Rewarding Learning

Centre Number

Candidate Number

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
2017

Biology

Assessment Unit AS 2
assessing

Organisms and Biodiversity

[AB121]

AB121

TUESDAY 6 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.
You must answer the questions in the spaces provided.
Do not write outside the boxed area on each page or on blank pages.
Complete in black ink only. **Do not write with a gel pen.**
Answer **all eight** questions.
You are provided with **Photograph 2.5** for use with **Question 5** 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.

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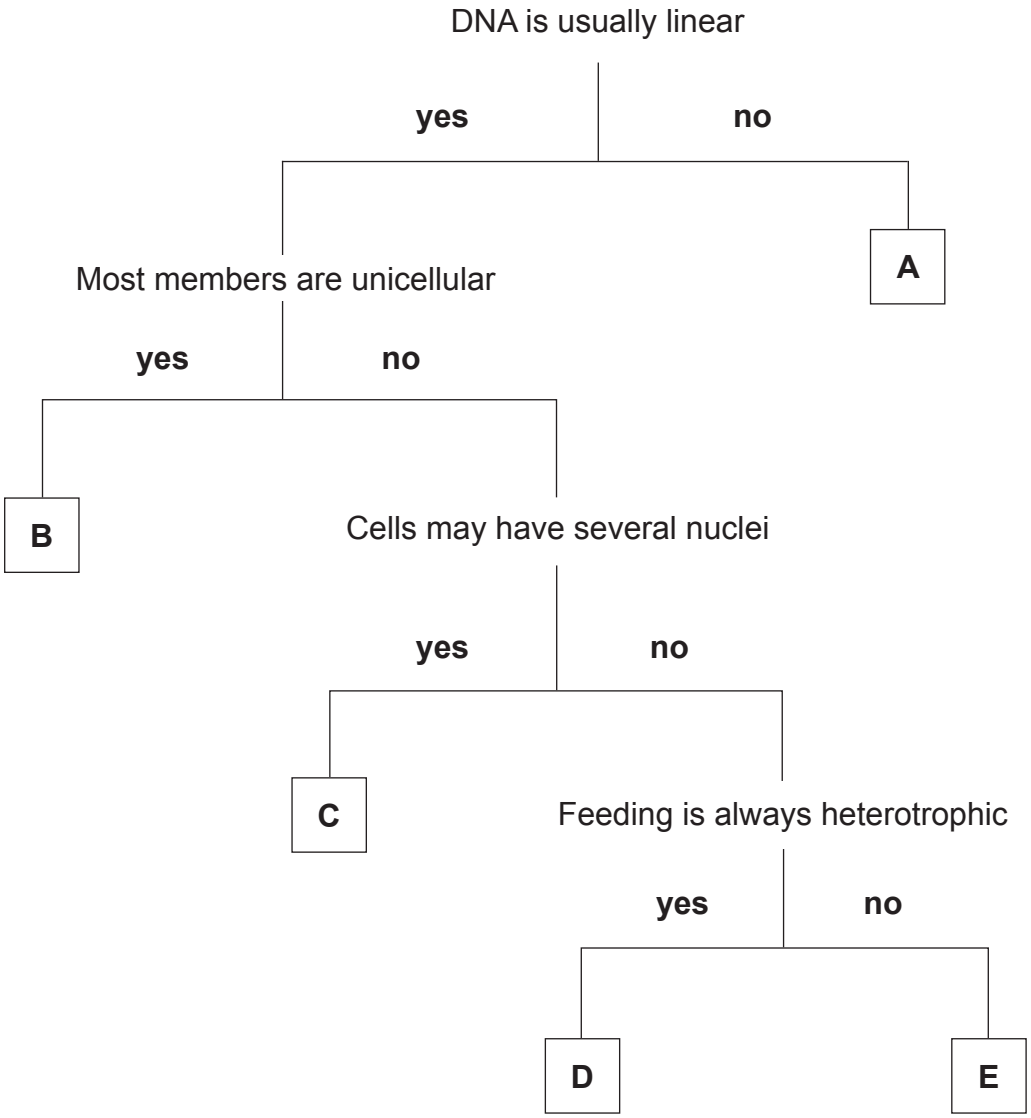
Section A

1 Using the key below, identify the five kingdoms of living organisms labelled **A–E**.



A _____

B _____

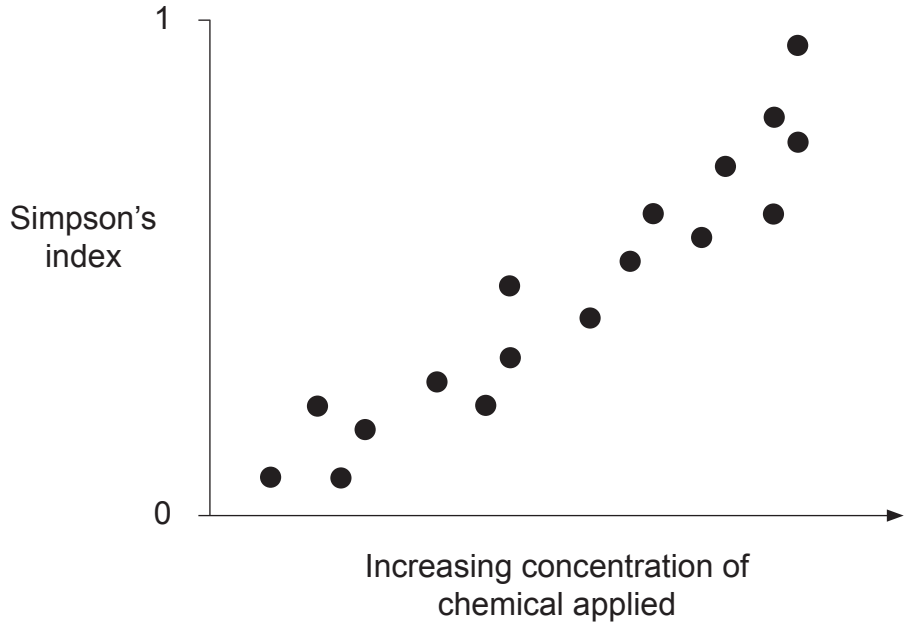
C _____

D _____

E _____ [5]

[Turn over

2 **(a)** Many farmers apply chemicals to their fields to kill weeds. An investigation was carried out into the effect of one of these chemicals on biodiversity. The results are summarised in the graph below.
(Simpson's index is a measure of biodiversity.)



(i) State the term used for a chemical that kills weeds.

_____ [1]

(ii) Describe and explain the relationship shown in the graph.

Description

_____

_____

_____

Explanation

_____

_____

_____

_____

_____

_____

_____ [4]

(b) Government regulations are in place to ensure that farmers manage their hedgerows in a way that promotes biodiversity. One such regulation states that hedgerows should only be cut at certain times of the year.

Suggest when farmers should cut hedgerows and explain how this would promote biodiversity.

_____

_____

_____

_____

_____ [2]

[Turn over

3 **(a)** Fick's Law states that the rate of diffusion increases if the concentration gradient is high and/or the diffusion distance is short.

(i) With reference to the mammalian respiratory system, describe how a high concentration gradient is maintained between the alveolus and the blood.

_____

_____

_____

_____

_____

_____ [2]

(ii) Describe how a short diffusion distance is created between the alveolus and the blood.

_____

_____

_____ [1]

(iii) According to Fick's Law, a third factor contributes to an increased rate of diffusion across an exchange surface. Identify this factor and describe how it is achieved in the lungs.

_____

_____

_____

_____

_____ [2]

(b) Special cells around the alveoli secrete a substance called surfactant. Some premature babies cannot produce enough of this substance and therefore need assistance to breathe.

State the function of surfactant and suggest, with reference to Fick's Law, how a lack of it would result in poor gas exchange in premature babies.

_____

_____

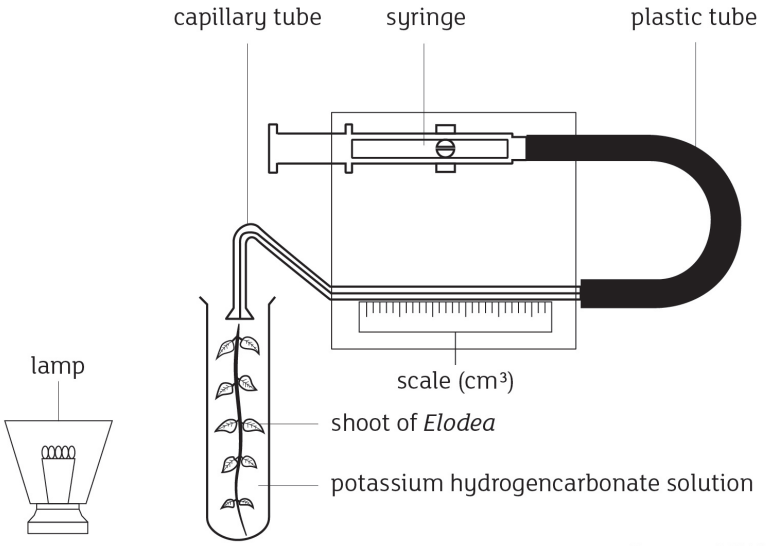
_____

_____

_____

_____ [2]

4 The Audus apparatus shown below was used to measure the volume of oxygen produced by a shoot of pondweed (*Elodea*) over 15 minutes in each of three different light intensities. This data could be used to indicate the rate of photosynthesis in this aquatic plant.



Source: CCEA

(a) (i) State the function of the syringe in this apparatus.

_____

_____

_____ [1]

(ii) Describe how the independent variable could have been changed.

_____

_____

_____ [1]

(iii) Name **one** variable, other than time, that would need to have been kept the same. Explain how this variable would be controlled.

_____

_____

_____

_____

_____ [2]

(b) The experiment was carried out three times in each light intensity and the results are shown in the table below.

Light intensity	Volume of oxygen collected in 15 minutes/cm³		
High	10.5	10.5	9
Medium	6	5.5	4.5
Low	2	3	1.5

(i) Calculate the average rate of oxygen collection per hour at **high** light intensity.

(Show your working.)

_____ $cm^3\ hour^{-1}$ [3]

[Turn over

(ii) Suggest why the volume of oxygen collected would be less than the total oxygen produced by this shoot.

_____

_____

_____ [1]

(c) Using the diagram of the apparatus provided, suggest how the accuracy of the results could be improved.

_____

_____

_____ [1]

5 **Photograph 2.5** is a photomicrograph of a transverse section through the root of a buttercup *(Ranunculus repens)*.

(a) In the space below, draw a block diagram to show the tissues present in the root, as shown in the photomicrograph. Label your diagram to identify **four** tissues.

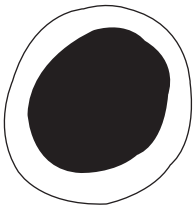
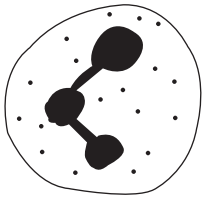
[5]

Some of the tissues shown in the photomicrograph are involved in the transport of water and minerals in the plant.

(b) Describe concisely how water is transported up a stem according to the cohesion-tension theory.

[3]

(c) In mammals, blood is involved in both transport and defending the body against disease. Some of the white blood cells involved in defence are shown below. Complete the table by naming the three types of white blood cell shown and stating the function of each.

Diagram	Name	Function
		
		
		

[3]

[Turn over

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6 In the UK the peppered moth *(Biston betularia)* has two distinct forms, a light peppered form and a dark melanic form, as shown in the photographs below. Before the UK became industrialised, the light form was more common and the dark form was rare.

Light form

Dark form

(a) (i) State the genus of the peppered moth.

_____ [1]

(ii) Despite the different appearance, the two forms are classified as the same species. Define the term 'species'.

_____

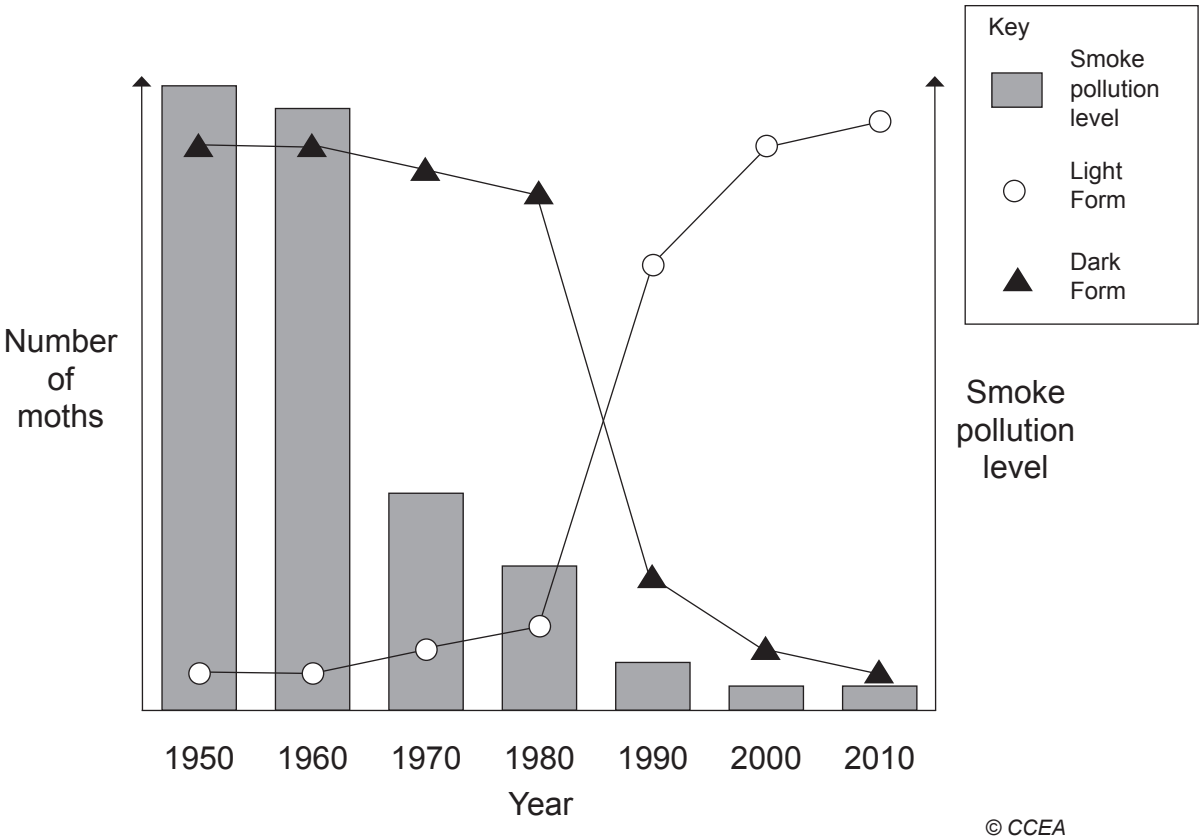
_____

_____ [1]

[Turn over

(b) During the day, the moths rest on lichen-covered tree branches and trunks where they are vulnerable to predation by a range of birds.

As a result of the Industrial Revolution, smoke pollution increased significantly in the UK, and tree trunks in many areas became blackened by soot. In the 1950s controls were put in place to reduce air pollution. The graph below shows pollution levels and the relative number of each form of moth between 1950 and 2010.



(i) Estimates of the numbers of the two forms were made by sampling the moths found on tree trunks. Suggest how this may result in an underestimation of numbers.

_____

_____

_____ [1]

(ii) Name the type of selection demonstrated by the data and explain the change in numbers of the **light** form from **1970** to 2010.

Type of selection

_____

Explanation

_____

_____

_____

_____

_____

_____

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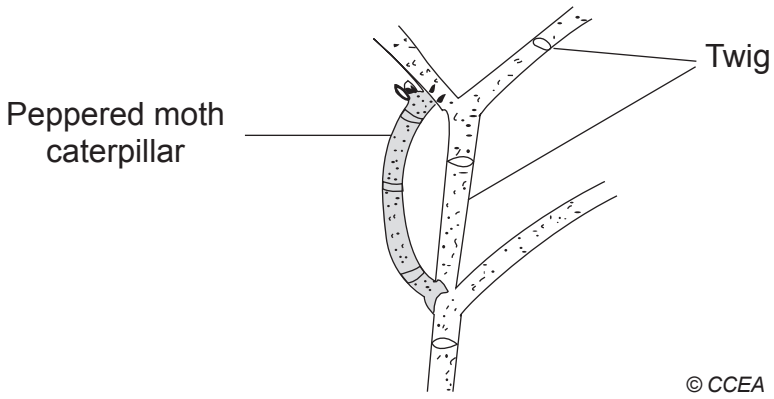
_____

_____

_____ [4]

(c) The diagram below represents the caterpillar of the peppered moth attached to a twig. Suggest how the caterpillar avoids predation.



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_____ [1]

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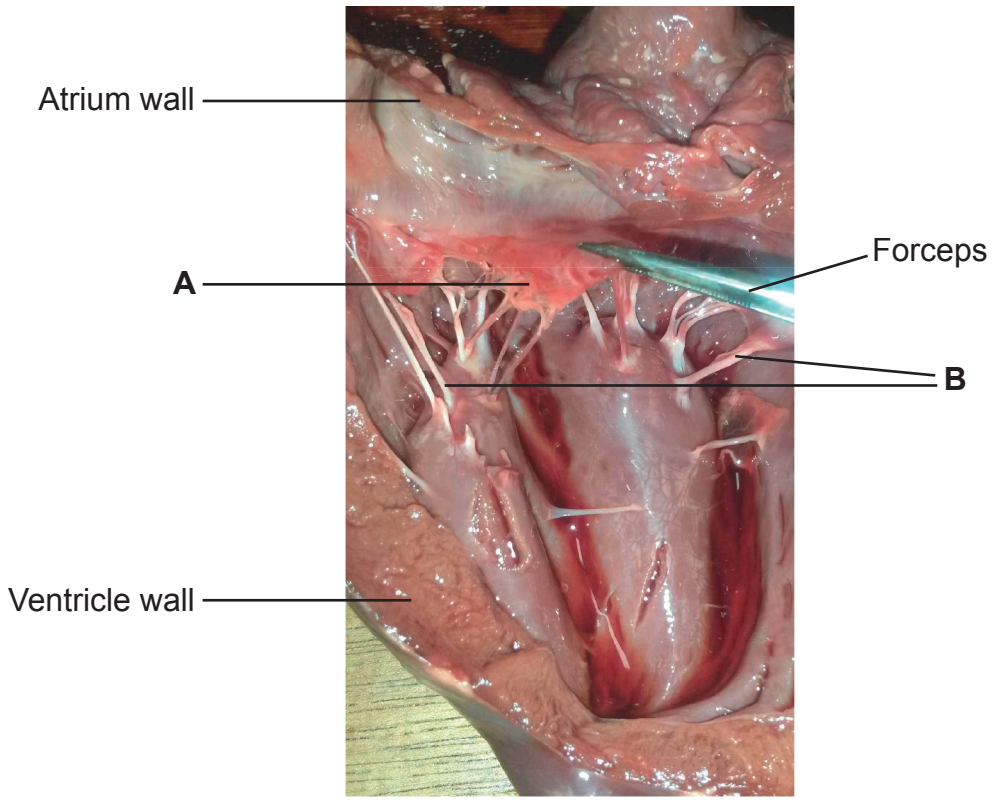
(Questions continue overleaf)

7 The heart contains several structures which are necessary for its function of pumping blood in one direction. The photograph below shows the left side of the heart when dissected.



(a) (i) Name the structures labelled **A** and **B**.

A _____

B _____ [2]

(ii) Explain how structures **A** and **B** ensure that blood flows through the heart in one direction.

A _____

_____

B _____

_____ [2]

(iii) Explain the difference in thickness of the atrium and ventricle walls as shown in the photograph.

_____

_____

_____

_____ [2]

(iv) Semi-lunar valves also have a role in maintaining the blood flow through the heart. Explain what causes these valves to open during ventricular systole.

_____

_____ [1]

[Turn over

(b) The sinoatrial node (SAN) is often referred to as the pacemaker of the heart.

(i) State precisely the location of the SAN in the heart.

_____ [1]

(ii) Describe how a wave of excitation, which originates in the SAN, eventually results in ventricular systole.

_____

_____

_____

_____

_____

_____

_____

_____

_____

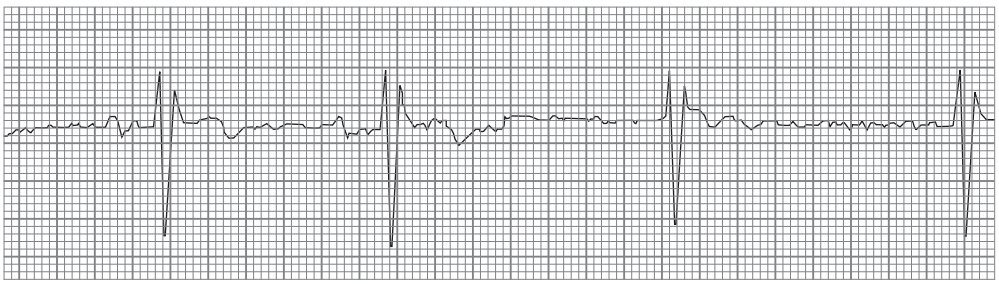
_____

_____

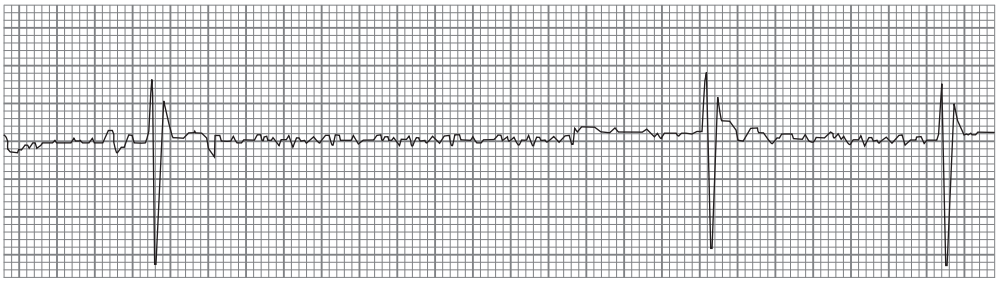
_____ [4]

(c) Sick Sinus Syndrome (SSS) is a condition where the SAN malfunctions. The ECGs below are from a healthy individual and an individual with SSS.

ECG from a healthy person



ECG from an individual with SSS



Symptoms of this condition include tiredness and fainting. Using the information in the ECGs, suggest a reason for these symptoms.

_____

_____

_____ [1]

[Turn over

Section B

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

8 Marram grass *(Ammophila arenaria)* is a plant species found in the sand dune system at Murlough Nature Reserve in County Down. After sampling the sand dunes, *A. arenaria* was found to be most abundant in the dunes closest to the shore, where water retention by the soil is very poor.

(a) Describe how the abundance of *A. arenaria* could be sampled along the sand dune system. [4]

(b) Describe and explain the environmental factors that affect the rate of transpiration in a plant and suggest **two** adaptations the leaves of *A. arenaria* may have to survive in a sand dune habitat. [9]

Quality of written communication [2]

(a) Describe how the abundance of *A. arenaria* could be sampled along the sand dune system.

[Turn over

(b) Describe and explain the environmental factors that affect the rate of transpiration in a plant and suggest **two** adaptations the leaves of *A. arenaria* may have to survive in a sand dune habitat.

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

Examiner Number

GCE Biology Advanced Subsidiary (AS)
Assessment Unit AS2
Organisms and Biodiversity
Summer 2017

Photograph 2.5
(for use with Question 5)