

Candidate Name	Centre Number	Candidate Number
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**GCSE**

235/02

**SCIENCE  
HIGHER TIER  
BIOLOGY 1**

P.M. TUESDAY, 7 June 2011

45 minutes

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1	5	
2	7	
3	3	
4	6	
5	4	
6	6	
7	6	
8	6	
9	7	
<b>Total</b>	<b>50</b>	

**ADDITIONAL MATERIALS**

In addition to this paper you may require a calculator and a ruler.

**INSTRUCTIONS TO CANDIDATES**

Use black ink or black ball-point pen.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

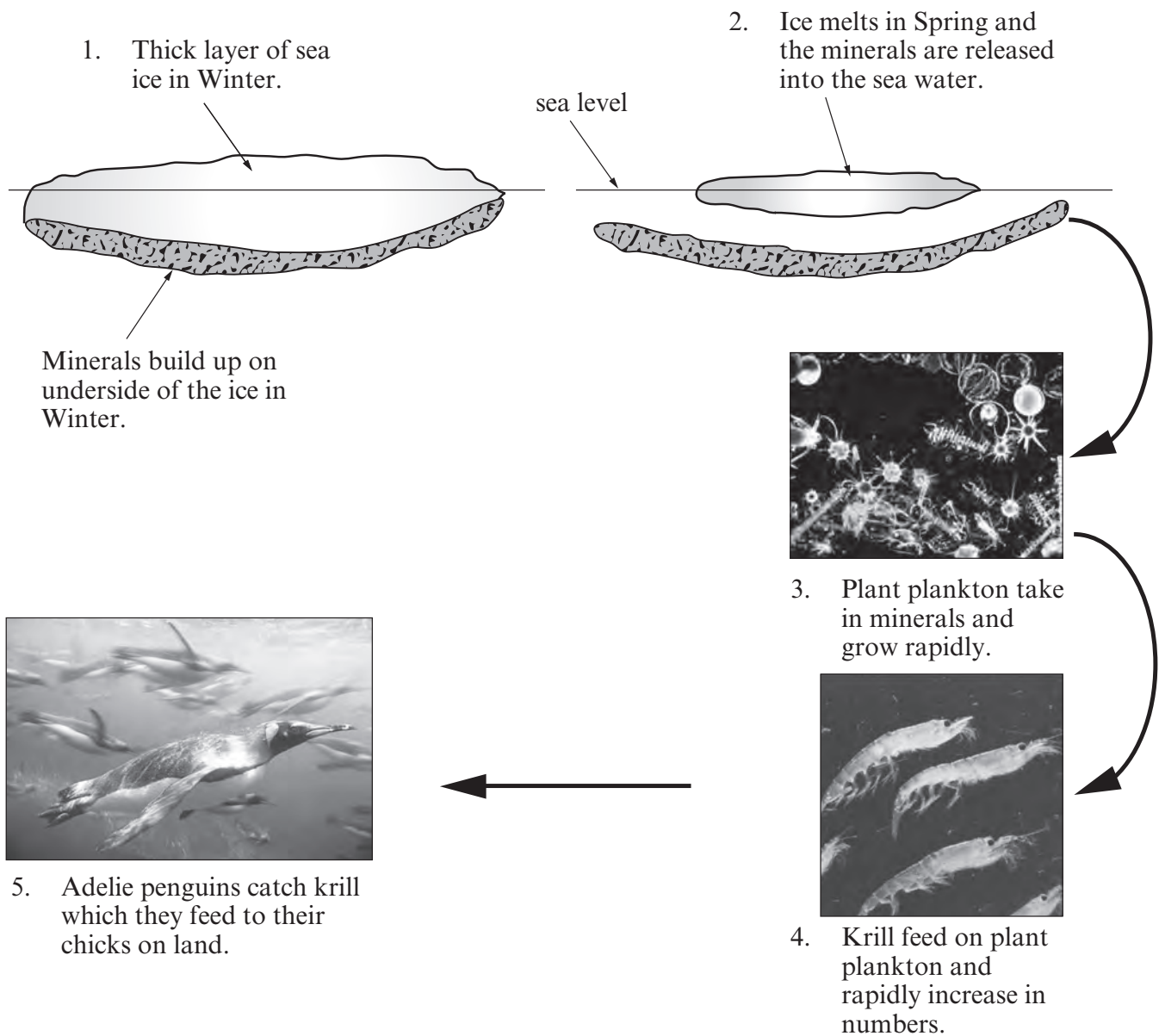
**INFORMATION FOR CANDIDATES**

The number of marks is given in brackets at the end of each question or part-question.

You are reminded of the necessity for good English and orderly presentation in your answers.

Answer **all** questions.

1. Sea ice builds up in the southern oceans around Antarctica every Winter. Vast quantities of minerals build up on the underside of the ice. In the Antarctic Spring the ice melts and releases the minerals into the sea water.



*Fact file:*

- In the Antarctic Winter of 1995 not as much sea ice formed as usual.
- In the following Antarctic Spring up to 50 Adelie penguin chicks starved to death each day on an Antarctic island.

(a) Using the information provided opposite, explain why the Adelie penguin chicks starved to death. [3]

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(b) Apart from competition for food and minerals, state **two** *other* environmental factors that can affect the size of a population of organisms. [2]

(i) .....

(ii) .....

2. Nearly 1 in 15 adults in the UK is obese. It is more likely that people will develop diabetes if they are obese.

(a) Suggest **two** ways in which a person could help to reduce the risk of developing diabetes. [2]

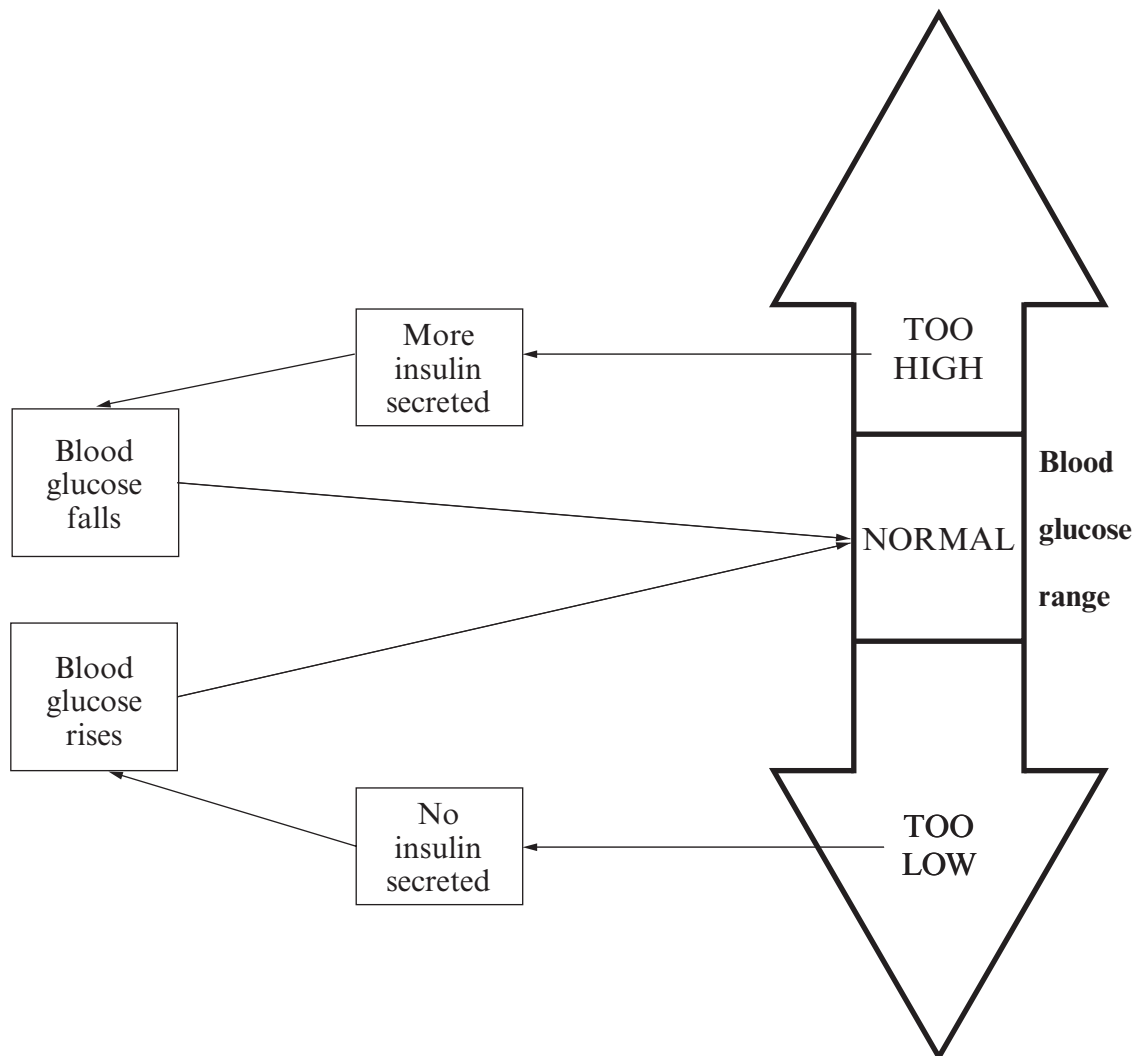
(i) .....

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(ii) .....

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(b) The diagram shows the mechanism of blood glucose control.



(i) Use your knowledge and the information in the diagram to explain how the blood glucose level is returned to normal when it rises too high. [3]

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(ii) I. How would the mechanism of blood glucose control differ in a person with diabetes? [1]

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II. How would this affect the blood glucose level? [1]

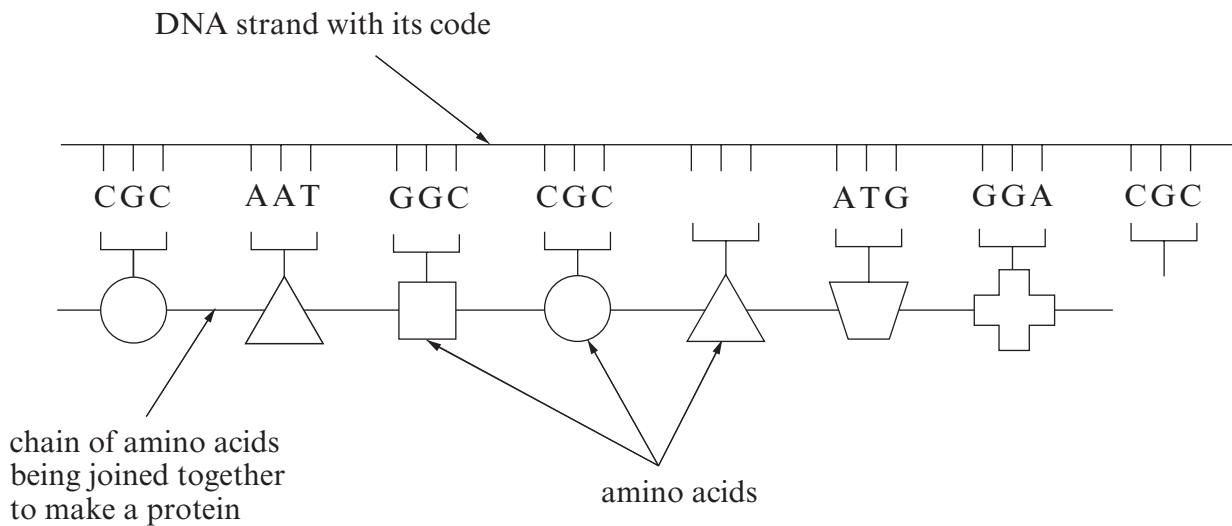
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3. DNA contains a code which arranges amino acids in an order to form proteins. The code is represented by the letters A, G, T and C.

The simplified diagram shows a strand of DNA with its code and amino acids being arranged to form a protein.



- (a) Complete the diagram by
- (i) drawing the missing amino acid, [1]
  - (ii) writing in the missing piece of the code. [1]
- (b) A mutation occurred which changed the code in the strand of DNA shown above. Suggest what effect this would have on the protein which is formed. [1]

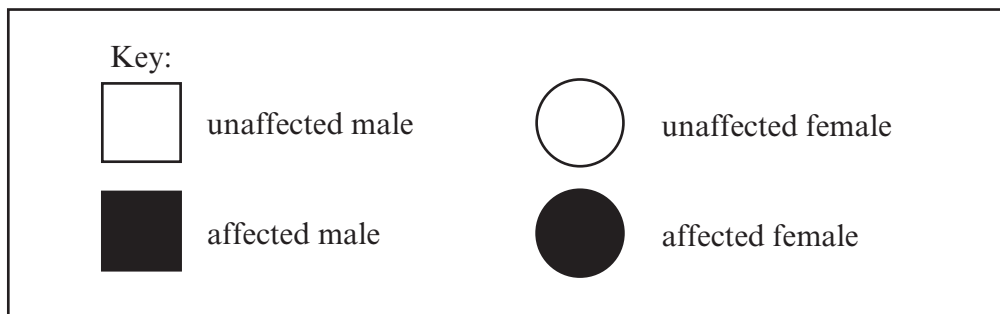
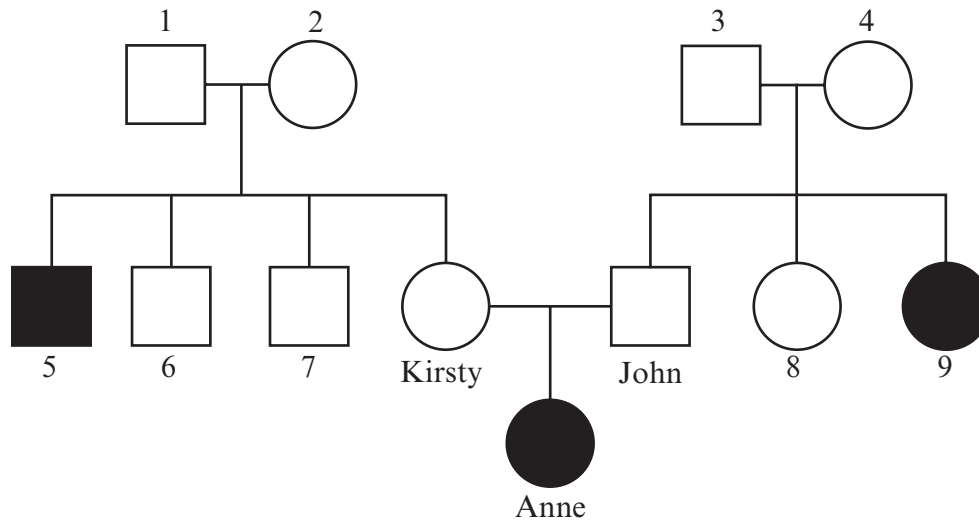
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4. Kirsty and John have a daughter, Anne, with cystic fibrosis. They went to see a genetic counsellor because they wanted to know the probability of any future children developing cystic fibrosis.

The genetic counsellor drew up the following family tree.



The allele for cystic fibrosis **n** is recessive to the normal allele **N**.

(a) Using these letters, state the genotype of:

(i) Kirsty ..... John .....

[1]

(ii) Anne .....

[1]



- (b) (i) Complete the Punnett square below to show the possibility of the different genotypes if Kirsty and John have more children. [2]

Gametes		

- (ii) What is the probability of Kirsty and John's next child

I. having cystic fibrosis;

[1]

.....

II. being a carrier of the cystic fibrosis allele?

[1]

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5. Scientists grew two varieties of Soya beans in a farm scale trial. Variety **A** was genetically modified (GM). Variety **B** was unmodified. During growth the Soya bean crops were regularly sprayed with herbicide to kill the weeds growing amongst them.



*Google images*

After 4 months the crops were analysed for their survival and weeds remaining. The results are shown in the table.

	Field with Soya bean variety <b>A</b> (GM)		Field with Soya bean variety <b>B</b> (unmodified)	
	Variety <b>A</b>	Weeds	Variety <b>B</b>	Weeds
Plants remaining after spraying with herbicide (%)	100	13	74	13

- (a) Soya bean variety **A** was genetically modified to be resistant to the herbicide. How do the results show that the genetic modification was successful? [1]

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(b) Describe how variety **A** was genetically modified.

[2]

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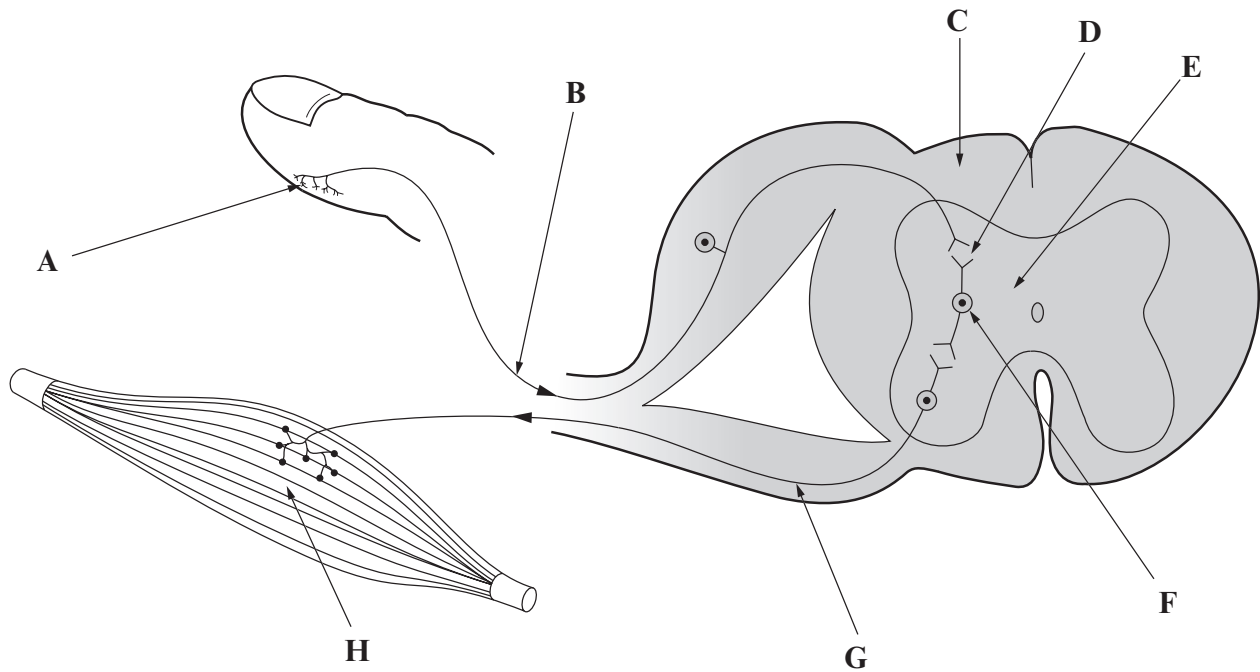
(c) No genetically modified crops have been approved for commercial growth in the UK. One of the main reasons for this is that the general public have voiced their concerns over genetic modification. Suggest **one** concern that some people have about genetically modified crops.

[1]

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6. The diagram shows the pathway of a reflex arc.

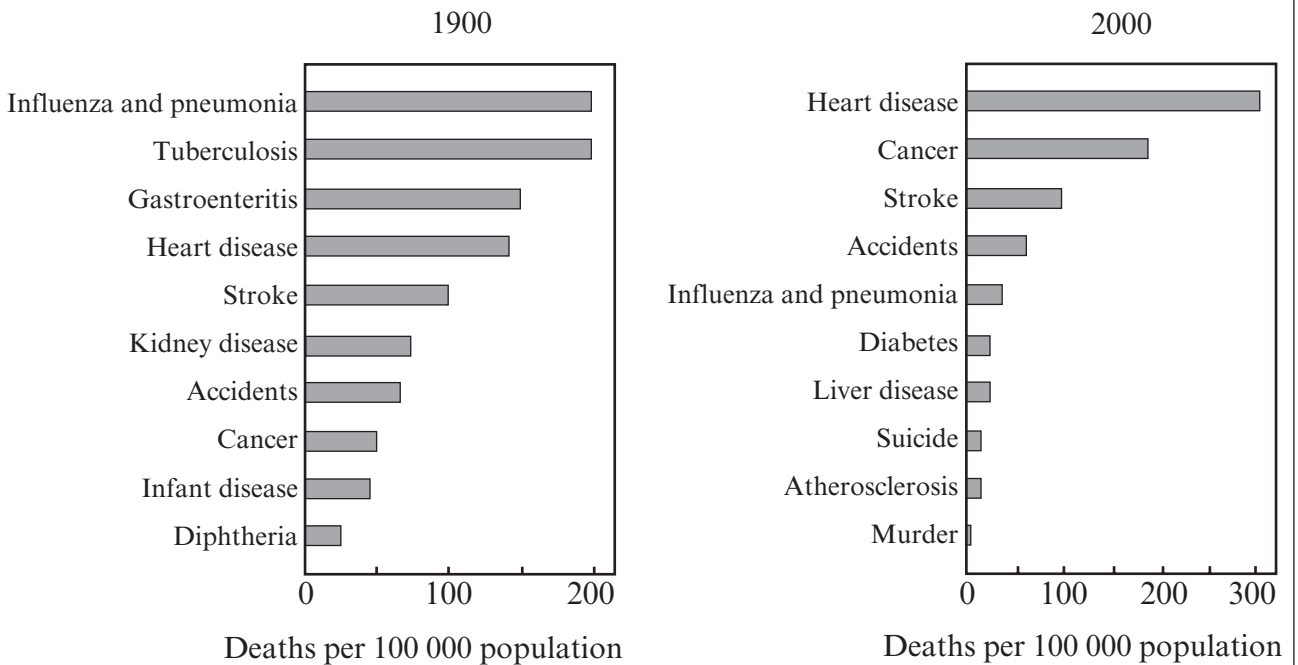


Select six correct letters from the diagram and match them with the labels in the table below.

Label	Letter
Connecting nerve cell	
Motor nerve cell	
Sensory nerve cell	
Synapse	
Receptor	
Effector	

[6]

7. The data shows the 10 main causes of death in the U.K. in 1900 and 2000.



(a) State the causes of death which appear in the top ten in **both** 1900 and 2000. [1]

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(b) Suggest reasons, due to lifestyle choices, for the difference in the data for each of the following in 1900 and 2000.

(i) Heart disease. [3]

I. ....

II. ....

III. ....

(ii) Cancer. [1]

.....

(iii) Liver disease. [1]

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8. Lichens grow on stone and tree bark. They are affected by sulphur dioxide from combustion of fossil fuels polluting the air. Table A shows the numbers of species of lichens present at different distances from the centre of an industrial city which is surrounded by a motorway.

Table A

Distance from city centre (km)	Number of species of lichens
0	1
2	4
4	8
6	14
8	20
10	12
12	20
14	26

- (a) (i) Use the data to suggest the distance of the motorway from the city centre. [1]

..... km

- (ii) Explain your answer. [2]

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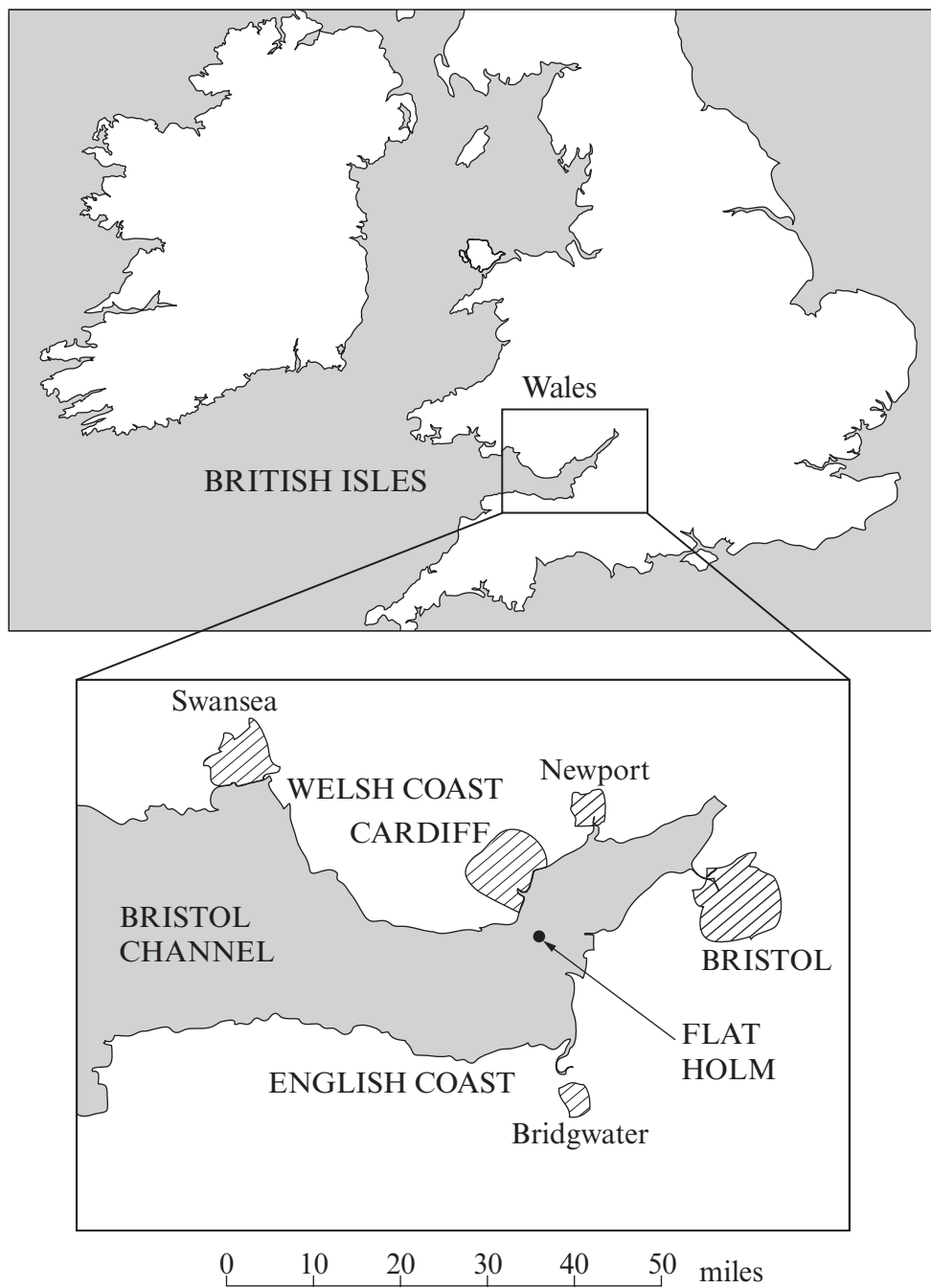
- (b) Table B below gives the names of five lichens and the highest concentration of sulphur dioxide in the air in which each can survive.

Table B

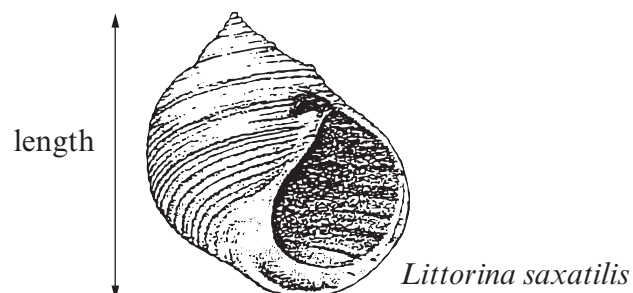
Name of lichen	Highest concentration of sulphur dioxide in which the lichen can survive ( $\mu\text{g m}^{-3}$ )
<i>Lobaria</i>	30
<i>Evernia</i>	35
<i>Parmelia</i>	60
<i>Xanthoria</i>	70
<i>Lecanora</i>	150

- (i) Only one species of lichen was found in the city centre (in Table A). From Table B, suggest the name of this lichen. [1]
- .....
- (ii) The concentration of sulphur dioxide near the motorway surrounding the city was  $50 \mu\text{g m}^{-3}$ . Give the names of those lichens you would expect to find growing near the motorway. [1]
- .....
- (iii) What name is given to a species which can be used to estimate the level of pollution in an environment? [1]
- .....

9. Flat holm is an island in the Bristol Channel.



A population of the rough periwinkle *Littorina saxatilis* is found on the rocky shore of Flat Holm.





The rough periwinkles on Flat Holm are larger than those on the rocky shore of the mainland opposite Flat Holm.

Some students investigated the reasons for the difference in size of the rough periwinkles. Their research showed the following:

The shell length of rough periwinkles is controlled by genes and by the availability of its food.

Periwinkle population	Average length of shell (mm)	Predators	Competition for food
Flat Holm	9.4	Very few	Very little
Mainland	6.3	Birds (rock pipits), crabs, fish (blennies)	Much competition from similar species

(a) State **two** factors which the students would have to keep the same when taking samples of *Littorina saxatilis* from Flat Holm and the mainland. [2]

(i) .....

(ii) .....

(b) Use all the information given above and your knowledge of Charles Darwin's theory of evolution to explain the difference in the average shell length in the two populations of *Littorina saxatilis*. [5]

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