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Centre Number	
71	

Candidate Number

ADVANCED
General Certificate of Education
2011

Biology

Assessment Unit A2 1

assessing

Physiology and Ecosystems

[AB211]

AB211

MONDAY 16 MAY, MORNING

TIME

2 hours.

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 nine** questions.
You are provided with **Photographs 1.2 and 1.6** for use with Questions 2 and 6 respectively in this paper.
Do not write your answers on these photographs.

INFORMATION FOR CANDIDATES

The total mark for this paper is 90.
Section A carries 72 marks. Section B carries 18 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 **25 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	

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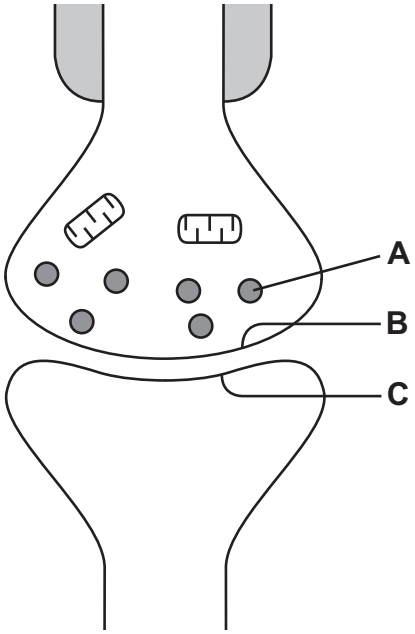
Marks	Remark

Section A

1 **(a)** **(i)** The diagram below shows two adjacent neurones at a synapse, as seen using an electron microscope.

Three important features of the synapse are labelled **A**, **B** and **C**.



The table below lists four statements describing functions of certain features of a synapse.

Number	Statement
1	stores acetylcholine
2	location of acetylcholine receptor sites
3	provides energy for the re-synthesis of acetylcholine
4	location of exocytosis of acetylcholine

Complete the table below by matching the labelled feature with the number of the most appropriate statement.

Feature	Statement number
A	
B	
C	

[3]

(ii) Mark **on the diagram** above:

– with **X**, the location of an excitatory post synaptic potential

– with **Y**, a structure necessary for saltatory conduction. [2]

(b) Explain why transmission between neurones is unidirectional.

_____

_____ [1]

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2 **(a)** **Photograph 1.2** shows a photomicrograph of a section through skeletal muscle.

(i) Identify the features labelled **A** to **D**.

A _____

B _____

C _____

D _____ [4]

(ii) The H-band (H-zone) is not very obvious in the photograph. What does this suggest about the state of the muscle at the time the photograph was taken?

_____

_____ [1]

(b) What is the role of calcium ions in muscle contraction?

_____

_____ [1]

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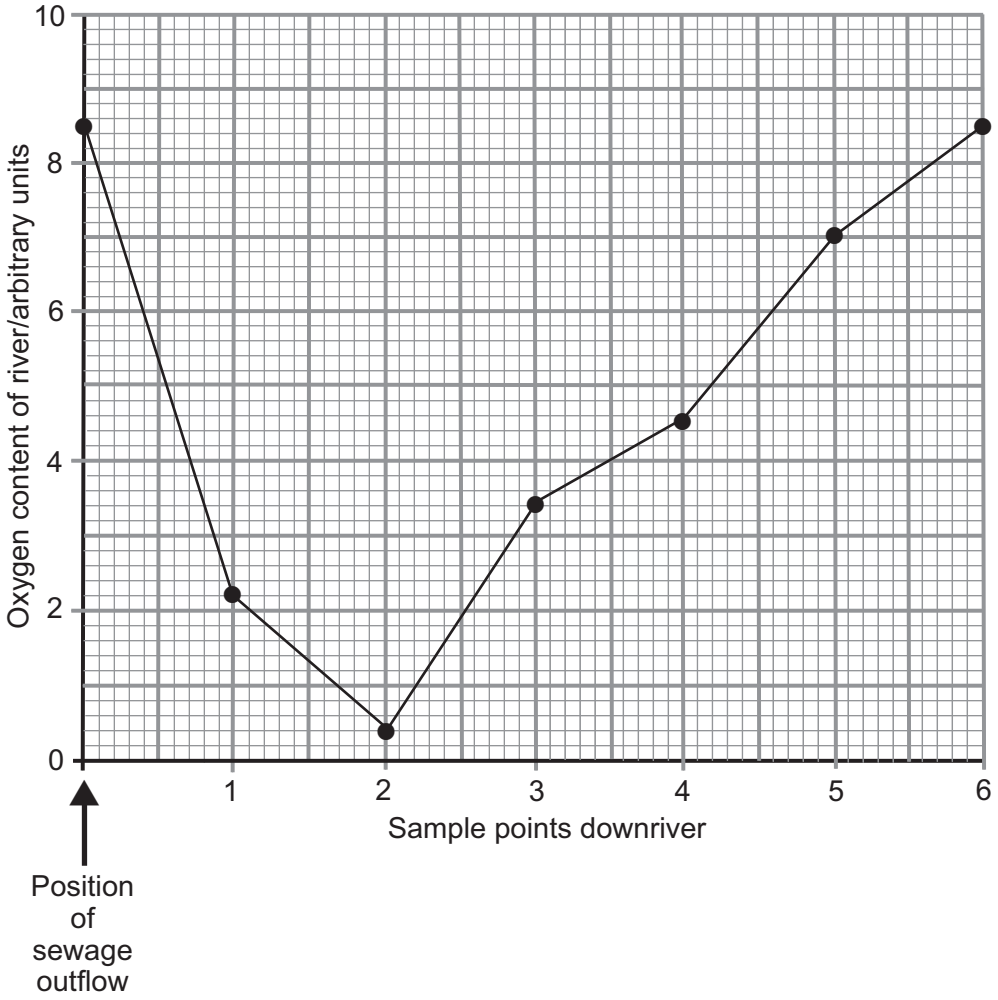
Marks	Remark

3 A river, otherwise unpolluted, was sampled from the source of a sewage outflow. Oxygen content of the river was measured at the point of outflow and at intervals downriver. The results are shown in the graph below.



(a) **(i)** Calculate the percentage decrease in the oxygen content between the sewage outflow and sample point **2**. (Show your working.)

_____ % [2]

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(ii) Explain this decrease in oxygen content.

_____

_____

_____

_____

_____

_____

_____ [3]

(b) Suggest **two** reasons for the increase in oxygen content from sample points **2** to **6**.

1. _____

_____

2. _____

_____ [2]

(c) Identify the sample point from the graph where you would expect to find the lowest biodiversity in the river. Explain your answer.

_____

_____

_____ [2]

(d) Aquatic invertebrates can act as 'indicator species' in monitoring river pollution. Suggest why these species are a better indicator of pollution than chemical tests for oxygen levels.

_____

_____

_____

_____ [2]

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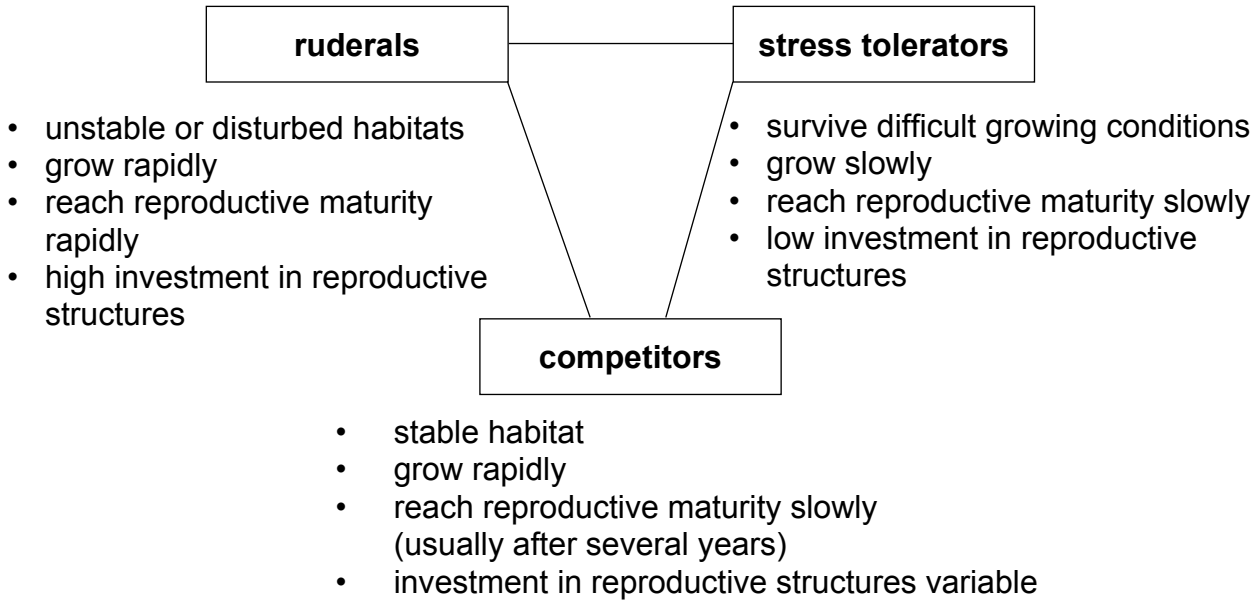
4 **(a)** According to their ecological role, plants may be grouped as 'competitors' or 'ruderals' or 'stress tolerators'. The features of each of these groups are summarised in the diagram below.



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Marks	Remark

(i) State which group shows characteristics typical of r-selected species.

_____ [1]

(ii) Many crop plants, such as carrots and cabbages, are classed as competitors. Suggest why farmers would choose competitors as crop plants rather than ruderals or stress tolerators.

Competitor rather than ruderal.

_____

_____

_____

Competitor rather than stress tolerator.

_____

_____

_____ [2]

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(b) Most crop plants can be affected by pests.

(i) Define what is meant by a 'pest'.

_____

_____ [1]

(ii) Describe **two** disadvantages of using broad spectrum, non-biodegradable pesticides to protect crops.

1. _____

_____

2. _____

_____ [2]

(c) The use of pesticides can maximise profit for the farmer but will not increase the carrying capacity for a crop species in a particular environment.

Suggest **one** way in which the farmer can increase the carrying capacity for a crop species.

_____

_____ [1]

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5 **(a)** Flowering in many plants will only take place when the photoperiod (relative length of day and night) is appropriate. It is controlled by a photoreceptor pigment.

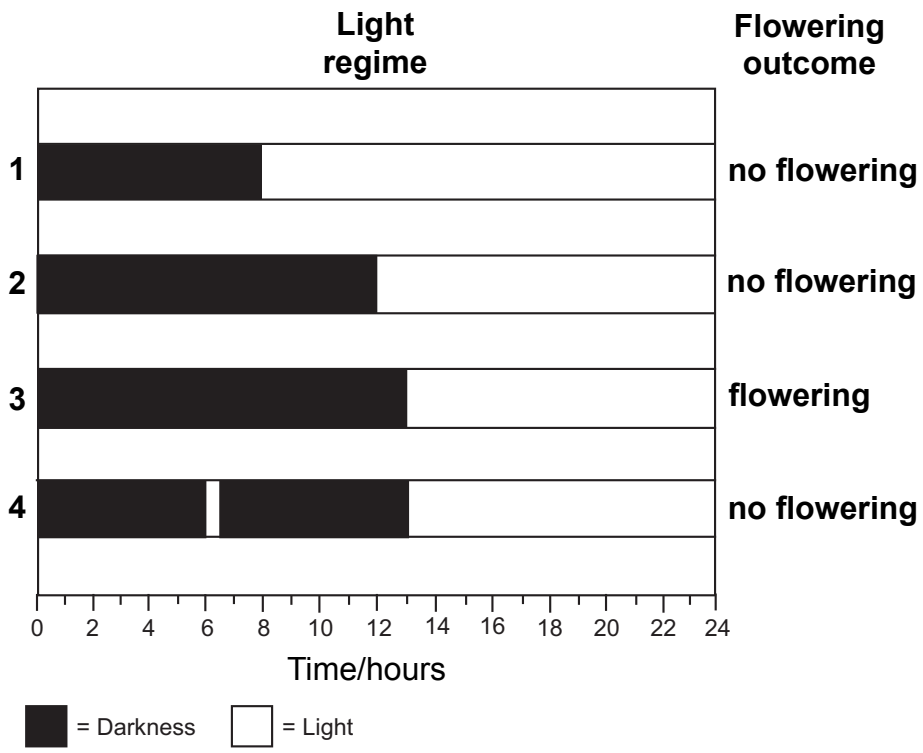
(i) Name the photoreceptor pigment which is involved in the control of flowering in plants.

_____ [1]

(ii) In which part of the plant is the photoreceptor pigment located?

_____ [1]

The outcome for flowering in chrysanthemum plants when exposed to four different light regimes is shown in the diagram below.



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Marks	Remark

(iii) Using the information in the diagram, determine whether the chrysanthemum is a short-day or long-day plant. Explain your answer.

_____

_____

_____

_____ [2]

(iv) Using your understanding of the phytochrome system, explain the difference in flowering outcomes in light regimes **3** and **4**.

_____

_____

_____

_____

_____

_____

_____ [3]

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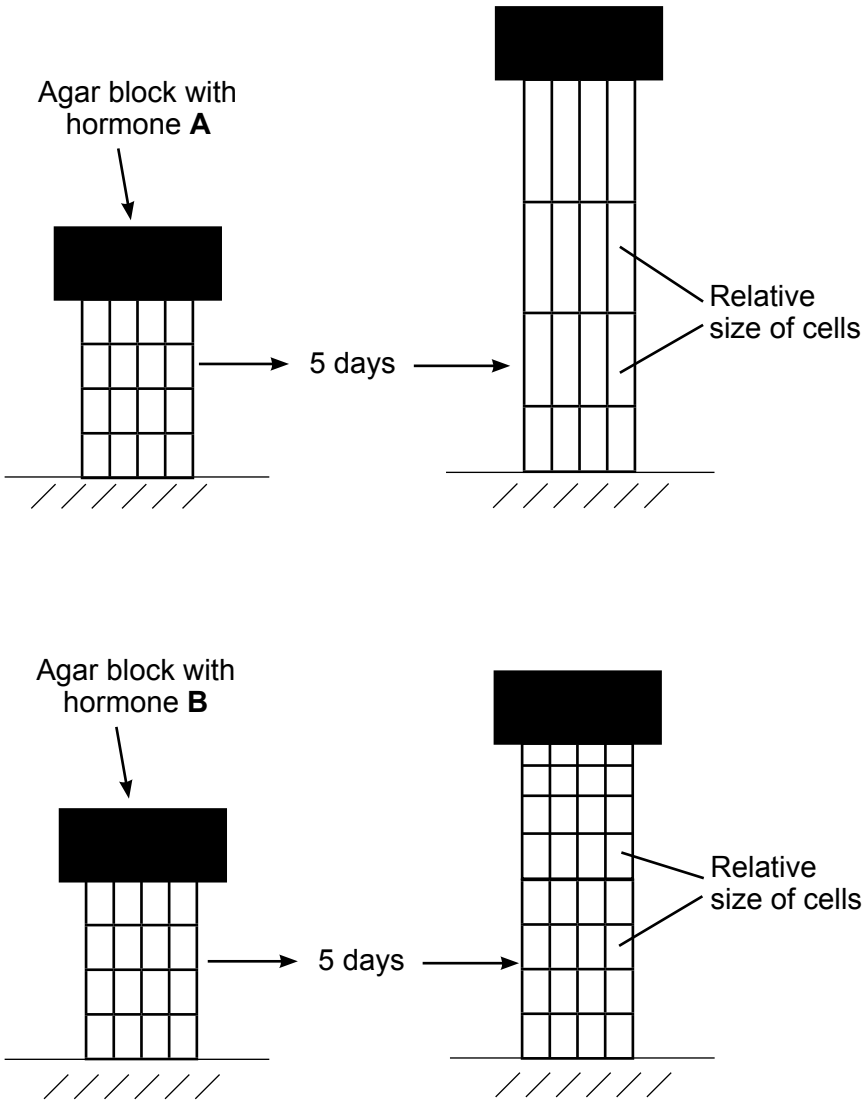
(b) Two plant hormones, **A** and **B**, were applied to decapitated shoots. The effect of each hormone, after five days, on the relative size of the cells within the shoots is shown in the diagram below.



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(i) Describe the effect of each hormone and identify hormones **A** and **B**.

_____

_____

_____

_____

_____

_____

_____ [3]

(ii) Suggest an appropriate control for this experiment. Explain why a control is necessary.

_____

_____

_____

_____ [2]

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6 **Photograph 1.6** shows part of a lake surrounded by forest which is the climax community in this environment. An imaginary transect line has been drawn from the lake, at point **A**, to the edge of forest at point **C**. Along this transect line there is evidence of succession.

(a) Explain what is meant by the terms 'succession' and 'climax community'.

Succession _____

_____

_____

Climax community _____

_____

_____ [2]

(b) Some of the plants have been labelled. Using the information in the photograph, describe and explain the process of succession that is suggested along the transect line from point **A** to point **C**.

_____

_____

_____

_____

_____

_____

_____

_____

_____ [4]

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Marks	Remark

(c) In the photograph both vetch and alder have been identified. Both these plants have the ability to fix nitrogen.

(i) Explain the meaning of the term 'nitrogen fixation'.

_____

_____ [1]

(ii) Explain how the subsequent decay of vetch and alder leaves may help to increase the level of nitrate available to other plants.

_____

_____

_____

_____

_____

_____

_____ [3]

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Marks	Remark

7 The human body has different lines of defence against bacteria and viruses. These range from natural barriers preventing their entry to specific reactions once entry is gained.

(a) **(i)** Describe how tears act as a barrier to entry.

_____

_____ [1]

(ii) Antibodies are produced which specifically react with the type of bacterium or virus which has entered the body. Antibodies are made of protein. Using your understanding of protein structure, explain why protein is suitable for this role.

_____

_____

_____

_____

_____

_____ [3]

(b) In the winter of 2010–2011, many of the patients occupying hospital intensive care beds were suffering from swine flu (a viral infection). Most of these patients were young while it appeared that many older people were less affected. It is suggested that many older people have gained immunity through coming into contact with similar viruses many years ago.

Suggest how previous infection with similar viruses may have made older people immune to swine flu, so preventing them becoming ill.

_____

_____

_____

_____

_____

_____

_____

_____ [4]

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Marks	Remark

8 Native hardwood (oak) forest and softwood (spruce) commercial plantations are very different ecosystems.

A comparison was made of the light intensity at ground level in an oak forest and a spruce plantation. In this investigation, light intensity on the woodland floor was calculated as a percentage of the light intensity outside the woodland (where there is no shade).

(a) Explain why the percentage daylight data for each month would have been an average of a number of measurements made at different regions of the woodland floor.

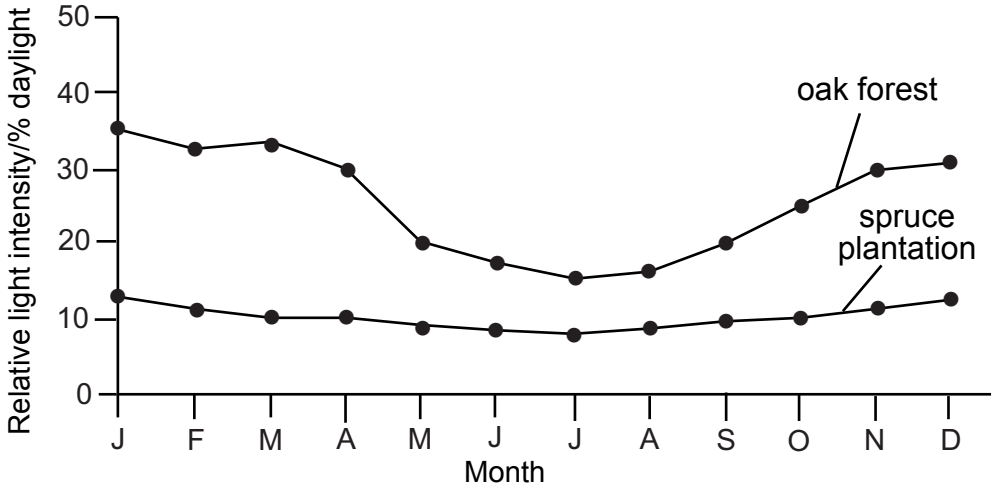
_____

_____

_____

_____ [2]

The results of the investigation are shown in the graph below.



(b) (i) Using the information in the graph, suggest which woodland would show greater diversity. Explain your choice.

_____

_____

_____

_____

_____

_____

_____ [4]

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Marks	Remark

(ii) Scientists estimated the biodiversity in each type of woodland by counting the number of species and the number of each species present in 30 quadrats within each type of woodland. They carried out this survey in mid-June.

Suggest **one** reason why their survey probably underestimated the biodiversity in the woodlands.

_____

_____ [1]

(c) The scientists wanted to monitor the numbers of a species of beetle that lived on the floor of the spruce plantation over a three year period.

Describe how they could use a mark/recapture technique to obtain a reliable estimate of the number of beetles.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____ [5]

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Section B

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

9 Give an account of

(a) the kidney and excretion [11]

(b) osmoregulation and the kidney [5]

(a) The kidney and excretion

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(b) Osmoregulation and the kidney

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Extra lined page

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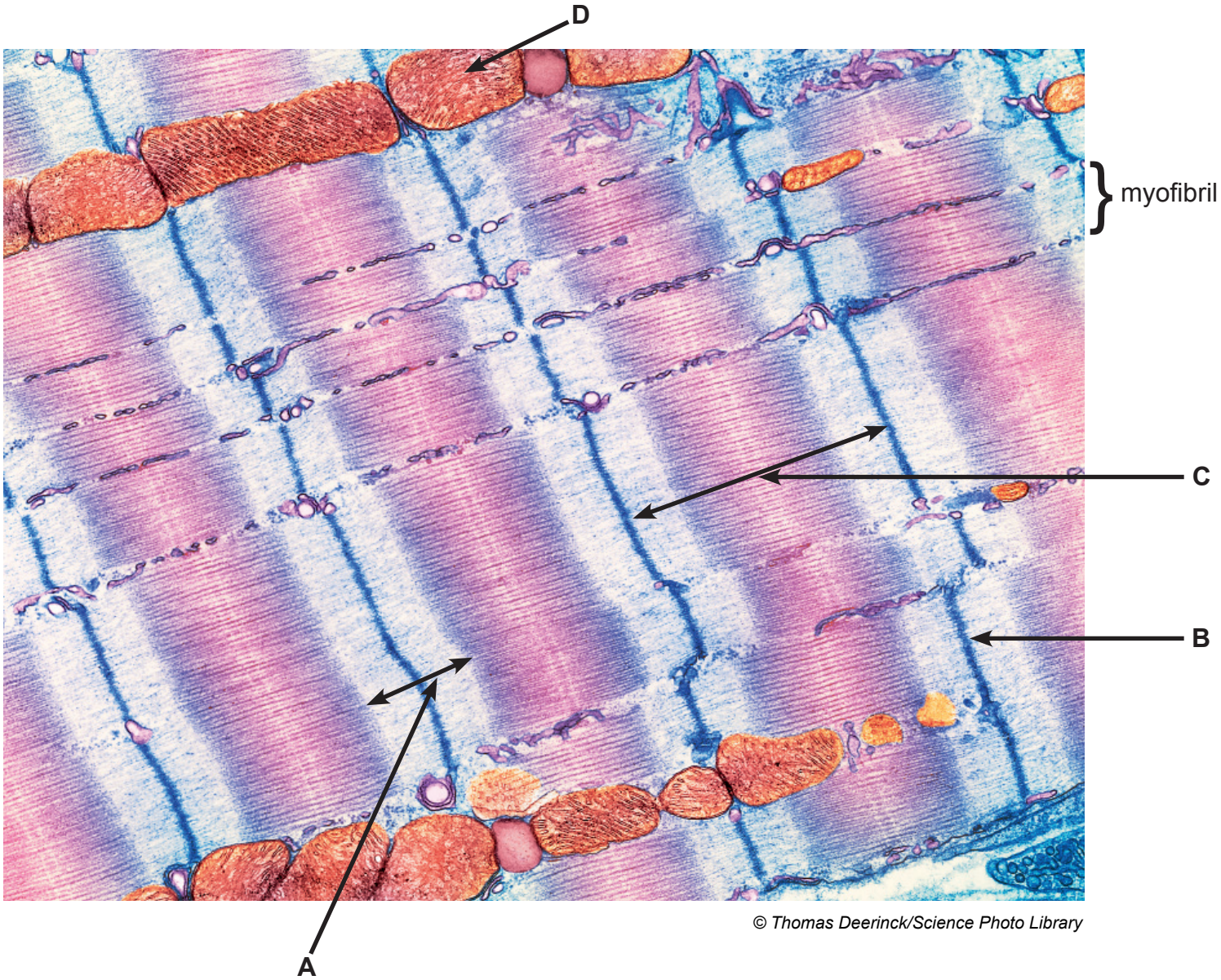
Photograph 1.2
(for use with Question 2)



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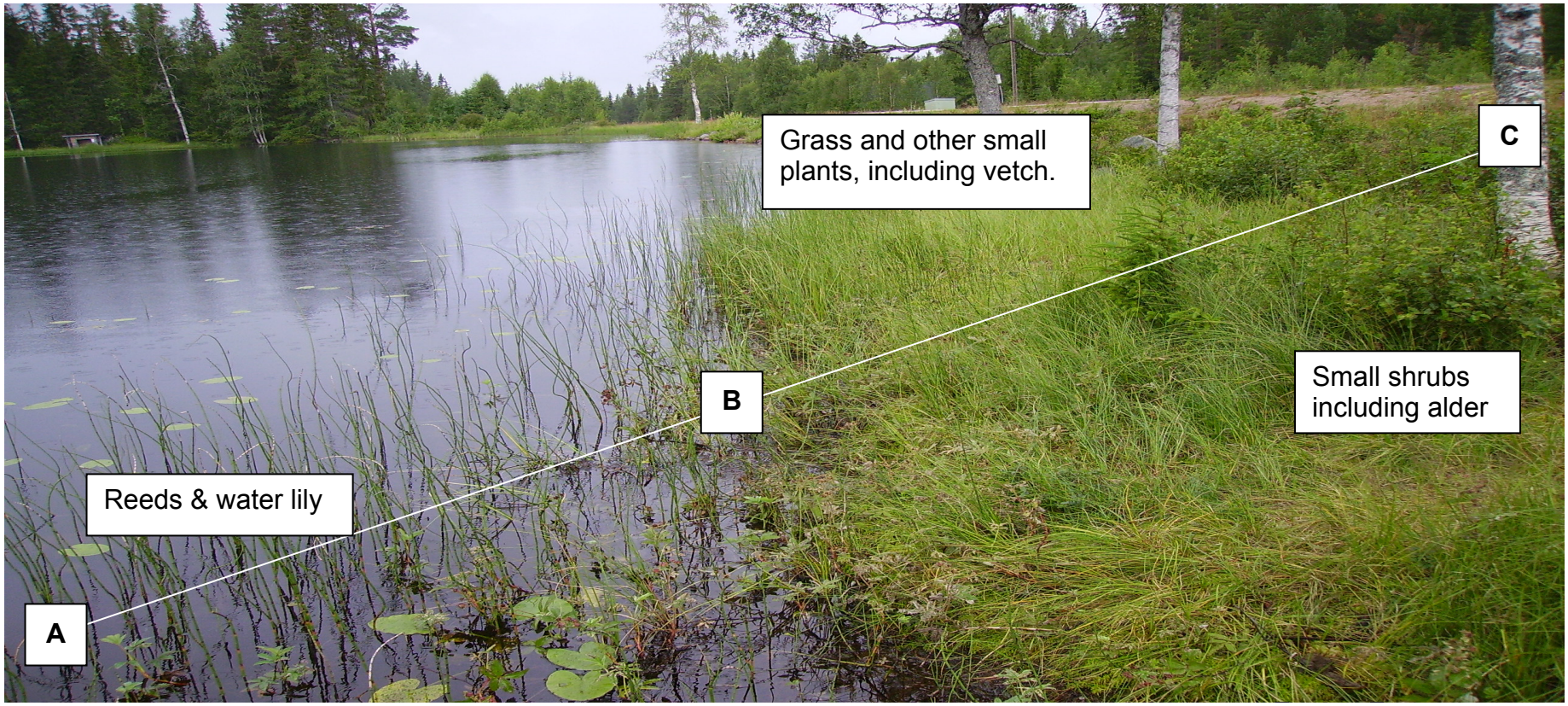
Photograph 1.6
(for use with Question 6)



Source: Principal Examiner