shown by the increase in beak depth in *G. fortis*.

[1]

Examiner Only	
Marks	Remark

Some information about the classification of *Geospiza fortis* and three other finch species, *Vidua macroura*, *Geospiza fuliginosa* and *Certhidea olivacea* is given below.

- The small ground finch, *Geospiza fuliginosa*, is also found on the Galapagos Islands.
- *G. fortis* is a member of the order Passeriformes, as are finches of the genus *Vidua* (family Viduidae)
- Both *G. fortis* and the warbler finch, *Certhidea olivacea*, are members of the family Thraupidae.

(e) State **two** distinct types of evidence which may be used to classify species.

1. _____

_____

2. _____

_____ [2]

(f) **(i)** Which of the three species is most closely related to *G. fortis*?

_____ [1]

(ii) Which species is most distantly related to *G. fortis*?

_____ [1]

Examiner Only	
Marks	Remark

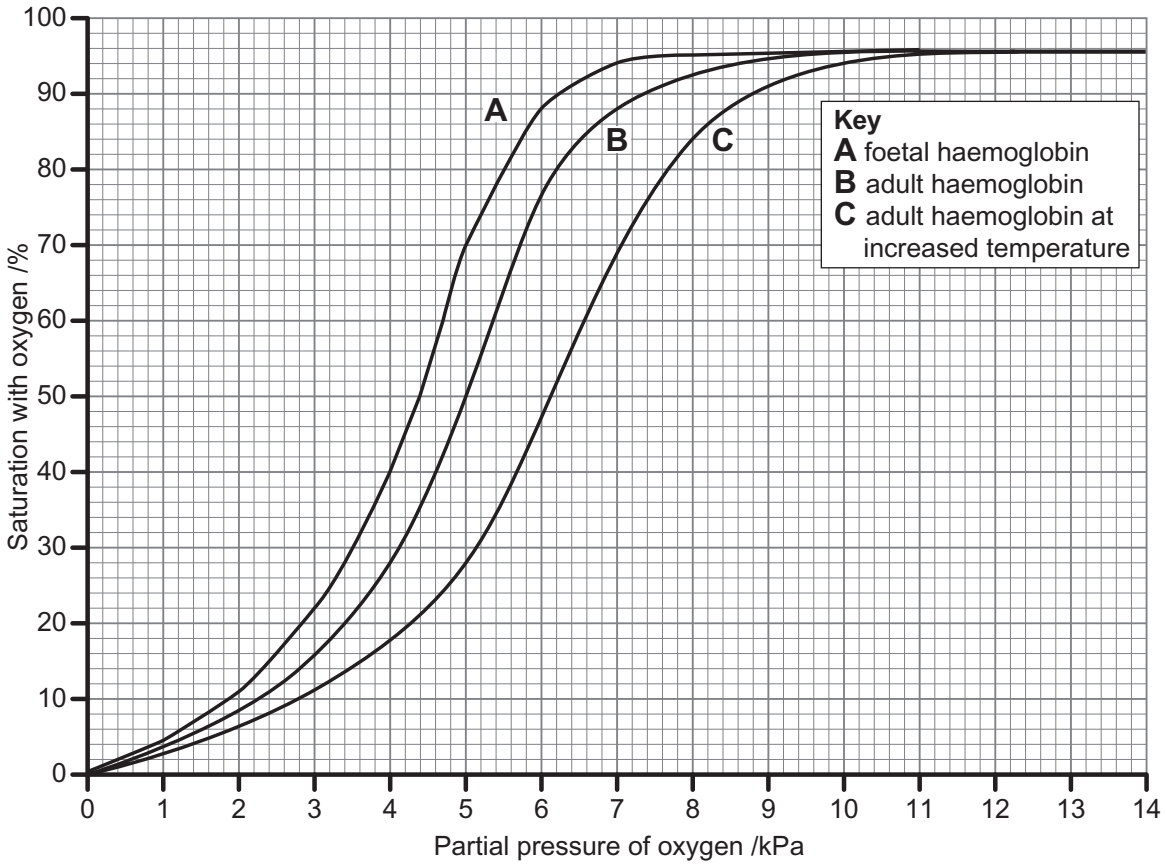
Examiner Only	
Marks	Remark

6 **(a)** When blood vessels are damaged, the process of blood clotting is initiated.

Describe the sequence of events which begins with a damaged blood vessel and results in the formation of a blood clot.

[4]

(b) The graph below shows some oxygen dissociation curves for human haemoglobin.



(i) As temperature increases, the oxygen dissociation curve for adult haemoglobin becomes displaced to the right (curve **C**). Explain the physiological significance of this for exercising muscles.

[3]

Examiner Only

Marks	Remark

(ii) The unloading tension is the partial pressure of oxygen at which haemoglobin is 50% saturated.

Use the graphs to determine the unloading tension for foetal haemoglobin (curve **A**) and for adult haemoglobin (curve **B**).

Foetal haemoglobin _____ kPa

Adult haemoglobin _____ kPa [2]

(iii) Suggest why it is important that the dissociation curve for foetal haemoglobin is different from that for adult haemoglobin.

_____

_____

_____

_____

_____ [2]

(c) The initial binding of an oxygen molecule to haemoglobin affects the binding of subsequent oxygen molecules. Explain this effect.

_____

_____

_____

_____ [2]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

7 Woodlands are complex ecosystems containing plants that grow to different heights. The leaf cover of the taller trees creates shade for those below. Different tree species provide varying degrees of shading. A fallen tree reduces the shading at that point.

A student was investigating the difference in ground-level plant species at different locations in a deciduous woodland ecosystem. The procedure followed by the student is outlined below.

- A transect line was positioned from the centre of the wood to the edge.
- Six sample sites were identified at 20 metre intervals along the transect line.
- One quadrat was placed at each sample site and the names of the main species present in the quadrat were recorded.

The following results were recorded by the student:

- Mosses were found mainly at site 1, but there were also some present at sites 2, 3 and 5.
- Bluebells were found in abundance at sites 2, 3 and 5 and a few were also present at site 4.
- Wood anemone was found at sites 2, 3 and 5
- Primroses were found at sites 4 and 6.
- Lesser celandine was found mainly at sites 2 and 3, but there was also a little of this at site 1.
- Grass was present at all sites but it was densest at sites 4 and 6.

(a) Organise these results into an appropriate table to show the presence or absence of each of the species recorded by this student. The relative abundance of plants does not need to be distinguished. Your table should have a caption and suitable column headings.

[4]

The following notes on the different sample sites were also made by the student:

- Sample point 1 was in the centre of the woodland. The tree cover was very dense, so it was the darkest and wettest of the six sample sites.
- A dead tree lay near the quadrat at sample site 4, so the tree cover was less dense, and sample site 6 was at the edge of the woodland. These two sample sites were only lightly shaded and were also the driest areas of the woodland.
- Sample sites 2, 3 and 5 appeared to have similar levels of light and moisture. They were drier and lighter than site 1, but darker and moister than sites 4 and 6.

(b) Using the information from your table and the notes made by the student on the different sites, describe the conditions favoured by each of the following plants.

Mosses _____

_____

_____

Bluebells _____

_____

_____

Primroses _____

_____

_____ [3]

(c) Explain why the student chose to place a transect line through the woodland, rather than selecting six random sites.

_____

_____ [1]

Examiner Only	
Marks	Remark

(d) This student simply recorded the presence of certain species at each site, although he did comment on the relative amount of some of the species. He also made general observations on the relative light and moisture conditions at each site.

Explain how this student could have obtained more meaningful and reliable results at each sample site.

_____

_____

_____

_____

_____

_____

_____ [3]

Examiner Only	
Marks	Remark

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(Questions continue overleaf)

Section B

Examiner Only	
Marks	Remark

Quality of written communication is awarded a maximum of 2 marks in this section.

8 **(a)** Give an account of the role of surface area and volume in the metabolism of an organism and the effect of increasing body size on the relationship between these two factors. [5]

(b) Using the lungs and the blood system as examples, explain how mammals have compensated for increasing body size. [8]

Quality of written communication [2]

(a) Give an account of the role of surface area and volume in the metabolism of an organism and the effect of increasing body size on the relationship between these two factors.

Examiner Only	
Marks	Remark

(b) Using the lungs and the blood system as examples, explain how mammals have compensated for increasing body size.

Examiner Only	
Marks	Remark

Extra lined page

Examiner Only	
Marks	Remark

THIS IS THE END OF THE QUESTION PAPER

112528

GCE Biology Advanced Subsidiary (AS)
Assessment Unit AS 2
assessing Organisms and Biodiversity
January 2012

Photograph 2.2

(For use with Question 2)