Rewarding Learning

71

Candidate Number

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
January 2011

Biology

Assessment Unit AS 2

assessing

Organisms and Biodiversity

[AB121]

AB121

TUESDAY 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.
Answer **all nine** questions.
You are provided with **Photograph 2.4** for use with **Question 4** 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	
9	
Total Marks	

Section A

1 Fungi are described as lysotrophs and feed by extracellular digestion.

(a) Explain why fungi are described as lysotrophs.

_____

_____ [1]

(b) Describe the process of extracellular digestion.

_____

_____

_____

_____ [2]

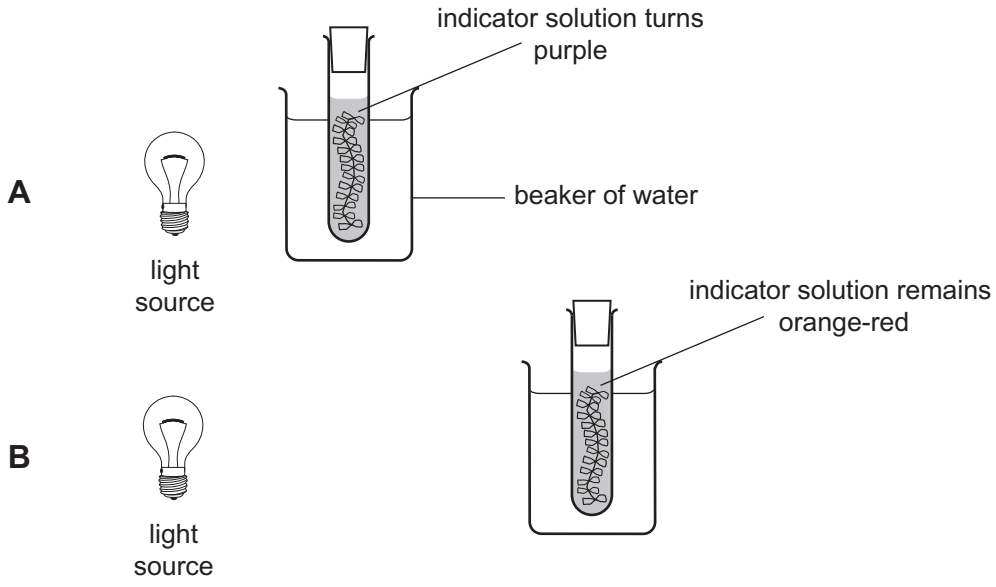
2 An investigation was designed to determine the effect of light intensity on gas exchange by pondweed. The experiment setup is shown in the diagram below.

In **A**, the lamp was placed close to a test tube containing pondweed immersed in an indicator solution.

In **B**, the lamp was placed further away.

In each case, the indicator was orange-red initially. After 1 hour, the colour was observed and recorded.

The experimental setup and results are shown below.



(a) Name the indicator solution used and the gas which caused the change in **A**.

Indicator solution _____

Gas _____ [1]

(b) Suggest a reason for the test tube containing the pondweed being placed in a beaker of water.

_____

_____ [1]

(c) Explain why the indicator solution remained orange-red in **B**.

_____

_____

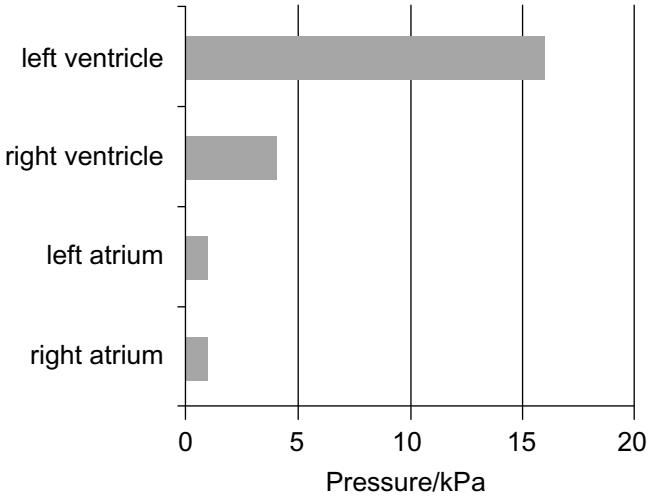
_____ [2]

3 Contraction of heart muscle causes an increase in pressure within the heart chambers.

(a) State the term for the phase of the cardiac cycle during which heart muscle is contracted.

_____ [1]

(b) The muscle surrounding the heart chambers is of different thicknesses. The graph below shows the maximum pressure reached in each of the heart chambers during contraction.



Using your understanding of the structure of the heart chambers, explain why the maximum pressure in both atria is the same, whereas the pressure in the left ventricle is much greater than the pressure in the right ventricle.

_____

_____

_____

_____

_____

_____ [3]

4 **Photograph 2.4** is a photomicrograph of a transverse section through a leaf of heather (genus *Erica*). Heather is a xerophyte.

(a) In the space below, draw a block diagram to show the tissue layers in the leaf as shown in the photograph. Label the tissue layers.

[5]

(b) Explain how each of the following xerophytic features in the heather leaf further limits water loss.

The thick cuticle _____

_____

Hairs on the surface _____

_____ [2]

5 In an investigation of hedgerow biodiversity, two hedges were systematically sampled (i.e. sampled at regular intervals) along their length. The two hedges differed in the degree to which they were managed and one had become "gappy" through lack of management. The hedges were arbitrarily called **A** and **B**.

(a) Describe another location where the use of systematic sampling along a transect is appropriate. Explain why this technique is most suitable in this situation.

_____

_____

_____ [2]

The table below shows the results of sampling the plant species within hedge **A**.

Species found	Number of each species (n_i)	$n_i(n_i - 1)$
Bramble, *Rubus spp.*	26	650
Ivy, *Hedera helix*	13	156
Stinging nettle, *Urtica dioica*	8	**X** _____
Cleavers, *Galium aparine*	6	30
Cow parsley, *Anthriscus sylvestris*	5	20
Gorse, *Ulex europaeus*	4	12
Herb Robert, *Geranium robertianum*	3	6
Hawthorn, *Crataegus monogyna*	4	12
Hazel, *Corylus avellana*	2	2
Sycamore, *Acer pseudoplatanus*	2	2
Wild cherry, *Prunus avium*	2	2
Total	$N = 75$	$\Sigma n_i(n_i - 1)$ _____

(b) (i) Complete the table by calculating the missing values **X** and $\Sigma n_i(n_i - 1)$. [2]

(ii) Using values from the table and the formula below calculate a Simpson's index value for hedge **A**.
(Show your calculations.)

The formula for the Simpson's index is $D = \frac{\Sigma n_i(n_i - 1)}{N(N-1)}$

[2]

(iii) Hedge **B** had a Simpson's index of 0.4. State which hedge was managed to encourage biodiversity. Explain your choice.

Hedge _____

_____

_____ [2]

(c) Describe **two** strategies which are recommended to maintain a good hedge.

1. _____

_____

2. _____

_____ [2]

6 An investigation was undertaken to determine the relationship between stomatal density and the rate of transpirational water loss in daffodil leaves.

The stomata of daffodil leaves are found on both surfaces of the leaf.

(a) A student took five counts of stomata in areas 2 mm × 2 mm (4 mm^2) on both surfaces. The mean number of stomata per 4 mm^2 was then calculated and, for the upper epidermis, this was converted to a count per cm^2. The results are shown in the table below.

	Number of stomata	
	Upper epidermis	**Lower epidermis**
Replicated counts/ 4 mm^{-2}	136	67
	146	81
	132	90
	154	58
Mean count/4 mm^{-2}	142	74
Mean count/cm^{-2}	3550	

(i) **Complete the table** by entering a mean value for the number of stomata per cm^2 in the shaded cell. [1]

(ii) Assess the variation shown within the replicates and comment on reliability of the measurements.

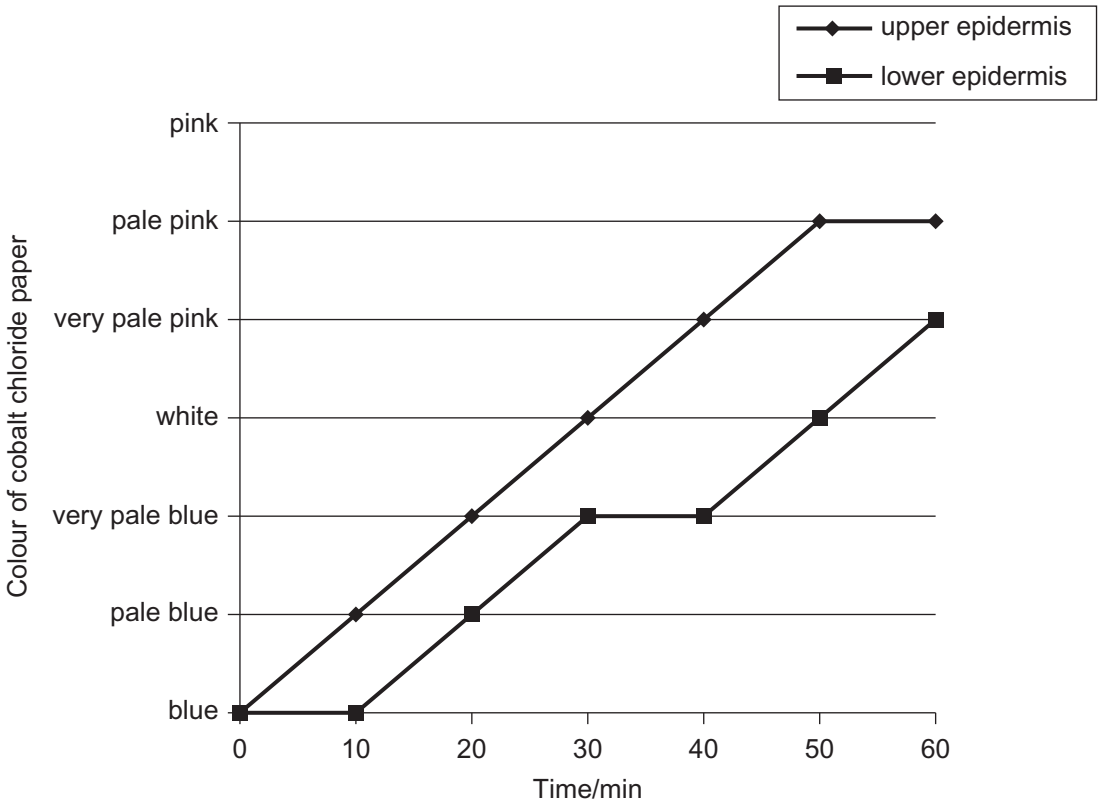
_____

_____

_____

_____ [2]

(b) An estimate was made of the amount of transpiration from both surfaces of a daffodil leaf by sticking small pieces of dry cobalt chloride paper on the upper and lower epidermis. The cobalt chloride paper changes from blue to pink as it absorbs water. The graph below shows the colour changes over a period of 60 minutes.



(i) Using the information in the graph and the table opposite, explain the colour changes shown.

_____

_____

_____

_____

_____

_____ [3]

(ii) Covering part of the leaf with the cobalt chloride paper may reduce the transpiration in that part. Suggest **one** reason for this.

_____

_____ [1]

(c) Explain how water loss from the leaf provides a means for water transport in the whole plant.

_____

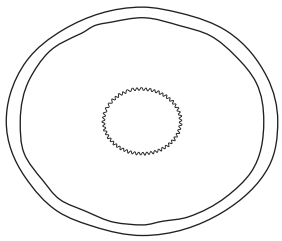
_____

_____

_____

_____ [2]

7 The diagram below represents a transverse section through a blood vessel.



(a) Select **two** pieces of evidence visible in the diagram which suggest that this is an artery.

1. _____

2. _____ [2]

(b) The wall of an artery contains smooth muscle tissue. Explain the role of the smooth muscle tissue in the functioning of an artery.

_____

_____

_____

_____ [2]

(c) Distinguish between the terms “atheroma” and “atherosclerosis” and explain how they may lead to a coronary thrombosis (heart attack).

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____ [5]

8 The distribution of bird populations is greatly influenced by changes in farming practice. A recent introduction involves the planting of tree species such as poplar or willow. These fast growing trees are harvested after a number of years to produce wood pellets for use as a fuel. This practice is called Short Rotation Coppicing (SRC).

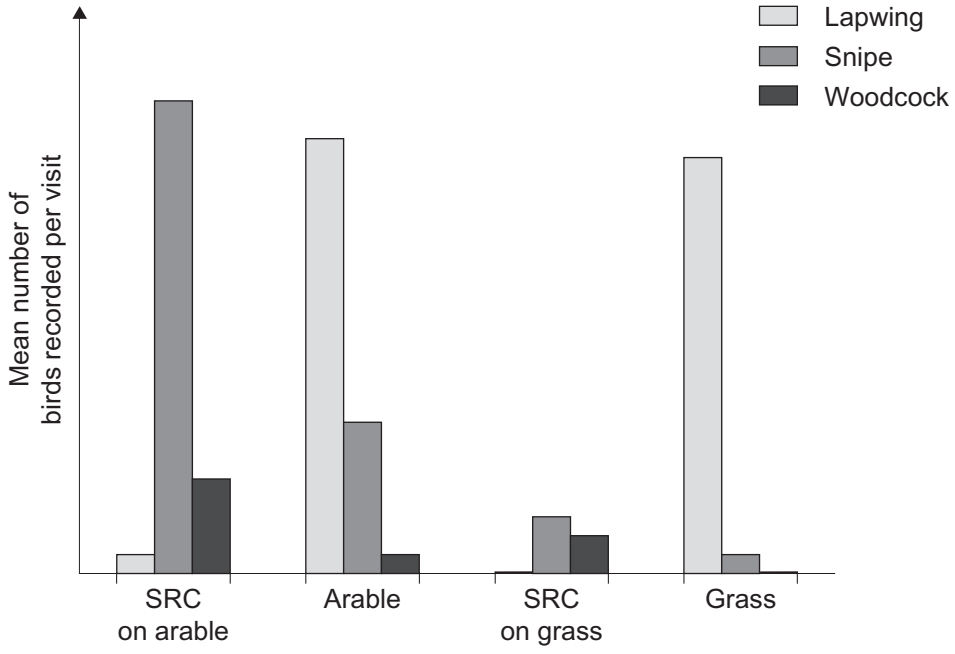
After several years, the trees form a dense plantation on land that was previously used for growing crops (arable land) or as grassland. The effects of changing land use to SRC was investigated for three bird species: the lapwing (*Vanellus vanellus*), the snipe (*Gallinago gallinago*) and the woodcock (*Scolopax rusticola*).

(a) State the genus name of the woodcock.

_____ [1]

(b) In the investigation of changing land use on the bird species, biologists visited farms to take counts of each species in four areas:

- short rotation coppices (SRC) on land previously used as arable land
- neighbouring area maintained as arable land
- short rotation coppices (SRC) on land previously used as grassland
- neighbouring area maintained as grassland



(i) Explain why the counts were made on neighbouring arable fields and on neighbouring grassland.

_____

_____ [1]

(ii) Using the information in the graph, state

- which of the three bird species seems to prefer the habitat of the grassland and arable land rather than the plantation habitat produced by SRC.

_____

- which of the two areas of SRC (previously grassland or arable) causes benefits in terms of biodiversity.

_____ [2]

(iii) Suggest **one** reason why SRC can cause a change in the numbers of these bird species.

_____

_____ [1]

(c) Biologists also investigated plant species that were associated with the floor of the SRC and the changes which occurred over a four year period. Plants were sampled and their numbers recorded at the edge of the SRC and in the middle of the SRC.

(i) Describe an appropriate sampling procedure, which ensures that results are representative of the plant species present in the two regions.

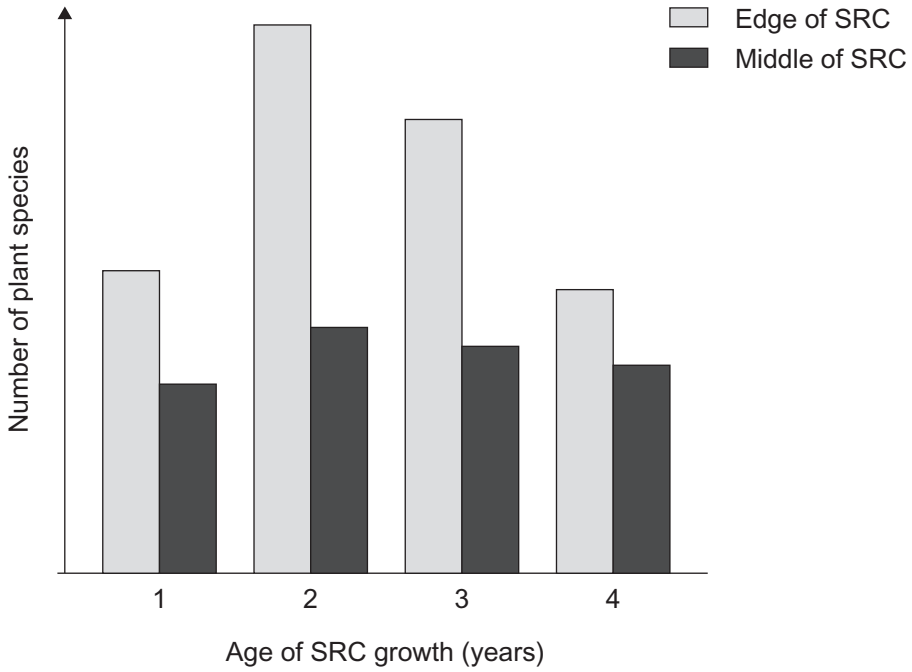
_____

_____

_____

_____ [2]

The results for the number of different plant species found, in the years following the planting of trees, are shown in the graph below.



(ii) One trend evident in the graph suggests that more plant species are found at the edge of the SRC. Suggest how **two** possible ecological factors may account for this difference.

1. _____

_____

2. _____

_____ [2]

(iii) Describe **one** other trend evident in the graph and suggest a possible explanation for it.

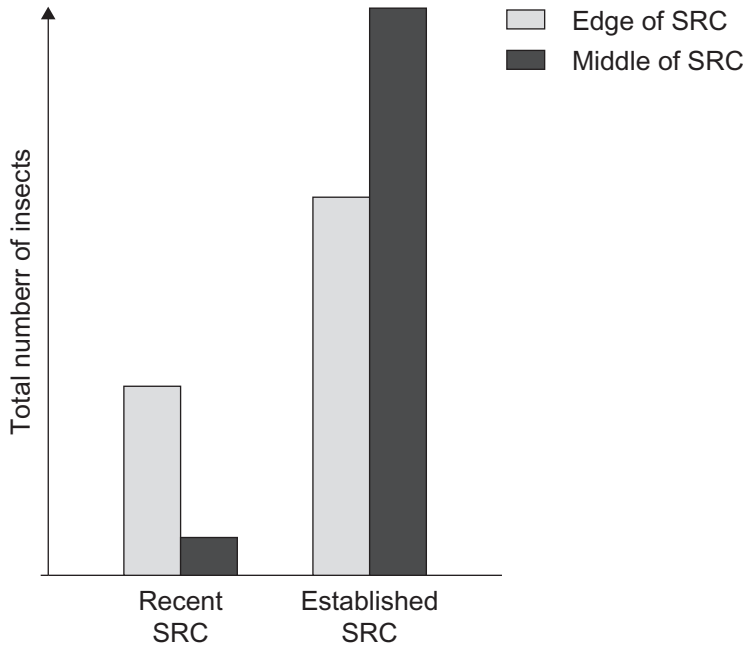
_____

_____

_____

_____ [2]

(d) In a separate study, biologists looked at the number of insect species living in the canopy of the trees planted in the SRC. Several SRCs were sampled in the first year after planting (Recent SRC) and again after four years (Established SRC). As in the plant survey, the biologists sampled at the edge and in the middle of the SRC. The total numbers of insects found are shown in the graph below.



(i) Describe **two** conclusions which may be made on the basis of these results.

1. _____

_____

2. _____

_____ [2]

(ii) Suggest **one** way in which insects may be of benefit to the biodiversity of an SRC.

_____

_____ [1]

Section B

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

(a) Give an account of the structure of haemoglobin and its role in absorbing oxygen in the lungs. [5]

(b) Explain how oxygen is supplied to strenuously exercising muscle. [8]

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(b) Explain how oxygen is supplied to strenuously exercising muscle.

THIS IS THE END OF THE QUESTION PAPER

111528

GCE Biology Advanced Subsidiary (AS)
Assessment Unit AS2 assessing Organisms and Biodiversity
January 2011

Photograph 2.4