



General Certificate of Secondary Education
2009

Science: Biology

Paper 2
Higher Tier

[G0904]

THURSDAY 28 MAY, 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 3(c)(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	



G0904

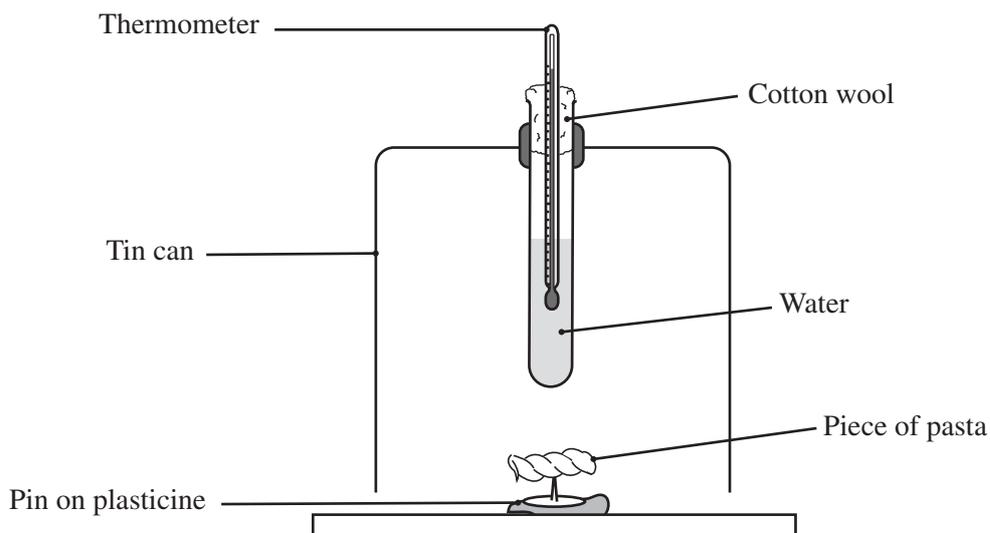
71	
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Candidate Number

1 (a) The graph shows the daily energy requirements for humans at different ages.

Image of graph not available due to copyright

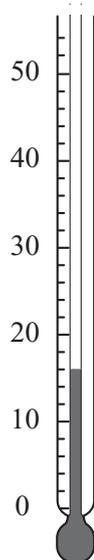
(b) The apparatus shown was used to calculate the energy in a piece of pasta.



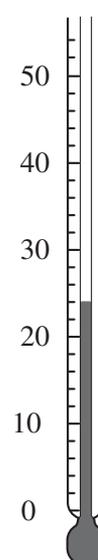
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The thermometers show what happened when the pasta was burned.

Temperature of water at start



Temperature of water **after** burning a piece of pasta



- (i) Use this information in the diagrams to help calculate the temperature rise.
Show your working.

Answer _____ °C

[2]

- (ii) Suggest **one** reason why not all the energy in the pasta was used to heat the water.

_____ [1]

Examiner Only	
Marks	Remark

- (c) The table summarises the nutritional information for pasta and the daily requirements for a 17-year-old male.

	Pasta/100 g	Recommended daily amount
Energy/kJ	1515	15 000
Protein/g	12.3	50
Carbohydrate/g	74.0	300
Fat/g	1.0	65
Fibre/g	3.0	25
Salt/g	Less than 0.1	6
Calcium/mg	18.0	1000
Iron/mg	1.0	18

Adapted from: <http://dietandfitnesstoday.com/calories-nutrition-facts.php?id=20420>

- (i) Using **one** piece of information from the table, suggest why eating 100 g of pasta, as part of a healthy diet, reduces the risk of

heart disease. _____

_____ [1]

constipation. _____

_____ [1]

- (ii) Explain how

fat is used in the body.

 _____ [1]

iron is used in the body.

 _____ [2]

calcium is used in the body.

 _____ [1]

Examiner Only

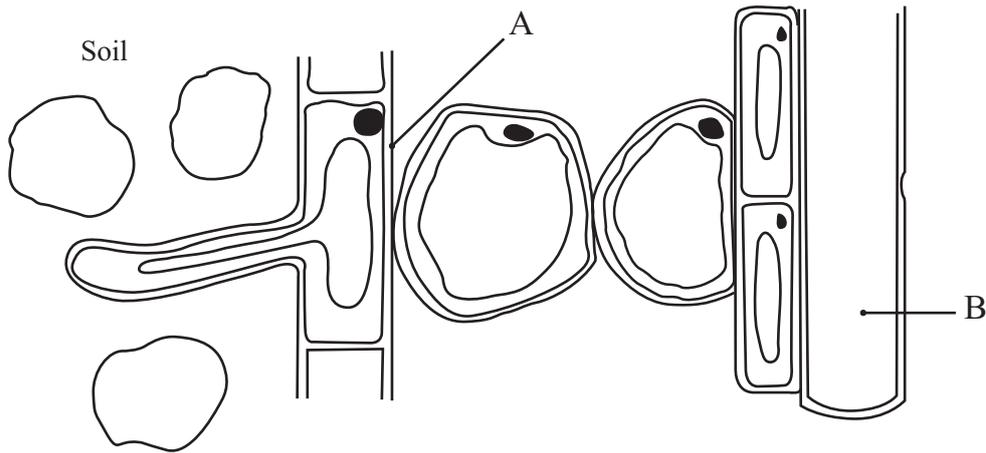
Marks Remark

(iii) Explain what is meant by a balanced diet.

[1]

Examiner Only	
Marks	Remark

(b) The diagram shows part of a root.



(i) Name cell A and explain how it is adapted to carry out a specific function.

Cell A _____

Adaptation _____

_____ [3]

Tissue B carries water up to the leaves.

(ii) Name tissue B.

_____ [1]

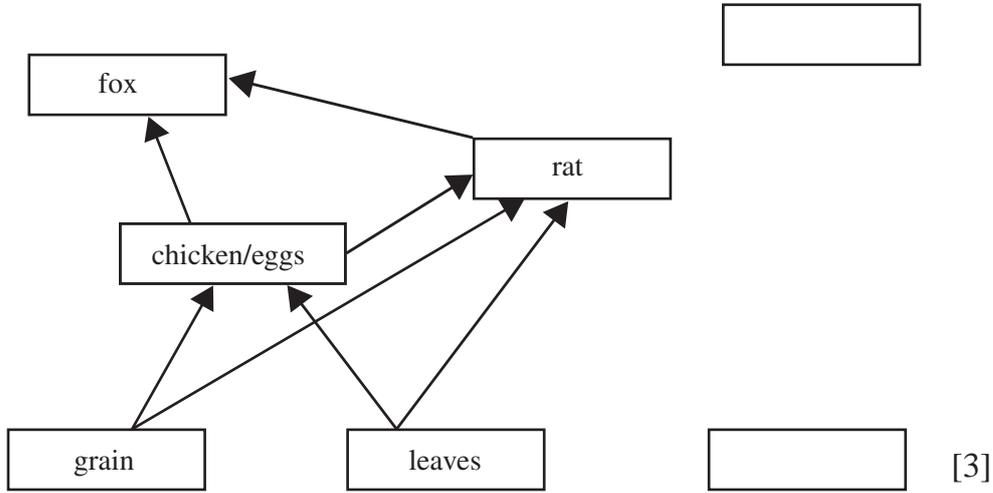
(iii) Explain how water moves from the soil to tissue B.

_____ [3]

Examiner Only	
Marks	Remark

(b) Owls hunt rats which feed on chicken eggs, grain, leaves and root vegetables.
 Chickens also eat grain and leaves.
 Rats and chickens are preyed on by foxes.

(i) Use this information to **complete the food web**.



(ii) Name a producer from this food web.

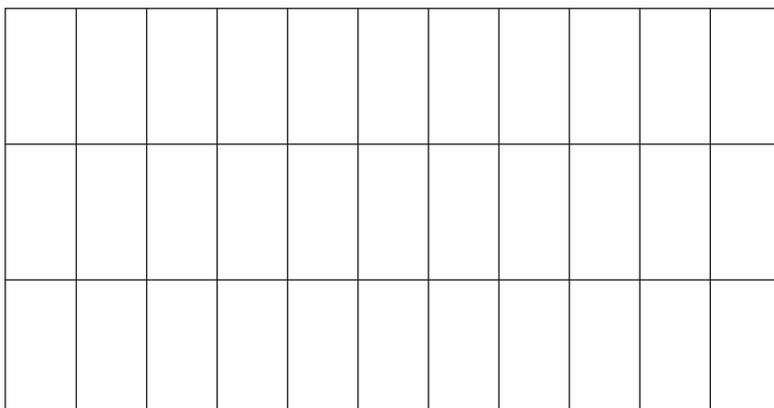
_____ [1]

(iii) At what trophic **level** do chickens feed?

_____ [1]

An examination of owl pellets over a period of time showed that one owl weighing 300 g ate 400 g of rats. These rats consumed about 600 g of food in the same period of time.

(iv) **Draw and label** a pyramid of biomass for this owl.



[3]

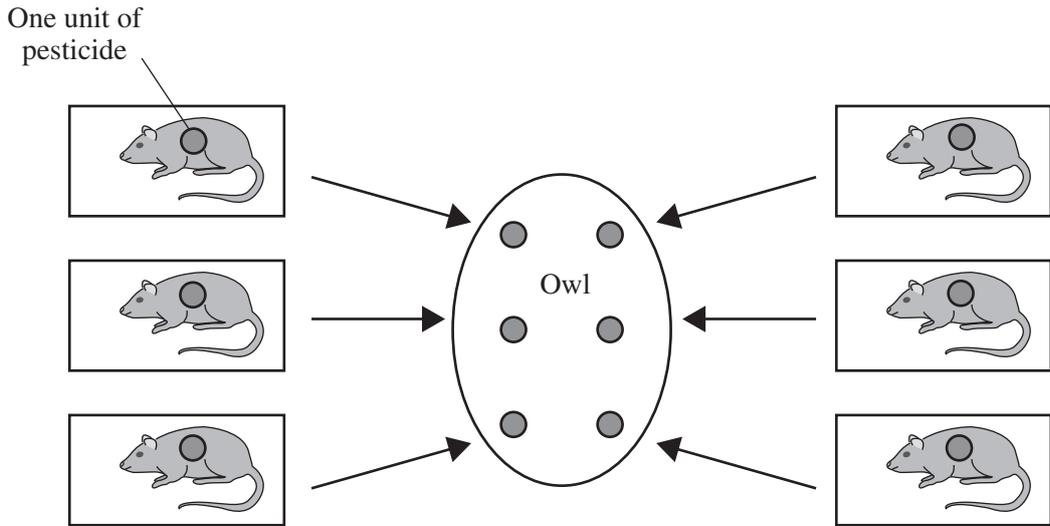
Examiner Only	
Marks	Remark

(c) Farmers use pesticides to control the number of rats.
Over-use of pesticides has led to rats building up resistance.

(i) What is a pesticide?

[2]

The diagram shows how the over-use of pesticides in rats can result in the death of an owl.



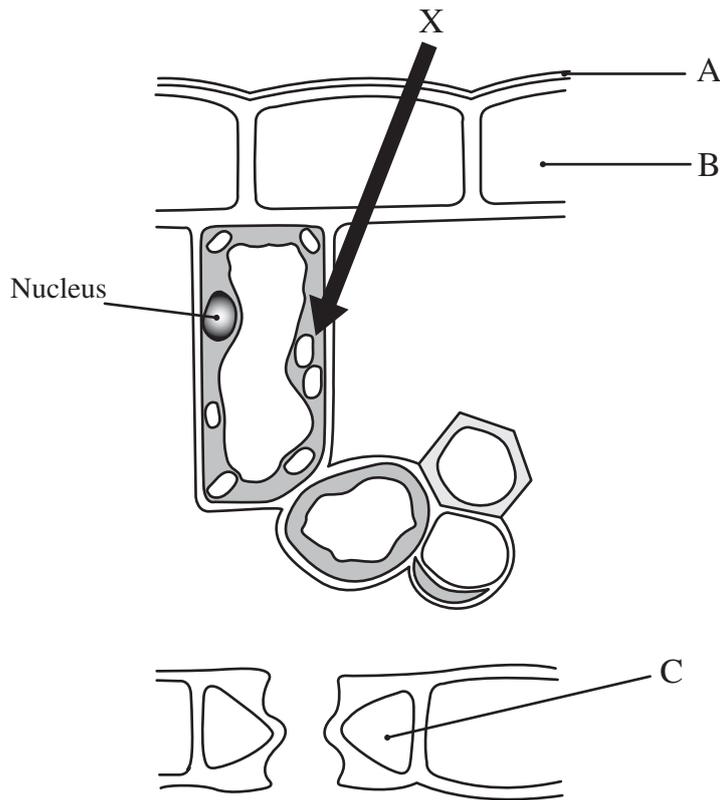
(ii) Use the diagram to help explain how the over-use of pesticides in rats can result in the death of an owl, but not that of rats.

[3]

Quality of written communication [2]

Examiner Only	
Marks	Remark

4 (a) The diagram shows part of a leaf.



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(i) What does arrow X represent?

_____ [1]

(ii) Name parts A, B and C.

A _____ [1]

B _____ [1]

C _____ [1]

(iii) Name the layer of cells where most photosynthesis occurs.

_____ [1]

(iv) Describe how carbon dioxide enters the leaf.

 _____ [2]

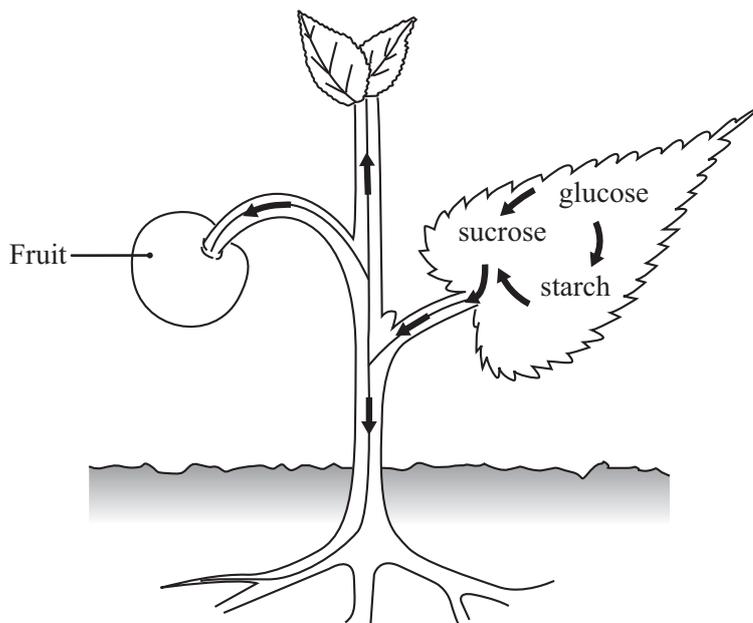
Examiner Only	
Marks	Remark

(b) Complete the table.

Adaptation of leaf	Function
1. Large surface area	
2.	To allow sunlight to reach all cells
3.	

[4]

(c) The diagram shows what happens to the products of photosynthesis.



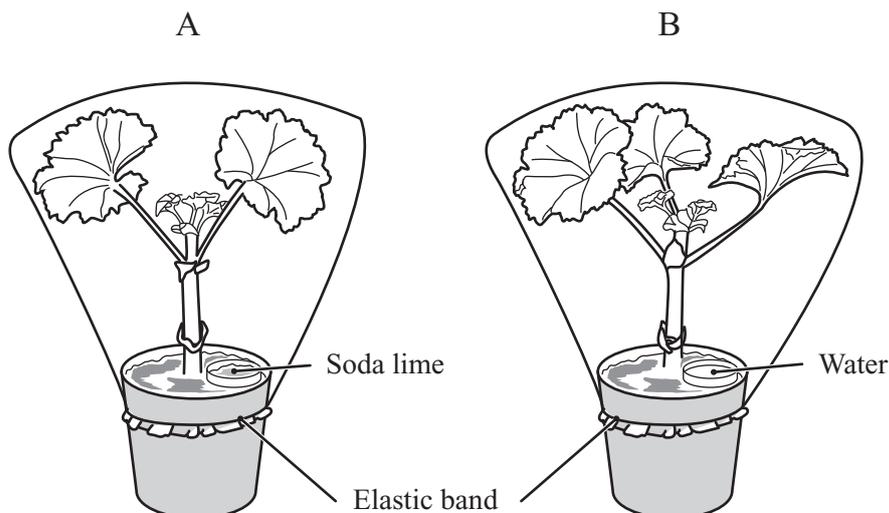
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Use the diagram to explain **three** ways the products of photosynthesis can be used by a plant.

[3]

Examiner Only	
Marks	Remark

- (d) The diagram shows a photosynthesis experiment.
Both plants were destarched and then left in the light for 48 hours.



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- (i) Explain why soda lime is present.

_____ [1]

- (ii) Why is plant B required?

_____ [1]

The table shows the results of the experiment.

Plant	Colour of leaf after starch test	Starch present/absent
A	Orange/brown	Absent
B	Blue/black	Present

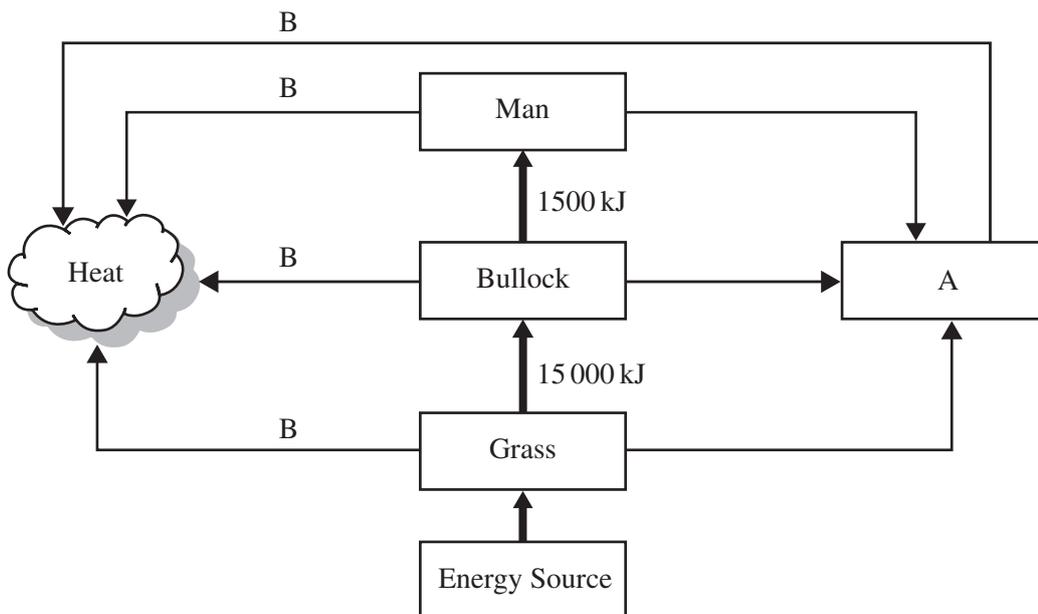
- (iii) Explain these results.

 _____ [2]

Examiner Only

Marks Remark

5 (a) The diagram represents the energy flow through a short food chain.



(i) Give the source of energy for the food chain.

_____ [1]

(ii) Name organism A and process B.

Organism A _____ [1]

Process B _____ [1]

(iii) Calculate the percentage of the energy in the grass that is transferred to the growth of the bullock.
Show your working.

Answer _____ [2]

Examiner Only	
Marks	Remark

Farmers can increase the percentage of the energy used by their bullocks for growth, by keeping them in cattle sheds during the winter.

(iv) Suggest **two** reasons why bullocks kept in cattle sheds in the winter could grow faster.

 [2]

(b) The table shows the estimated mass of spawning herring between 1998 and 2003.

Year	Mass of spawning herring/thousands of tonnes
1998	700
1999	850
2000	800
2001	1200
2002	1600
2003	2250

Adapted from: <http://www.cefas.co.uk/media/31684/herringnorthsea.pdf> © Crown Copyright

(i) Draw a histogram of the mass of spawning herring.



[4]

Examiner Only	
Marks	Remark

(c) The human population is estimated to rise to 6 000 000 000 in 2010.

(i) Suggest **two** factors which have helped increase the human population.

_____ [2]

(ii) Suggest **two** factors which can cause a decrease in the human population.

1. _____ [1]

2. _____ [1]

Examiner Only	
Marks	Remark

6 (i) Complete the table to show the processes involved in the nitrogen cycle.

Process	Chemical reaction	
	From	To
	ammonia (ammonium compounds)	nitrates
Denitrification	nitrates	
Nitrogen fixation		
	protein	ammonia

Examiner Only	
Marks	Remark

[5]

(ii) Explain why nitrates are needed for plant growth.

_____ [1]

Farmers plough fields to aerate the soil.

(iii) Suggest **two** ways ploughing may improve crop yield.

_____ [2]

Over-use of fertilizers can result in eutrophication.

(iv) Give **two** examples of natural fertilizers.

1. _____ [1]

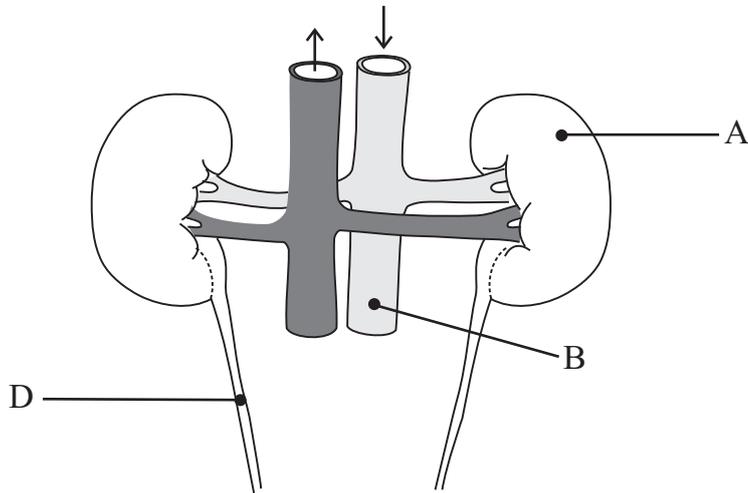
2. _____ [1]

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7 (a) (i) What is excretion?

_____ [2]

The diagram shows part of the human excretory system.



(ii) Complete the diagram to show the bladder. [2]

(iii) Name parts A, B, C and D.

A _____ [1]

B _____ [1]

C _____ [1]

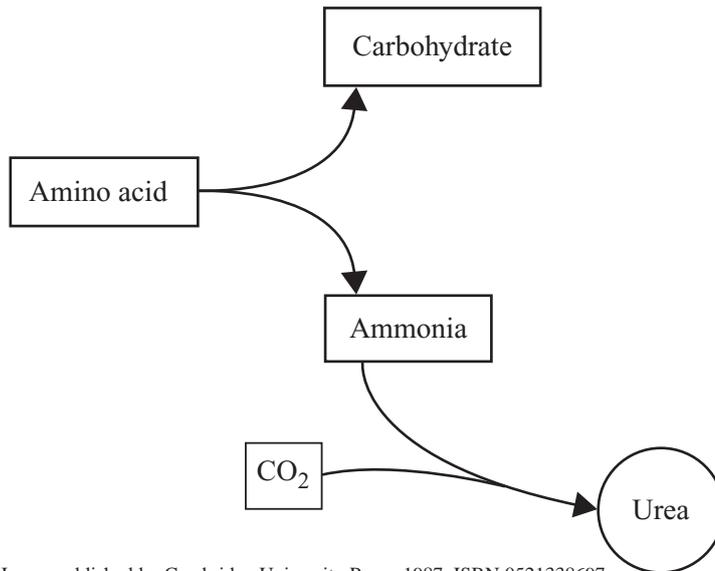
D _____ [1]

(iv) Give the function of the sphincter muscle.

_____ [1]

Examiner Only	
Marks	Remark

(b) The diagram shows urea production.



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(i) Describe what happens to excess amino acids in the blood.

_____ [1]

(ii) Name the organ which produces urea.

_____ [1]

removes urea from the blood.

_____ [1]

(iii) Give **two** uses of the carbohydrate produced.

1. _____

2. _____ [2]

(iv) Explain why the volume of urine produced is greater in winter than in summer.

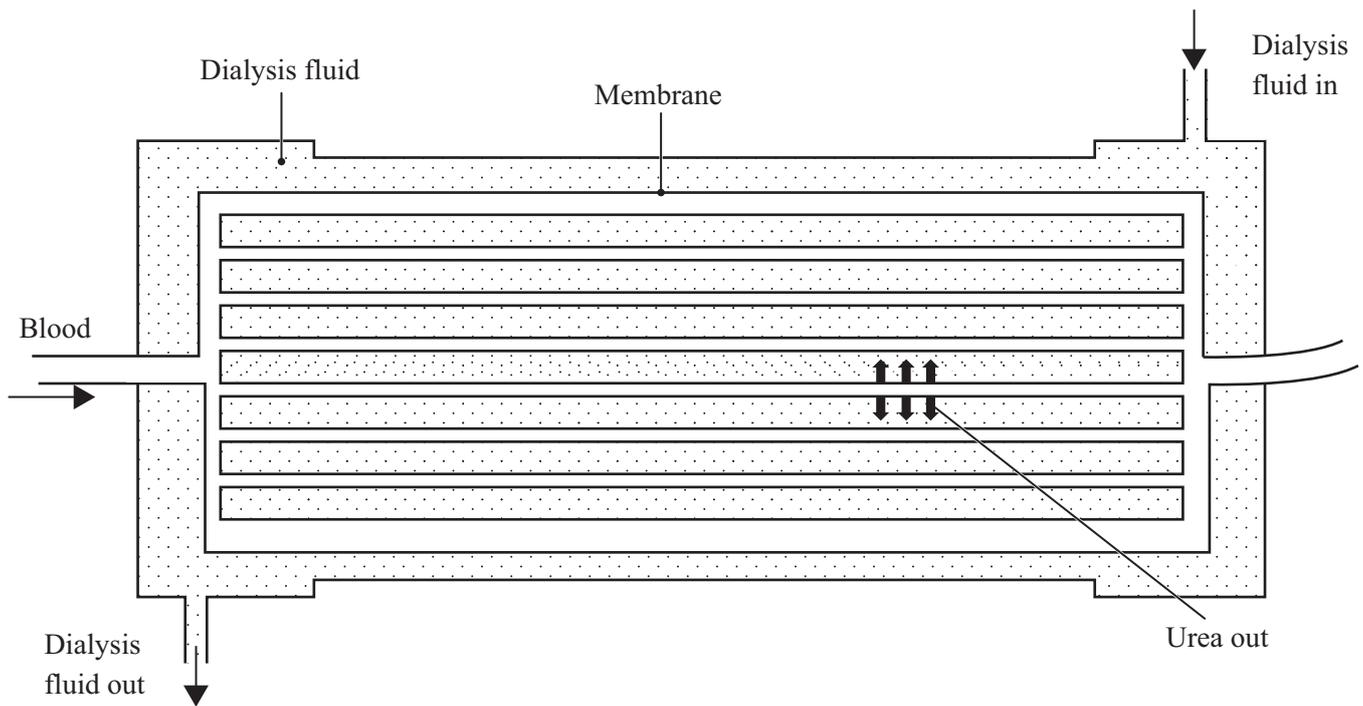
 _____ [2]

(v) Give the term used to describe the homeostatic control of water in the blood.

_____ [1]

Examiner Only	
Marks	Remark

(c) The diagram shows part of a kidney dialysis machine.



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(i) Name **two** substances which would be in the same concentration in the blood and in the dialysis fluid.

1. _____ [1]

2. _____ [1]

(ii) Explain why urea moves into the dialysis fluid.

 _____ [2]

(iii) Suggest why the dialysis fluid must be continually replaced.

_____ [1]

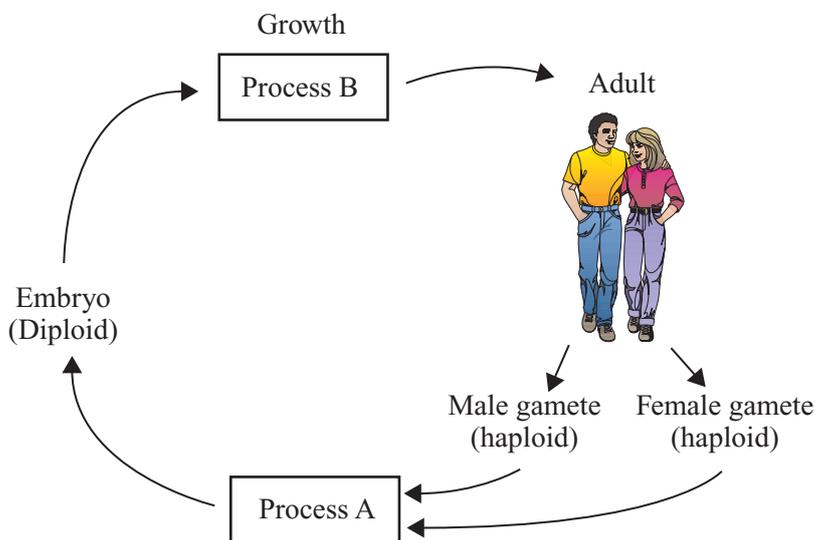
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Marks	Remark

8 (a) (i) Complete the table.

Description	Mitosis	Meiosis
Example	Skin	
Genetic information		Gives rise to variation
Number of divisions		
Number of daughter cells		

[4]

The diagram shows a human life cycle.



(ii) Mark with an X on the diagram where in the life cycle meiosis occurs. [1]

(iii) Name processes A and B.

A _____ [1]

B _____ [1]

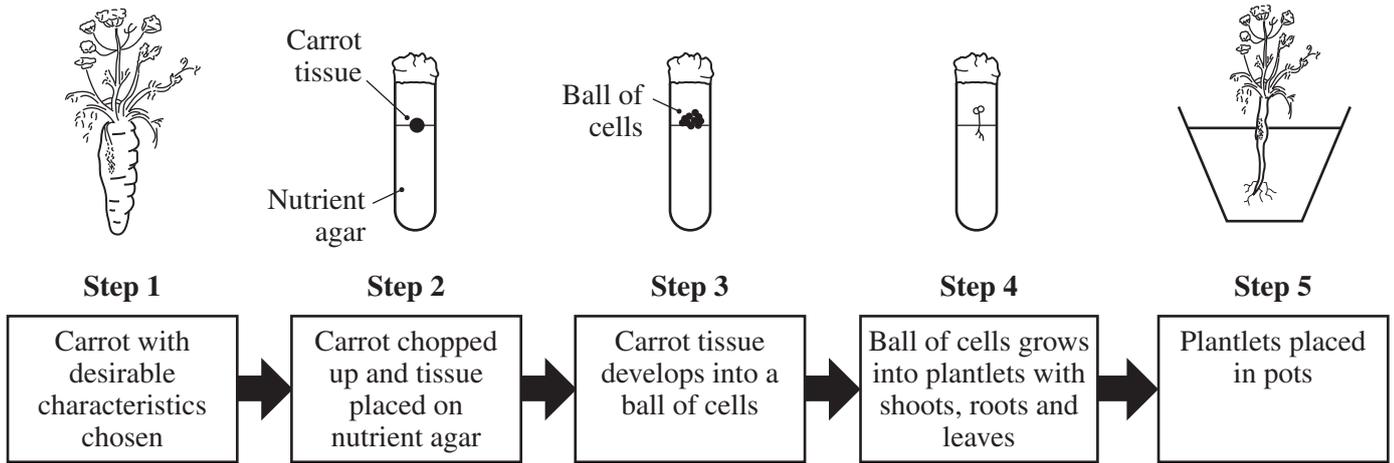
Gametes are described as haploid.

(iv) Explain what is meant by haploid.

 _____ [1]

Examiner Only	
Marks	Remark

(b) The diagram shows a modern cloning technique used in carrots.



(i) Give the name of this cloning technique.

_____ [1]

(ii) Suggest **two** features of carrots a grower might select in step 1, to make the carrot attractive to consumers.

 _____ [2]

(iii) Explain why the offspring produced by this technique are described as clones.

 _____ [2]

(iv) Give **one other** advantage of cloning.

 _____ [1]

(v) Suggest **two** disadvantages of this technique.

 _____ [2]

Examiner Only	
Marks	Remark

(c) Carrot crops are often damaged by carrot flies.
Growers use insecticides to kill these pests but some of the flies are resistant to the insecticide.

(i) Explain what is meant by resistance.

[1]

(ii) Explain how natural selection may lead to an increase in the number of resistant flies.

[3]

(iii) Suggest **two** ways the development of pesticide resistance in the carrot fly population may be expensive for growers.

[2]

THIS IS THE END OF THE QUESTION PAPER

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Marks	Remark

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