Centre No.						Surname	Initial(s)
Candidate No.						Signature	

Paper Reference(s)

4325/2H

London Examinations IGCSE

Biology

Paper 2H

Higher Tier

Thursday 9 November 2006 – Morning

Time: 2 hours

Examiner's use only

Team Leader's use only

Question Number	Leave Blank
1	
2	
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12	
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14	
15	
Total	

Materials required for examination
Nil

Items included with question papers
Nil

Instructions to Candidates

In the boxes above, write your centre number and candidate number, your surname, initial(s) and signature.
The paper reference is shown at the top of this page. Check that you have the correct question paper.
Answer **ALL** the questions in the spaces provided in this question paper.
Show all the steps in any calculations and state the units.
Calculators may be used.

Information for Candidates

The total mark for this paper is 120. The marks for the parts of questions are shown in round brackets: e.g. **(2)**.
There are 28 pages in this question paper. All blank pages are indicated.

Advice to Candidates

Write your answers neatly and in good English.

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Turn over

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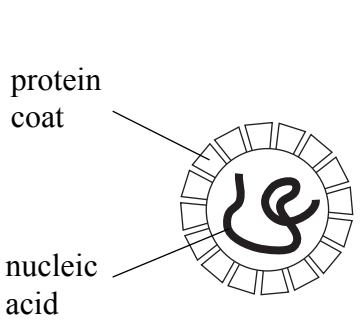
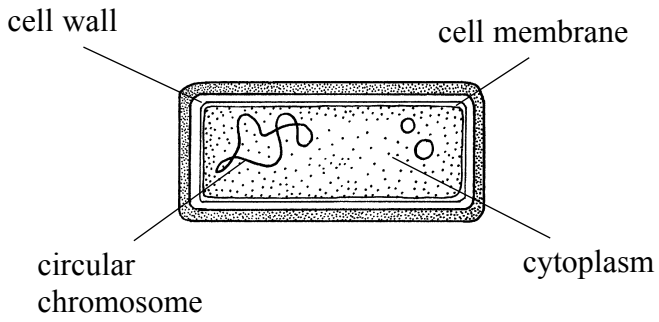
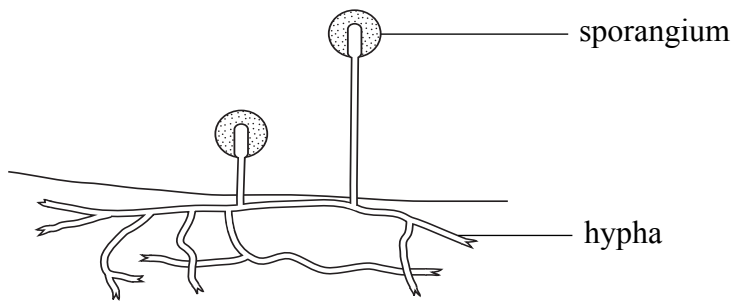
1. The diagrams show three different types of living organism. The diagrams are not drawn to the same scale.



A



B



C

(a) Organisms **A**, **B** and **C** belong to three different main groups. Which main group does each organism belong to?

A .....

B .....

C .....

(3)

(b) Which of the organisms **A**, **B** or **C** is the smallest?

.....

(1)

(c) For each of the following statements, write the appropriate letter of the organism.

It is able to reproduce only inside a living cell. .....

It is an organism made up of a single cell. .....

It contains many nuclei. .....

It feeds by the secretion of extracellular enzymes onto food. .....

(4)

Q1

(Total 8 marks)

Leave blank

2. The stems and roots of plants respond to the stimulus of gravity. Describe the responses and suggest how they help plants to survive.

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Q2

(Total 5 marks)

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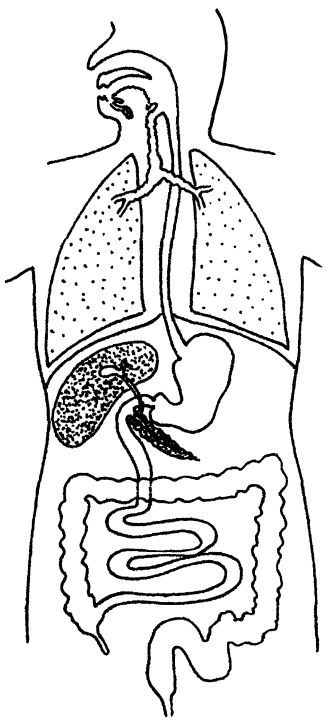
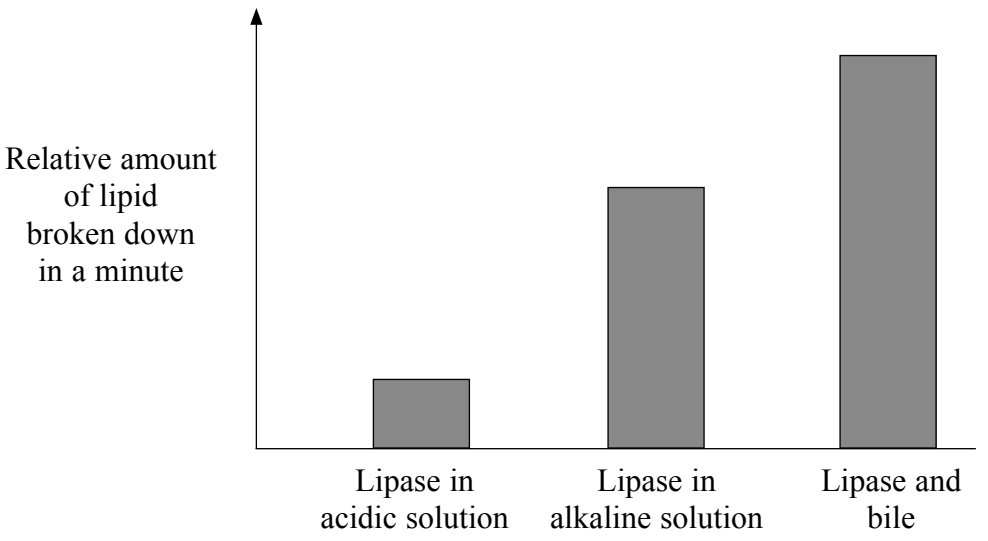
3. Lipase is an enzyme that breaks down lipids (fats) to fatty acids and glycerol and is produced in the pancreas and in the small intestine.

(a) On the diagram, label the pancreas and the small intestine.



(2)

(b) The graph shows the relative amount of lipid broken down by lipase under different conditions.



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Describe and explain the results shown by the graph.

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(4)

(c) Two other digestive enzymes are amylase and maltase. Complete the table to show the food molecule and the product of digestion for these enzymes.

Enzyme	Food molecule	Product of digestion
amylase		maltose
maltase	maltose	

(2) **Q3**

(Total 8 marks)

Leave blank

4. Cystic fibrosis is an inherited condition. The allele for cystic fibrosis is recessive. The condition develops when a person is homozygous recessive.

(a) How many copies of the allele need to be present for someone to have cystic fibrosis?

.....

(1)

(b) The letter **N** is used for the normal allele, and the letter **n** is used for the allele for cystic fibrosis. A mother and father both have the genotype **Nn** and do not have cystic fibrosis.

In the space below, complete the genetic diagram to show the genotypes of the gametes of the mother and father and the possible genotypes of their children. You should also state which of the children would develop cystic fibrosis.

	Mother	**Father**
Genotype of parents	**Nn**	**Nn**
Gametes		
Genotype of children		
Does the child develop cystic fibrosis? (yes or no)		

(3)

(c) Scientists can test people to find out if they carry the allele **n**. The test is done on genetic material from inside cells.

(i) Which part of a cell contains genetic material?

.....

(1)

(ii) Name the molecule that genetic material is made from.

.....

(1) **Q4**

(Total 6 marks)

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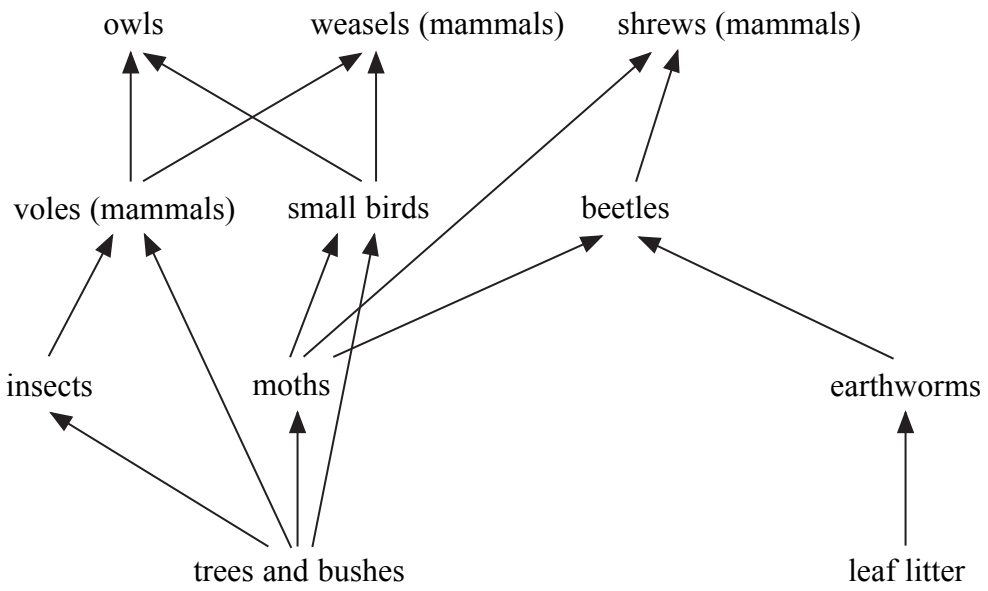
5. The diagram shows a food web for a wood.



(a) Give a food chain that contains four organisms and includes shrews.

(2)

(b) Explain what would happen to the populations of voles and of owls if a farmer catches a lot of weasels.

Voles .....

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Owls .....

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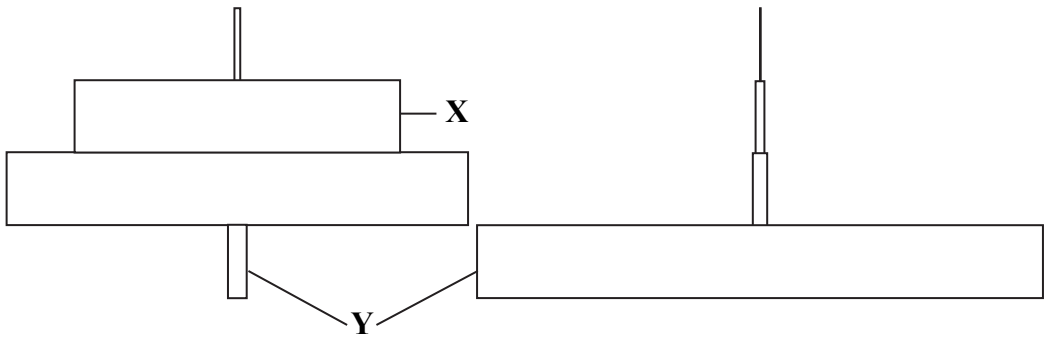
(4)

Leave blank

(c) The diagrams show a pyramid of numbers and a pyramid of biomass for the same area in this wood.



Pyramid of numbers **Pyramid of biomass**

(i) Name **one** organism from the food web that is in trophic level **X**.

.....

(1)

(ii) The organisms in trophic level **X** are described as secondary consumers. What term describes the organisms in trophic level **Y**?

.....

(1)

(iii) Explain why trophic level **Y** is narrow in the pyramid of numbers but is the widest trophic level in the pyramid of biomass.

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(2)

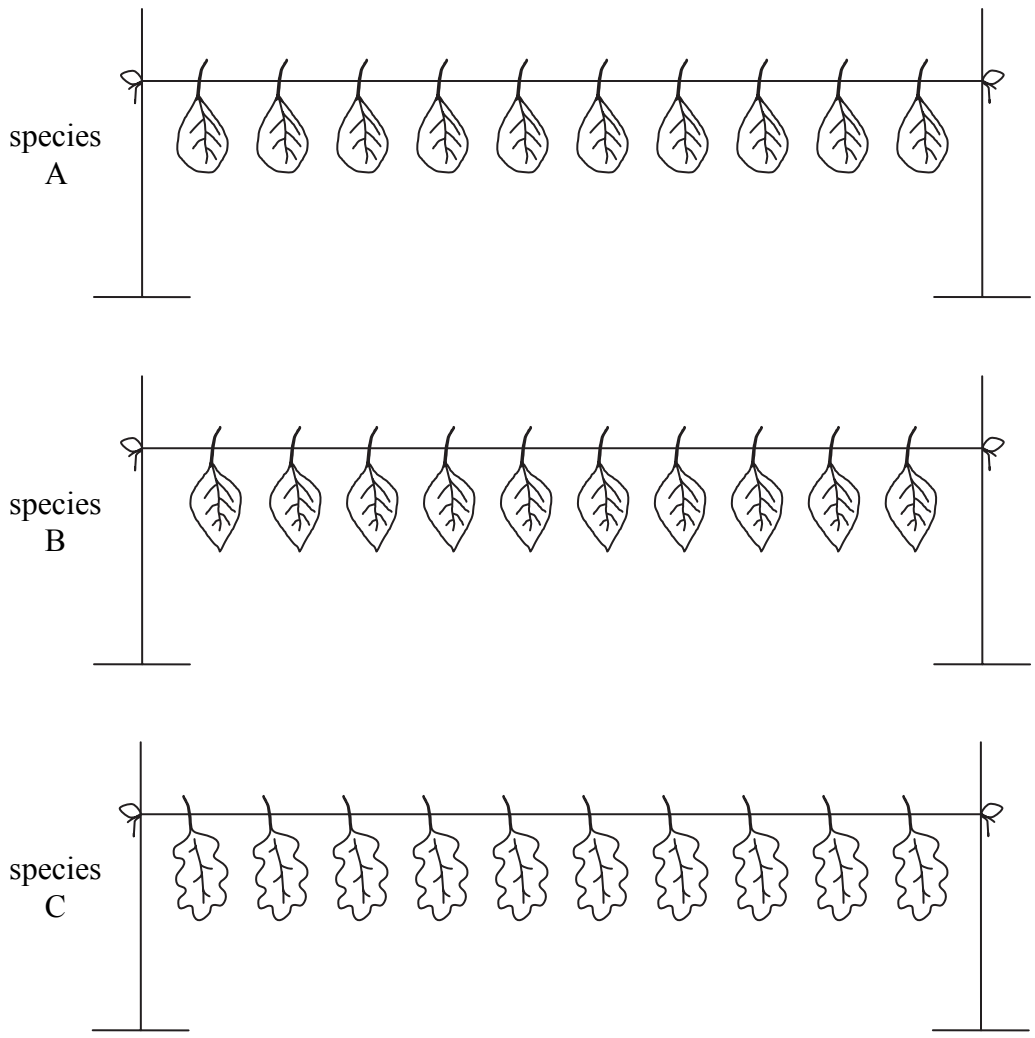
Q5

(Total 10 marks)

Leave blank

6. Plants lose water from the surface of their leaves.

A student did an experiment to compare the loss of water from leaves of three different species of plant A, B and C. He weighed 10 leaves of similar size of each species and hung them on a wire for three hours. Then he weighed the leaves again.



(a) What name is given to the loss of water from the surface of a leaf?

.....

(1)

Leave blank

(b) The table shows the student's results.

Species	Mass of 10 leaves in g	
	At start	After three hours
A	2.25	2.23
B	2.37	2.36
C	2.51	2.51

Which species appeared to lose most water? Give a reason for your answer.

.....

.....

.....

(2)

(c) Suggest **three** reasons why leaves of different plants lose water at different rates.

1 .....

2 .....

3 .....

(3) **Q6**

(Total 6 marks)

Leave blank

7. Etoposide is a drug that can be used against cancer. The drug is made by a rare plant. Scientists are using micropropagation to produce clones of this plant.

(a) The passage below describes the process of micropropagation. Write on the dotted lines the most suitable word or words to complete the passage.

Small pieces (called explants) are ..... from the parent plant. The small pieces of plant are dipped into dilute bleach to ..... their surfaces. They are then grown *in vitro* by placing them into test tubes containing ....., in conditions free from microorganisms. Each piece of plant develops into a ball of cells called a callus. Growth regulators are then added to encourage each callus to grow shoots and ..... . In this way large quantities of the rare plant can be produced.

(4)

(b) Why are the plants produced by micropropagation called clones?

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(2)

(c) Suggest **one** reason for using micropropagation to produce these plants rather than natural reproduction.

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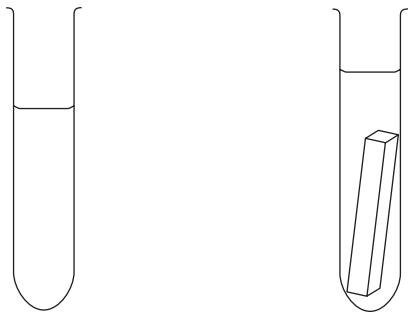
(1)

Q7

(Total 7 marks)

Leave blank

8. The diagram shows a test tube of water and then the same test tube after a potato chip has been placed in the water.

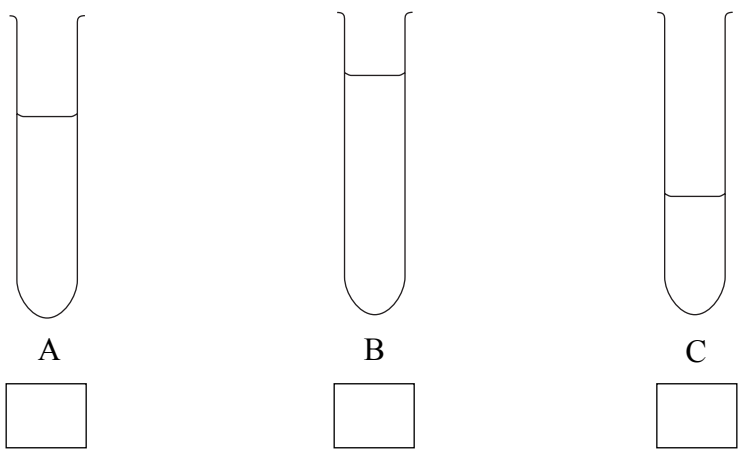


without potato chip **with potato chip**

The chip was left in the test tube for 30 minutes. It was then removed, allowing the surface water to drain back into the test tube.

(a) Which test tube shows the level of water after the potato chip had been removed?

Place a tick in the correct box.



A ☐ B ☐ C ☐

(1)

(b) Explain the reason for your choice.

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.....

(3) **Q8**

(Total 4 marks)

Leave blank

9. The eggs produced by chickens are an important source of protein in the human diet.

(a) (i) Describe how you would test the contents of a chicken egg for protein.

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(2)

(ii) Describe what happens to egg protein in the human stomach.

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(3)

(b) To improve egg production, chickens are kept inside rather than outside. Egg production is measured as a percentage using the formula below.

$$\frac{\text{number of eggs laid in one day}}{\text{total number of chickens}} \times 100$$

Leave blank

The table shows the egg production of 3 000 chickens during a period from when they were 20 weeks old until they were 72 weeks old.

Age of chickens in weeks	Egg production as a percentage
20	0
24	20
28	70
32	90
36	88
40	85
44	80
48	78
52	75
56	72
60	70
64	65
68	60
72	55

(i) Describe how egg production changes with the age of the chickens.

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.....

.....

(2)

(ii) How many eggs were laid in one day by the 32-week old chickens?

.....

.....

(1)

(c) Chickens are also kept for meat production. Suggest why the growth rate of chickens for meat production is higher if they are kept inside rather than outside (free range).

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(2)

Q9

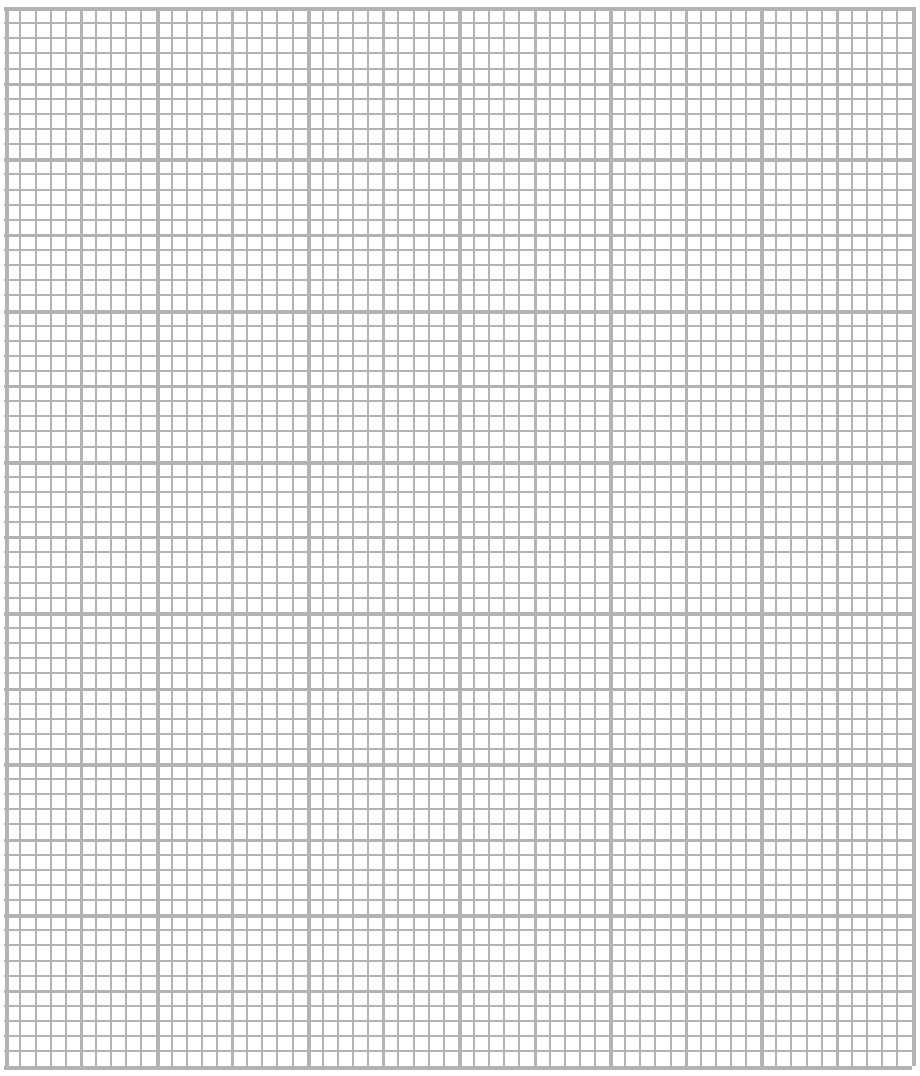
(Total 10 marks)

Leave blank

10. The table shows the volume of blood flowing through different organs in the body at rest and during exercise.

Organ	Volume of blood in cm^3 per minute	
	At rest	**During exercise**
intestine	1400	600
muscles	1200	12500
skin	500	2000

(a) (i) Use the grid below to draw a bar chart of the information in the table.



(4)

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(ii) In one hour, at rest, what volume of blood in cm^3 would flow through the intestine?

.....

(1)

(iii) Calculate the percentage increase in the volume of blood flowing through the skin during exercise compared to the volume at rest. Show your working.

Answer ..... %

(2)

(b) (i) Describe what happens to blood vessels in the skin to enable more blood flow.

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(2)

(ii) Explain the advantage of more blood flowing through the skin during exercise.

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(2)

(iii) Explain the advantage of more blood flowing through the muscles during exercise.

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(2)

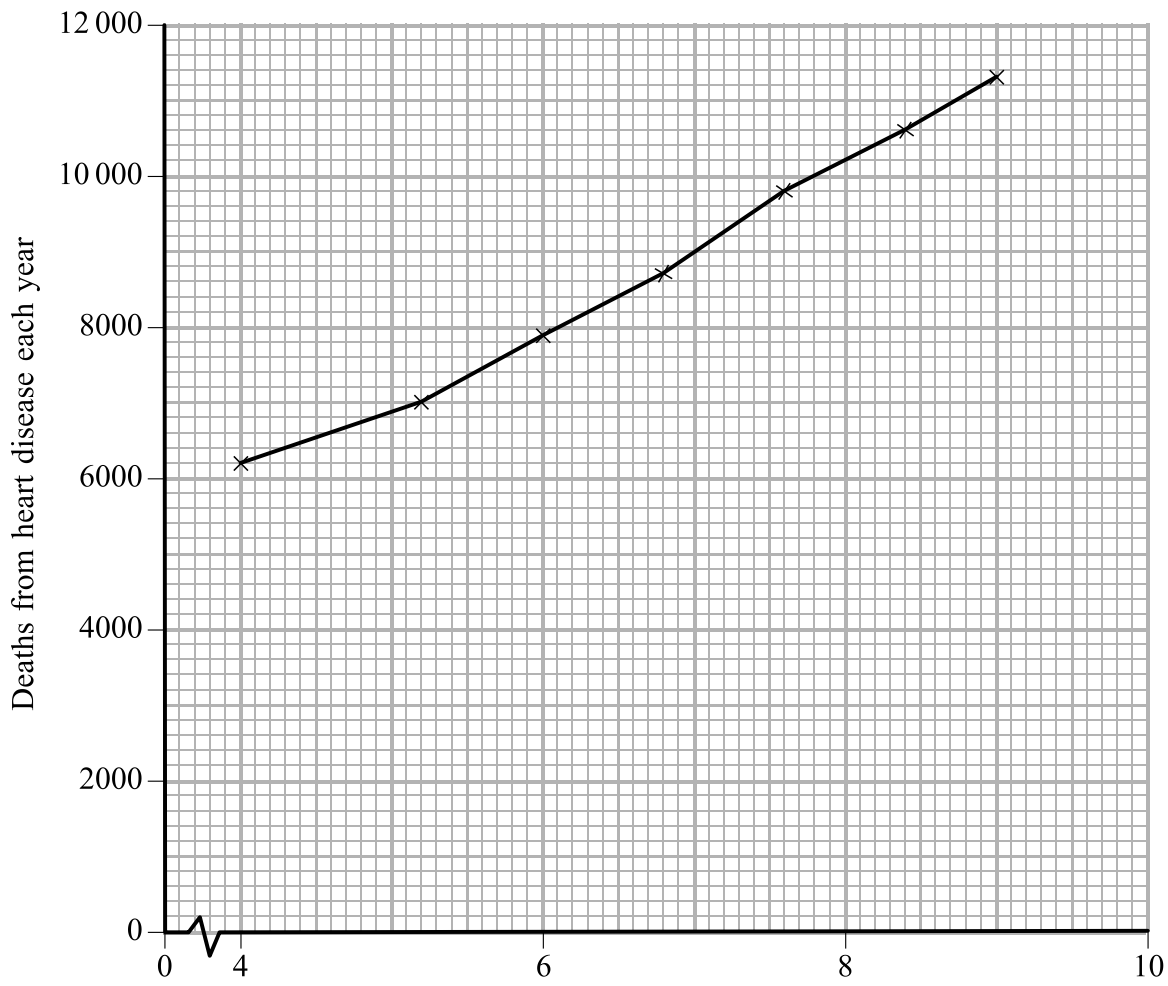
Q10

(Total 13 marks)

Leave blank

11. Cholesterol is a molecule that is needed by the human body. Unfortunately, too much cholesterol in the body can be harmful.

The graph shows the relationship between the level of cholesterol in the blood and the number of deaths from heart disease. The data refer to men aged 44 to 60 in the UK.



(a) (i) How many deaths occur each year from heart disease in men who have the highest blood cholesterol level recorded in these data?

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(1)

(ii) How many fewer deaths would occur each year from heart disease if these men reduced their blood cholesterol to 4 mmol per litre?

.....

(1)

Leave blank

(b) Cholesterol causes heart disease by blocking blood vessels leading to important organs such as the heart.

(i) Name the blood vessel that transports blood to the heart muscle.

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(1)

(ii) Explain how blocking this blood vessel can cause death.

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(3)

(c) Cholesterol is used in the human body to make some important substances. Three of these substances are shown in the table. Complete the table by giving **one** function of each substance.

Substance	Function
testosterone	
progesterone	
myelin	

(3)

Q11

(Total 9 marks)

Leave blank

12. Glasshouses are used to increase the yield of certain crops.

(a) Explain why increasing the temperature in a glasshouse would affect the yield of crops.

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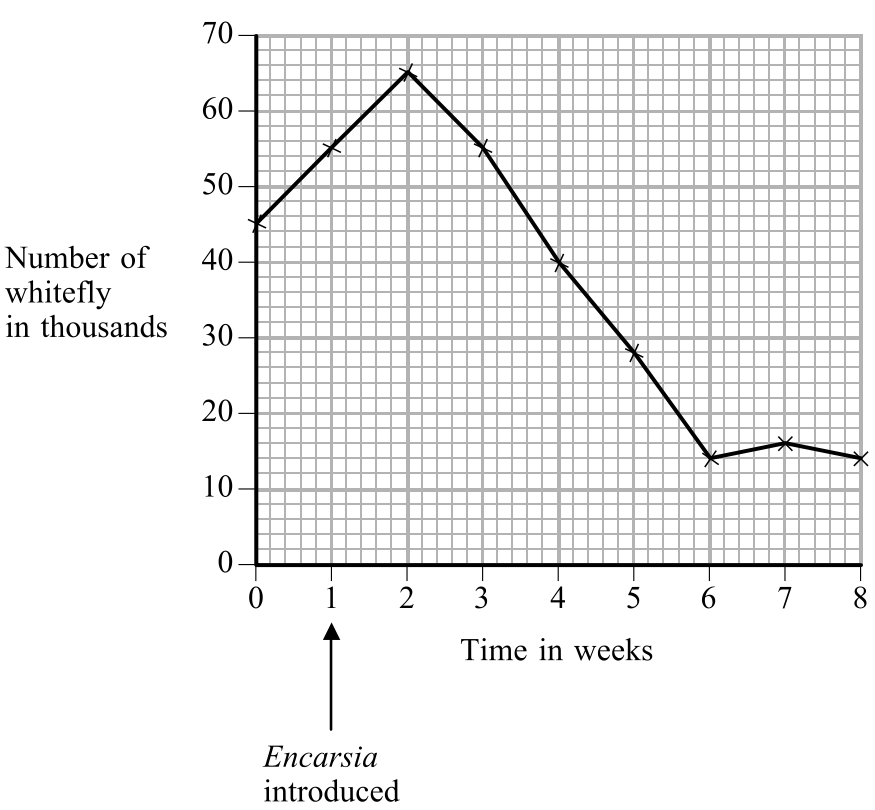
(3)

(b) Whitefly are insect pests that eat crops in glasshouses. An organism called *Encarsia* kills whitefly and is used in biological control of the pest.

The graph shows changes in the number of whitefly in a glasshouse during eight weeks. *Encarsia* were introduced into the glasshouse after one week.



Draw a line on the grid to show what you expect would happen to the number of whitefly if pesticide was sprayed in the glasshouse after one week instead of using *Encarsia*.

(2)

Leave blank

(c) Give **three** advantages of using biological control rather than chemical pesticides to control the number of whitefly.

1 .....

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2 .....

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3 .....

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(3)

Q12

(Total 8 marks)

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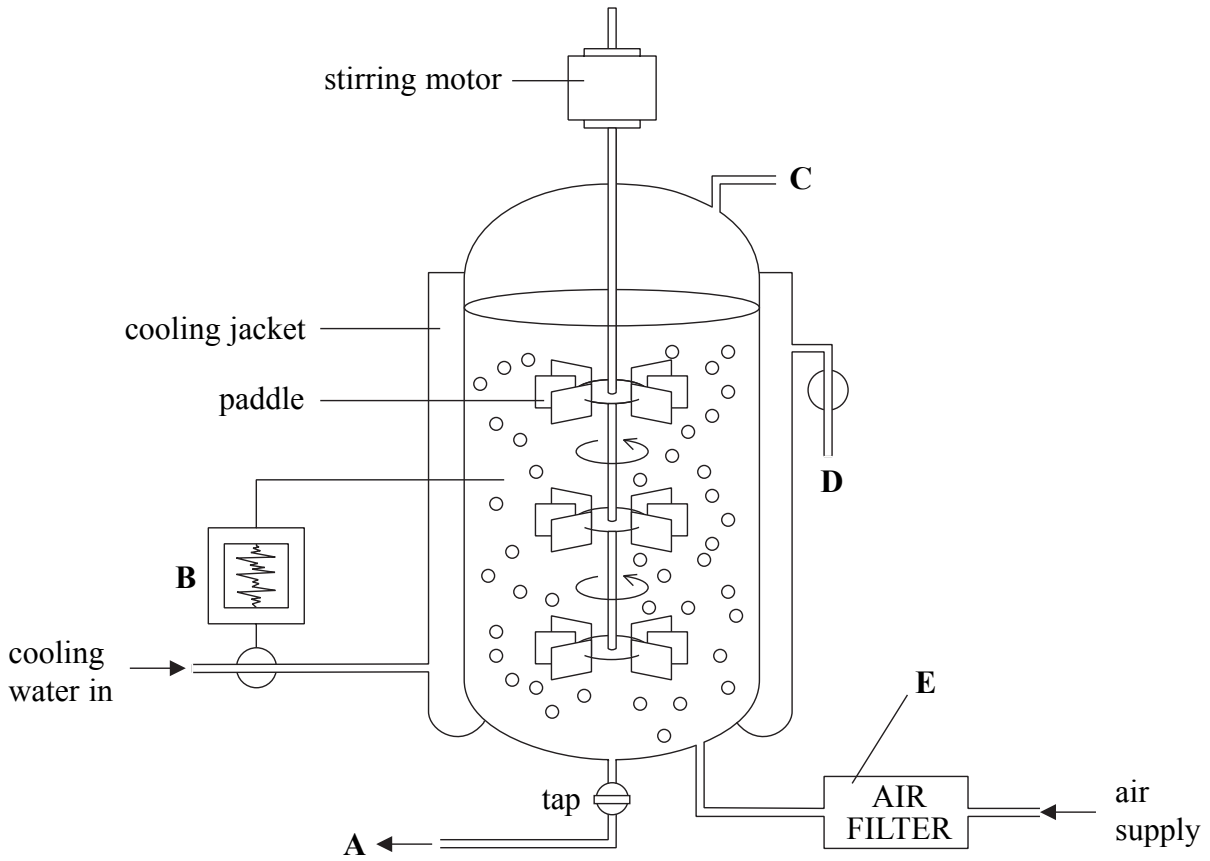
13. The diagram shows a fermenter used to grow bacteria that have been genetically modified so that they produce large amounts of human insulin.



The table lists problems that occurred when parts of the fermenter did not work properly.

(a) Complete the table by giving the letter of the part that did not work properly.

Problem	Part that did not work properly
Other bacteria got into the fermenter	
The liquid food got too hot	

(2)

Leave blank

(b) Bacteria can be genetically modified so that they produce human insulin.

Describe this process.

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(5)

(c) The human insulin produced in the fermenter is used by people who cannot make their own insulin. In these people, the organ that produces insulin is damaged.

(i) Name the organ that produces insulin.

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(1)

(ii) Explain what insulin does in the human body.

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(3)

Q13

(Total 11 marks)

Leave blank

14. Some people are unable to produce enough of the hormone ADH. This condition is called diabetes insipidus.

(a) (i) Name the organ that normally produces ADH.

.....

(1)

(ii) How does ADH get from this organ to the kidney?

.....

(1)

(iii) Name the part of the kidney nephron that responds to ADH.

.....

(1)

(b) (i) Explain why a lack of ADH is a problem.

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(2)

(ii) Suggest what people with diabetes insipidus must do in order to survive.

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(1)

Q14

(Total 6 marks)

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15. Clover is a small plant that is often eaten by snails. Scientists have found two types of clover plant growing on a mountain. They differ in their ability to make a poisonous substance called cyanide.

The clover plants that grow at the bottom of the mountain can produce cyanide. They have alleles that make their cells produce small bags of an enzyme in the cytoplasm. If a snail starts to eat the plant the bags are broken and the enzyme is released. The enzyme produces cyanide and so the snails stop eating the clover.

The clover plants that grow at the top of the mountain cannot make cyanide. Their cells have different alleles and do not produce small bags of enzyme. If they did, ice crystals that sometimes appear in the cytoplasm would burst the bags and kill the plants. It is too cold for snails to survive at the top of the mountain.

(a) Explain why clover plants that make cyanide are found growing at the bottom of the mountain and not at the top of the mountain. Use your understanding of natural selection in your answer.

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(5)

Leave blank

(b) All clover plants have swellings called nodules on their roots. These nodules contain nitrogen fixing bacteria. These are one type of bacteria that play an important part in the nitrogen cycle.

The table shows events that occur in the nitrogen cycle. Complete the table by naming the type of bacteria involved with each event.

Event in the nitrogen cycle	Type of bacteria
Convert nitrite into nitrate	
Convert nitrate into nitrogen gas	
Convert nitrogen gas into ammonium compounds	
Break down dead organic tissue into ammonium compounds	

(4) Q15

(Total 9 marks)

TOTAL FOR PAPER: 120 MARKS

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