Rewarding Learning

71	

Candidate Number

General Certificate of Secondary Education
2011

Science: Biology

Paper 2
Higher Tier

[G0904]

G0904

THURSDAY 2 JUNE, MORNING

TIME

2 hours.

INSTRUCTIONS TO CANDIDATES

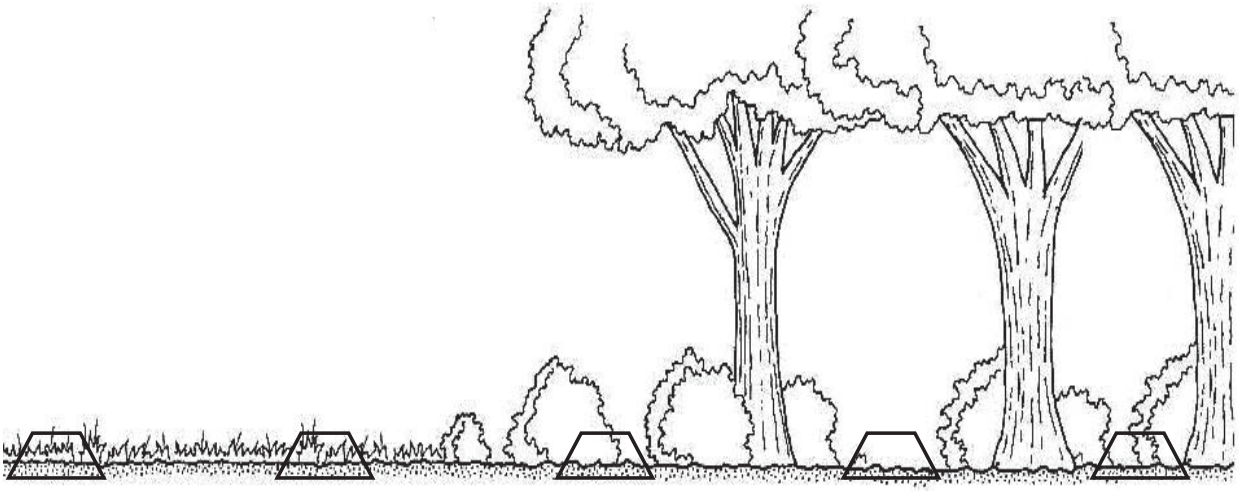
Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
Write your answers in the spaces provided in this question paper.
Answer **all eight** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 160.
Quality of written communication will be assessed in question **2(b)(ii)**.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Details of calculations should be shown.
Units must be stated in numerical answers where appropriate.

For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
Total Marks	

1 **(a)** The diagram shows where light measurements and samples were taken in a habitat study.



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Examiner Only	
Marks	Remark

The table shows the number of plant species in each sample area.

Sample area	1	2	3	4	5
Number of plant species	12	11	7	4	3

(i) Suggest why the number of plant species decreases from sample area 1 to sample area 5.

_____

_____ [1]

(ii) Explain how light is used by plants.

_____

_____

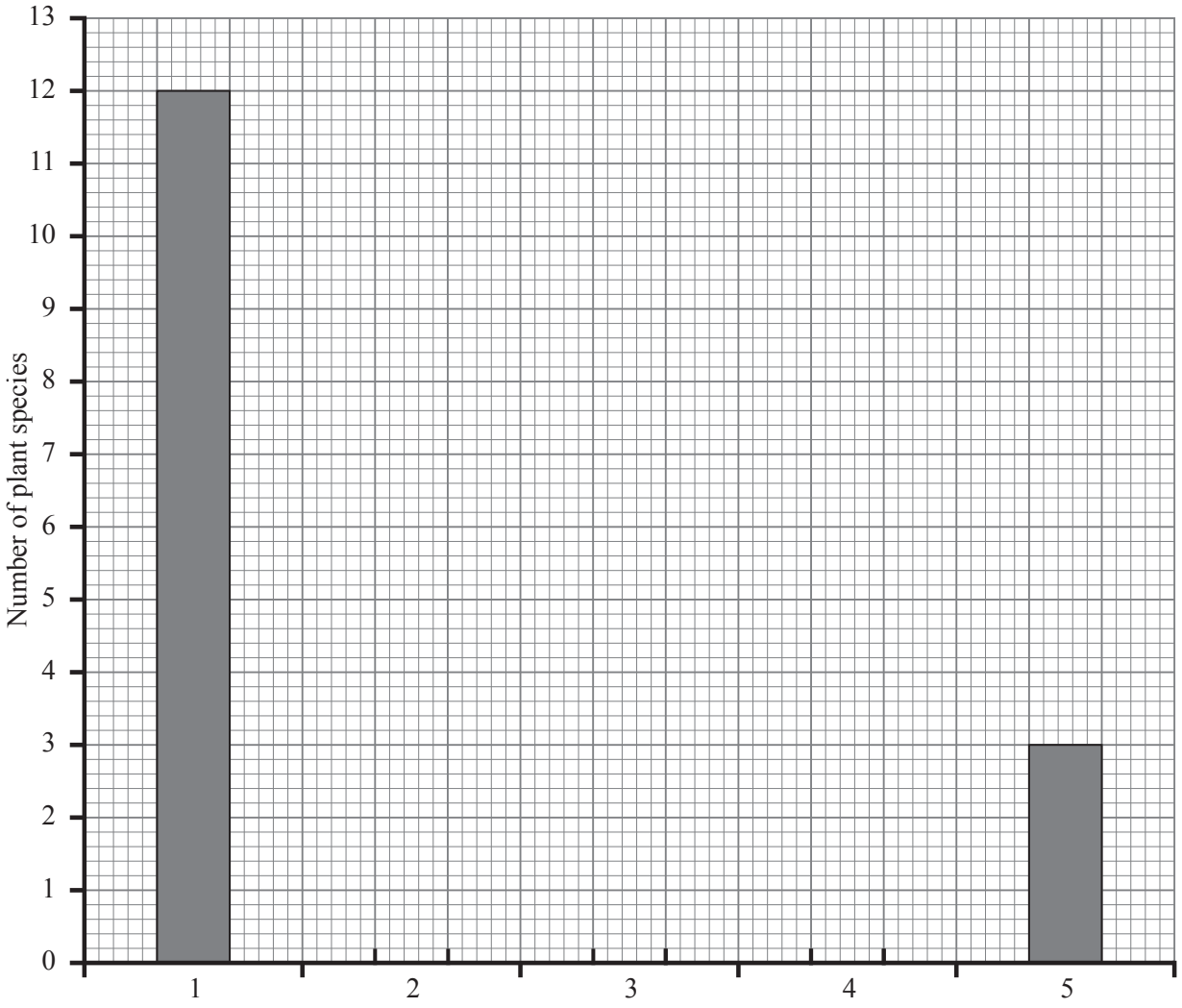
_____ [2]

(iii) Give **two other** environmental factors which could affect the plants found.

1. _____ [1]

2. _____ [1]

(iv) Use the results table to label the axis of the graph and complete the bar graph.



[3]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

(b) The diagram shows a sample of the animals collected during the habitat study.

A – © iStockphoto / Thinkstock
B – © iStockphoto / Thinkstock
C – © Brand X Pictures / Thinkstock
D – © iStockphoto / Thinkstock
E – © Hemera / Thinkstock

(i) Give the letters of the animals which are insects.

_____ [1]

(ii) Give **two** features of insects **not visible** in the diagram.

1. _____ [1]

2. _____ [1]

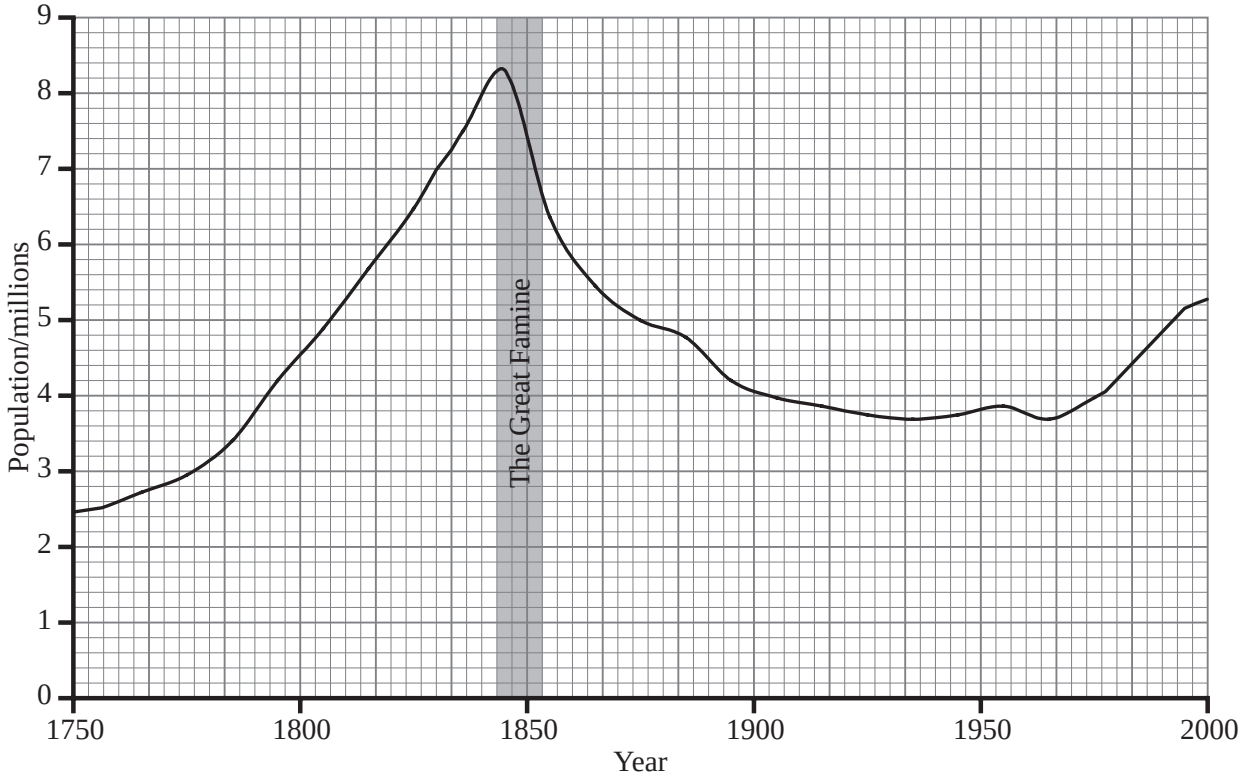
(iii) To which group do insects belong?

_____ [1]

(iv) Give **one** feature **visible** in the diagram, which adapts all these animals for life on land.

_____ [1]

(c) The graph shows changes in the population of Ireland between 1750 and 2000.



Examiner Only	
Marks	Remark

(i) Explain, in terms of birth rate and death rate, the population change during the Great Famine.

_____

_____

_____ [2]

After the Great Famine, the population decreased mainly due to emigration.

(ii) What is emigration?

_____

_____ [1]

(iii) Suggest **two** reasons why the population started to increase after 1960.

1. _____ [1]

2. _____ [1]

2 (a) (i) Complete the table on organ systems.

Organ system	Function
Skeletal	
	Breaks down food for absorption
Circulatory	
	Controls and co-ordinates body functions

[1]

[1]

[1]

[1]

(ii) What is meant by an organ system?

_____

_____ [1]

The main function of the respiratory system is gas exchange.

(iii) Suggest why it is an advantage to take air in through the nose rather than the mouth.

_____

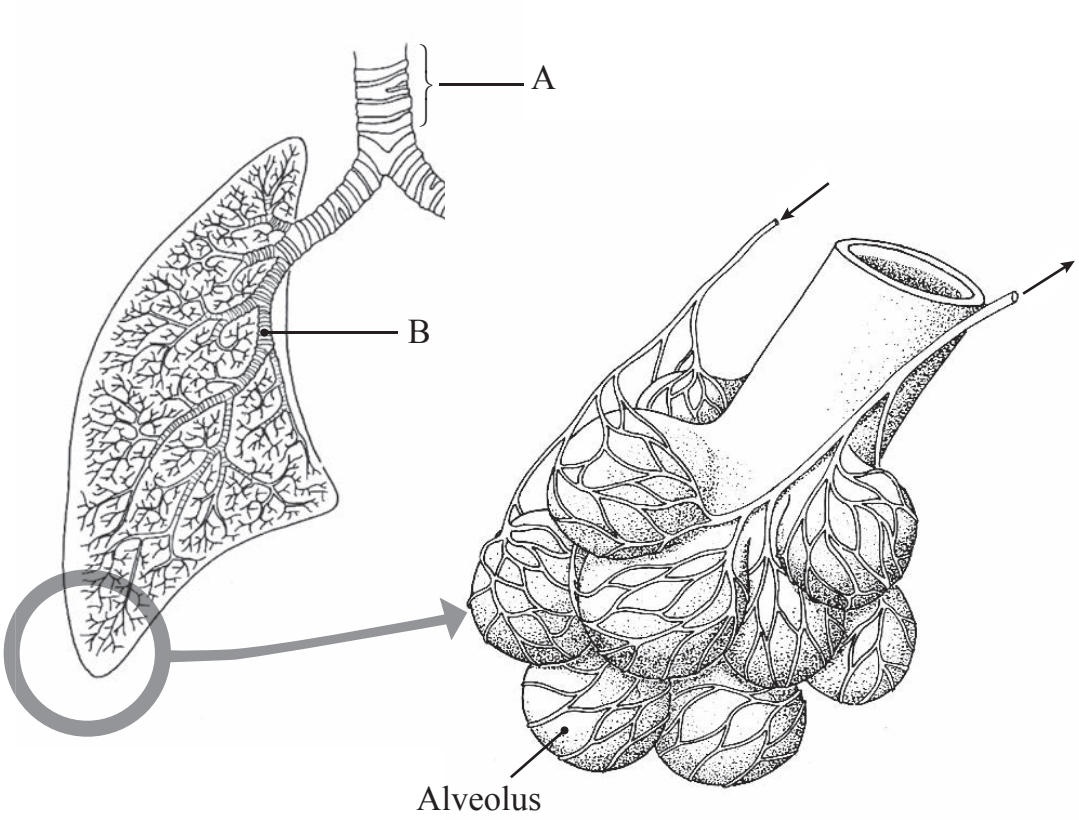
_____

_____

_____ [2]

Examiner Only	
Marks	Remark

(b) The diagrams show part of the human respiratory system.



(i) Name parts A and B.

A _____ [1]

B _____ [1]

(ii) Describe how an alveolus is adapted for gas exchange.

_____

_____

_____

_____

_____

_____

_____

_____ [3]

Quality of written communication [2]

Examiner Only

Marks	Remark

(c) Use this passage about smoking cigarettes, to help answer the question.

Examiner Only	
Marks	Remark

In the UK about 120,000 people per year die of smoking-related diseases. 82% of all deaths from lung cancer, 83% of all deaths from bronchitis and emphysema and about 25% of all deaths from heart disease are linked to smoking.
People who smoke between 1 and 14 cigarettes a day have 8 times the risk of dying from lung cancer compared to non-smokers. The risk increases the more cigarettes are smoked; those who smoke over 25 cigarettes a day have 25 times this risk.
Many smokers would like to quit. Ten years after stopping smoking the risk of getting lung cancer has fallen to half that of a smoker and the risk of having a heart attack is the same as never having smoked.

(i) How many people die of smoking-related diseases each year?

_____ [1]

(ii) Complete the table. (Lines 2–4)

Cause of death	Percentage linked to smoking	
Bronchitis and emphysema		[1]
	25	[1]
		[1]

(iii) Describe the difference in the risk of smoking 10 cigarettes per day compared to 30 cigarettes per day. (Lines 5–8)

_____

_____

_____ [2]

(iv) Which chemical in cigarette smoke can cause lung cancer?

_____ [1]

(v) Suggest why people who smoke cigarettes find it hard to stop.

_____ [1]

Examiner Only	
Marks	Remark

3 **(a)** Complete the table on cell structure by placing a ✓ or an ✗ in the boxes.

✓ = present ✗ = absent

Cell structure	Plant cell	Animal cell
Cell wall	✓	
Cytoplasm		
Chloroplast		
Vacuole		✗

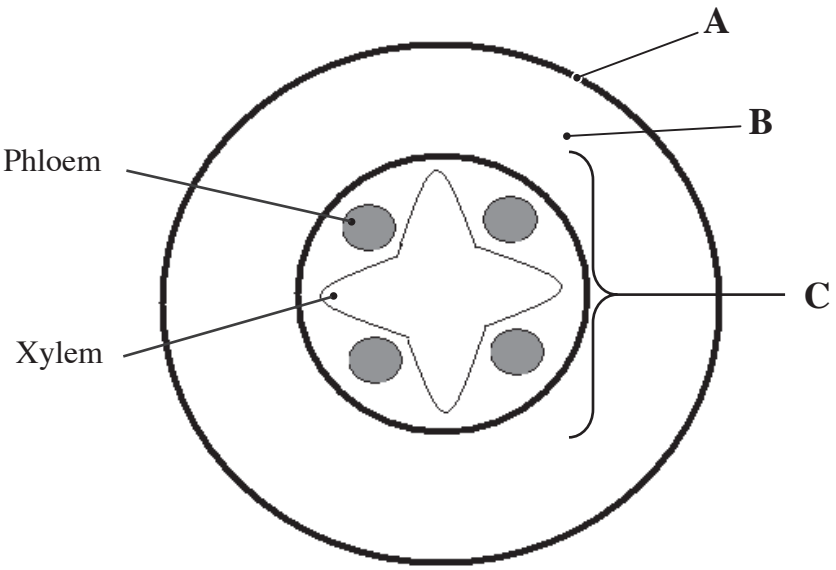
[1]

[1]

[1]

[1]

(b) The diagram shows a section through a plant root.



(i) Name parts A, B and C.

A _____ [1]

B _____ [1]

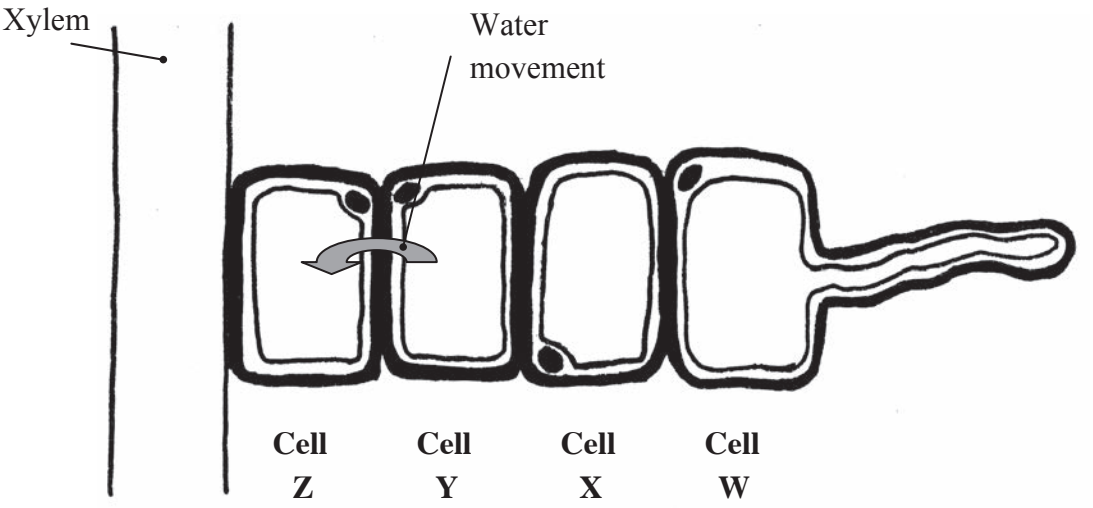
C _____ [1]

(ii) Describe the function of phloem.

_____

_____ [2]

The diagram shows an enlarged section through part of the plant root.



(iii) On the diagram draw an arrow to show the direction water moves in the xylem. [1]

(iv) Give the name of this movement of water in the xylem.

_____ [1]

(v) Name the process by which water diffuses from cell Y to cell Z.

_____ [1]

Examiner Only

Marks	Remark

(vi) Draw cell X enlarged three times.

[3]

(vii) Name cell W and describe how it is adapted for its function.

_____

_____

_____

_____

_____[3]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

4 **(a)** The table shows the information given on a box of wholegrain breakfast cereal.

	Amount per 100 g
Energy/kJ	1520
Protein/g	9.5
Carbohydrate/g	70.9
Fat/g	5.3
Fibre/g	9.4
Salt/g	0.18
Iron/mg	11.9

(i) Calculate the amount of energy in a 40g serving of this breakfast cereal.
Show your working.

_____ kJ [2]

(ii) Use the table to name the food group which

can be an immediate source of energy for the body.

_____[1]

is made up of long chains of amino acids.

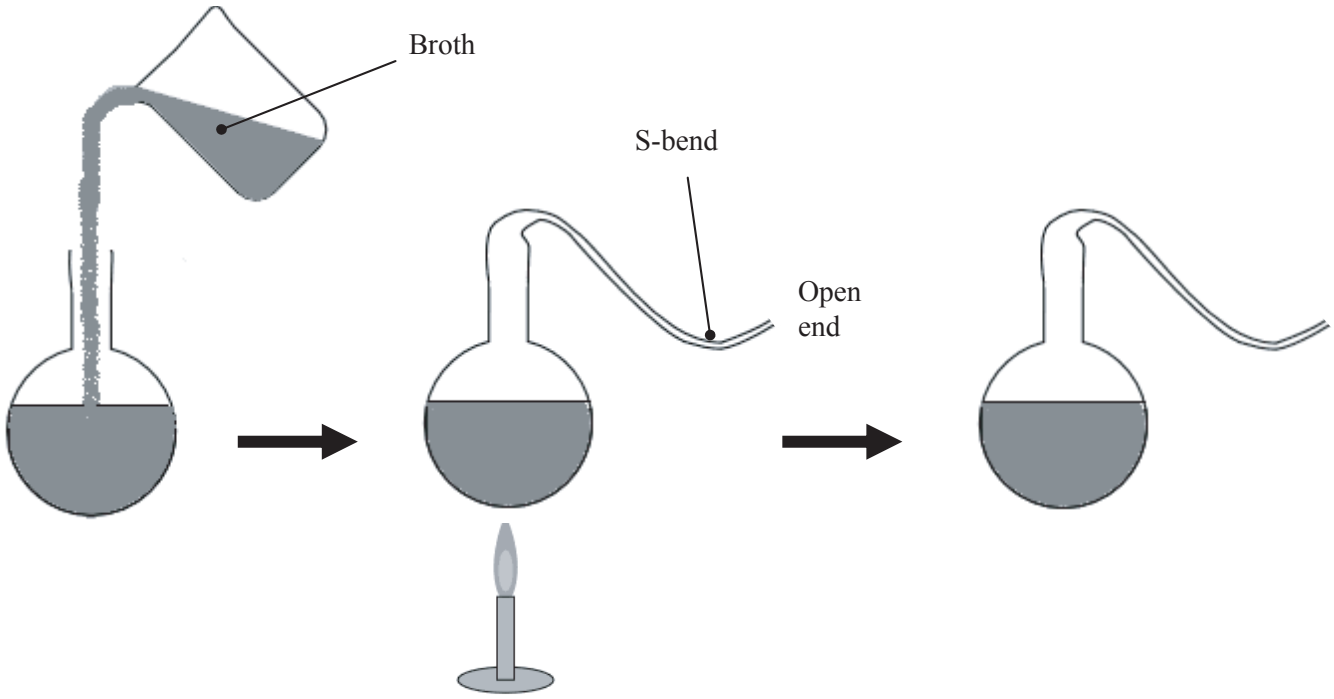
_____[1]

(iii) Explain why children need more protein in their diet than an adult.

_____

_____[1]

(b) The diagrams show an experiment carried out by Louis Pasteur.



Examiner Only	
Marks	Remark

(i) Explain what is meant by spontaneous generation.

_____

_____

_____[2]

In step 2, Pasteur drew the neck of the flask into a long S-shape leaving it open at the end.

(ii) Explain the purpose of the

S-bend. _____

_____ [1]

open end. _____

_____[1]

(iii) What would be a suitable control for this experiment?

_____

_____[1]

(iv) Explain why a bottle of milk remains fresh for longer when it is kept in the fridge.

_____

_____

_____[2]

(c) The photograph shows a compost bin.

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(i) Suggest a reason for the holes in the sides.

_____

_____[1]

(ii) Give **two other** conditions needed for decomposition.

1. _____[1]

2. _____[1]

Examiner Only

Marks	Remark

(iii) Suggest **two** items of kitchen waste which could be composted.

1. _____[1]

2. _____[1]

(iv) Name one invertebrate detritus feeder, which may be found in a compost bin.

_____ [1]

Examiner Only	
Marks	Remark

5 **(a)** Complete the table of diseases caused by microorganisms.

Disease	Type of organism	Method of transfer	Prevention or cure
	H I Virus	Sexual intercourse	
Rubella		Droplet infection	Vaccination
	Bacteria		Cooking food to a high temperature

[5]

(b) **(i)** Name the antibiotic discovered by Alexander Fleming.

_____ [1]

(ii) Describe how he discovered the antibiotic.

_____

_____

_____

_____

_____[2]

(c) Give **three** ways the body prevents microorganisms from entering.

1. _____[1]

2. _____[1]

3. _____[1]

Examiner Only

Marks	Remark

(d) The vaccine for Rubella contains an inactivated form of the microorganisms which cause the disease.

Examiner Only	
Marks	Remark

(i) Explain what happens when inactivated Rubella microorganisms are injected into the bloodstream.

_____

_____

_____

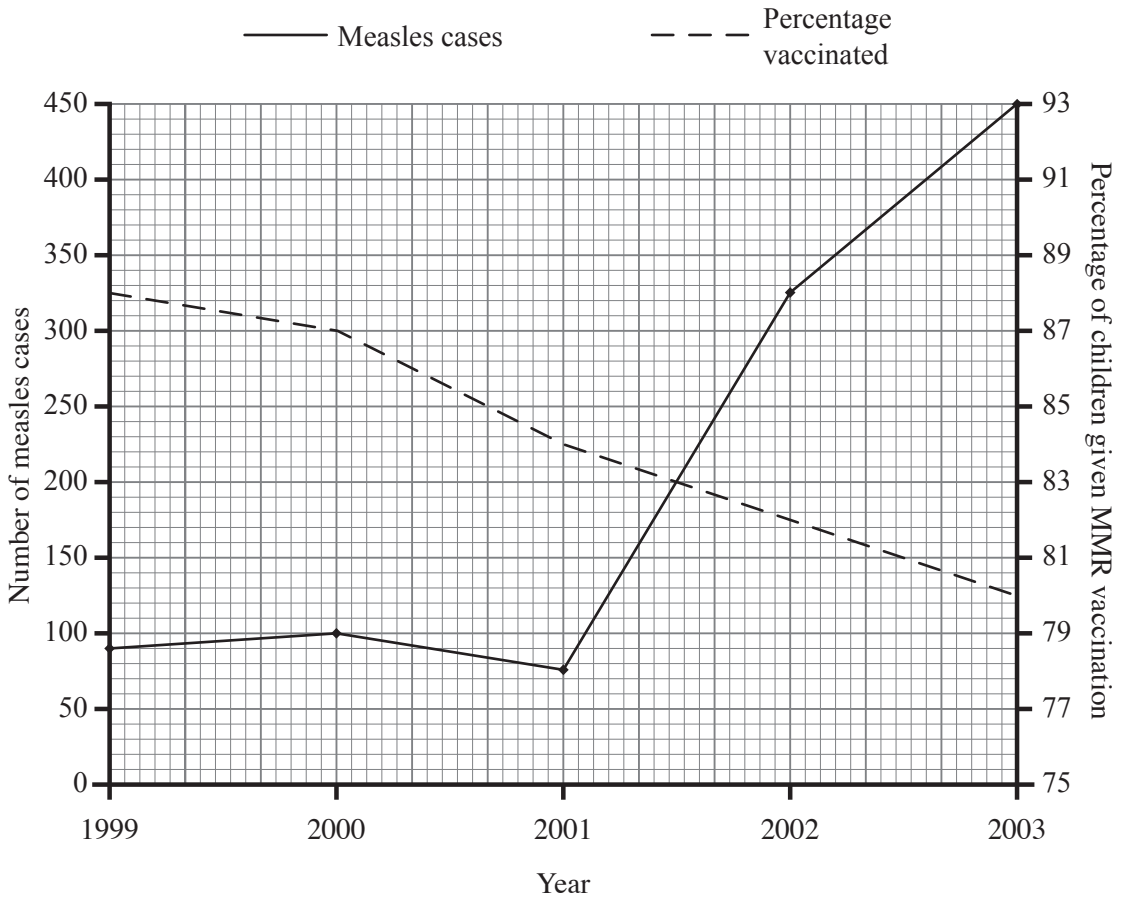
_____[2]

(ii) Explain why it is important to give women the Rubella vaccine before they become pregnant.

_____

_____[1]

Rubella vaccine is usually given in combination with vaccines for measles and mumps, known as the MMR vaccine.
The graph shows changes in the percentage of children given the MMR vaccination and the numbers of measles cases in the UK between 1999 and 2003.



(e) (i) What percentage of children were given the MMR vaccination in 2001?

_____ [1]

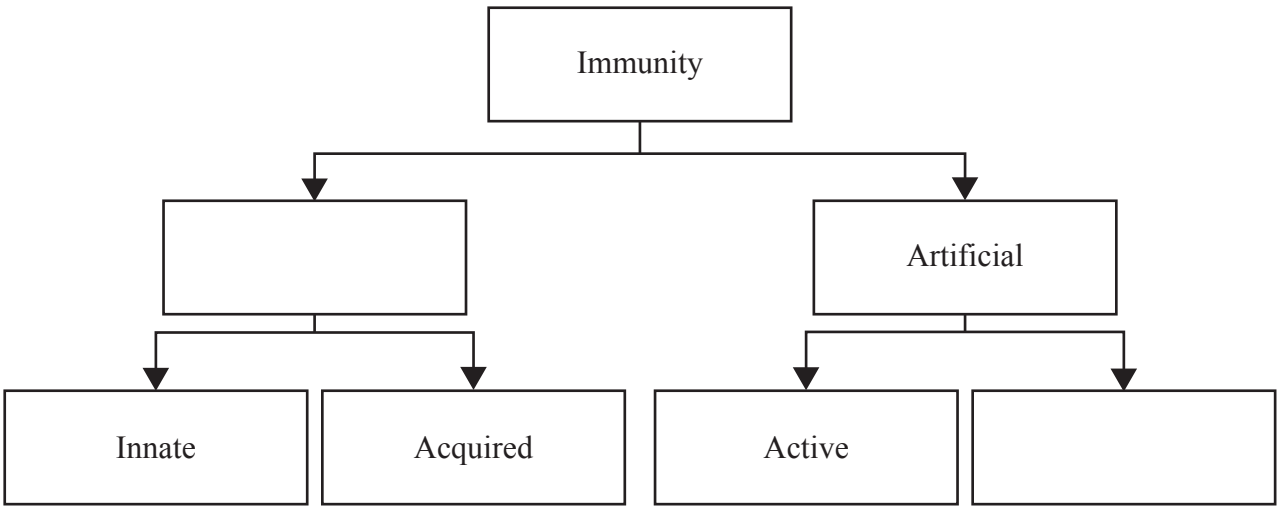
(ii) Calculate the percentage increase in measles cases between 2001 and 2003.
Show your working.

Answer _____ [2]

Examiner Only

Marks	Remark

(f) (i) Complete the diagram summarising different types of immunity.



[2]

Examiner Only	
Marks	Remark

(ii) Give **two** similarities between acquired and active immunity.

_____

_____

_____[2]

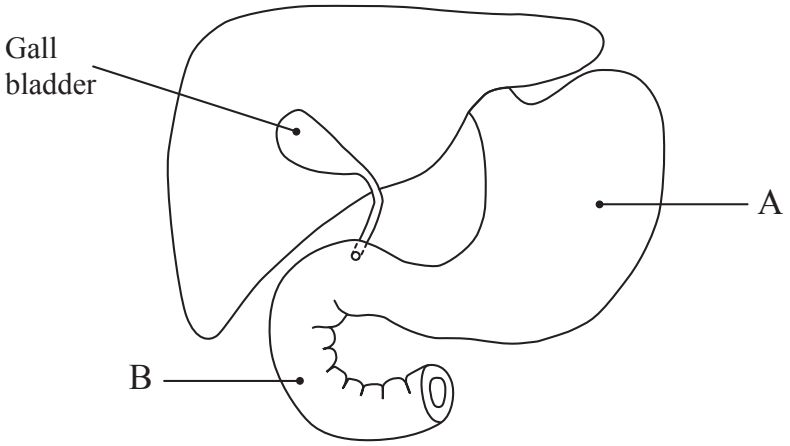
(iii) Explain innate immunity.

_____

_____[1]

Examiner Only	
Marks	Remark

6 **(a)** The diagram shows part of the digestive system.



(i) Name parts A and B.

A _____ [1]

B _____ [1]

The gall bladder stores bile.

(ii) Give the function of bile and name the organ which produces it.

_____

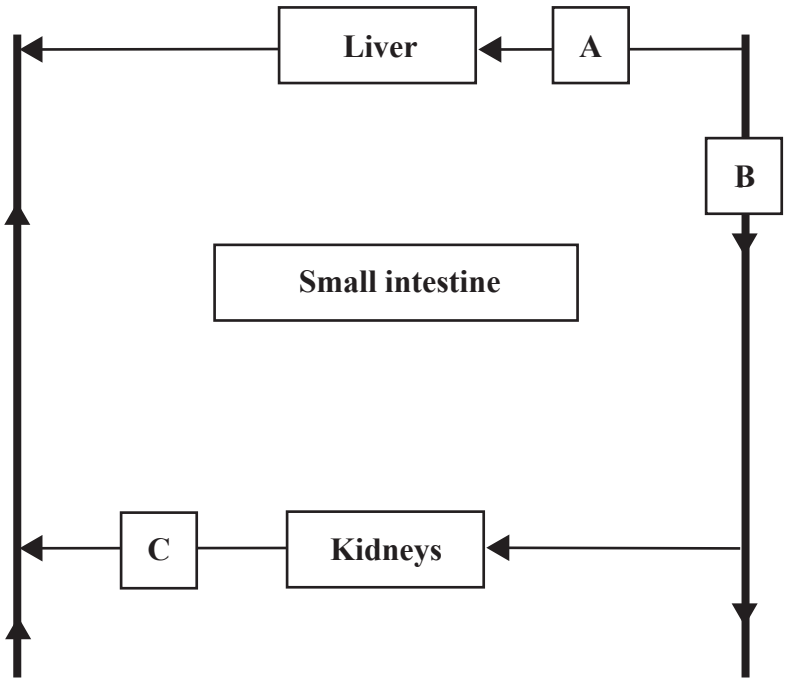
_____

_____ [2]

(iii) Name the process which pushes food along the intestine.

_____ [1]

(b) The diagram shows the blood supply to part of the human abdomen.



(i) **Complete the diagram** to show the blood supply to and from the small intestine. [3]

(ii) Name blood vessels A, B and C.

A _____ [1]

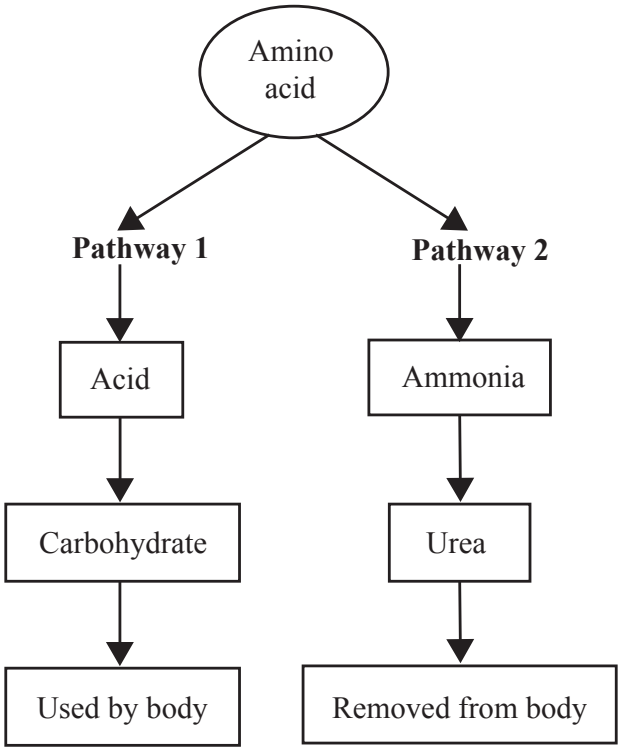
B _____ [1]

C _____ [1]

Examiner Only

Marks	Remark

(c) The diagram summarises the breakdown of excess amino acids.



(i) Name the process which breaks down excess amino acids.

_____ [1]

(ii) Name the organ where this process occurs. _____ [1]

(iii) Use the diagram to help explain what happens to the part of the amino acid broken down in Pathway 1.

_____

_____

_____ [2]

(iv) Suggest why urea is removed from the body and describe how this occurs.

_____

_____

_____

_____

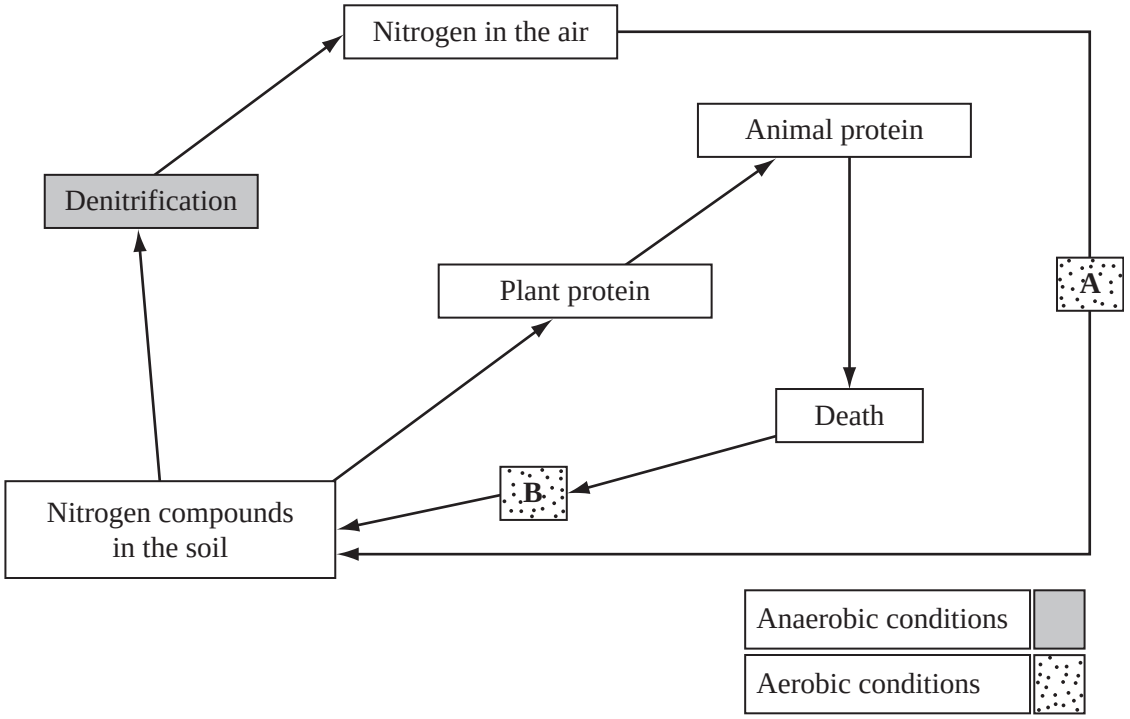
_____ [3]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

7 **(a)** The diagram shows part of the nitrogen cycle.



(i) Name the processes A and B.

A _____ [1]

B _____ [1]

(ii) Use the diagram to help suggest how flooding decreases the concentration of nitrogen compounds in the soil.

_____

_____

_____ [2]

In the soil ammonium compounds can be converted into nitrates.

(iii) Name this process.

_____ [1]

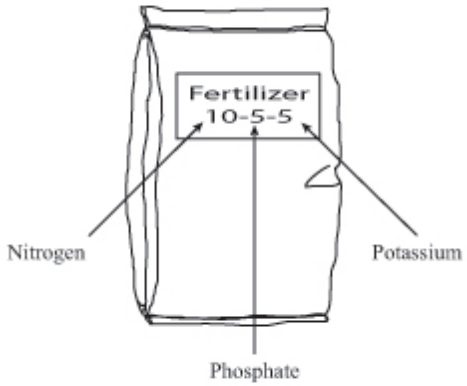
(iv) Why is nitrate content of the soil important to plants?

_____

_____

_____ [2]

(b) The diagram shows some artificial fertilizer.



(i) Explain why farmers apply fertilizers to their fields.

_____

_____

_____ [2]

Examiner Only

Marks	Remark

(ii) Give **two** reasons why some farmers use artificial fertilizer instead of natural fertilizer.

1. _____

_____[1]

2. _____

_____[1]

Application of excess fertilizers may cause water pollution.

(iii) Explain how fertilizers can enter river water.

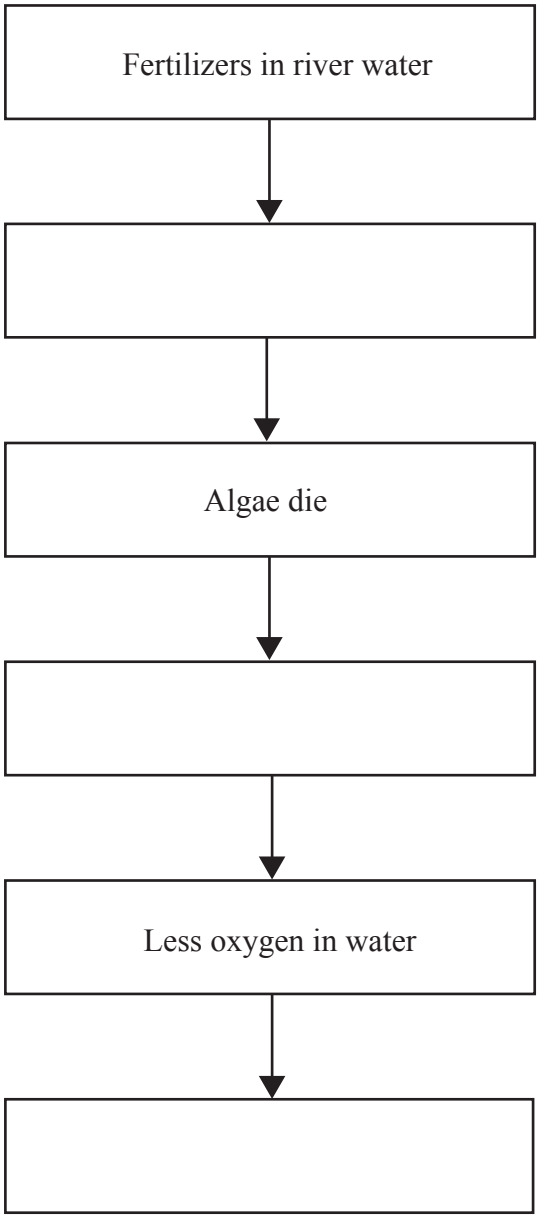
_____

_____

_____[2]

Examiner Only	
Marks	Remark

(iv) Complete the diagram showing the effects of applying an excess of fertilizers.



[3]

(v) Name this type of water pollution.

_____[1]

Examiner Only

Marks	Remark

(vi) Suggest **three** ways to reduce this type of pollution.

1. _____

_____[1]

2. _____

_____[1]

3. _____

_____[1]

(vii) Suggest **two** ways in which natural fertilizers are beneficial to the soil.

_____

_____

_____

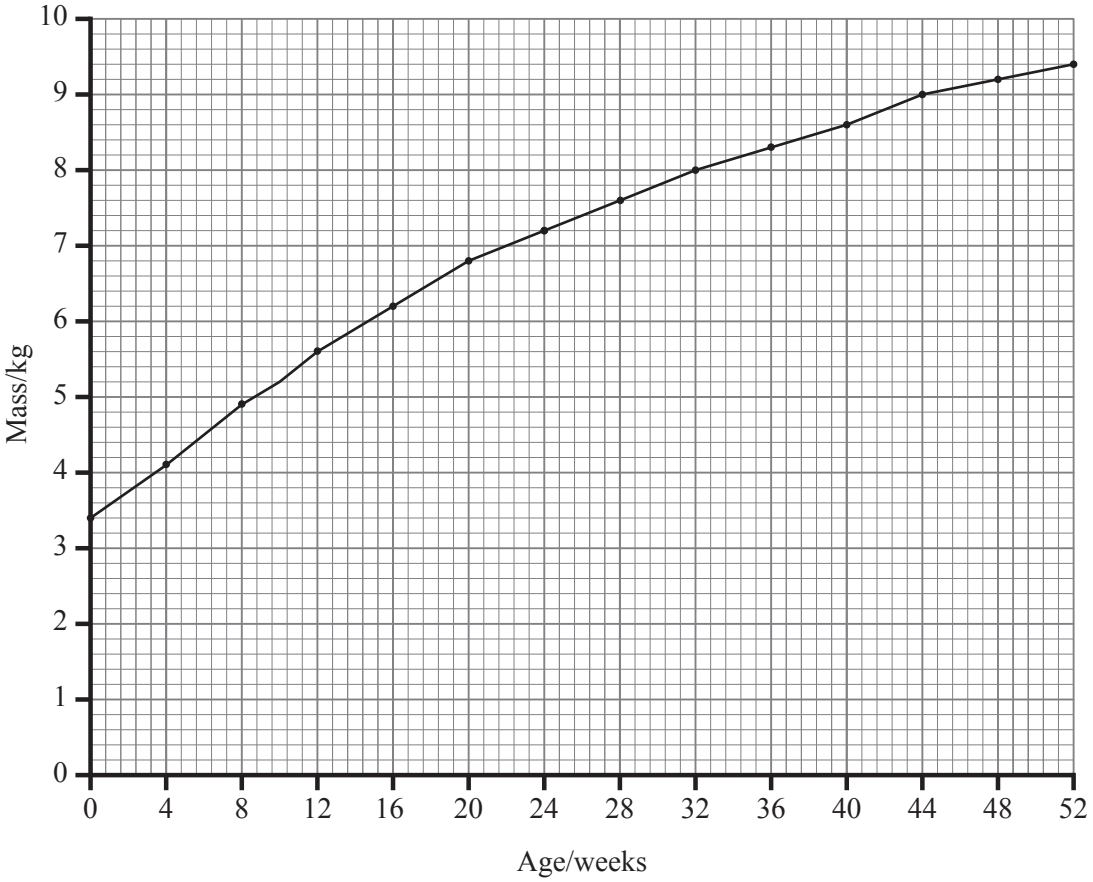
_____[2]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

8 **(a)** Mass can be used as a measure of growth.

The graph shows how the mass of a baby girl increases from birth to one year old.



(i) Calculate the **rate** of increase in mass over the first 10 weeks. Show your working.

Answer _____ [2]

(ii) Describe what happens to the **rate** of growth over the 52 weeks.

_____

_____ [1]

(iii) Name the **mineral** needed for the growth of bones.

_____[1]

(iv) Describe the most appropriate way to measure the growth of a tree._____[1]

population of single-celled organisms such as yeast.

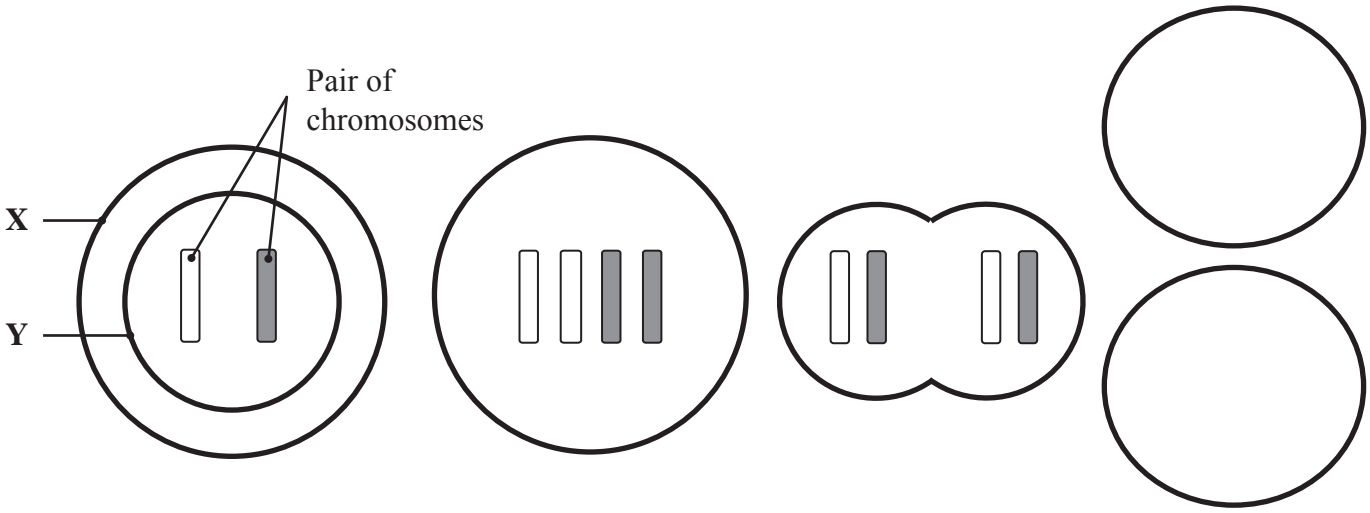
_____[1]

Examiner Only	
Marks	Remark

(b) (i) Name the type of cell division involved in growth.

_____[1]

The diagrams show different stages during the division of a growing animal cell containing one pair of chromosomes.



Stage A **Stage B** **Stage C** **Stage D**

Examiner Only	
Marks	Remark

(ii) Complete the diagram to show the cells at stage D. [2]

(iii) Name parts X and Y.

X _____ [1]

Y _____ [1]

(iv) Describe **two** differences between the cell at stages A and B.

_____

_____

_____[2]

(c) Use the passage about genetic engineering to help answer the questions.

Examiner Only

Marks	Remark

Human growth hormone (HGH) is a protein which stimulates cell growth. Low production of this protein during childhood results in dwarfism. This can be treated with genetically engineered HGH. **1** **3**

The HGH gene is cloned and inserted into a circular DNA from a bacterial cell. This DNA is then put back into the bacterium. **6**

The bacterium is then placed into a biodigester where it reproduces asexually to form a large population of identical bacteria. These bacteria use the HGH gene to produce large amounts of the HGH protein which is released from their cells into the growth medium. **9**

This genetically engineered HGH can be used to restore normal height to children with HGH deficiency. **12**

(i) Describe the role of a hormone in the human body.

_____

_____[1]

(ii) Explain what is meant by cloning the HGH gene (line 5).

_____

_____[1]

(iii) Explain why it is important that the bacterium reproduces asexually when it is placed into the biodigester (line 8).

_____

_____

_____[1]

(iv) Describe the structure of a gene.

_____

_____

_____

_____[3]

(v) Suggest **one** advantage of the HGH protein being released from the bacterial cells into the growth medium (lines 10 and 11).

_____

_____[1]

(vi) Suggest **two** advantages of using bacteria, rather than other organisms, for genetic engineering.

_____

_____

_____

_____[2]

Examiner Only

Marks	Remark

THIS IS THE END OF THE QUESTION PAPER