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International GCSE

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Biology

Unit: 4BI0

Science (Double Award) 4SC0

Paper: 1B

Tuesday 15 May 2018 – Afternoon	Paper Reference
Time: 2 hours	4BI0/1B 4SC0/1B

<p>You must have:</p> <p>Ruler</p> <p>Calculator</p>	Total Marks
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Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
– *there may be more space than you need.*
- Show all the steps in any calculations and state the units.

Information

- The total mark for this paper is 120.
- The marks for **each** question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Write your answers neatly and in good English.
- Try to answer every question.
- Check your answers if you have time at the end.

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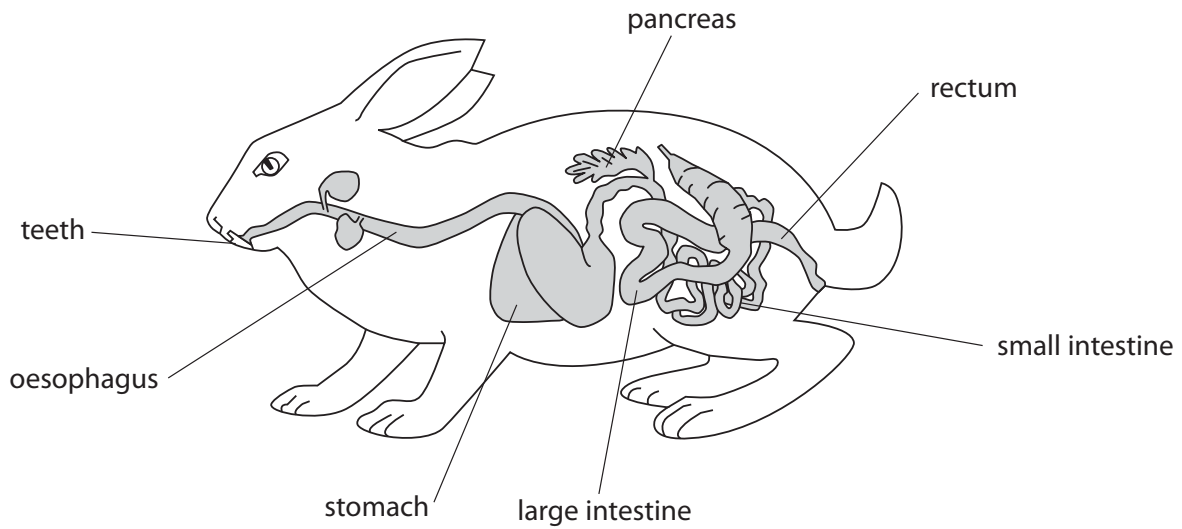
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Answer ALL questions.

1 The diagram shows the alimentary canal of a rabbit with some parts labelled.



(a) The table lists descriptions of some parts of the alimentary canal.

Complete the table by giving the correct part from the diagram to match each description.

One has been done for you.

(3)

Description	Part
used to chew food	teeth
has most villi for absorption	
produces hydrochloric acid	
stores faeces	

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(b) Explain how the liver helps digestion in the alimentary canal.

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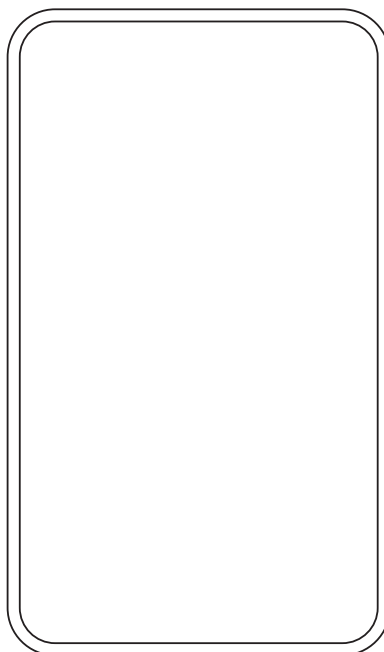
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(c) Rabbits eat grass.

The diagram shows the cell wall of a leaf cell from a grass plant.

Complete the diagram by drawing and labelling other structures in this leaf cell.

(3)



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(d) Grass cell walls are made of cellulose.

Rabbits cannot digest cellulose.

Bacteria living in the large intestine of rabbits can digest cellulose into glucose.

Rabbits eat their own faeces to obtain this glucose.

(i) Give two differences between the structure of bacterial cells and the structure of plant cells.

(2)

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(ii) Describe a test to show that rabbit faeces contain glucose.

(3)

(Total for Question 1 = 14 marks)

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2 Human blood contains red blood cells and white blood cells.

Different situations can cause changes in the numbers of these blood cells.

The table shows some of these changes.

Situation	Number of red blood cells	Number of white blood cells
having poor diet	decreases	stays the same
living at high altitude	increases	stays the same
receiving therapy for cancer	decreases	decreases

(a) Explain why poor diet can cause a change in the number of red blood cells.

(2)

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(b) Suggest why athletes often live at high altitude before competing in a long distance race.

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(c) Explain how the change in the number of white blood cells during therapy for cancer could be a risk to the patient.

(4)

Area for writing the answer, consisting of multiple horizontal dotted lines.

(Total for Question 2 = 8 marks)

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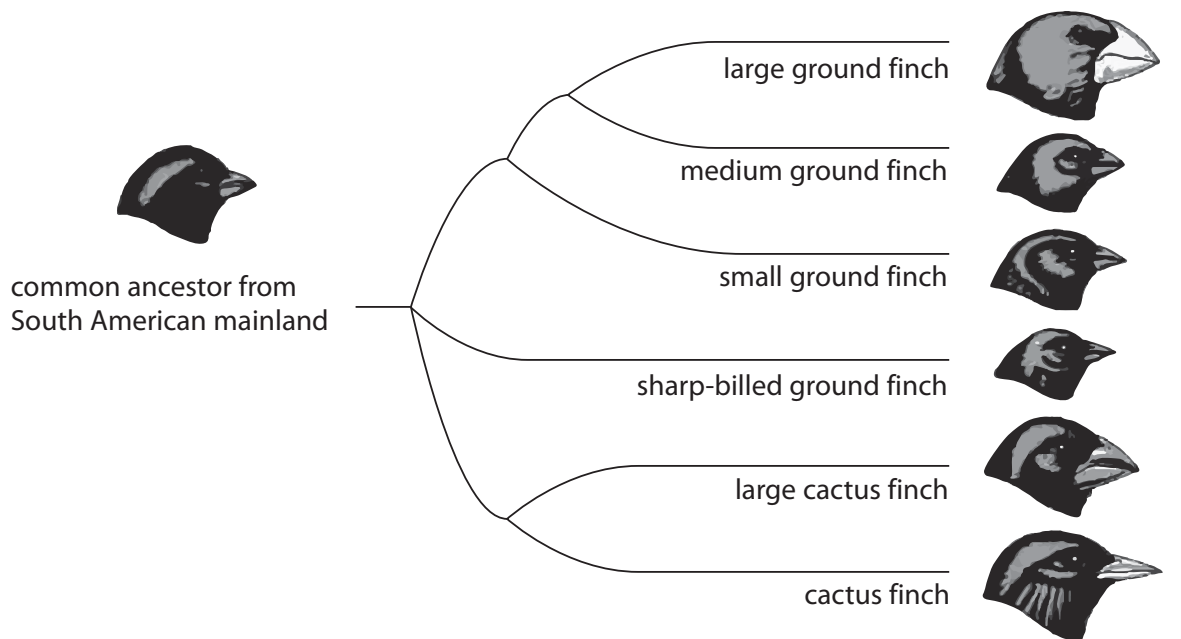


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- 3 (a) Charles Darwin observed finches (birds) in the Galapagos, a group of islands off the coast of South America.

Darwin's observations helped develop his theory of evolution by means of natural selection.

The diagram shows the common ancestor and some of the finch species now living in the Galapagos.



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The large ground finch has a large beak and feeds on big seeds with hard seed coats.

The cactus finch feeds on nectar from cactus flowers.

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(i) Explain how the beak of the cactus finch could have evolved by natural selection. (4)

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(ii) One of the Galapagos islands is called Fernandina. Suggest why the large ground finch is found on Fernandina but the cactus finch is not. (2)

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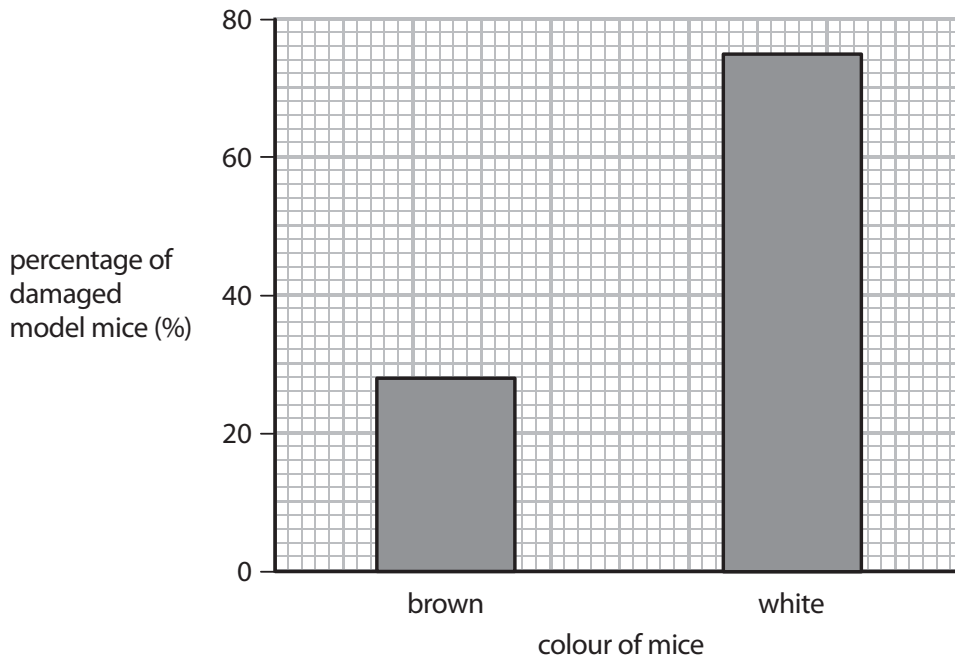
(b) A student uses 400 clay models of mice to investigate natural selection.

He paints 200 of the clay models white and 200 brown.

He places the model mice in woodland in the morning.

He checks the models in the evening for damage by predators.

The graph shows his results.



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- (i) Calculate the difference between the **number** of damaged white model mice and the **number** of damaged brown model mice.

(2)

difference =

- (ii) Suggest why the results would differ if the student used live white mice and live brown mice rather than clay models.

(2)

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(Total for Question 3 = 10 marks)



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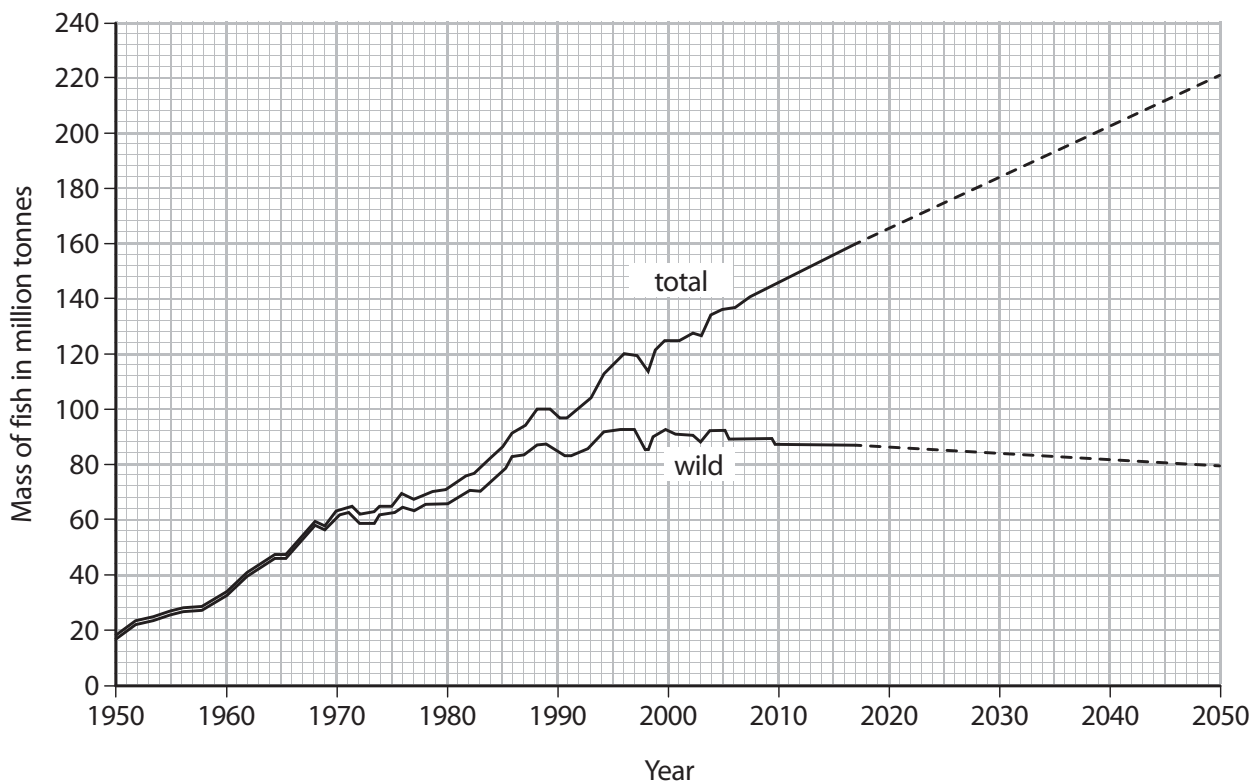
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4 The world supply of wild fish is decreasing.

Fish farming provides an alternative method of supplying fish.

(a) The graph shows the change in total supply of fish and the supply of wild fish between 1950 and 2017.

The graph also shows the predicted total supply of fish and supply of wild fish from 2017 to 2050.



(i) The total supply of fish is the sum of the supply of wild fish and the supply of farmed fish.

Describe the change in the supply of wild fish and the supply of farmed fish between 1950 and 2017.

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(ii) Calculate the predicted rate of increase in the total supply of fish in tonnes per year between 2017 and 2050.

Give your answer in tonnes per year.

Show your working.

(2)

rate of increase = tonnes per year

(b) To increase production, fish farmers maintain water quality and food quality on a fish farm.

Explain three other ways that farmers could increase production on a fish farm.

(6)

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(Total for Question 4 = 10 marks)



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5 A student investigates the effect of deforestation on the number of insects living in the soil. She uses a quadrat to sample the soil from two areas in an oak forest. One area has trees growing. The other area has been deforested. She compares the number of insects in each area. The table shows her results.

Area	Average (mean) number of insects per m ²
trees growing	1943
deforested	40

(a) Name the independent variable in this investigation.

(1)

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(b) Suggest an explanation for these results.

(2)

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(c) The student's results are valid and reliable.

Suggest how the student made sure that her results were valid and reliable.

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(d) The student claims her results show that deforestation should be prevented.

What are the advantages and disadvantages of deforestation?

(6)

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(Total for Question 5 = 12 marks)



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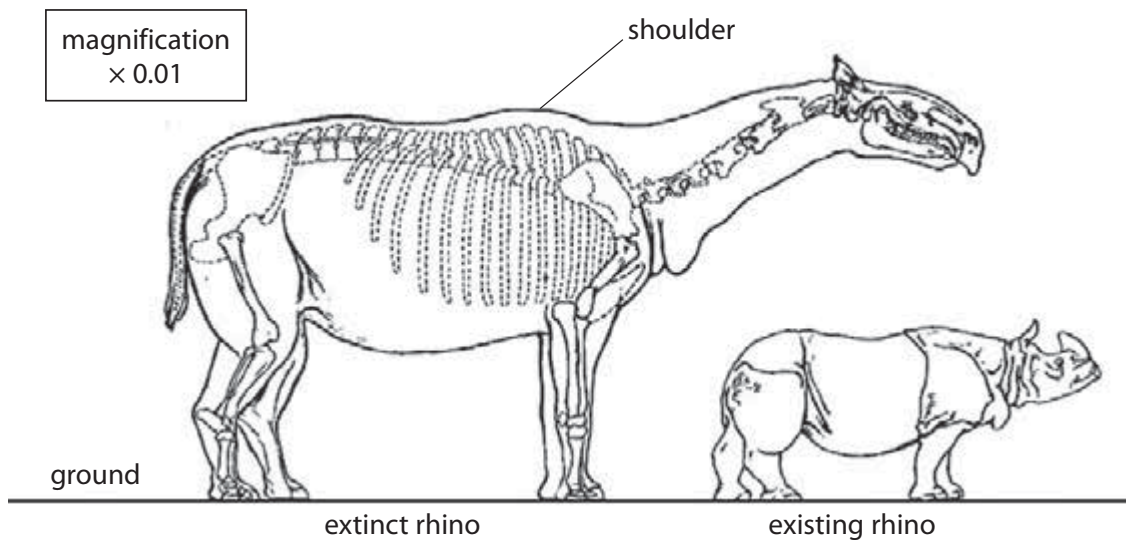
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- 6 One of the largest land mammals ever known is an extinct species of rhino that lived in Mongolia.

The diagram compares the size of the extinct rhino with an existing rhino.



- (a) Using the scale on the diagram, calculate the shoulder height of the extinct (large) rhino.
Give your answer in metres.

(2)

height of shoulder = metres

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(b) Some people think that the large rhino became extinct because of global warming.

Suggest how global warming could have made it difficult for the large rhino to maintain a constant body temperature.

(2)

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(c) Suggest two factors, other than global warming, that may have caused the large rhino to become extinct.

(2)

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(Total for Question 6 = 6 marks)

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7 All living cells contain enzymes.

(a) Describe the role of enzymes in cells.

(2)

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(b) The table lists some enzymes, where they are produced and their function.

Complete the table by giving the missing information.

(5)

Enzyme	Where produced	Function
amylase	salivary gland	
protease		
	bacteria	cutting DNA at certain points
ligase	cell nucleus	

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(c) Explain how changes in temperature affect the activity of an enzyme.

(4)

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(Total for Question 7 = 11 marks)

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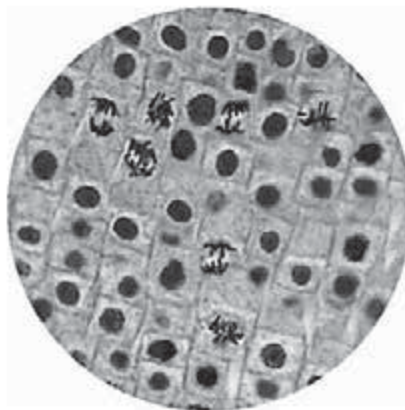
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8 Plant roots grow when cells in the root tip divide by mitosis.

Cells in the process of dividing by mitosis can be identified because their chromosomes become visible when viewed with a microscope.

The photograph shows the cells of a squashed root tip seen using a microscope.



(a) How many cells in this diagram are dividing by mitosis?

(1)

(b) Scientists measure growth in root tips by calculating the mitotic index.

The equation shows how to calculate the mitotic index.

$$\text{mitotic index} = \frac{\text{number of cells showing mitosis}}{\text{total number of cells}} \times 100$$

Root tips that are growing rapidly have a high mitotic index.

(i) Calculate the mitotic index for a root tip with 9 cells showing mitosis and 110 cells not showing mitosis.

(2)

mitotic index =

(ii) Explain why it is difficult to obtain the data to calculate the mitotic index.

(2)

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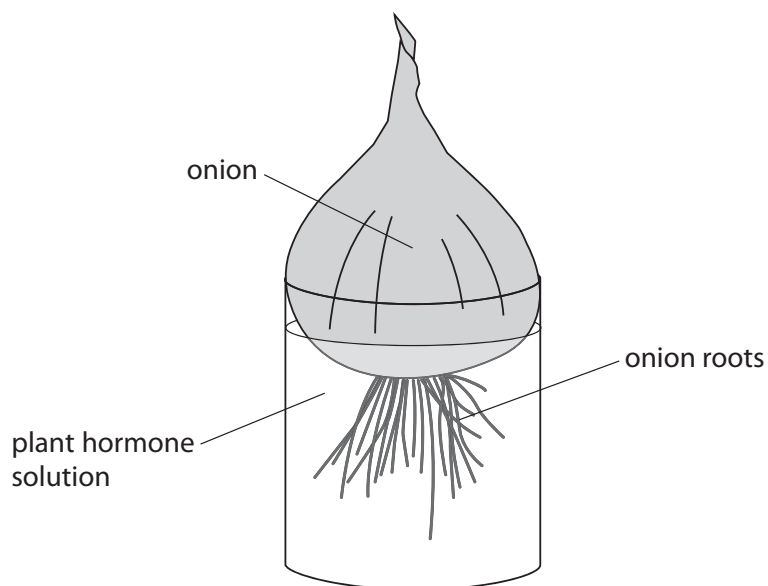
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- (c) A student uses this apparatus to investigate the effect of a plant hormone on the mitotic index in onion roots.



The student puts onions in different concentrations of plant hormone solution.

She then squashes samples of the root tips and calculates the average (mean) mitotic index for each concentration.

The table shows her results.

Concentration of plant hormone in parts per million	Average mitotic index
0.0	4.65
0.005	9.65
0.05	6.55
0.5	4.10

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(i) Describe the results of this investigation.

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(ii) Name three abiotic (non-living) factors that the student should control in her investigation.

(3)

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(Total for Question 8 = 10 marks)

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- 9 NASA (the National Aeronautics and Space Administration) is investigating how to grow plants on space stations.

As part of their investigation, NASA scientists looked at the effect of using different types of lamp on the rate of photosynthesis in spinach plants.

- (a) Explain why the scientists expected a link between rate of photosynthesis and biomass produced.

(2)

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- (b) The scientists measured the rate of photosynthesis and the biomass produced for different types of lamp.

The table shows their results.

Type of lamp	Rate of photosynthesis in arbitrary units	Biomass produced in g / m ²
fluorescent	6.8	6.0
sodium	6.7	8.8
LED 660	6.5	7.8
LED 670	8.3	8.2
LED 680	10.1	7.8
LED 690	9.1	9.0

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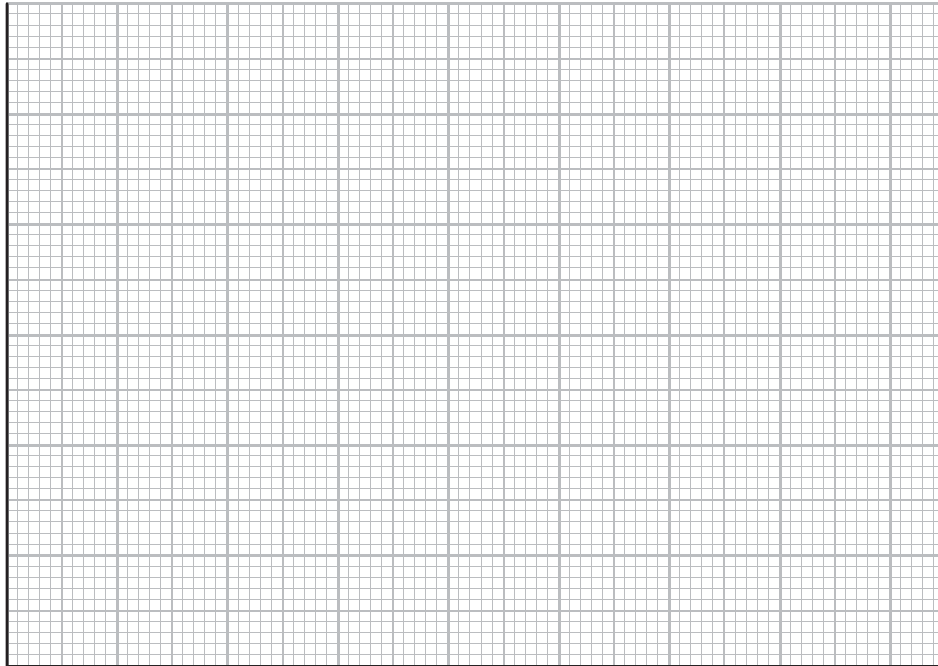
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(i) Plot a bar graph to show the biomass produced for each type of lamp.

(5)



(ii) Suggest why the rate of photosynthesis and the biomass produced do not follow a similar pattern.

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(c) Suggest which lamp would be best for a spinach grower to use in his glasshouse. (2)

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(d) Name three factors, other than light, that would affect the rate of photosynthesis. (3)

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(e) Suggest why NASA is investigating how to grow plants in space stations. (1)

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(Total for Question 9 = 15 marks)

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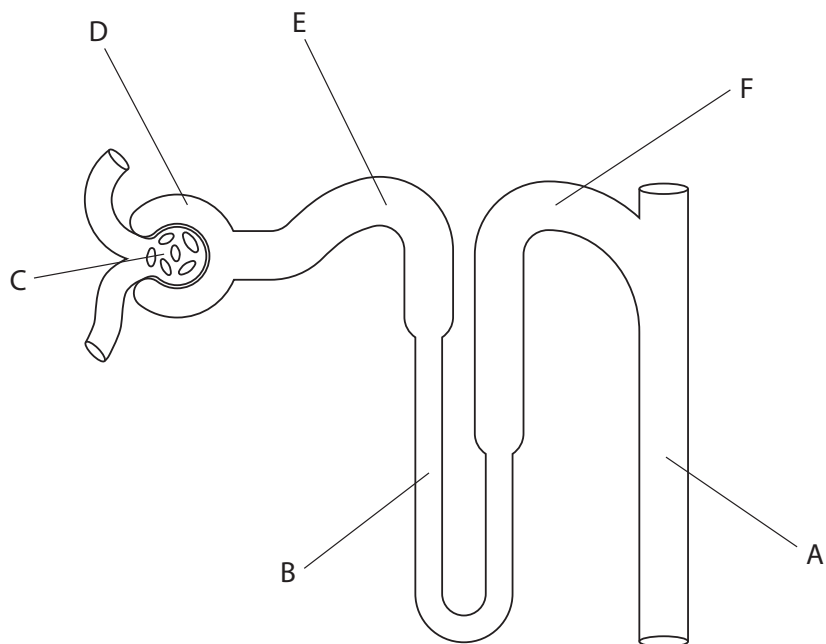
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10 The diagram shows a nephron from a human kidney.



(a) Name the structures labelled A, B, C and D.

(4)

A

B

C

D

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(b) The nephron produces urine that flows out of tube A to the bladder.

Explain how changes in the composition of this liquid are brought about when a person is dehydrated (short of water).

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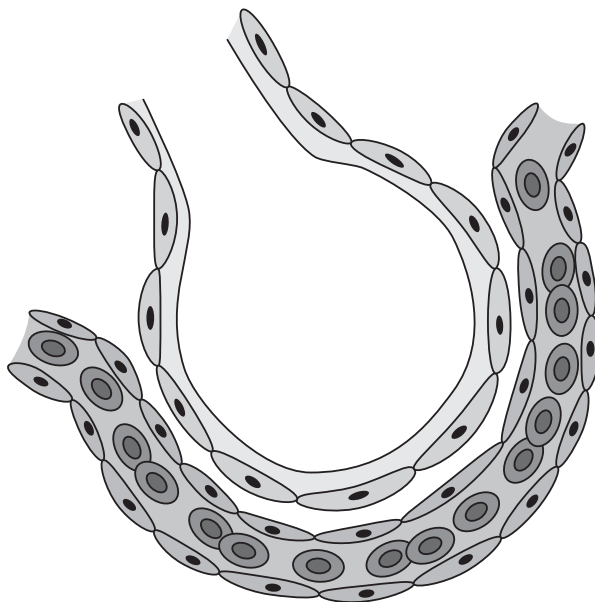
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(Total for Question 10 = 10 marks)



- 11** Human lungs and plant leaves both contain gas exchange surfaces.
 These gas exchange surfaces have a number of features in common.
 (a) The diagram shows a cross-section through human lung tissue.



Explain, with reference to features shown in the diagram, how lung tissue enables efficient gas exchange.

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(b) Explain how the structure of a leaf is adapted for efficient gas exchange.

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(Total for Question 11 = 8 marks)

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