

Surname		Other Names	
Centre Number		Candidate Number	
Candidate Signature			

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General Certificate of Secondary Education
June 2003



**BIOLOGY
FOUNDATION TIER**

3411/F

F

Monday 2 June 2003 1.30 pm to 3.45 pm

In addition to this paper you will require:
a ruler.
You may use a calculator.

For Examiner's Use			
Number	Mark	Number	Mark
1		14	
2		15	
3		16	
4		17	
5		18	
6		19	
7		20	
8		21	
9		22	
10		23	
11			
12			
13			
Total (Column 1)	→		
Total (Column 2)	→		
TOTAL			
Examiner's Initials			

Time allowed: 2 hours 15 minutes

Instructions

- Use blue or black ink or ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions in the spaces provided.
- Do all rough work in this book. Cross through any work you do not want marked.

Information

- The maximum mark for this paper is 135.
- Mark allocations are shown in brackets.
- You are reminded of the need for good English and clear presentation in your answers.

Answer **all** questions in the spaces provided.

1 Complete the table to show which part of the blood carries out each function.

Choose your answers from the list.

plasma

platelet

red blood cell

white blood cell

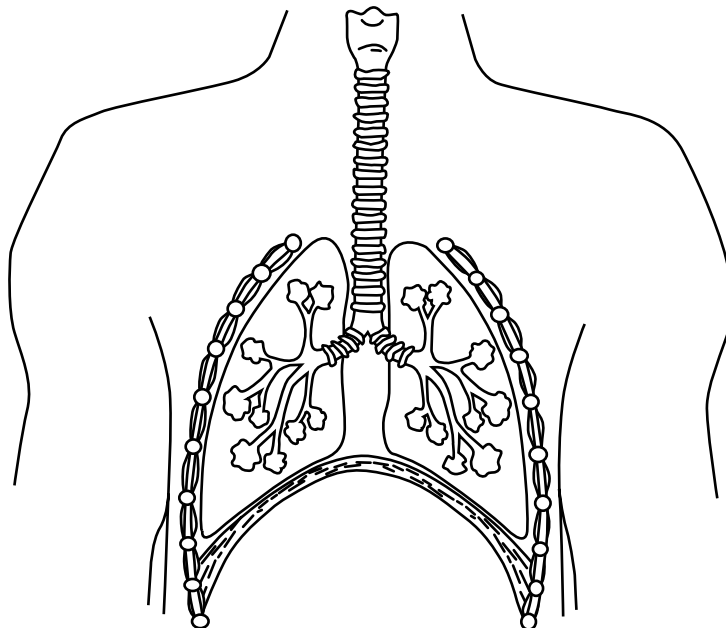
The first answer has been done for you.

Function	Part of the blood
Transports most of the carbon dioxide	plasma
Transports most of the oxygen	
Helps blood to clot at a wound	
Defends the body against microorganisms	
Transports the products of digestion	

(4 marks)

4

2 The diagram shows the human breathing system.



(a) Place on the diagram:

- (i) a letter **X** where oxygen enters the blood; *(1 mark)*
- (ii) an arrow showing the direction the diaphragm moves when we breathe in. *(1 mark)*

(b) List the following structures in the order the air passes through them when we breathe in.

alveoli **bronchi** **bronchioles** **trachea**

1

2

3

4

(1 mark)

(c) By what process does oxygen enter the blood? Draw a ring around your answer.

diffusion **digestion** **osmosis** **respiration**

(1 mark)

4

Turn over ►

3 Complete each sentence by choosing the correct terms from the box.

23	46	ADH	DNA	XX	XY	YY
dominant	female	male	recessive	strong	weak	

A gene is made up of a substance called Genes are found on chromosomes and most human cells contain pairs of chromosomes. In females the two sex chromosomes are , but in males the two sex chromosomes are

Alleles are alternative forms of a gene. Two healthy parents can sometimes have a child with a genetic disorder such as cystic fibrosis. This is because cystic fibrosis is caused by a allele.

The two parents are healthy because they also have the allele.

(6 marks)

6

4 Bread contains starch, protein and fat.

(a) Complete each sentence by choosing the correct words from the box.

amino acids	protein
fat	starch
fatty acids	sugar

Amylase speeds up the digestion of The product of this digestion is Protease speeds up the digestion of The product of this digestion is

(4 marks)

(b) Why do molecules of starch, protein and fat need to be digested?

.....

(2 marks)

(c) In which part of the digestive system does the digestion of starch begin? Draw a ring around your answer.

large intestine **mouth** **small intestine** **stomach**

(1 mark)

(d) What do we call substances like amylase and protease which speed up chemical reactions?

.....

(1 mark)

8

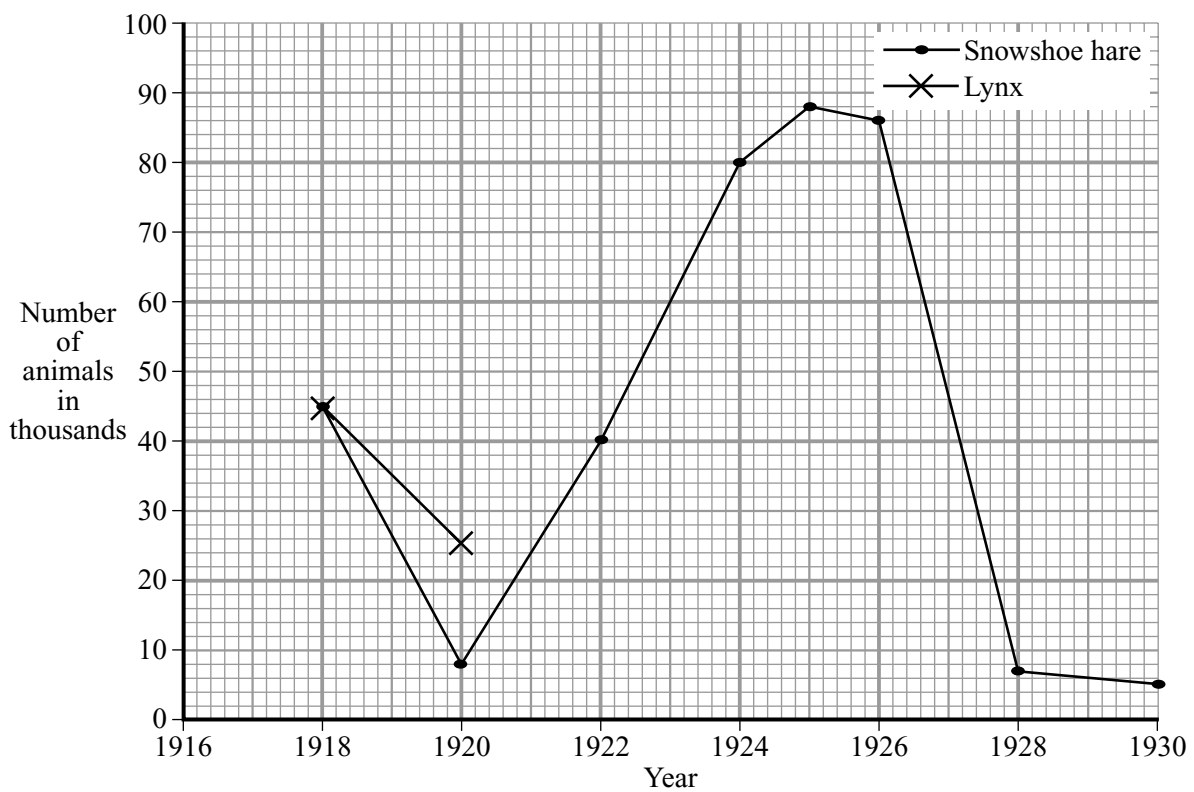
TURN OVER FOR THE NEXT QUESTION

Turn over ►

- 5 The lynx is a wild cat which lives in Canada. The table shows the number of lynx trapped in a part of Canada in certain years.

Year	Number of lynx in thousands
1918	45
1920	25
1922	10
1924	20
1926	40
1928	50

The snowshoe hare is another wild animal found in Canada. The graph shows the number of snowshoe hares trapped in the same years. The lynx eats the snowshoe hare.



- (a) Draw a graph of the data in the table. The first two points have been plotted for you.

(2 marks)

(b) From your graph, predict how many lynx were trapped in 1925.

..... thousand
(1 mark)

(c) Use the information to answer the following.

(i) What would you expect to happen to the number of lynx trapped in 1930? Draw a ring around your answer.

rise **fall** **stay the same**

(1 mark)

(ii) Give a reason for your answer to part (c) (i).

.....
.....
(1 mark)

(d) The lynx is a predator. What is a predator?

.....
.....
(1 mark)

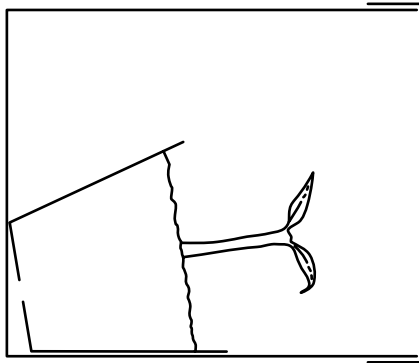
6

TURN OVER FOR THE NEXT QUESTION

Turn over ►

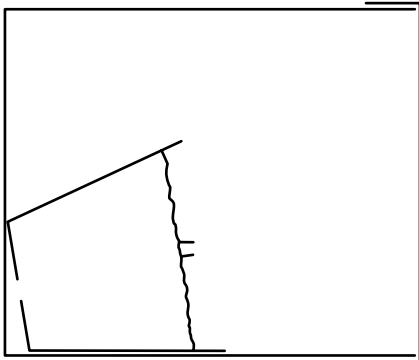
- 6 A young tomato plant was placed on its side, in the dark, as shown in Diagram 1.

Diagram 1



- (a) Complete Diagram 2 to show how you would expect the plant to look after two days.

Diagram 2

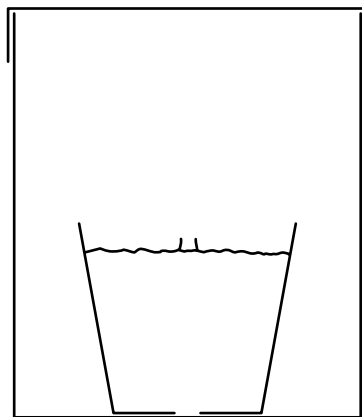


(2 marks)

- (b) The plant pot was then turned through 90°, as shown in Diagram 3.

Complete Diagram 3 to show how you would expect the plant to look after two more days.

Diagram 3



(2 marks)

- (c) Suggest why the tomato plant was kept in the dark during this experiment.

.....

(1 mark)

- 7 A runner might drink a special 'sports drink' at intervals during a marathon race. The table shows the substances present in a sports drink.

Substance	Percentage
Water	
Sugar	5.0
Ions	0.2

- (a) Complete the table to show the percentage of water in the sports drink. *(1 mark)*

- (b) The runner sweats and also breathes heavily during the race.

- (i) Why does the runner need to sweat?

.....
(1 mark)

- (ii) Which **two** substances in the table are lost from the body in sweat?

.....
(1 mark)

- (iii) Which substance in the table is lost from the body during breathing?

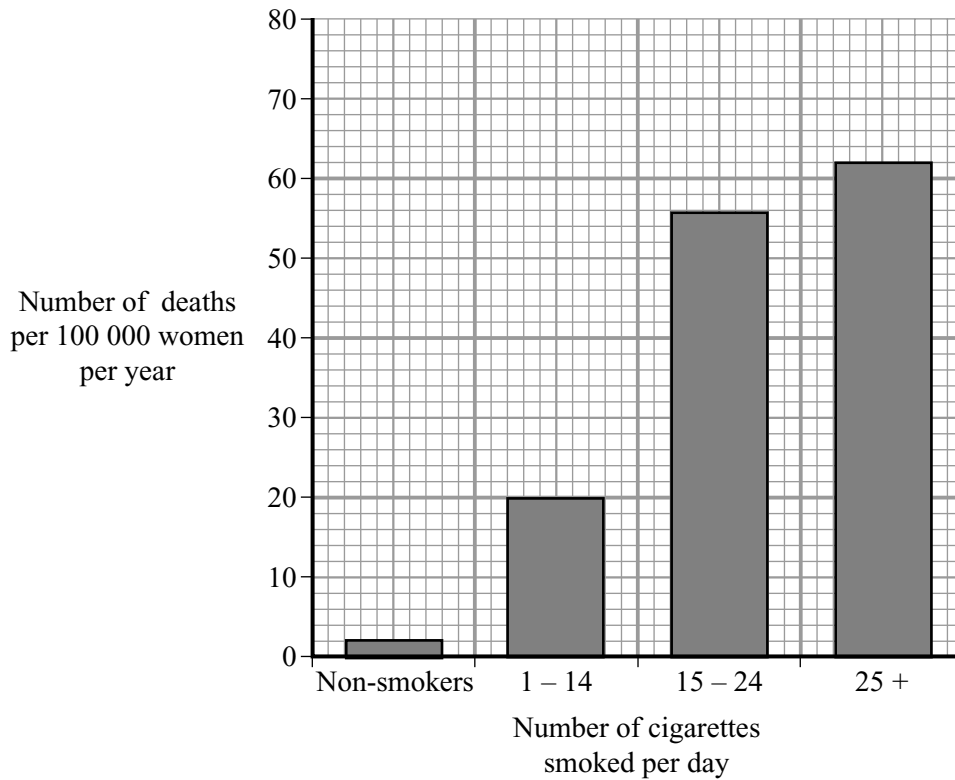
.....
(1 mark)

- (c) How does the sugar in the sports drink help the athlete during the marathon?

.....
.....
(2 marks)

6

8 The bar graph shows how cigarette smoking affects the number of deaths from bronchitis and emphysema in women.



(a) (i) Of the women who smoke 25+ cigarettes per day, how many die each year from bronchitis and emphysema?

.....per 100 000.
(1 mark)

(ii) The death rate for women who smoke 25+ cigarettes per day is higher than the death rate for non-smokers. How much higher is it?

.....per 100 000.
(1 mark)

(b) Name **one** other disease caused by cigarette smoking.

.....
(1 mark)

(c) Tobacco smoke contains carbon monoxide.

- (i) What effect does carbon monoxide have on the amount of oxygen that can be carried by the blood?

.....
(1 mark)

- (ii) What effect does cigarette smoking by pregnant women have on the average birth mass of their babies?

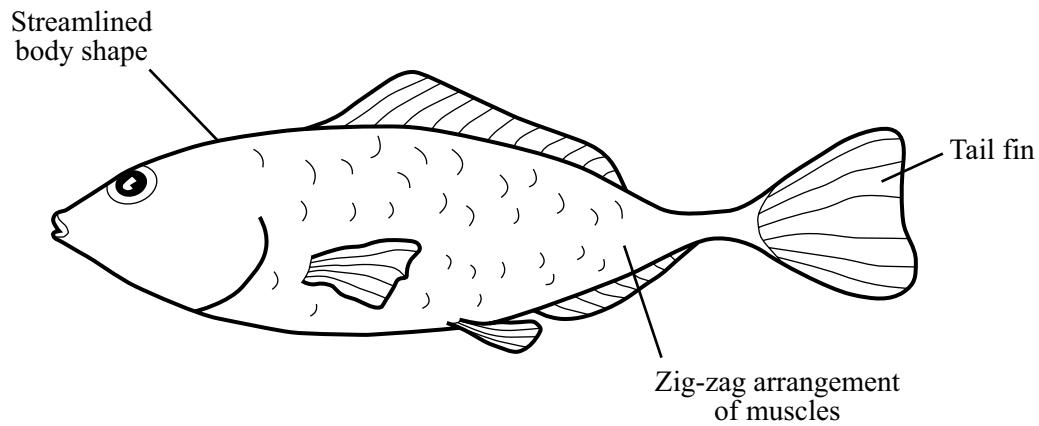
.....
(1 mark)

5

TURN OVER FOR THE NEXT QUESTION

Turn over ►

10 The diagram shows a fish.



Fish are adapted to move quickly in water.

List **A** describes features of the fish. List **B** explains how these features help the fish to move quickly in water.

Draw a straight line from each feature in List **A** to the way in which it helps the fish to move quickly in water, in List **B**.

List A

Zig-zag arrangement of muscles

A tail with a fin providing a large area

Streamlined body shape

List B

Pushes against the water

Produces wave-like body movements

Reduces resistance

(3 marks)

3

Turn over ►

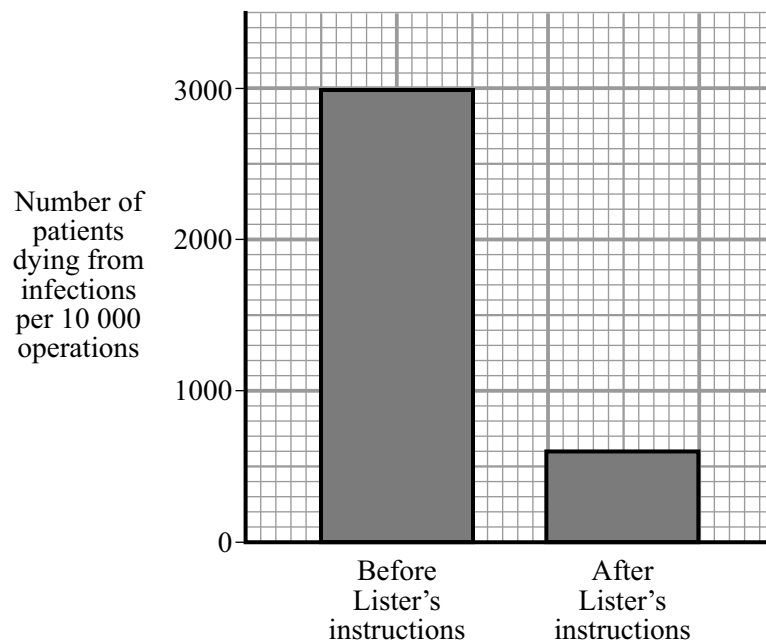
11 In the eighteenth century, surgeons did not wear special clothing or wash their hands before operations. Many of their patients died from infections.

(a) Suggest why patients often died from infections after operations.

.....
(1 mark)

(b) In the nineteenth century, Joseph Lister told surgeons to use sprays of carbolic acid in operating theatres and to wash their hands.

The graph shows the effect that using Lister’s instructions had on the number of patients who died from infections after surgery.



Describe how Lister’s instructions affected the number of patients dying from infections after surgery.

.....
.....
.....
(2 marks)

(c) Kidney transplants were introduced in the twentieth century as one way of treating patients with kidney failure.

(i) Give **one** other way of treating kidney failure.

.....
(1 mark)

(ii) The patient’s body may reject a transplanted kidney unless doctors take precautions.

Some of these precautions are listed below.

- A donor kidney is specially chosen.
- The recipient’s bone marrow is treated with radiation.
- The recipient is treated with drugs.
- The recipient is kept in sterile conditions.

Explain how **each** of these precautions may help the patient to survive.

.....

.....

.....

.....

.....

.....

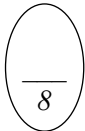
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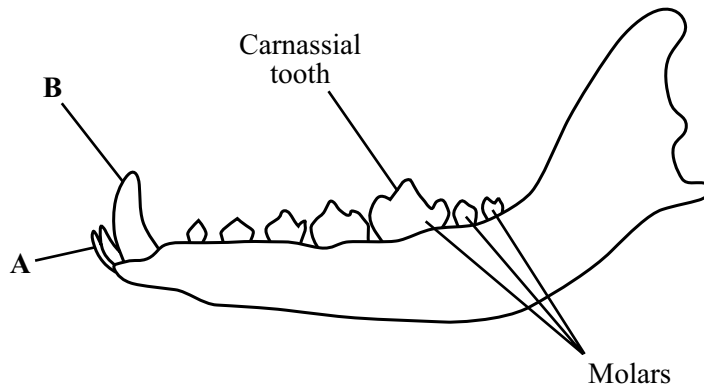
(4 marks)



TURN OVER FOR THE NEXT QUESTION

Turn over ►

12 The diagram shows the arrangement of teeth in the lower jaw of a dog.



(a) What are **two** functions of teeth?

1

.....

2

.....

(2 marks)

(b) Name the type of teeth shown by the letter **A** on the diagram.

.....

(1 mark)

(c) Describe how the teeth labelled **B** are adapted to a dog's diet.

.....

.....

.....

(2 marks)

(d) The carnassial teeth are large teeth. What special function do they have?

.....

(1 mark)

13 Microorganisms can be used to make useful products for man.

- (a) Complete each sentence by choosing the correct words from the box. Some words will be used more than once.

bacteria	moulds	yeasts
-----------------	---------------	---------------

..... are used in the manufacture of yoghurt.

..... and are both fungi.

..... can be used to add taste to blue cheeses.

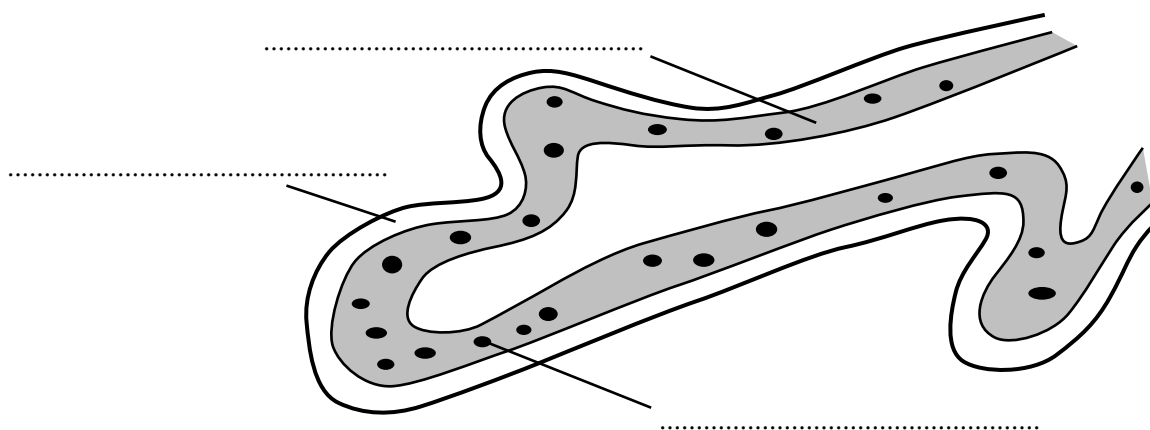
The alcohol in alcoholic drinks is produced by the action of

(5 marks)

- (b) The diagram shows part of a mould.

- (i) Add the following labels to the diagram.

cytoplasm nucleus wall



(2 marks)

- (ii) Moulds produce spores. What method of reproduction is used by moulds to produce spores?

.....

(1 mark)

8

Turn over ►

- 14 (a) The equation describes the process of photosynthesis.

carbon dioxide + + light energy \longrightarrow glucose +

- (i) Write in the names of the **two** missing substances. *(2 marks)*

- (ii) Name the green substance which absorbs the light energy.

.....
(1 mark)

- (b) (i) In bright sunlight, the concentration of carbon dioxide in the air can limit the rate of photosynthesis. Explain what this means.

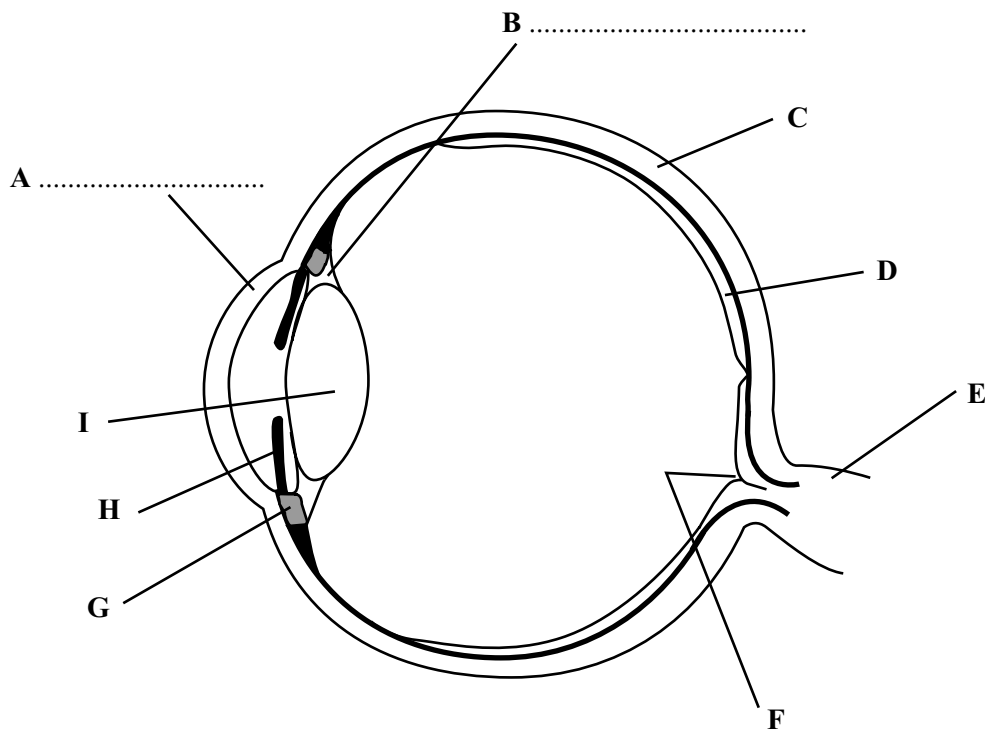
.....
.....
.....
(2 marks)

- (ii) Give **one** environmental factor, other than light intensity and carbon dioxide concentration, which can limit the rate of photosynthesis.

.....
(1 mark)

6

15 The diagram shows a section through the eye.



(a) On the diagram, label parts **A** and **B**. (2 marks)

(b) Give the letter, **A** to **I**, of the part which controls the amount of light entering the eye.

Letter.....
(1 mark)

(c) What is the function of part **E**?

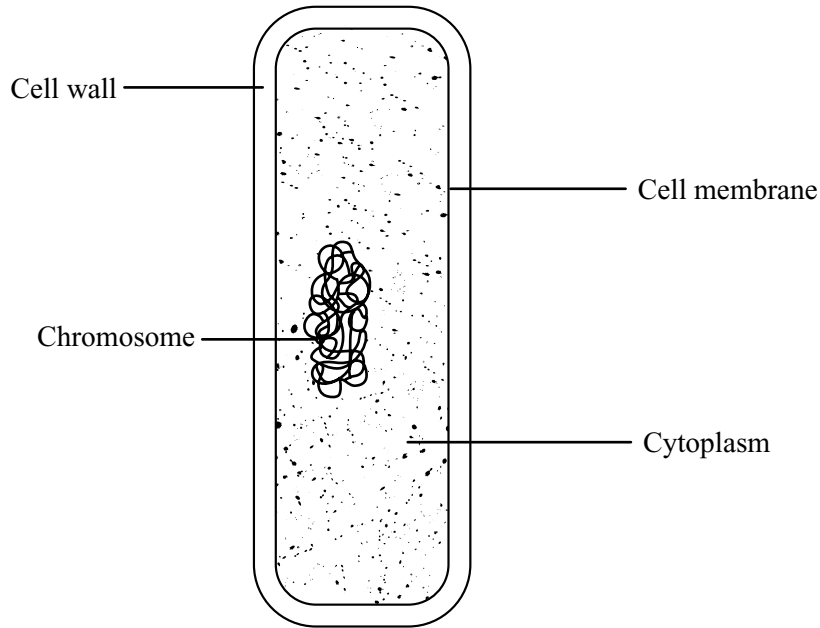
.....
(1 mark)

4

TURN OVER FOR THE NEXT QUESTION

Turn over ►

16 (a) The diagram shows a bacterial cell.



A bacterial cell is smaller than a human cell. Give **two** other ways in which the bacterial cell is different from a cell in the human body.

- 1
- 2 (2 marks)

(b) Describe and explain **two** natural defences which help to prevent bacteria entering and harming the human body.

- 1
-
- 2
- (2 marks)

- (c) The table shows changes in resistance to the antibiotic penicillin in one species of bacterium between 1991 and 1996.

Years	Percentage of cases where bacteria were resistant to penicillin
1991–92	7
1993–94	14
1995–96	22

A doctor was asked to treat a patient who had a sore throat.

- (i) How does penicillin help to treat infection?

.....
(1 mark)

- (ii) Use the data in the table to suggest why the doctor should **not** prescribe penicillin.

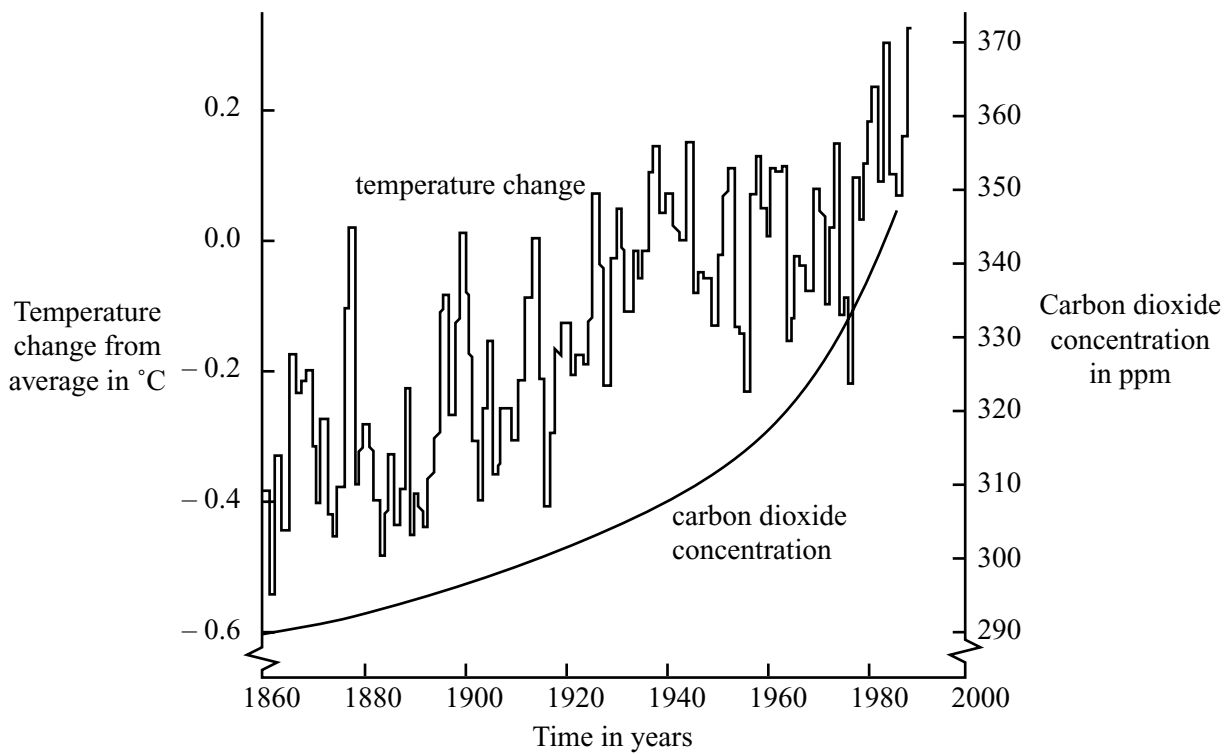
.....
.....
.....
.....
(2 marks)

7

TURN OVER FOR THE NEXT QUESTION

Turn over ►

17 The graph shows changes in temperature and in carbon dioxide concentration in the earth's atmosphere between 1860 and 1990.



(a) Give **two** human activities which may have helped to increase the concentration of carbon dioxide in the atmosphere.

1

2

(2 marks)

(b) (i) Describe the changes in temperature shown by the graph between 1860 and 1990.

.....

.....

.....

(2 marks)

(ii) Do the data in the graph prove that increased carbon dioxide concentrations in the atmosphere caused the changes in temperature you described in part (b) (i)? Give a reason for your answer.

.....

.....

(1 mark)

- (c) Describe **one** way in which a change in temperature such as that shown in the graph might affect the environment.

.....

.....

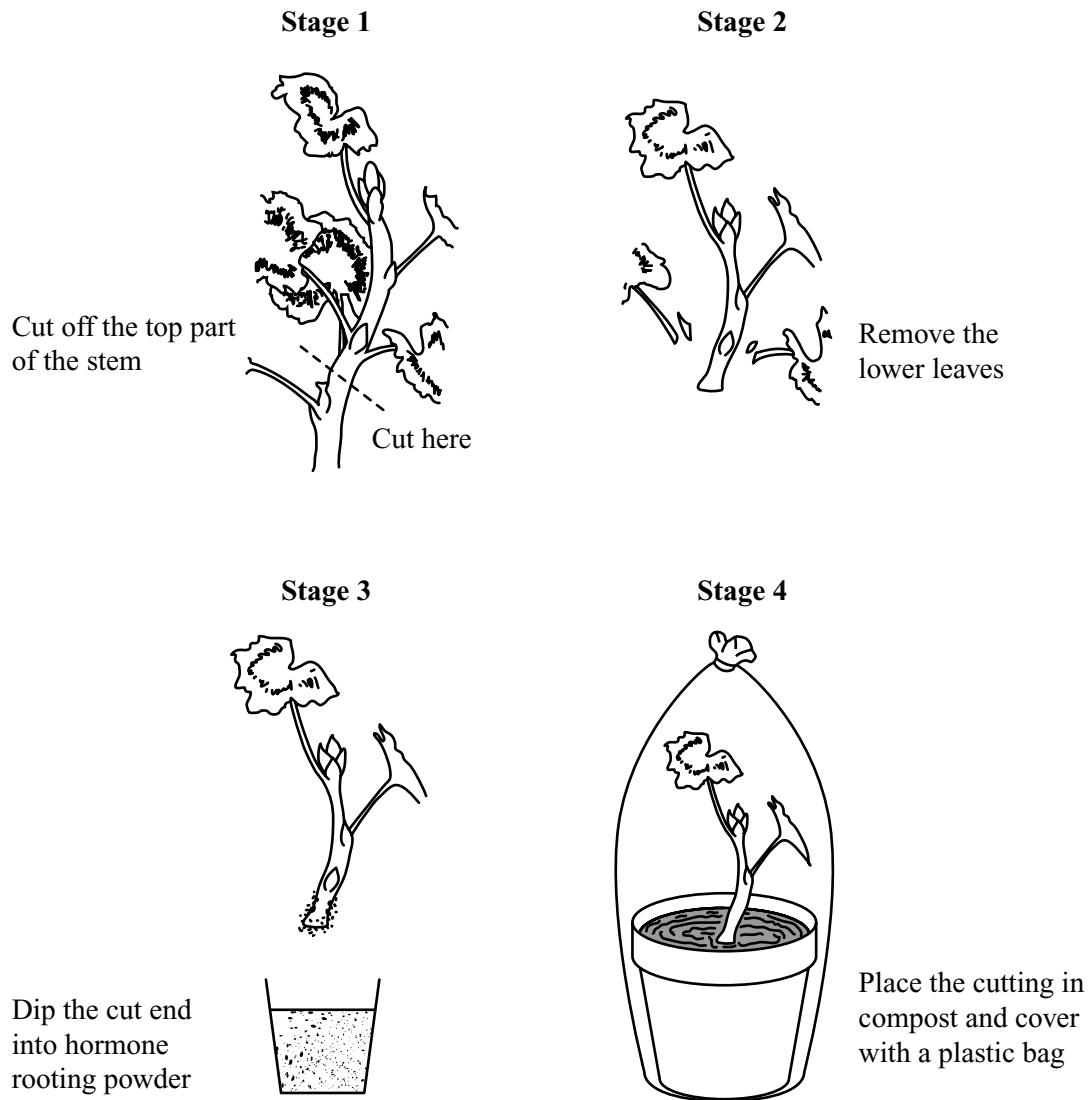
(1 mark)

6

TURN OVER FOR THE NEXT QUESTION

Turn over ►

- 18 (a) New plants can be produced from a parent plant by taking cuttings. The diagram shows how this is done.



(i) Hormone rooting powder stimulates the growth of new roots (Stage 3). Why would the cutting die without roots?

.....
(1 mark)

(ii) Why were the cutting and the pot of soil covered with a plastic bag (Stage 4)?

.....
(1 mark)

(b) A new variety of plant was developed by a gardener. Would the first plant of this new variety have been grown from a seed or from a cutting taken from another plant? Explain your answer as fully as you can.

To gain full marks in this question you should write your ideas in good English. Put them into a sensible order and use the correct scientific words.

.....
.....
.....
.....
.....
.....

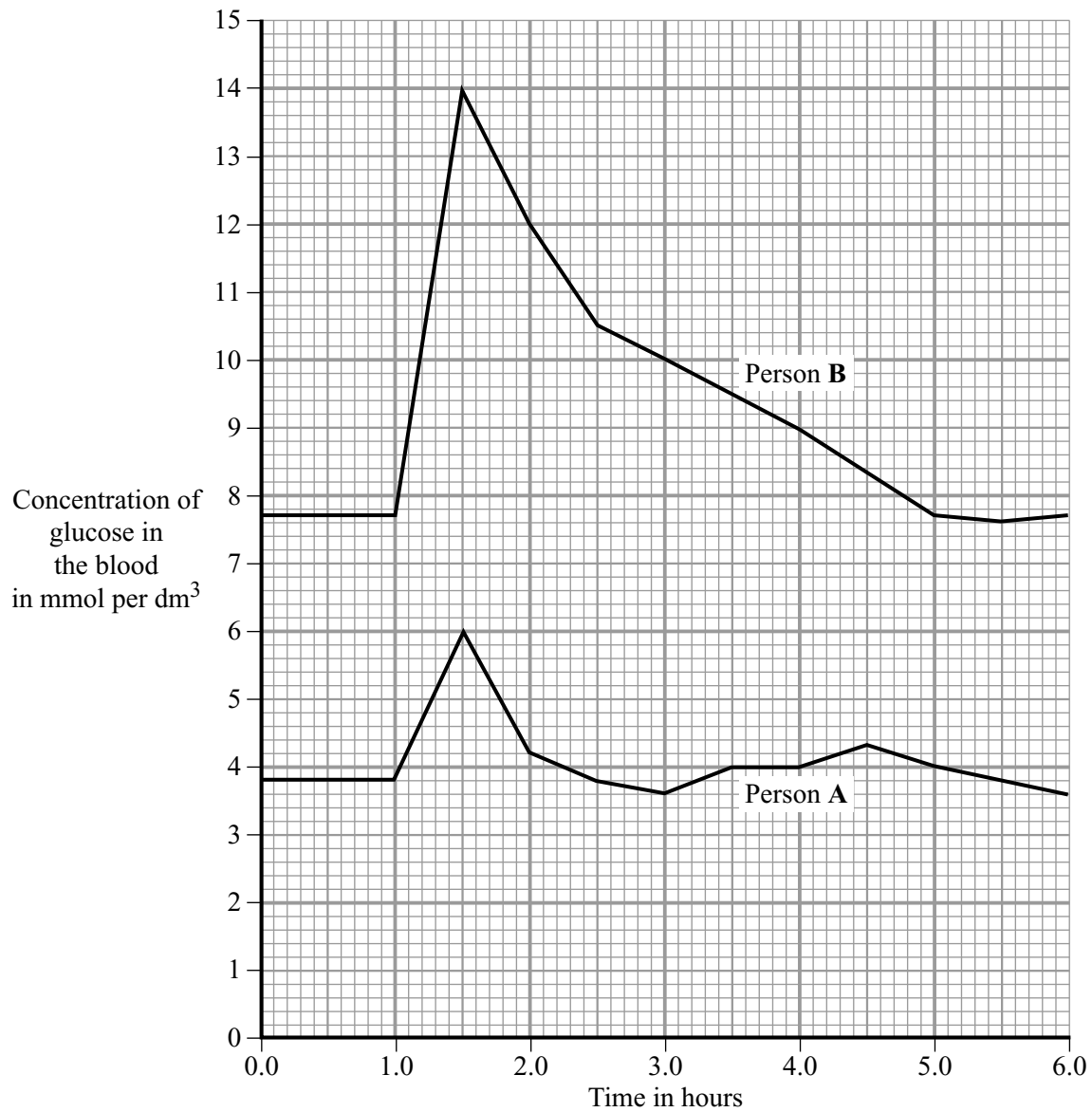
(3 marks)

5

TURN OVER FOR THE NEXT QUESTION

Turn over ►

- 19 The graph shows the concentration of glucose in the blood of two people. Person A is a non-diabetic. Person B has diabetes. Each person ate 75 grams of glucose at 1.0 hours.



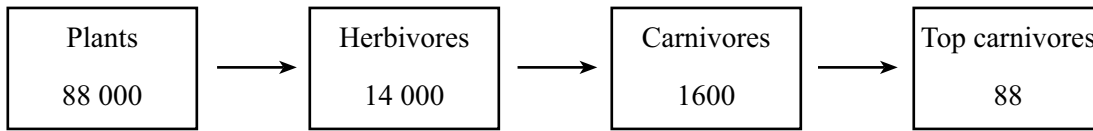
- (a) (i) What was the maximum concentration of glucose in the blood of Person A?

.....mmol per dm³
(1 mark)

- (ii) After eating the glucose, how long did it take for the concentration of glucose in the blood of Person B to return to normal?

.....hours
(1 mark)

20 The diagram shows a food chain in a pond. The figures show the amounts of energy in each type of organism, in kilojoules per m² of pond per year.



(a) Calculate the percentage of the energy in the plants that is passed to the top carnivores. Show clearly how you work out your final answer.

.....

.....

.....

Answer%
(2 marks)

(b) In the space below, draw a pyramid of biomass for this food chain. Label your drawing with the names of the organisms.

(2 marks)

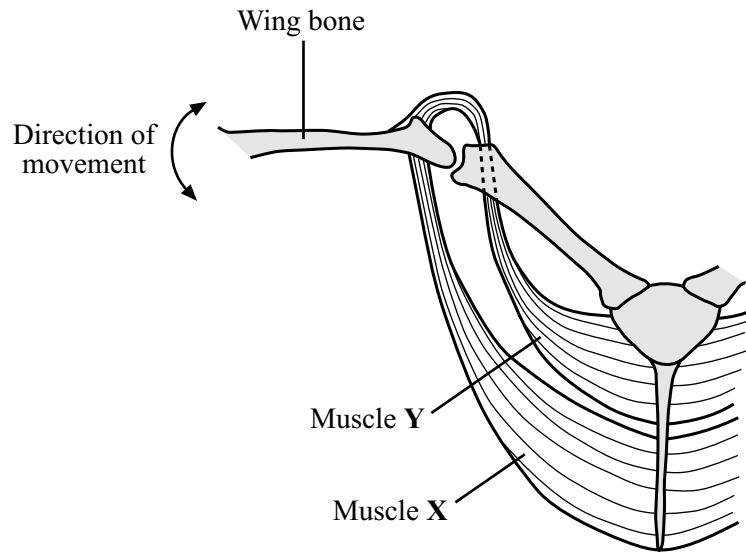
(c) If humans ate organisms from this food chain, it would be more efficient to eat plants than to eat herbivores. Why is this?

.....

.....

(1 mark)

21 The diagram shows the arrangement of some of the bones and muscles involved in moving a bird's wing.



(a) (i) Suggest how muscles X and Y bring about movement in the bird's wing during flight.

.....

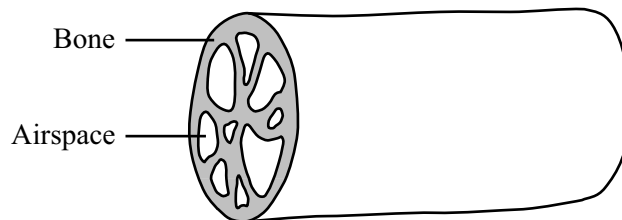
(3 marks)

(ii) Suggest why muscle X is much larger than muscle Y.

.....

(1 mark)

(b) The diagram shows a section through the wing bone.



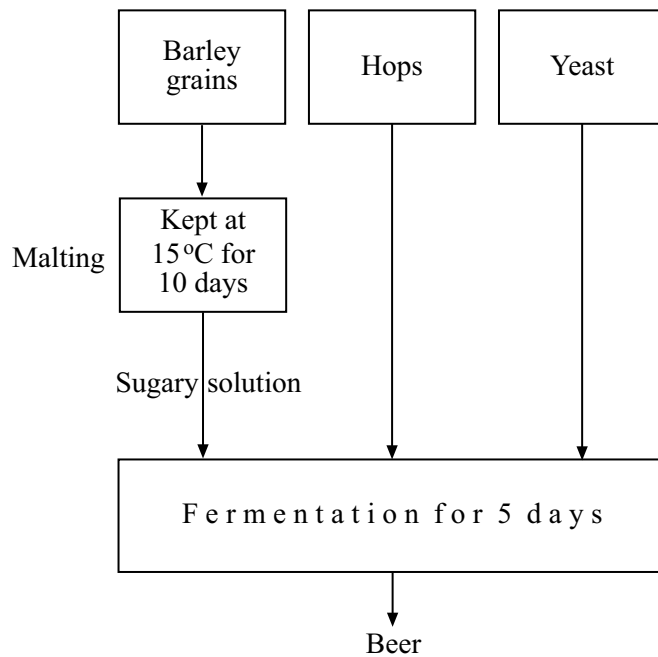
Explain how this arrangement of bone and airspaces is an adaptation for flight.

.....

(2 marks)

Turn over ►

23 The flow chart shows some of the stages in making beer.



(a) A sugary solution is made from the barley grains during the malting process. Describe how sugar is made in the barley grains.

.....
.....
.....
.....

(2 marks)

(b) Yeast is added to the sugary solution to ferment it. Describe what happens to the sugar during fermentation.

.....
.....
.....
.....

(2 marks)

(c) Brewers use different varieties of hops in their products. Suggest why.

.....
.....

(1 mark)

END OF QUESTIONS