Rewarding Learning

Centre Number

71

Candidate Number

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
2009

Biology

Assessment Unit AS 2

assessing

Module 2: Organisms and Biodiversity

[AB121]

AB121

FRIDAY 12 JUNE, 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.
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	

Section A

1 Identify the word or phrase that is described by each of the following statements.

- Cells which form the walls of the alveoli and reduce the diffusion path for oxygen in the lungs.

  _____

- Veins which carry oxygenated blood.

  _____

- The effect whereby an increase in carbon dioxide causes a further release of oxygen from oxyhaemoglobin.

  _____

- A pigment with a high affinity for oxygen found within red muscle.

  _____ [4]

2 The distribution of two species of marine mollusc, *Littorina littorea* (the edible periwinkle) and *Littorina saxatilis* (the rough periwinkle), was investigated on a rocky shore. A belt transect from lower shore to upper shore indicated that *L. littorea* (the edible periwinkle) was found on the lower part of the shore and *L. saxatilis* (the rough periwinkle) was limited to the upper shore.

Both species of periwinkle graze on algae which are abundant on the rocks. Also, they have a heavy shell (with a cover over the opening) to protect them from desiccation and mechanical damage.

However, they differ in a number of ways.

- *L. littorea* (the edible periwinkle) produces fertile eggs which are released into the water and the larvae swim among the plankton. It has gills and can breathe for only a relatively short period out of water.

- *L. saxatilis* (the rough periwinkle) retains the fertilised eggs inside the body where they hatch so that there is no planktonic existence. The gills are modified to absorb air and it can survive for up to a month out of water. It has a high temperature tolerance and, in extremes of desiccation and temperature, it cements itself to a rock.

(a) The lower shore area was covered by seawater for most of the day while the sea only reached the upper shore at high tide (twice a day). Explain how the adaptations of the *L. saxatilis* (the rough periwinkle) equip this periwinkle for life on the upper part of the shore.

_____

_____

_____

_____

_____

_____ [3]

(b) Suggest an explanation why *L. littorea* (the edible periwinkle) outcompetes *L. saxatilis* (the rough periwinkle) on the lower shore.

_____

_____

_____

_____ [1]

3 **Photograph 2.3** is a photomicrograph of a transverse section through a leaf of the tobacco plant (*Nicotiana tabacum*). The tobacco leaf has some xerophytic adaptations.

In the space below, draw a block diagram to show the tissue layers in the leaf as shown in the photograph. Annotate the drawing to identify **two** xerophytic features and, in each case, explain how the feature acts as an adaptation.

Examiner Only	
Marks	Remark

[9]

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(Questions continue overleaf)

4 There are approximately 20 different species of free-living flatworm in Ireland. One such species is *Dendrocoelum lacteum*.

(a) Define the term "species".

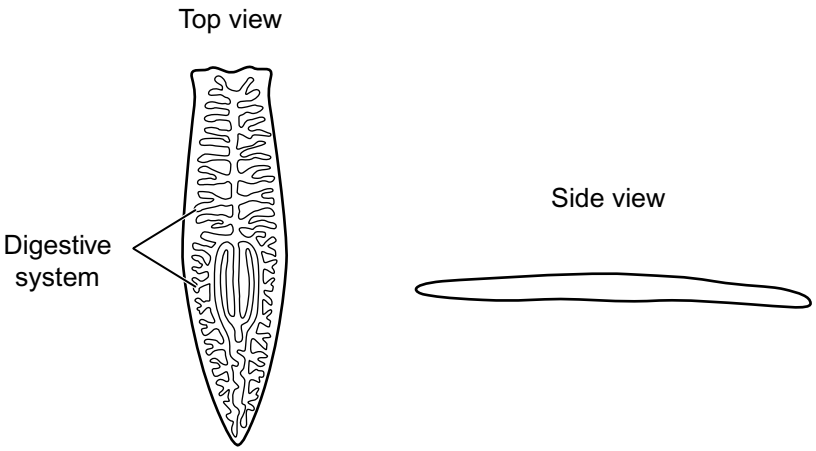
_____

_____

_____

_____ [2]

(b) The diagrams below show two views of *Dendrocoelum lacteum*.



The flatworm lacks a blood system. Explain how it is adapted for the distribution of food and oxygen throughout its body.

(i) Distribution of food

_____

_____

_____

_____ [2]

(ii) Distribution of oxygen

_____

_____

_____

_____ [2]

Two species of flatworm, the New Zealand flatworm (*Artioposthia triangulata*) and the Australian flatworm (*Australoplana sanguinea var. alba*), have been introduced into Ireland. Both species predate earthworms.

(c) These alien species are considered a threat to the biodiversity in the areas that they inhabit. Explain why.

_____

_____

_____

_____ [2]

5 **(a)** The table below includes descriptions of three types of white blood cell. Complete the table by identifying each cell type and give a brief description of the function of each.

Description	Identification	Function
Cells with a very large nucleus and little cytoplasm		
Cells with granular cytoplasm and a lobed nucleus		
Large cells with a kidney-shaped nucleus		

[6]

(b) The table below shows the red blood cell counts for a person living at sea level, and the same person after acclimatisation at high altitude in preparation for climbing Mount Everest.

	Red blood cell count/dm^{-3}
At sea level	5.0×10^{12}
After acclimatisation at high altitude	5.6×10^{12}

(i) Describe how the partial pressure of atmospheric oxygen varies with altitude.

_____

_____ [1]

(ii) Explain the advantage of having a higher red blood cell count at high altitude.

_____

_____

_____

_____ [2]

(iii) People such as the Quechua Indians in the Andes, who live permanently at high altitude, not only have increased red blood cell counts but possess other adaptations for life at high altitude. Describe **one** other adaptation to life at high altitude which might be expected, and explain how this adaptation aids their survival.

_____

_____

_____

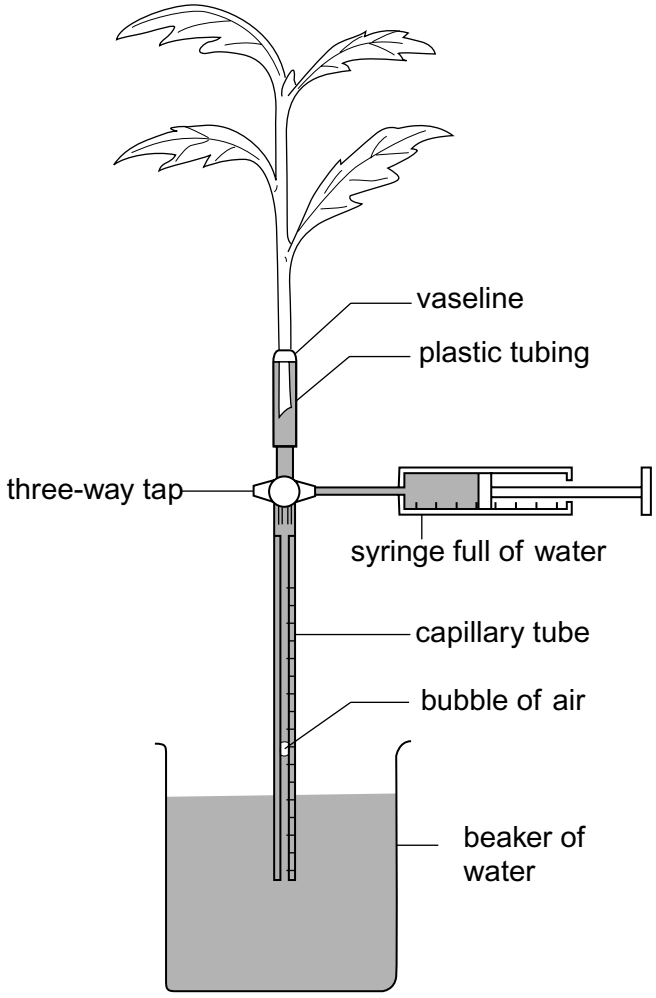
_____ [2]

(iv) The increased production of red blood cells is due to the release of the hormone erythropoietin (EPO) in the body. Athletes can inject EPO to artificially stimulate the red blood cell count and so boost performance. Suggest **one** possible danger to the athlete of an artificially raised blood cell count.

_____

_____ [1]

6 A potometer is a device for investigating the rate of transpiration. Prior to setting up, the potometer and the stem of a leafy shoot are immersed in water. Under water, the bottom centimetre of the stem is cut off and the cut end inserted into the plastic tubing. The apparatus is removed from the water, a bubble of air allowed to enter the open end of the capillary tube and that end then inserted into a beaker of water. The completed set-up for a simple potometer is shown below.



(a) What assumption is made when this apparatus is used to investigate the rate of transpiration?

_____

_____ [1]

(b) Explain each of the following.

- why it is necessary to cut the leafy shoot and fit it into the potometer under water

_____

_____

- how the bubble of air is introduced into the capillary tube

_____

_____

- why a syringe is attached

_____

_____

- why the set-up is left for 15 minutes before taking readings

_____

_____ [4]

(c) The table below shows some results recorded using the apparatus.

Time/minutes	Distance travelled by bubble/mm		
	"Normal" room conditions	Covered with clear plastic bag	Covered with black plastic bag
0	0	0	0
2	18	10	4
4	36	19	8
6	55	29	11
8	74	38	15
10	90	48	18

(i) Explain, as fully as possible, the results obtained.

_____

_____

_____

_____

_____

_____

_____

_____ [3]

(ii) In "normal" room conditions, the distance moved by the bubble was 90 mm during 10 minutes. The capillary tube has a cross sectional area of 0.8 mm^2. Calculate the rate of movement in mm^3 $minute^{-1}$. (Show your working in the space below.)

Answer _____ mm^3 $minute^{-1}$ [2]

(d) In experiments using a potometer it is usual to use the same shoot throughout. Give **one** limitation of using different shoots in the potometer when investigating the rate of transpiration.

_____

_____ [1]

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

Ireland is one of the least wooded countries in Europe, even though forestry plantations have increased tree cover from less than 1% of land cover to about 10% in the last century. A new plan aims to increase this to 17% by 2030, mainly by planting new commercial forests at approximately 20,000 hectares per year. This increase represents a huge change in land use across Ireland, and has far-reaching economic, social and ecological consequences.

The most widely planted species in these commercial forests is sitka spruce (*Picea sitchensis*). This is a non-native conifer, which maintains a canopy of needle-like leaves throughout the year. A policy change in the late 1990s promoted the use of broadleaf trees in plantations. The planting of ash (*Fraxinus excelsior*), which is a deciduous tree with a full canopy only during the summer months, has increased significantly and broadleaf trees now constitute 20% of new plantings.

In a project investigating the diversity of plant species growing within these different woodland types, the plants were categorised as either bryophytes or as vascular plants. Bryophytes, mostly mosses, form a ground layer close to the soil surface as they require dampness. They are shade-tolerant plants. The vascular plants, ferns and flowering plants, form a herbage layer. These plants may be either shade-tolerant, mostly the ferns, or grow rapidly in early spring before the tree canopy closes out the light during the summer season.

(a) State **two** features of the kingdom Plantae.

1. _____

_____

2. _____

_____ [2]

(b) (i) Explain why ferns may be relatively abundant in both sitka spruce and ash woodlands.

Examiner Only
Marks | Remark

_____

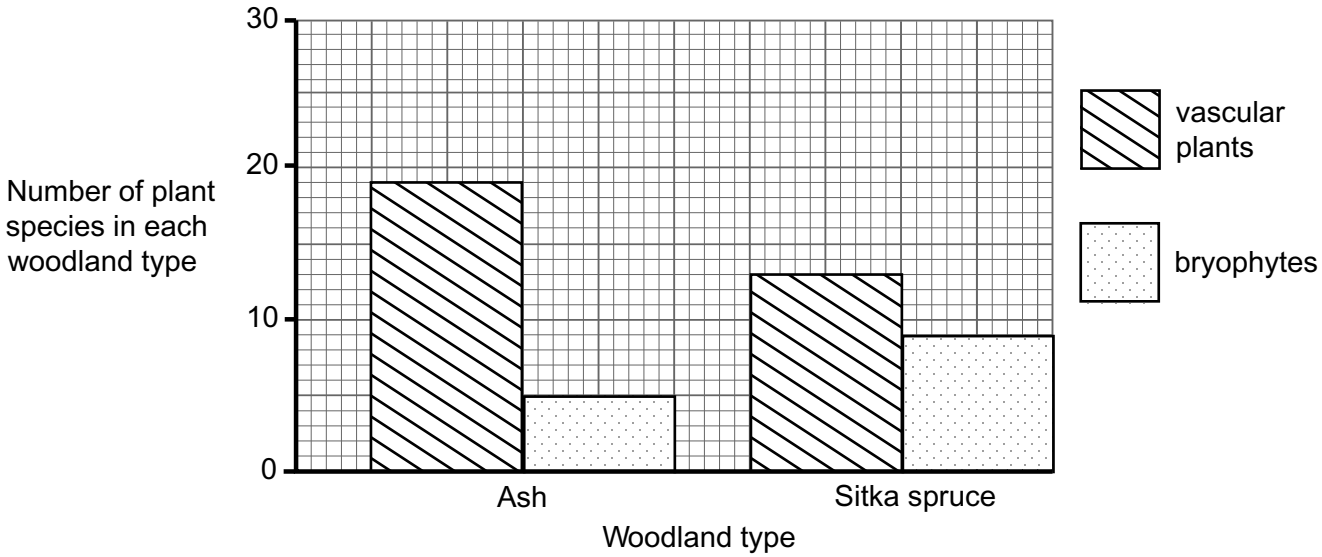
_____ [1]

(ii) Identify the niche occupied by most species of flowering plants in the ash woodland.

_____

_____ [1]

(c) The number of different species (species richness) of vascular plants and bryophytes was determined for each woodland type. The results are shown in the graph below.



Describe the trends evident in the graph.

Examiner Only
Marks | Remark

_____

_____

_____

_____

_____

_____[3]

(d) **(i)** Explain how the diversity of animal species may be increased by greater plant species diversity.

_____

_____ [1]

(ii) Suggest how the introduction of a non-native conifer as the main forest plant has decreased animal diversity.

_____

_____ [1]

(e) Suggest **one** economic consequence [line 7] of increased commercial forests in Ireland.

_____

_____ [1]

(f) Briefly describe **one** strategy which encourages biodiversity and explain how this strategy conserves or improves biodiversity.

_____

_____

_____

_____ [2]

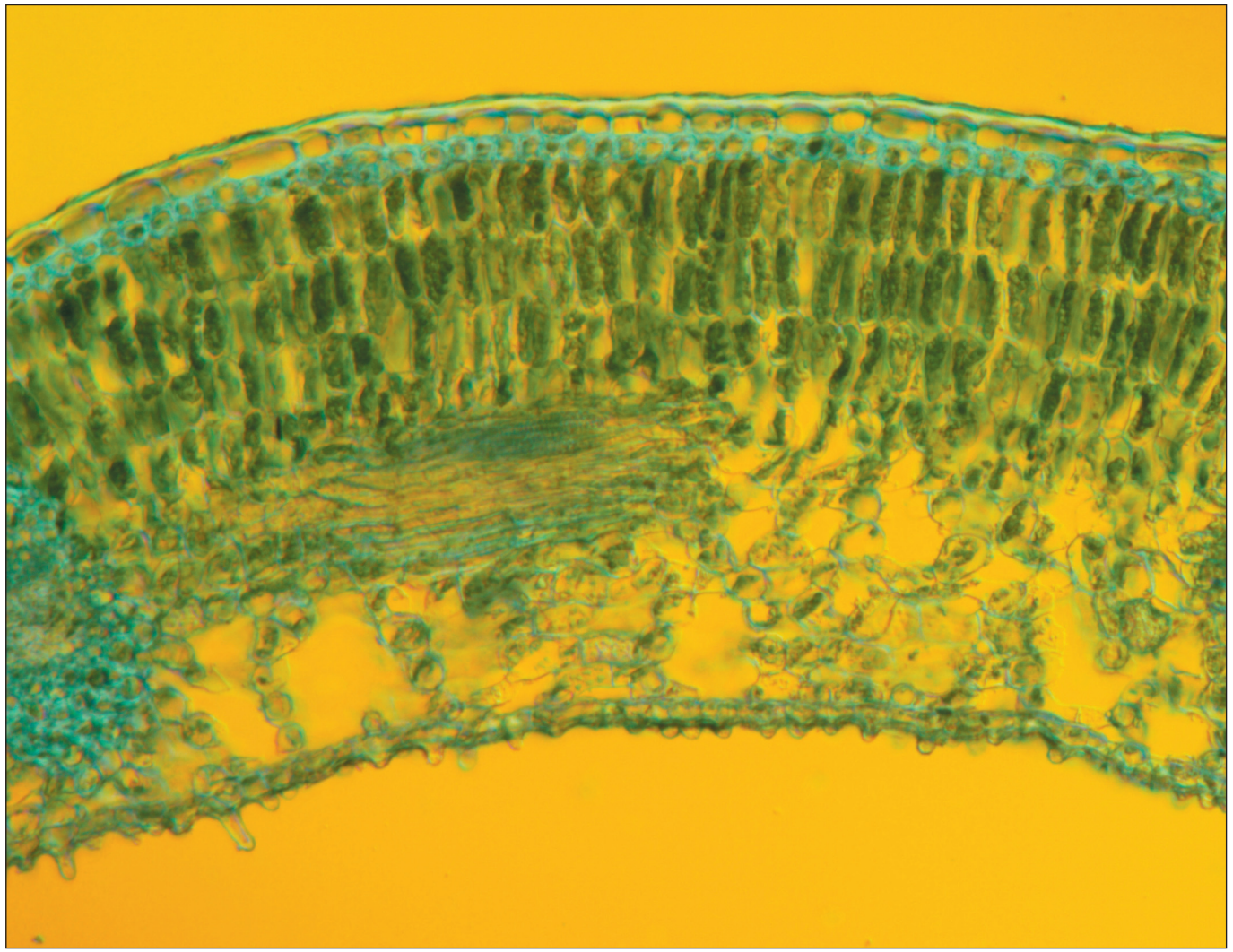
Section B

8 Give an account of the co-ordinated sequence of events which result in the flow of blood through the heart during one cardiac cycle. [15]

4976.02

GCE Biology Advanced Subsidiary (AS)
New Specification
Assessment Unit AS 2
Module 2: Organisms and Biodiversity
Summer 2009

Photograph 2.3
(for use with Question 3)



Source: Sinclair Stammers/Science Photo Library

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