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Centre Number	
71	

Candidate Number

ADVANCED
General Certificate of Education
2009

Biology

Assessment Unit A2 1

assessing

Module 4: Co-ordination, Biochemistry and Environment

[A2B11]

A2B11

TUESDAY 12 MAY, 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 4.8** for use with Question **8** 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.
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**.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.

For Examiner's use only	
Question Number	**Marks**
1	
2	
3	
4	
5	
6	
7	
8	
9	
Total Marks	

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Section A

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

(a) All of the populations of organisms inhabiting a common environment and interacting with one another.

_____ [1]

(b) The relatively stable end-stage of a succession which is in equilibrium with the environment.

_____ [1]

(c) The process by which certain bacteria, living in poorly aerated soils, break down nitrates releasing nitrogen back into the atmosphere.

_____ [1]

(d) The addition of nutrients to water, especially in lakes, resulting in an algal bloom.

_____ [1]

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2 Read the following passage on the immune response to a viral infection, and write the most appropriate word or letter in the blank spaces to complete the account.

Viruses have a capsid, individual proteins of which act as

_____ and attach to specific receptors on a

_____ lymphocyte. This clones to produce many

_____ cells which produce _____,

ultimately leading to the destruction of the virus.

Cells infected with viruses present a viral protein on their cell-surface membrane. This is recognised by a specific _____ lymphocyte which clones to produce a variety of cells.

_____ cells stimulate the action of other cells in the immune system, while _____ cells lyse the viral-infected cells.

In both cases _____ cells are produced which are used in future infections of the same virus. [6]

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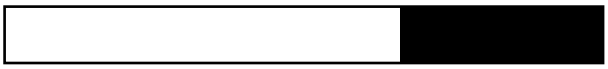
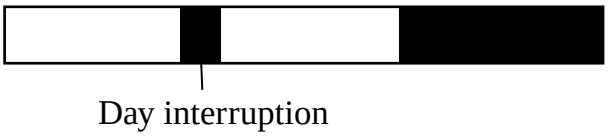
3 The table below summarises the effects of day-length, night/day interruption[illegible]ffect of interruptions by both red (R) and far-red light (FR) on the flowering activity [illegible]y and long day plants.

Complete the table by indicating whether the plant would flower (✓) or not flower (✘).

Light regime	Flowering response	
	Short day plant	**Long day plant**
 Day Night		
		
 Night interruption		
 Day interruption		
 R FR		
 R FR R		

[6]

Examiner Only	
Marks	Remark

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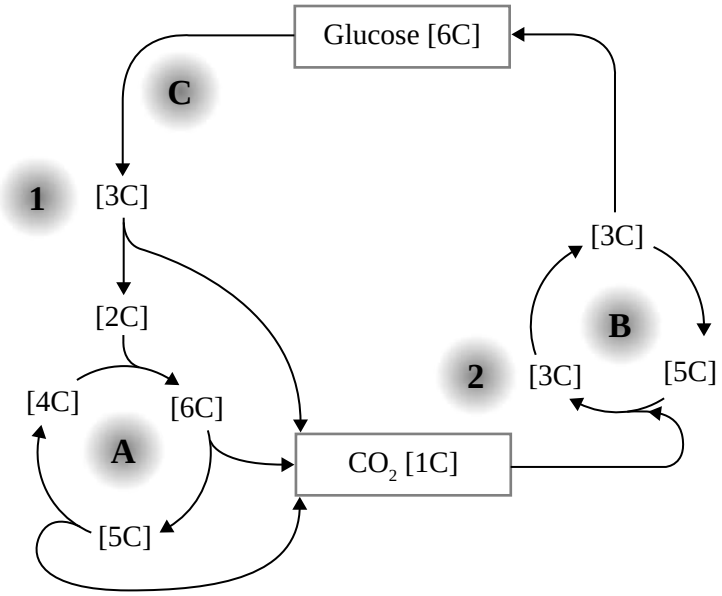
4 The diagram below illustrates the flow of carbon through metabolic pathways in the mesophyll cell of a leaf. The number of carbon atoms [C] within individual compounds is shown.



(a) Identify the three-carbon compounds labelled **1** and **2**.

1. _____

2. _____ [2]

(b) Identify the cycles occurring at **A** and **B** in the diagram.

A _____

B _____ [2]

(c) State the location of **A**, **B** and **C** within the mesophyll cell.

A _____

B _____

C _____ [3]

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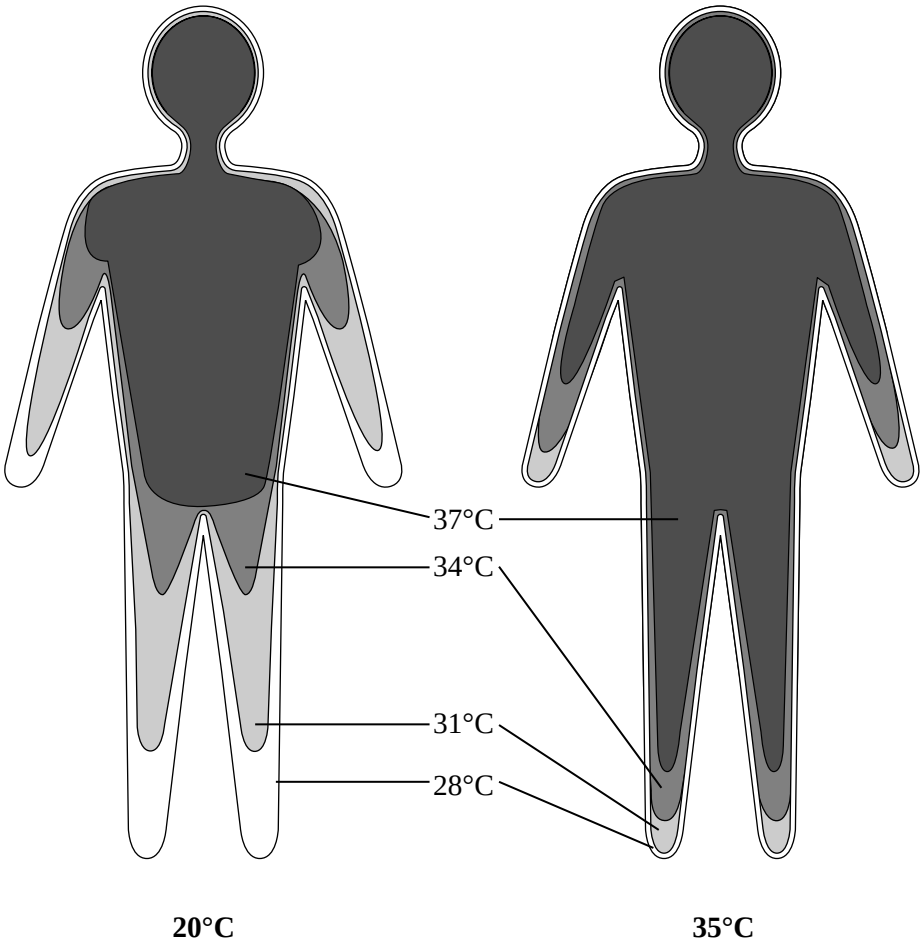
5 The diagram below represents the temperature distribution in different parts of the body of a naked human when exposed to two different external temperatures, 20 °C and 35 °C. (The different body temperatures are illustrated as different shades of grey.)



Source: New Perspectives in Advanced Biology, Martin Hanson, Hodder & Stoughton, 1999.

(a) Describe the trends evident in the diagram.

_____

_____

_____

_____ [2]

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(b) Calculate the percentage reduction in temperature from the body core to the foot in a naked human in an external temperature of 20 °C. (Show your working.)

Answer _____ [2]

(c) Explain how the distribution of blood is altered and its effect on heat exchange when a human is exposed to 20 °C.

_____

_____

_____

_____ [2]

(d) Suggest **one** other way in which heat loss to the environment can be reduced.

_____

_____ [1]

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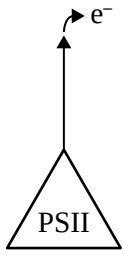
6 The diagram below shows the flow of electrons from photosystem II (PSII) within an illuminated chloroplast.



(a) (i) Explain what happens to cause this flow of electrons from PSII.

_____

_____

_____

_____ [2]

(ii) State the precise location of PSII within a chloroplast.

_____ [1]

(b) The flow of electrons from PSII can be studied by using an artificial electron acceptor, DCPIP, in an illuminated chloroplast suspension. DCPIP changes from blue to colourless upon reduction.

(i) Describe what should happen to the DCPIP in the illuminated chloroplast suspension.

_____

_____ [1]

(ii) Suggest how, experimentally, you could measure the change in colour.

_____

_____ [1]

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(c) Explain what normally happens to electrons emitted from PSII within an illuminated chloroplast.

_____

_____

_____

_____

_____

_____ [3]

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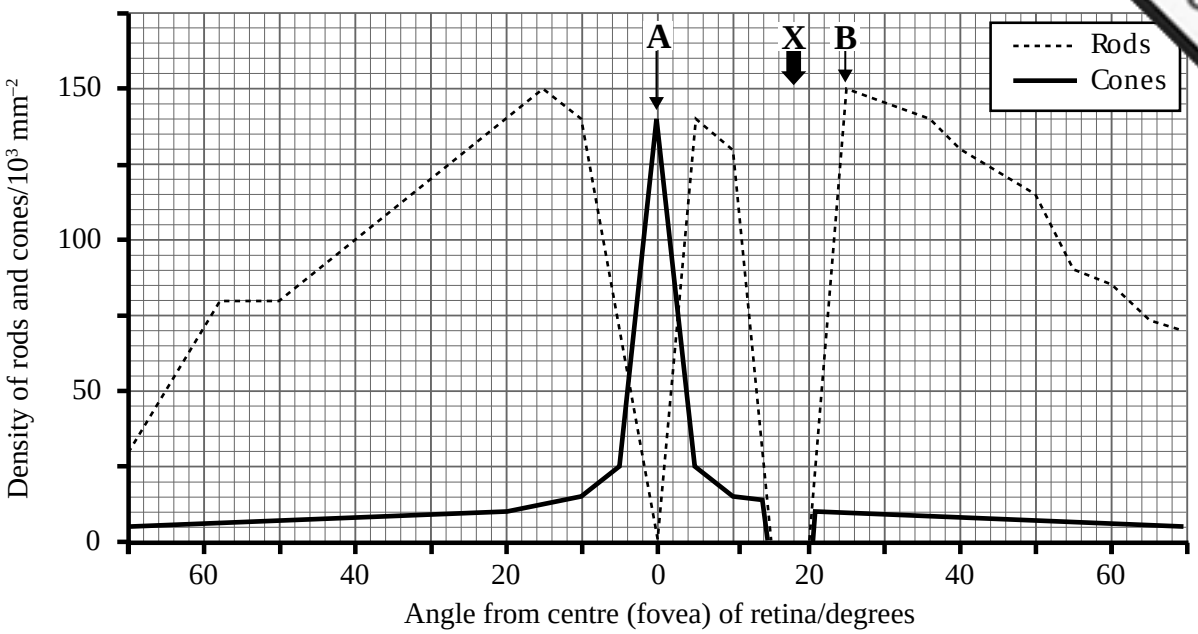
7 The graph below shows the density of cones and rods across the retina of a human eye.



Examiner Only	
Marks	Remark

(a) Analyse the information in the graph, and use your own understanding to answer the questions which follow.

(i) Explain why there is no photoreception at point **X** on the graph.

_____

_____ [1]

(ii) Explain why cones provide visual acuity at **A**, but not at **B**.

_____

_____

_____

_____ [2]

(iii) Explain why rods cannot provide visual acuity, even at **B**.

_____

_____ [1]

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(b) Describe how rods provide light perception even when under conditions of low illumination.

_____

_____

_____

_____ [2]

(c) Describe how cones provide colour perception.

_____

_____

_____

_____ [2]

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8 **Photograph 4.8** shows a transmission electronmicrograph (colour enhanced) of a junction between a nerve ending and a striated muscle fibre. The synaptic knob is shown in blue.

(a) Identify the features labelled **A** and **B**.

A _____

B _____ [2]

(b) Describe the sequence of events that results from an action potential arriving in the synaptic knob and leading to an action potential within the muscle fibre.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____ [5]

(c) Protein filaments within the striated muscle fibre are labelled **1** and **2**. Identify these filaments.

1. _____

2. _____ [2]

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(d) Describe the sequence of events that results from an action potential occurring in the muscle fibre and leading to the contraction of the muscle fibre.

_____

_____

_____

_____

_____

_____

_____

_____

_____ [5]

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Section B

In this section you are expected to answer in continuous prose, supported, where appropriate, by diagrams. You are reminded that up to two marks in this question are awarded for the quality of written communication. [2]

9 Give an account of chemical communication in organisms with particular reference to anti-diuretic hormone in mammals and auxin in plants. [13]

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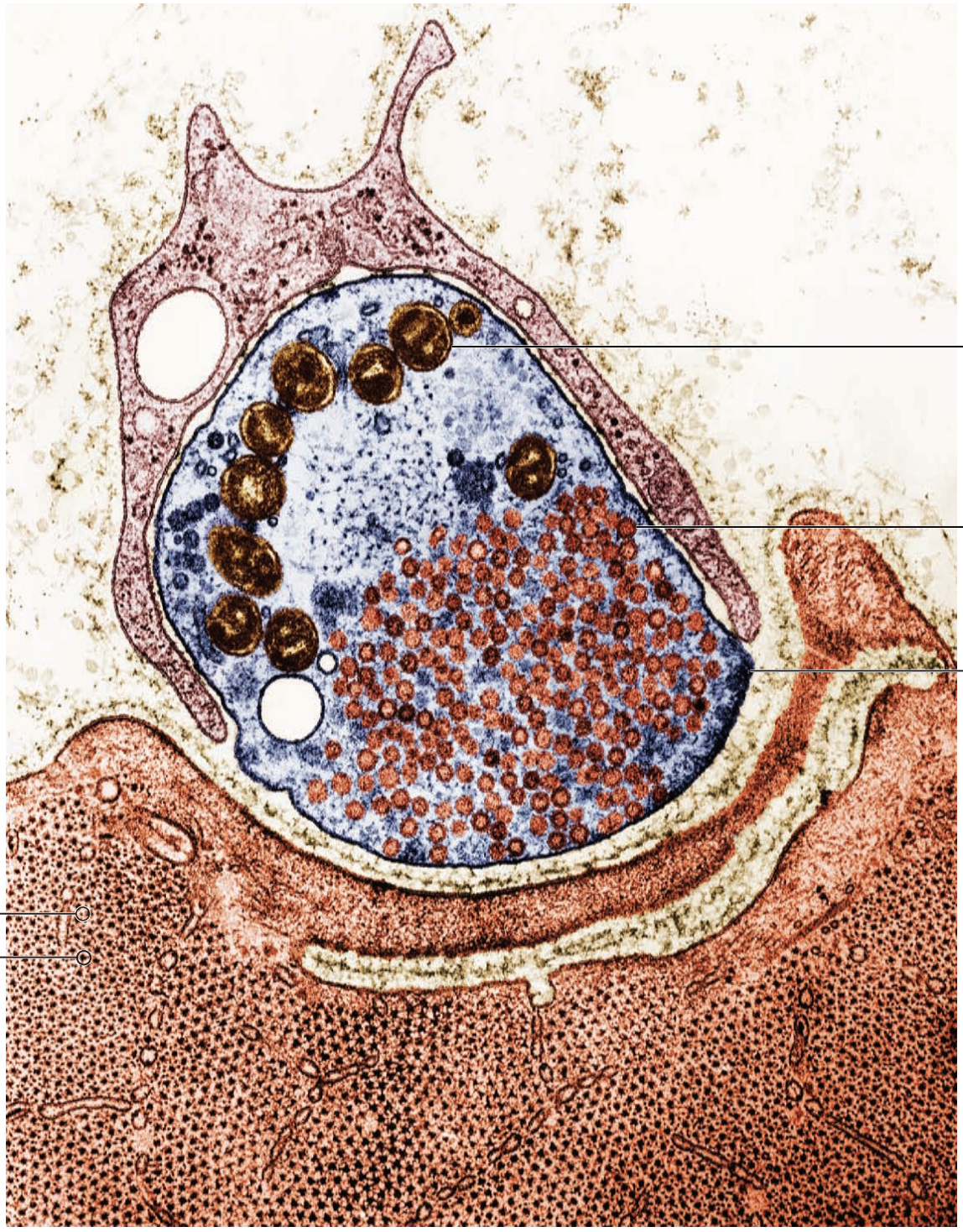
GCE Biology Advanced Assessment Unit A2 1
Module 4: Co-ordination, Biochemistry and Environment
Summer 2009

Photograph 4.8
(for use with Question 8)



Source: Don Fawcett, Science Photo Library

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