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Centre Number	
71	

Candidate Number

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
2011

Biology

Assessment Unit AS 2

assessing

Organisms and Biodiversity

[AB121]

AB121

WEDNESDAY 22 JUNE, MORNING

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.
Answer **all eight** questions.
You are provided with **Photograph 2.3** for use with Question 3 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	

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Section A

Examiner Only	
Marks	Remark

1 Describe how gas exchange is facilitated in the lungs of a mammal.

_____

_____

_____

_____

_____

_____ [3]

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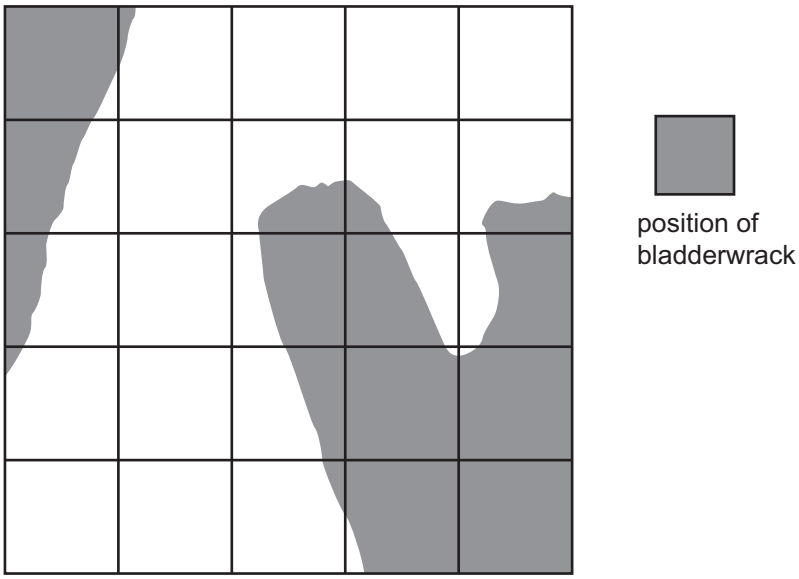
Examiner Only	
Marks	Remark

2 Bladderwrack (*Fucus vesiculosus*) is a common seaweed on most rocky shores in Northern Ireland.

(a) In an investigation into the distribution of bladderwrack on a rocky shore, quadrats were placed at particular sites. The drawing below shows the areas in one quadrat in which bladderwrack was found. Wires were used to divide the quadrat into smaller squares.



Determine the percentage cover of bladderwrack in the quadrat.
Explain how you arrived at your answer.

_____

_____

_____ [2]

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Marks	Remark

(b) The rocky shore in which the investigation took place contained not only bladderwrack, but four other species of seaweed. Explain how you would investigate the distribution of the seaweeds on the rocky shore to determine whether they are adapted to specific zones of the shore.

_____

_____

_____

_____

_____

_____

_____

_____ [4]

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3 **Photograph 2.3** is a photomicrograph of part of a transverse section through the root of a buttercup (*Ranunculus*).

In the space below, draw a block diagram to show the tissue layers in the root as shown in the photograph. Label the drawing to identify at least **four** structures.

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Marks	Remark

[9]

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Examiner Only	
Marks	Remark

4 The holm oak (*Quercus ilex*) is a tree of Mediterranean origin which was introduced into Ireland during the 16th century.

(a) The leaf of the holm oak possesses a thick waxy cuticle. What does this suggest about its adaptation to a Mediterranean climate? Explain your reasoning.

_____

_____

_____ [2]

Only two species of insect feed on the leaves of holm oak and both of these are moth larvae. The table below shows data for the abundance of these moth larvae in a group of holm oaks.

Insect feeding on holm oak	Number of individuals
Holm oak leaf-mining moth (*Phyllonorycter messaniella*) larvae	526
Lacky moth (*Malacosoma neustrium*) larvae	371

(b) Calculate the value for Simpson's Diversity Index (D) for holm oak. The formula for calculating D is presented as:

$$D = \frac{\sum n_i(n_i - 1)}{N(N - 1)}$$

where n_i = the total number of organisms of each individual species.
N = the total number of organisms of all species
(Show your working.)

[2]

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Marks	Remark

The lacky moth larvae graze the edges of the leaves. However, the leaf-mining moth larvae feed internally on the mesophyll (following the placing of an egg into the interior of the leaf) and are thus said to "mine" the leaf.

(c) Suggest how placing the egg inside the leaf is an advantage for the survival of the leaf-mining moth larvae.

_____

_____

_____ [2]

The number of insect species associated with certain deciduous and coniferous trees in Ireland is given in the table below. Two of the deciduous trees are native to Ireland while two have been introduced by man.

Tree	Type	Number of insect species
Sessile oak (*Quercus petraea*)	native deciduous	284
Birch (*Betula pendula*)	native deciduous	229
Beech (*Fagus sylvatica*)	introduced deciduous	64
Sycamore (*Acer pseudoplatanus*)	introduced deciduous	15
Pine (*Pinus sylvestris*)	coniferous	91
Yew (*Taxus baccata*)	coniferous	4

(d) Which tree would you expect to have the highest value for Simpson's Index (D)? Explain your reasoning.

_____

_____ [1]

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(e) Suggest which tree species should be planted in new woodlands with a view to increasing biodiversity. Explain your reasoning.

_____

_____

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_____ [2]

Examiner Only	
Marks	Remark

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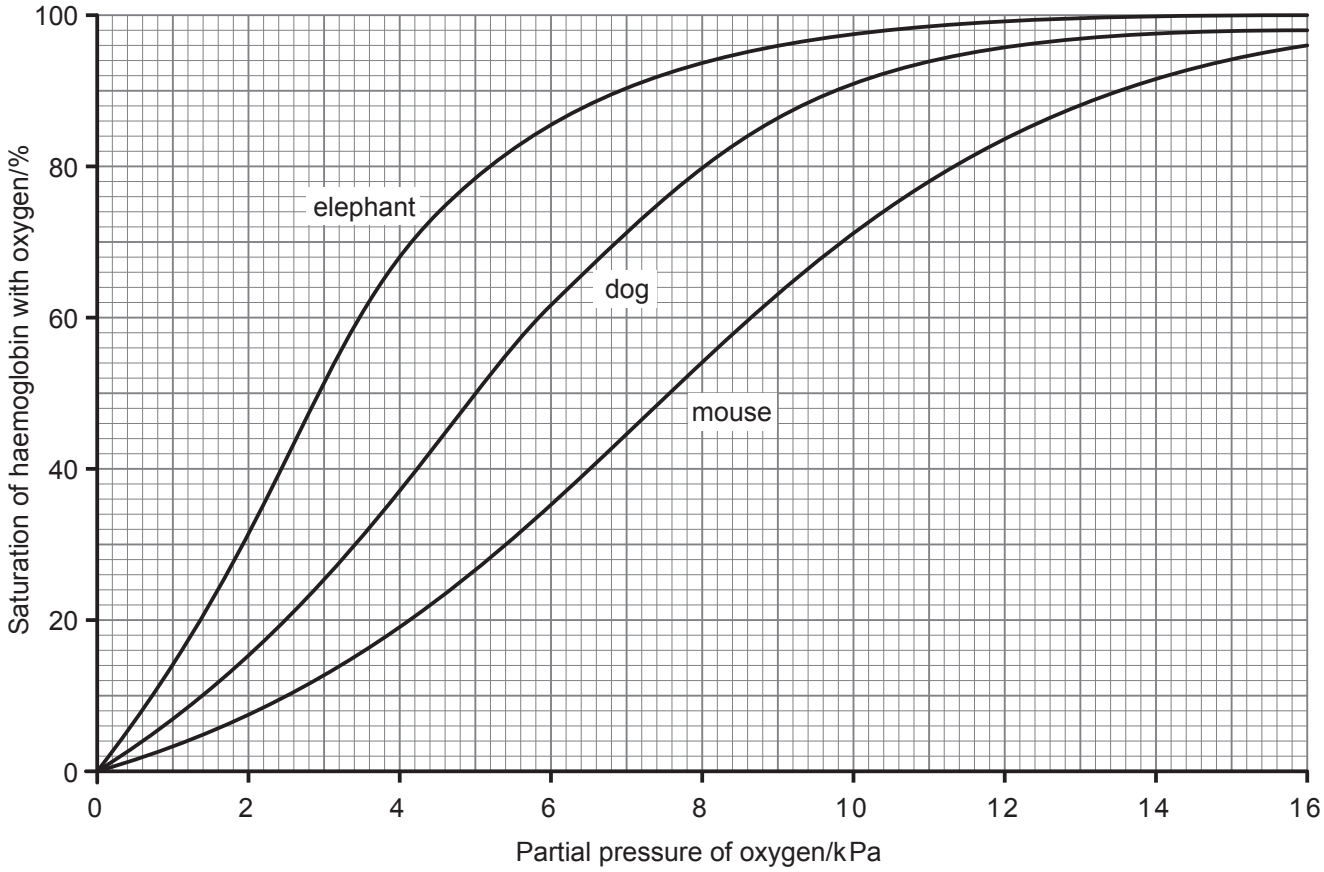
5 The graph below shows the oxygen dissociation curves for the haemoglobin from three different mammals.



Examiner Only	
Marks	Remark

(a) The haemoglobin of which mammal has the greatest affinity for oxygen? Explain your reasoning.

_____

_____

_____ [2]

(b) The mouse has a higher metabolic rate than either the dog or the elephant. Explain how mouse haemoglobin is adapted for maintaining a high metabolic rate.

_____

_____

_____

_____ [2]

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Examiner Only	
Marks	Remark

(c) The partial pressure of carbon dioxide will influence the oxygen dissociation curve for haemoglobin.

(i) Sketch, on the graph, the oxygen dissociation curve you would expect for dog haemoglobin when $ppCO_2$ has increased. [1]

(ii) Under what circumstances would the $ppCO_2$ increase in a dog?

_____

_____ [1]

(iii) Explain the advantage of the effect described.

_____

_____

_____

_____ [2]

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6 Read the passage below and then use the information in the passage, and your own understanding, to answer the questions which follow.

The barn owl, *Tyto alba*, is an instantly recognisable white owl and is characteristic of lowland mixed farmland where it feeds on small mammals found in rough grassland along field margins, roadways, riverbanks, woodland edges and around farm buildings. In Northern Ireland, its diet consists mainly of mice, shrews and young rats. It nests inside buildings, mature hollow trees and rock crevices. It will also use nest boxes.

The barn owl has been in serious decline across Britain and Ireland since the 1930s. It is thought that, in Northern Ireland, there has been a decline of 69% between 1932 and 1985. Today the Northern Ireland population is estimated to be between 45–65 pairs. The population remains fragile and fragmented.

Factors which have caused the decline are fairly well understood: a reduction in the area of rough grassland, loss of hedgerows, more frequent periods of heavy or continuous rain and flooding, loss of suitable nest and roost sites, and widespread use of rodenticides. Other hazards include road deaths and drowning in farmland water troughs. In the latter case, the birds bathe to remove parasites but, if they fall in, their soft plumage waterlogs very quickly.

(a) The table below shows the classification of *Tyto alba*. Complete the table by inserting the names of the three missing taxonomic groups.

Kingdom	Animalia
	Chordata
Class	Aves
	Strigiformes
Family	Tytonidae
	Tyto
Species	*alba*

[3]

(b) Explain why rodenticides, which are used to kill rats and mice, would prove lethal to barn owls.

_____

_____

_____

_____ [2]

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Marks	Remark

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Marks	Remark

(c) Barn owls have difficulty hunting in periods of sustained wet weather. Suggest **two** reasons for this.

1. _____

_____

2. _____

_____ [2]

(d) A number of schemes have been designed to develop favourable conditions for the improvement in barn owl numbers. Suggest **three** strategies which would be beneficial to barn owls.

1. _____

_____

_____

2. _____

_____

_____

3. _____

_____

_____ [3]

(e) With a small and fragmented population of barn owls in Northern Ireland, there is a danger of inbreeding which would result in a loss of genetic diversity. Explain why genetic diversity (variability) is important to populations.

_____

_____

_____

_____ [2]

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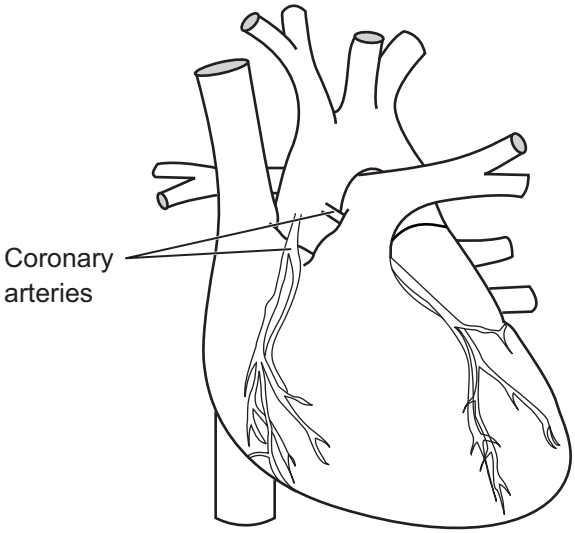
Marks	Remark

7 The diagram below represents a surface view of the heart showing the coronary arteries as well as other major blood vessels.



(a) **(i)** On the diagram, label one of the pulmonary arteries with the letter **P**. [1]

(ii) Identify the blood vessel from which the coronary arteries arise.

_____ [1]

The development of an atheroma in the coronary arteries may lead to the formation of a clot – a coronary thrombosis – which may lead in turn to a myocardial infarction (heart attack).

(b) **(i)** Describe the sequence of events which leads to the development of an atheroma in the coronary arteries.

_____

_____

_____

_____

_____

_____ [3]

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Marks	Remark

(ii) Explain how a thrombosis in the coronary arteries would lead to a myocardial infarction.

_____

_____

_____

_____ [2]

Patients who are considered to be susceptible to thrombosis are treated with anticoagulant drugs, such as warfarin and heparin.

(c) **(i)** Warfarin acts by inhibiting the production of prothrombin though this takes time, approximately 3 days. Use your understanding of blood clotting to explain why warfarin treatment prevents blood clotting.

_____

_____

_____

_____ [2]

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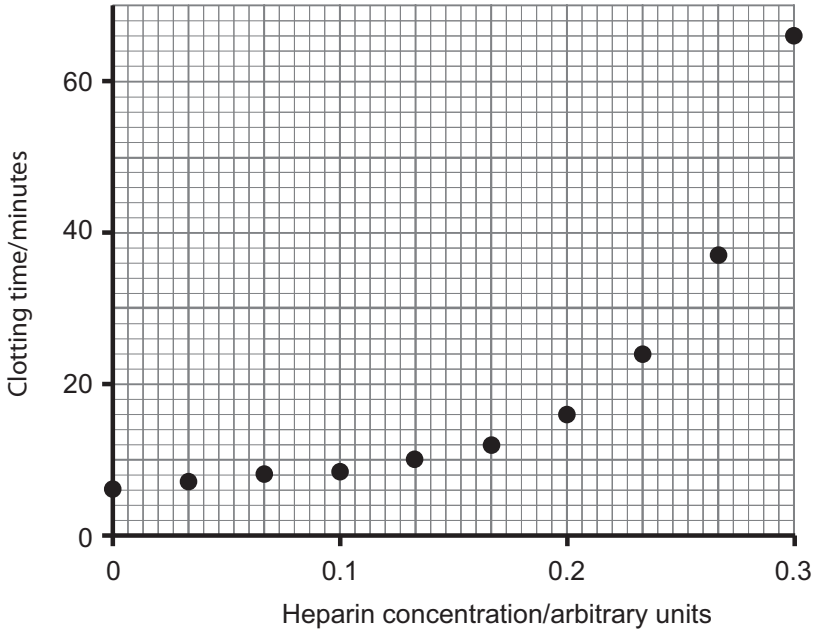
Marks	Remark

Heparin acts rapidly in preventing blood clotting. The graph below shows the effect of heparin concentration on the clotting time of blood samples.



(ii) Describe the effect of adding heparin to samples of blood. What does this suggest about the concentration of heparin used to treat patients?

_____

_____

_____

_____ [2]

(iii) Warfarin is often the preferred treatment since it can be taken orally. However, medication will initially include heparin. Suggest why.

_____

_____

_____

_____ [2]

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Section B

Examiner Only	
Marks	Remark

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

8 Give an account of the processes involved in the movement of water through a plant, to include:

- the uptake of water into and through the root
- the movement of water through the stem
- the movement of water through and out of the leaf [13]

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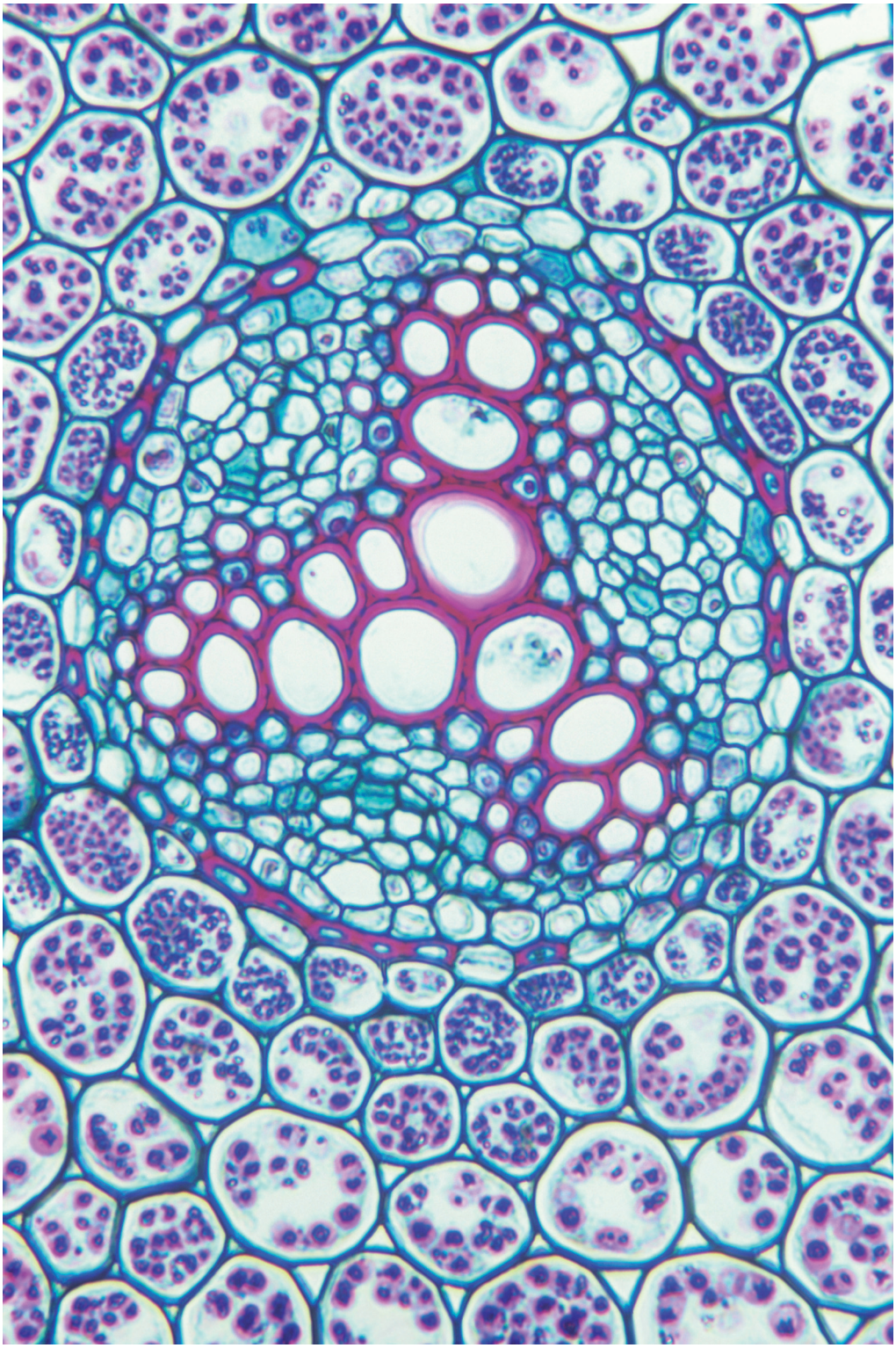
GCE Biology Advanced Subsidiary (AS)
Assessment Unit AS 2
***assessing* Organisms and Biodiversity**
Summer 2011

Photograph 2.3

(For use with Question 3)



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