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ADVANCED SUBSIDIARY (AS)  
General Certificate of Education  
January 2010

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Centre Number  
71

Candidate Number

**Biology**  
Assessment Unit AS 2  
*assessing*  
Module 2: Organisms and Biodiversity  
[AB121]



AB121

TUESDAY 19 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.

**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	

<b>Total Marks</b>	
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## Section A

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

- The tough but flexible organic molecule found in the cell walls of fungi.

\_\_\_\_\_

- The principle non-carbohydrate component of the secondary cell wall of xylem vessels.

\_\_\_\_\_

- The waterproofing agent found in the radial walls of the endodermis of a root.

\_\_\_\_\_

[3]

2 The list below represents the taxonomic hierarchy of the stoat (*Mustela erminea*).

Animalia  
Chordata  
Mammalia  
Carnivora  
Mustelidae  
*Mustela*  
*erminea*

(a) Name the class to which a stoat belongs.

\_\_\_\_\_ [1]

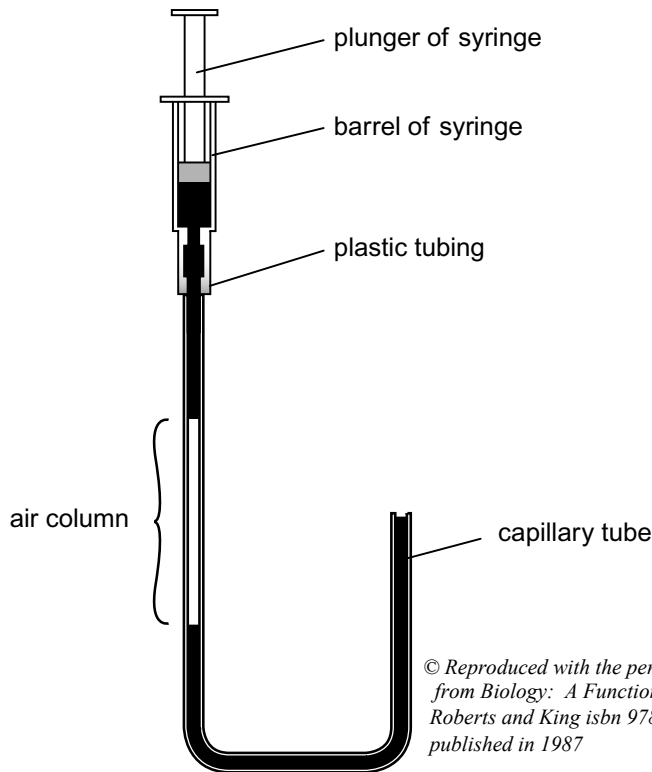
(b) What is the species name of the stoat?

\_\_\_\_\_ [1]

(c) Define the term "species".

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ [2]

3 The J-tube apparatus, illustrated below, can be used to analyse the composition of an air column that has been trapped in the capillary tube.



(a) Explain why the analysis of the air column is carried out when the J-tube apparatus is under water.

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[1]

The following results were obtained using the J-tube apparatus.

Original length of air column:	10.0 cm
Length of air column after potassium hydroxide treatment:	9.6 cm
Length of air column after pyrogallol treatment:	8.0 cm

(b) (i) Use the above results to calculate the percentage of oxygen in the air column. (Show your working.)

[2]

(ii) From your result above, what can you conclude about the source of the air sample?

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[1]

4 The diagram below shows a magnified view of a section of lung tissue.

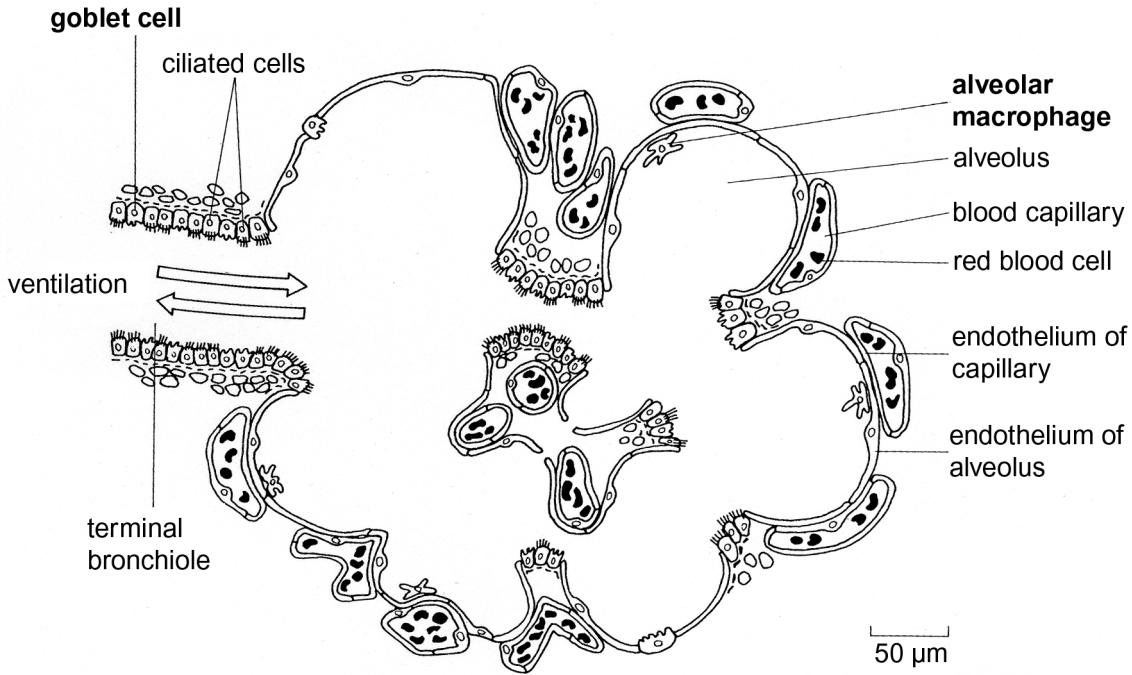


Figure from *A Level Biology* by WD Phillips & TJ Chilton (OUP, 1994) copyright © Oxford University Press, reprinted by permission of Oxford University Press

(a) Using the information in the diagram, describe **three** features of the lung tissue which facilitate gas exchange.

1. \_\_\_\_\_  
\_\_\_\_\_
  2. \_\_\_\_\_  
\_\_\_\_\_
  3. \_\_\_\_\_  
\_\_\_\_\_
- [3]

(b) Suggest a role for each of the following.

- goblet cell \_\_\_\_\_  
\_\_\_\_\_
  - alveolar macrophage \_\_\_\_\_  
\_\_\_\_\_
- [2]

5 In Northern Ireland farmers have been encouraged to be more environmentally friendly in their farming practice. One example is the planting of double row hawthorn hedges to replace single wire fences on many farms.

(a) (i) Explain how the planting of the hedges encourages biodiversity.

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[2]

(ii) Describe **one** other strategy which is used to encourage biodiversity.

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[1]

An ecological survey was carried out in and around a small Northern Ireland woodland to investigate the distribution of two plant species, wood sorrel (*Oxalis acetosella*) and meadow buttercup (*Ranunculus acris*). A transect line was placed from the edge of the woodland to its centre and the percentage cover of the two species of plant was measured using a quadrat placed at five metre intervals along the transect line.

(b) (i) Explain why a transect was used in this ecological survey.

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[1]

(ii) Explain why the investigators measured the percentage cover of the two species of plant and not just the number of individual plants.

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[1]

The table below illustrates the results of this ecological survey.

Quadrat number	Percentage cover/%	
	Wood Sorrel ( <i>Oxalis acetosella</i> )	Meadow Buttercup ( <i>Ranunculus acris</i> )
1 (woodland edge)	0	75
2	5	50
3	20	30
4	30	5
5	40	0
6 (centre of woodland)	45	0

(c) (i) Plot the above results, using an appropriate graphical technique.  
(Use the graph paper opposite.) [6]

(ii) Describe the trends shown in the results.

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[2]

(iii) Suggest **one** explanation for a trend that you have described.

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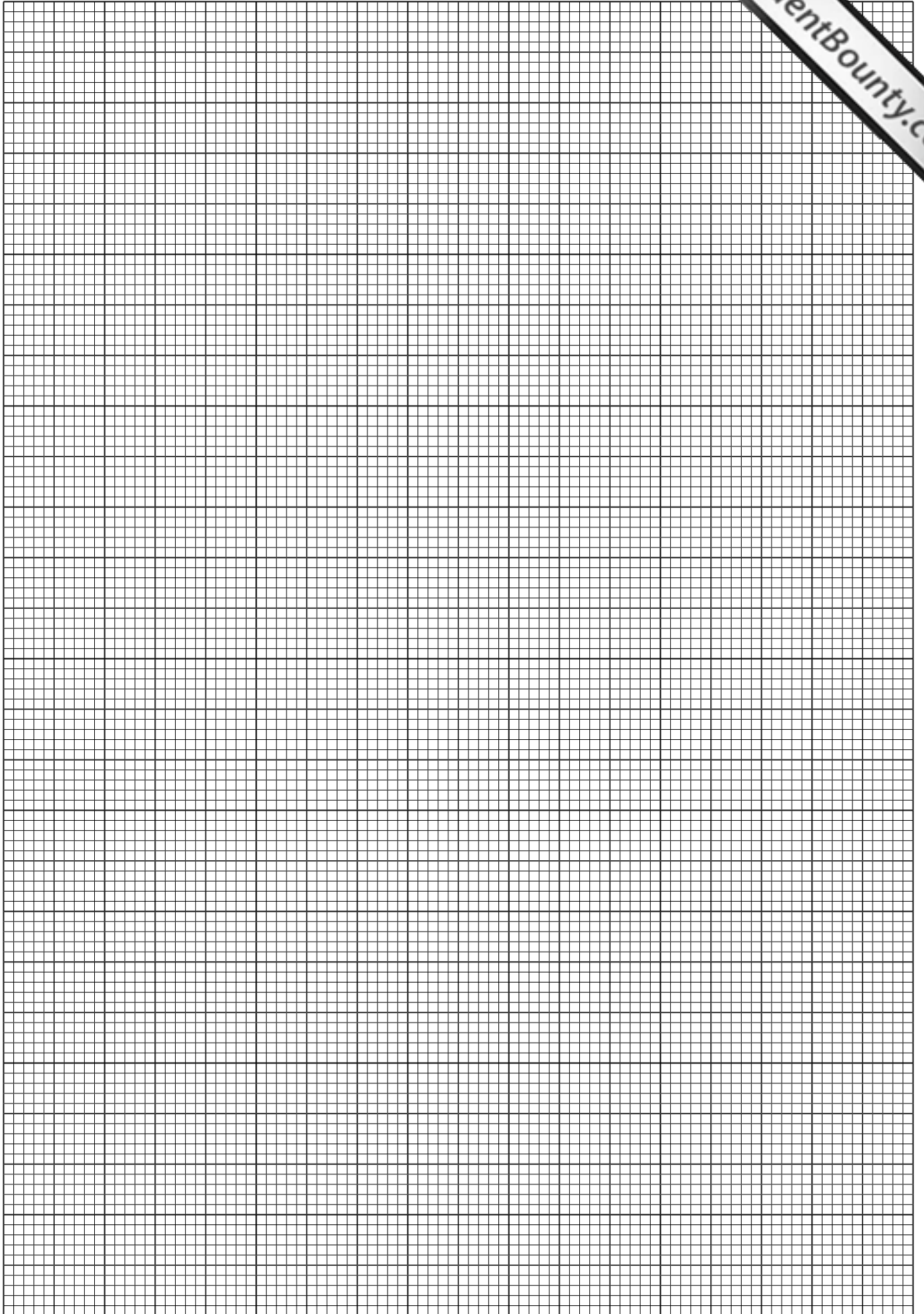
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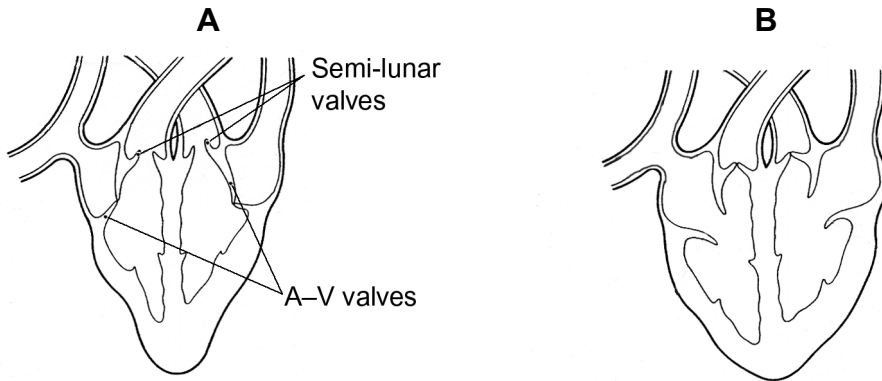
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[1]





6 The diagrams **A** and **B** below show the heart at different stages during the cardiac cycle.



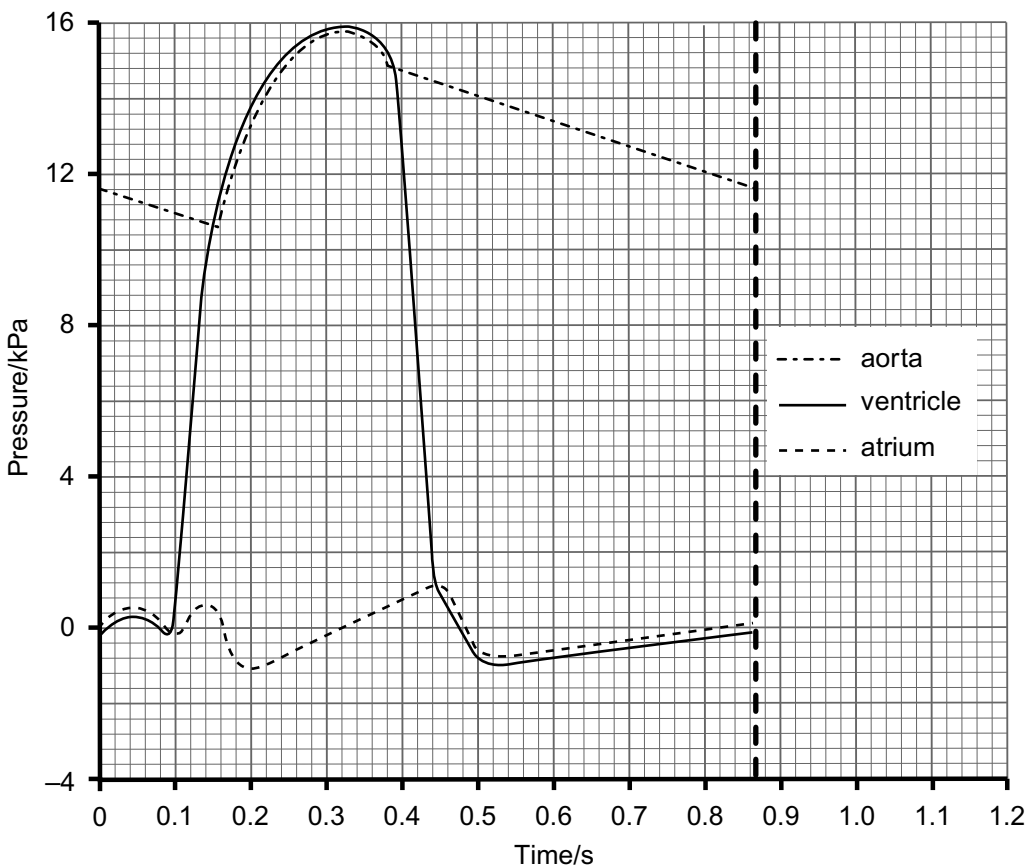
© Biological Science 2nd edition by NPO Green, GW Stout, DJ Taylor, ed. R Soper, published by Cambridge University Press, 1990, ISBN 0521383803

(a) Identify the stage of the cardiac cycle shown in diagrams **A** and **B**.

**A** \_\_\_\_\_

**B** \_\_\_\_\_ [2]

The graph below shows pressure changes which take place in the left side of the heart during one complete cardiac cycle.



(b) Identify which of the diagrams opposite, **A** or **B**, corresponds to the ventricular pressure rise between 0.15 and 0.3 seconds on the graph. Explain your choice.

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[2]

(c) The semi-lunar valves and the A–V valves respond differently during the ventricular pressure rise between 0.1 and 0.15 seconds.

(i) Identify the response of the A–V valves at 0.1 seconds.

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[1]

(ii) Identify the response of the semi-lunar valves at 0.15 seconds.

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[1]

(iii) Explain how the structure of each valve type allows for these different responses.

A–V valves

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[2]

Semi-lunar valves

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[2]

(d) Explain the increase in the **atrial** pressure at each of the following points:

- between 0 and 0.05 seconds

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- between 0.2 and 0.45 seconds

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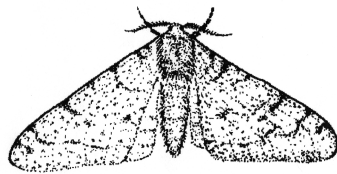
[2]

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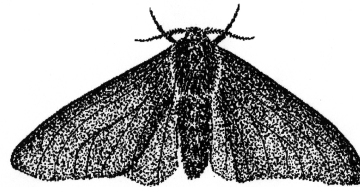
**(Questions continue overleaf)**

7 One of the greatest environmental changes during the 19th century resulted from the increase in burning fossil fuels, especially coal. The burning of coal released sulphur dioxide and black soot. Lichens on tree bark were destroyed by the sulphur dioxide and tree bark was blackened by deposits of soot.

The peppered moth, *Biston betularia*, has a speckled pattern over its wings, an effective camouflage when it is resting on lichen covered tree bark. Before 1850 a rare form of moth, which was almost black, was known. However, by 1850, in industrial cities such as Manchester, 85% of the peppered moth population in the city was the black form.



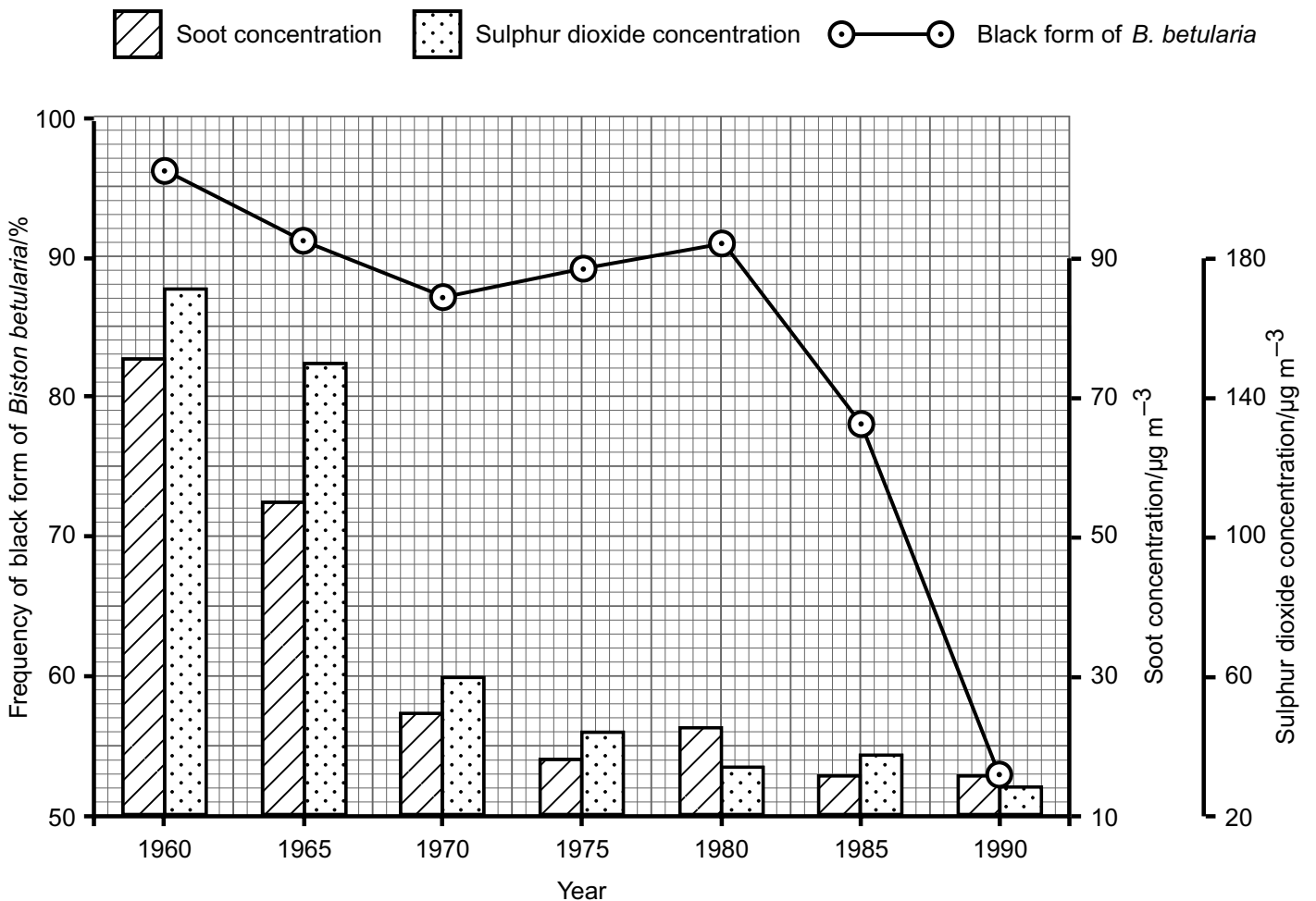
Speckled form



Black form

© Essential Genetics: A course Book by Lynn Burnet, published by Cambridge University Press, 1986, ISBN 0521313805

The graph below shows a period of time between 1960 and 1990 when less coal was burnt and smokeless fuel was introduced for domestic use. The graph shows the frequency of the black form of the moth over this period as well as the concentration of the two pollutants.



(a) Use the information in the graph and your own understanding to answer the following questions.

(i) What is the evidence for a reduction in coal burning and the introduction of smokeless fuel?

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[2]

(ii) What is the evidence for lichen regrowth on the bark of trees?

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[2]

(b) Suggest why the black form of the moth did not decline significantly until after 1980.

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[2]

(c) Explain why the changes in the frequencies of the different forms of *Biston betularia* is an example of directional selection.

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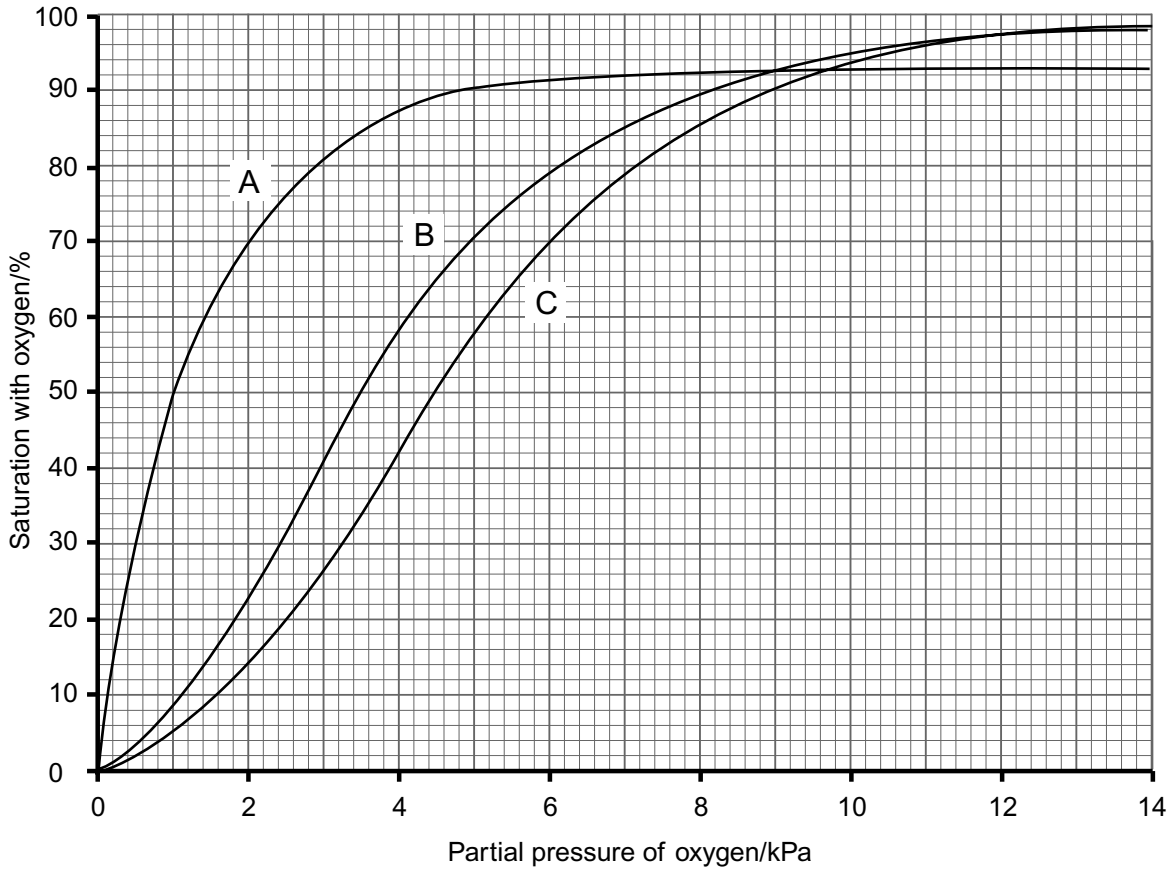
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[2]

8 The graph below shows three different oxygen dissociation curves.

**A** is the dissociation curve for myoglobin.

**B** and **C** are two different dissociation curves for haemoglobin at different partial pressures of carbon dioxide (ppCO<sub>2</sub>).



(a) (i) Myoglobin and haemoglobin are both described as conjugated proteins. Define the term “conjugated protein”.

\_\_\_\_\_

\_\_\_\_\_ [1]

(ii) Explain what is meant by the term “partial pressure of oxygen”.

\_\_\_\_\_

\_\_\_\_\_ [1]



(b) (i) State the role of myoglobin in muscle tissue.

\_\_\_\_\_ [1]  
\_\_\_\_\_

(ii) Explain the circumstances which will cause myoglobin to unload oxygen in working muscle.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ [2]

(c) **B** and **C** are two different dissociation curves for haemoglobin at different partial pressures of carbon dioxide ( $ppCO_2$ ).

(i) Which of the curves, **B** or **C**, would represent the dissociation curve for haemoglobin in a muscle during exercise? Explain your choice.

Curve \_\_\_\_\_

Explanation

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ [3]

(ii) Use the graph to calculate the decrease in percentage saturation of haemoglobin when, during exercise, the  $ppO_2$  in a muscle falls from 6 kPa to 2 kPa. (Show your working.)

Answer \_\_\_\_\_ [2]













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