



ADVANCED
General Certificate of Education
January 2013

Centre Number

71

Candidate Number

Biology

Assessment Unit A2 1

assessing

Physiology and Ecosystems

[AB211]

FRIDAY 11 JANUARY, AFTERNOON



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 **Photograph 1.4** for use with Question 4 in this paper.

Do not write your answer on this photograph.

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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Section A

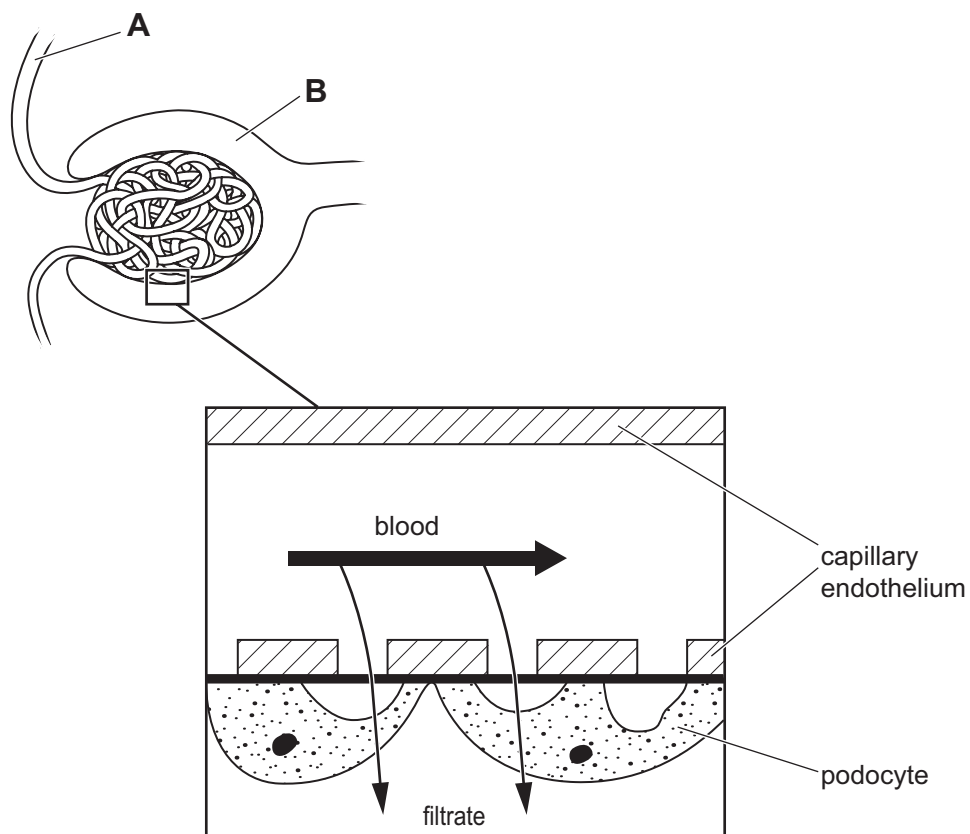
- 1 Read the following passage about the control of flowering in plants and write the most appropriate word(s) in the blank spaces to complete the account.

The pigment _____ is found in the leaves of flowering plants and occurs in two interchangeable forms. In daylight, the _____ form is rapidly changed to the _____ form. Short day plants will flower when the period of _____ reaches or exceeds a minimum length.

[3]

Examiner Only	
Marks	Remark

2 The diagram below shows the site of ultrafiltration in a kidney.



(a) (i) Identify structures **A** and **B** shown on the diagram.

A _____

B _____

[2]

(ii) On the diagram, label and name the structure which is the effective filter in ultrafiltration.

[1]

Blood plasma	Renal filtrate
$\psi_s = -3.5$ $\psi_p = 6.5$	$\psi_s = -0.5$ $\psi_p = 1.2$
$\psi_{\text{plasma}} =$	$\psi_{\text{filtrate}} =$

Using the information provided, calculate the net filtration force.
(Show your working out.)

Net filtration force _____ kPa [2]

- (c)** In healthy individuals, protein does not normally appear in the urine. One indicator of high blood pressure is the presence of protein in the urine. Explain the presence of protein in the urine in someone with high blood pressure.

[1]

Examiner Only	
Marks	Remark

- Suggest how this reduces nitrate enrichment of waterways.

[2]

- An important adaptation in *Phragmites* is that oxygen can be transferred from the leaves, through the stem and into the roots. Diffusion of oxygen out of the roots creates an oxygen-rich environment in the area immediately surrounding the roots. Consequentially oxygen gradients are created over very short distances resulting in localised aerobic and anaerobic conditions – conditions that favour highly diverse microbial populations.

Investigations have shown that constructed reed bed systems are very effective small-scale biofilters (filters of biological materials), particularly in reducing nitrate levels.

- (i) With reference to the nitrogen cycle, explain why localised gradients in oxygen levels are important in the breakdown and removal of organic waste.

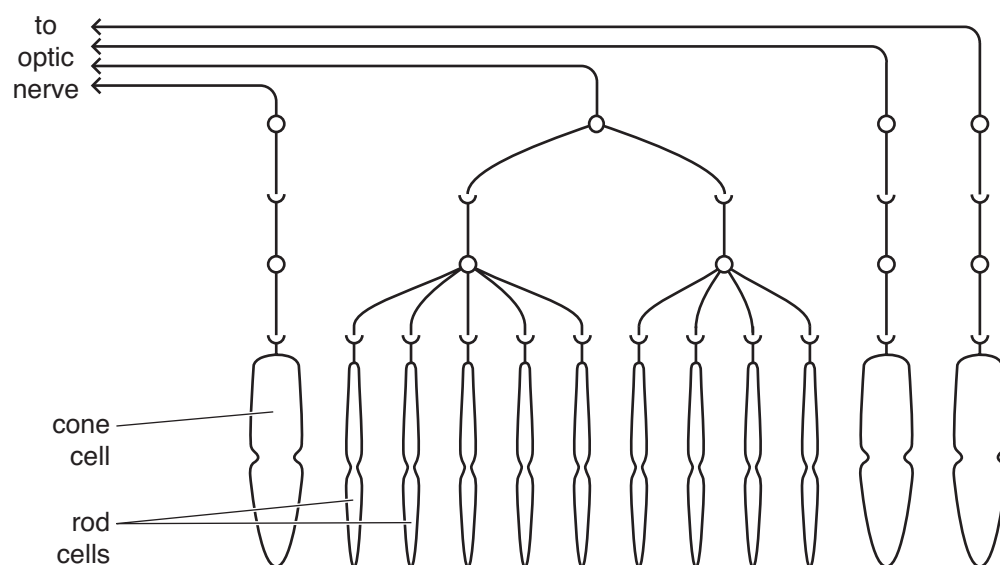
[3]6

-
- [1]

-
- [1]

-
-
-
-
- [2]

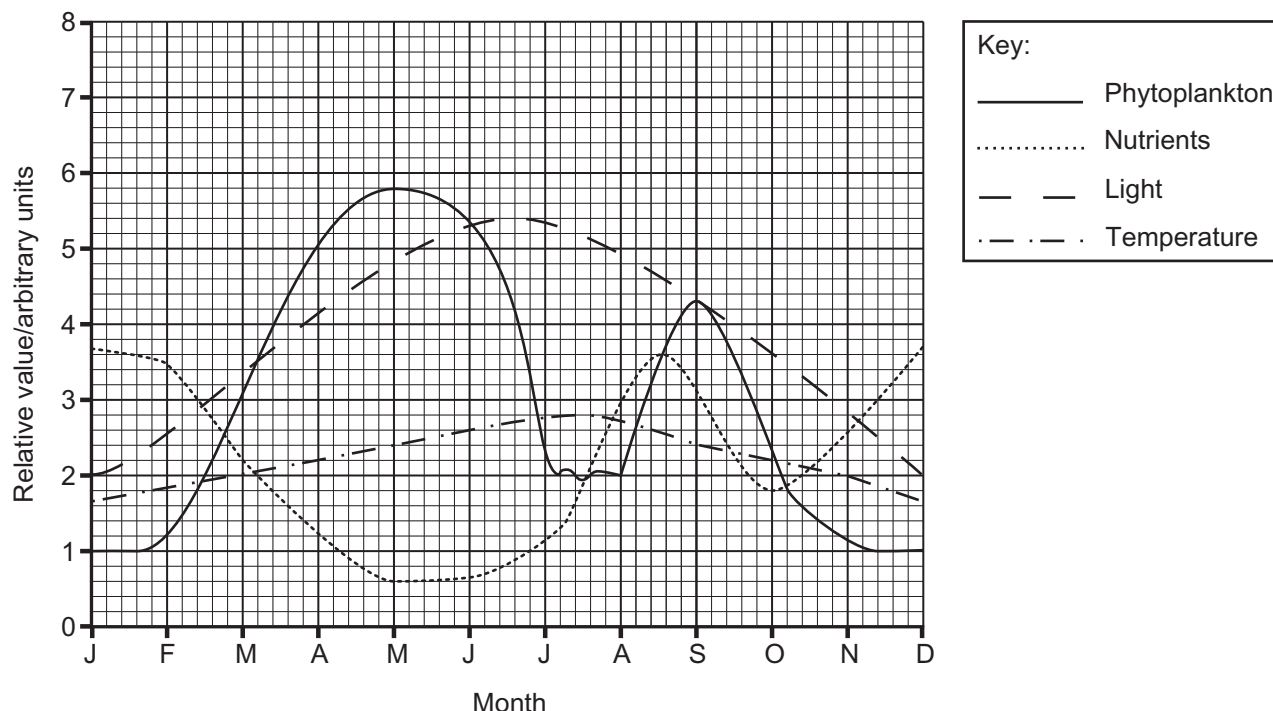
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The diagram shows that the rods and cones differ in the structural arrangement with their associated neurones. Describe and explain the significance of this to human vision.

[4]

Examiner Only	
Marks	Remark



- (i) Using the information in the graph, explain why the population of phytoplankton increases in early spring (February–April).

[2]

- (ii) Suggest why there is a second peak of phytoplankton numbers in late summer (August–September).

[2]

Examiner Only	
Marks	Remarks

In Fermanagh, hedges are commonly associated with water-filled ditches and frequently border semi-natural vegetation such as rough pasture or meadow. In intensively-farmed East Down, hedgerows less frequently have ditches and they often border large fields commonly used for silage, crop or livestock farming. In addition, East Down hedges tend to be much more frequently trimmed than Fermanagh hedges.

In an investigation of the biodiversity of hedgerows, 25 Fermanagh and 25 East Down hedgerows were sampled at the same time of year. The number of plant species in 30 metre lengths of hedge was determined for each hedgerow. Flowering plants, and the moisture-requiring ferns and mosses, were only recorded as far out from the hedgerow as the extent of the lateral growth of the woody species.

The table below shows the average number of species recorded in Fermanagh and East Down hedgerows.

	Average number of plant species in 30 m of hedge	
Plant species	Fermanagh	East Down
Woody species	8	3
Flowering plants	15	5
Ferns and mosses	8	4

- (a)** Suggest an explanation for the increased species-richness in Fermanagh hedges.

[4]

Examiner Only	
Marks	Remark

-
-
- [1]

-
-
- [1]

-
-
- [1]

1. _____
 2. _____
- [2]

Examiner Only	
Marks	Remark

(i) Suggest how infection with a virus can act as an environmental trigger.

[1]

(ii) Explain why Type 1 diabetes is a cell-mediated response and not an antibody-mediated immune response.

[2]

(iii) Describe the process of cell-mediated immunity.

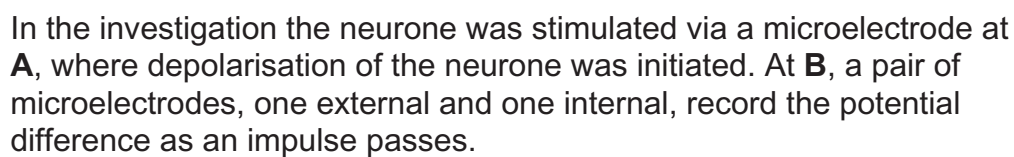
[4]16

Child	Age	Rhesus status
Mary	6	negative
Sean	4	positive
Bill	3	negative
Aoife	1	positive

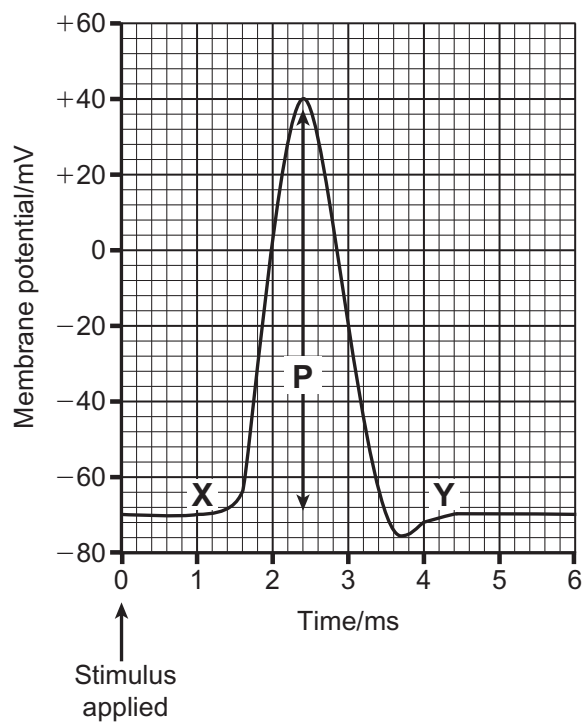
In terms of rhesus incompatibility, explain why Sarah's pregnancies required careful monitoring. Your answer should explain which child, or children, were at particular risk and state one thing that would have been done to reduce the risk.

[4]

Examiner Only	
Marks	Remark

18

The graph below shows the potential difference detected by the microelectrodes at **B**, following stimulation by the microelectrode at **A**.



- (i) State the name of the change in the potential difference shown as **P** on the graph.

_____ [1]

- (ii) Describe and explain the sequence of events between **X** and **Y** following stimulation.

 _____ [4]

Examiner Only	
Marks	Remark

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Examiner Only	
Marks	Remark

[illegible]

Examiner Only	
Marks	Remark

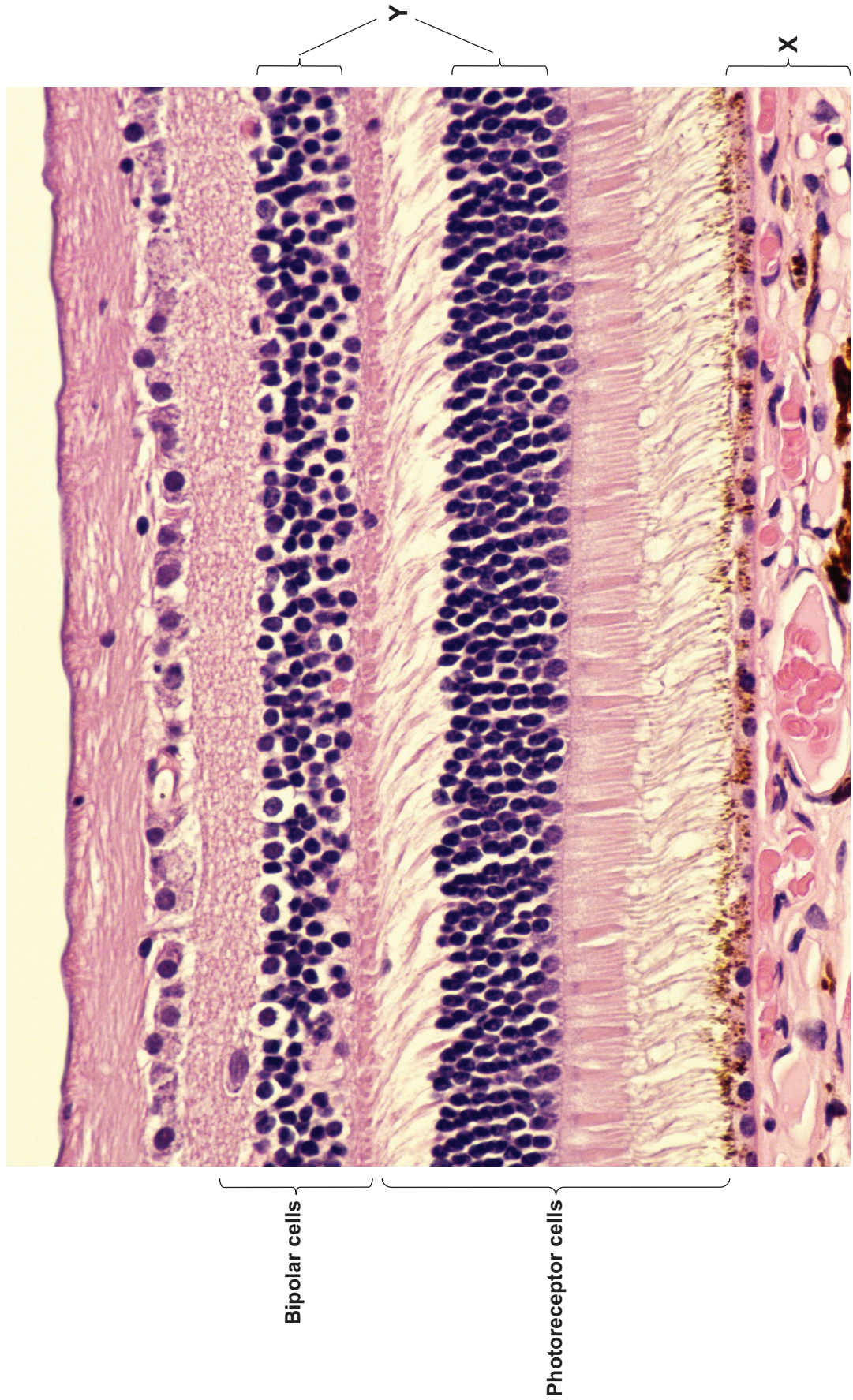
Examiner Only	
Marks	Remark

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GCE Biology Advanced (A2)
Assessment Unit A2 1: Physiology and Ecosystems
January 2013

Photograph 1.4
(for use with Question 4)



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