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**Pearson Edexcel  
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# Biology

**Unit: 4BI0****Science (Double Award) 4SC0****Paper: 1BR**

Tuesday 17 May 2016 – Afternoon

**Time: 2 hours**

Paper Reference

**4BI0/1BR****4SC0/1BR****You must have:**

Ruler

Calculator

Total Marks

## 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.

Turn over ►

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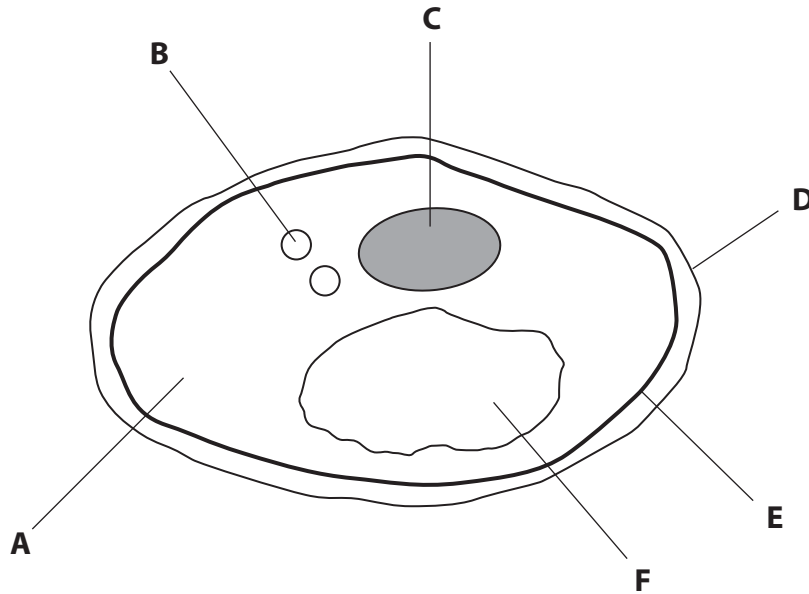


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**Answer ALL questions.**

1 Yeast is a single-celled fungus. The diagram shows a yeast cell with parts labelled A to F.



(a) The table lists functions of different parts of the yeast cell.

Complete the table by giving the letter of the part that carries out the function.

(2)

Function	Letter of part
controls the movement of molecules into the cell	
contains DNA that controls the cell	

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(b) The table lists statements.

Put a tick (✓) in the boxes next to the statements that are correct for yeast.

(2)

Statement	Tick
can be used in the production of beer	
contains chloroplasts	
cell wall is made of chitin	
can only reproduce inside living cells	
contains plasmids	

(Total for Question 1 = 4 marks)

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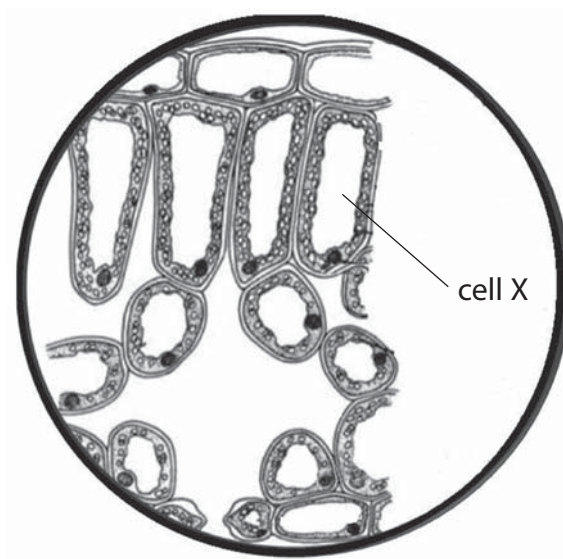
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2 A student uses a microscope to look at some cells from an organ found in a plant.

The diagram shows what the student observes through the microscope. One cell has been labelled X.



(a) Name the organ that the student observes.

(1)

(b) What is meant by the term **organ**?

(1)

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(c) Draw a labelled diagram of cell X.

(3)

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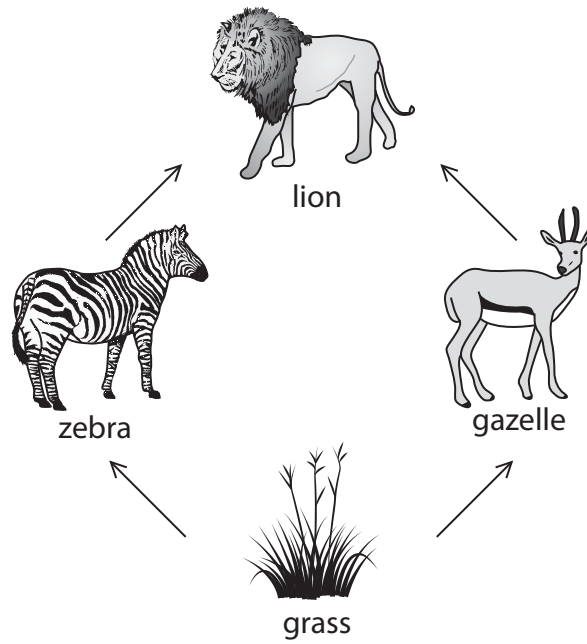
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(Total for Question 2 = 5 marks)



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3 The diagram shows a simple food web in East Africa.



(a) Name the producer in this food web.

(1)

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(b) Gazelles try to avoid being caught by lions by running away quickly. They can run at a top speed of 96 km per hour.

(i) Calculate the distance in metres a gazelle runs in one minute at a speed of 96 km per hour.

Show your working.

(2)

distance = ..... metres

(ii) Gazelles cannot maintain their top speed for a long time because a change in the type of respiration takes place in their muscle cells.

Explain how this change in respiration stops gazelles from running at a top speed for a long time.

(3)

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(c) Zebras also try to avoid being caught by lions. It was thought that the striped coat of zebras helps to camouflage them.

A new theory suggests the striped coat evolved because it reduces the number of biting flies that feed on zebra blood.

Use your knowledge of natural selection to explain how a striped coat that reduces the number of flies feeding on zebra blood may have evolved.

(4)

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(d) Lions' eyes are adapted to help them see in dim light.

(i) Their eyes have a layer of cells behind the retina that reflects light which has passed through the retina.

Suggest how this would help a lion see in low light intensities.

(1)

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(ii) Suggest one other adaptation in the structure of a lion's eye that helps the lion to see in low light intensities.

(1)

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(e) When a lion catches its prey it tears the meat into smaller pieces in its mouth before swallowing.

(i) Suggest why the saliva released into the lion's mouth does not contain amylase. (2)

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(ii) Explain how tearing the meat into smaller pieces helps digestion in the stomach. (2)

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**(Total for Question 3 = 16 marks)**

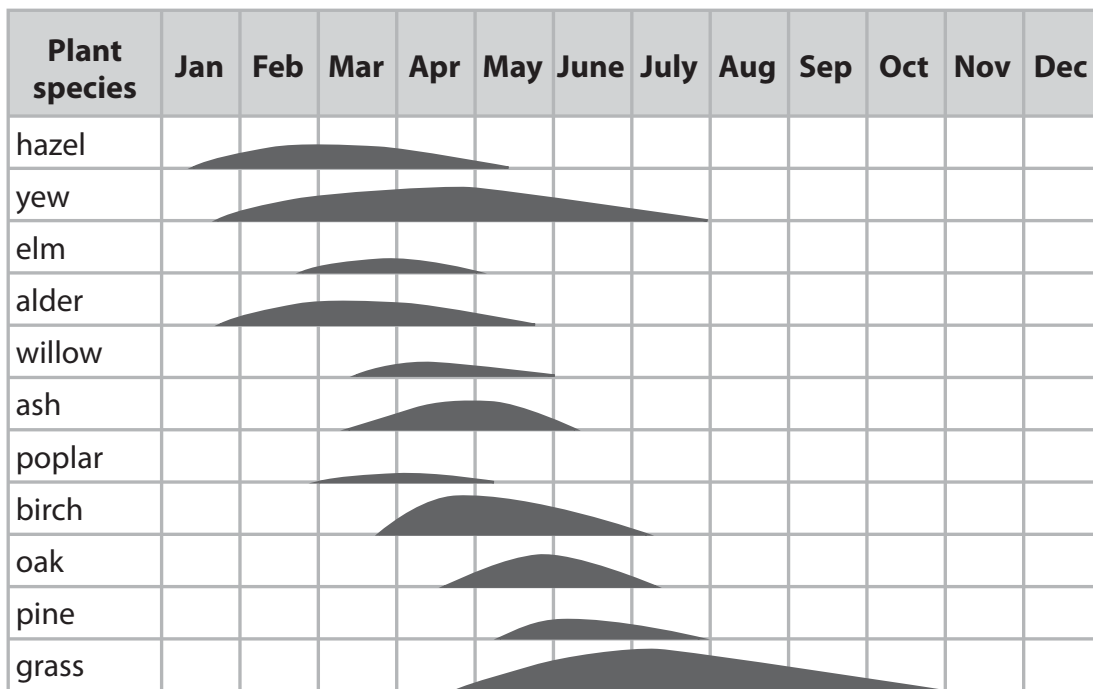


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- 4 Different plant species in the UK release pollen in the air.  
This pollen may land on people causing an allergic reaction called hay fever.

For this reason, daily pollen counts are carried out in some cities and the results are used to advise people who have allergic reactions when to stay inside their houses.

The diagram shows how the size of the pollen count varies for each species. It also shows the months when the pollen from each species is released into the air.



- (a) (i) In which months is there no risk of hay fever? (1)

- (ii) Explain which plant species is likely to have the greatest effect of causing hay fever. (2)

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(b) In order to measure the pollen count, pollen is collected using glass slides coated with jelly. The pollen grains stick to the jelly and can then be counted.

Suggest two abiotic (non-living) factors that could affect the number of pollen grains that land on the slides.

(2)

1 .....

2 .....

(c) Describe the events that take place from when pollen lands on the stigma of a flower to when seeds are formed.

(5)

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**(Total for Question 4 = 10 marks)**

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- 5 The photograph shows an insect called a fire ant.  
These insects are a pest because their bite is painful.



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Scientists compared two different methods for reducing the population of fire ants in the USA.

In the first method the scientists treated an area with pesticide.

In the second method they released an organism that killed fire ants by biological control.

They then estimated the number of fire ants every 6 months for a period of 30 months.

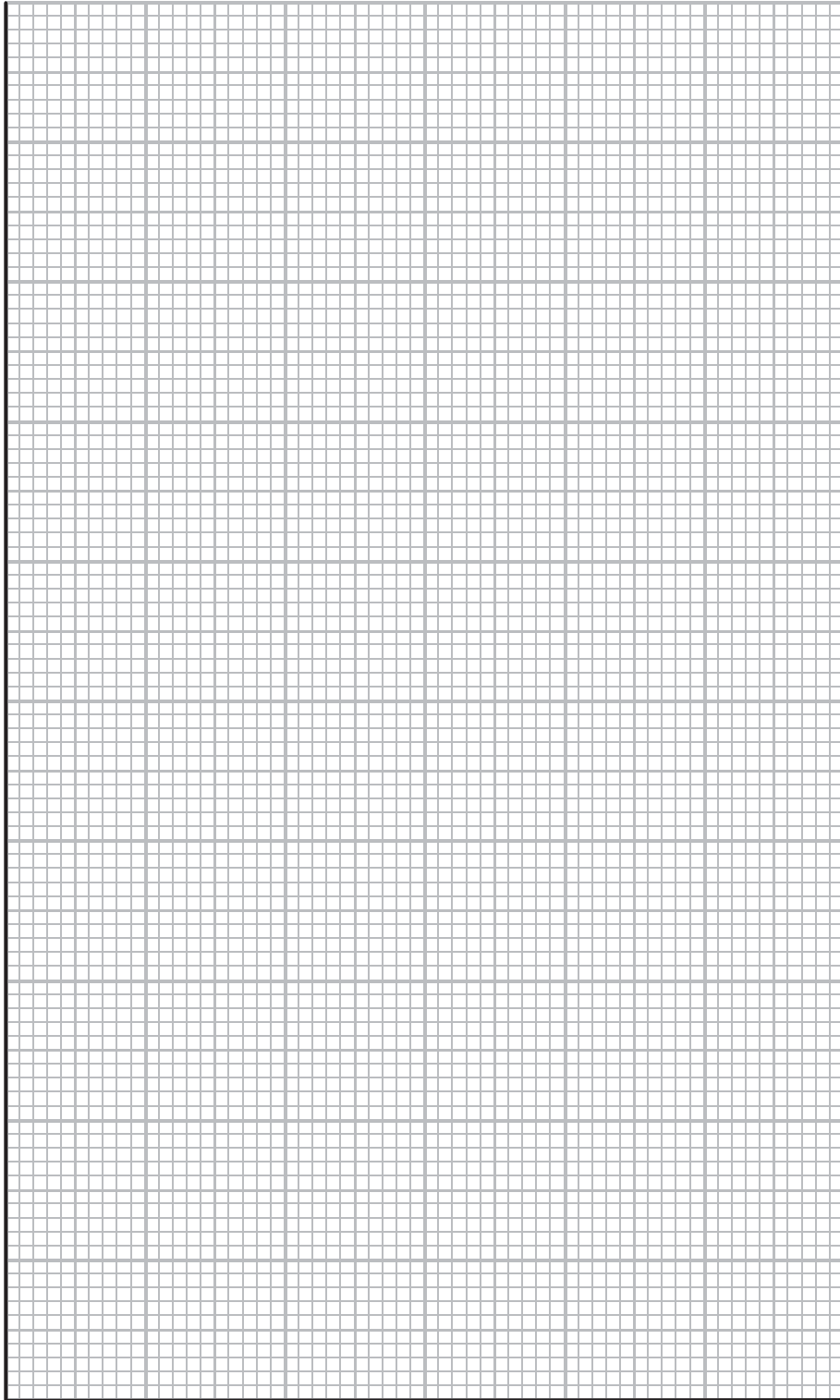
The table shows the results of their investigation.

Time after treatment in months	Percentage of fire ant population remaining after different treatments	
	Pesticide treatment	Biological control treatment
0	100	100
6	18	2
12	12	5
18	18	2
24	30	2
30	44	4



(a) Plot a line graph to show the change in population of fire ants when pesticide was used and when biological control was used. Join the points with straight lines.

(6)



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(b) Explain the changes in the number of fire ants over the 30-month period when the area they were in was treated with pesticide. (3)

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(c) Give two advantages of using biological control rather than pesticide to reduce the number of fire ants. (2)

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(d) Suggest a method that could be used to estimate the population of fire ants in an area. (4)

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**(Total for Question 5 = 15 marks)**



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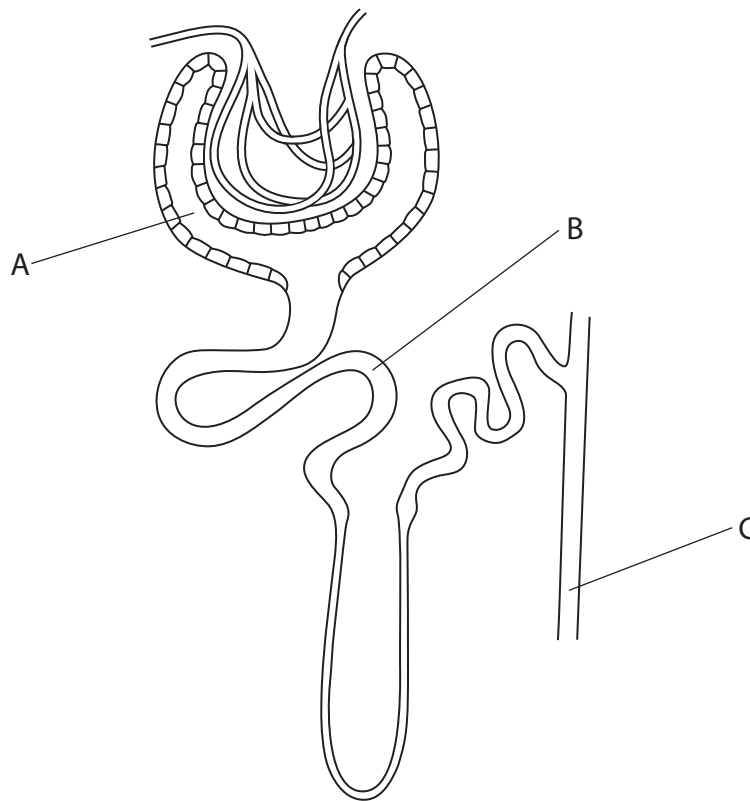
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6 (a) The diagram shows a kidney nephron with parts labelled A, B and C.



The table lists events that take place in the nephron.

Complete the table by giving the letter of the part where each event takes place.

(2)

Event	Letter
ultrafiltration	
glucose reabsorption	

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(b) The photograph shows a flower called a dandelion.



If a person picks this flower and then licks their fingers, they will want to urinate. This is because the plant produces a chemical called a diuretic that affects the regulation of the water content of the blood.

Suggest how this diuretic causes more urine to be produced.

(5)

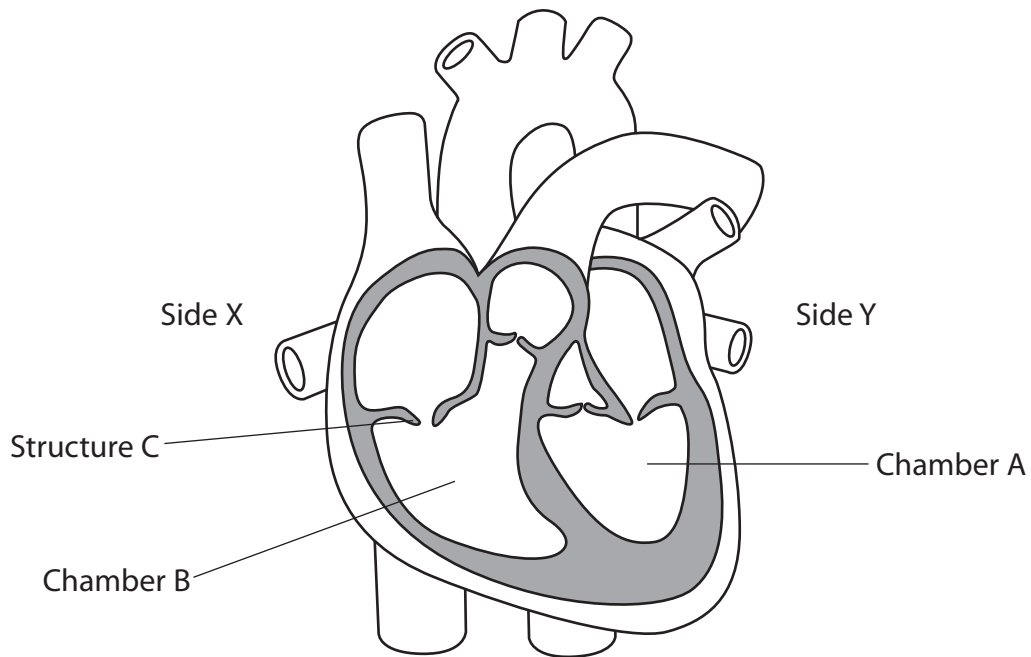
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(Total for Question 6 = 7 marks)



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7 The diagram shows the structure of the human heart.



(a) (i) Explain how you know that X is the right side of the heart.

(1)

(ii) Give the name of chamber A.

(1)

(iii) On the diagram, label the pulmonary artery.

(1)

(iv) Explain the difference in the structure of the walls of chamber A and chamber B.

(2)

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(b) (i) Give the name of structure C.

(1)

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(ii) Describe the function of structure C.

(1)

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(c) Sometimes a baby is born with a hole between chambers A and B.

Suggest the effects that this condition may have on the baby.

(3)

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(d) A student wants to investigate the effect of exercise on heart rate.

(i) Describe how the student could measure heart rate.

(2)

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(ii) Explain how the student could ensure that the results obtained would allow a valid comparison to be made.

(2)

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**(Total for Question 7 = 14 marks)**





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8 The passage describes atmospheric pollution by gases.

Complete the passage by writing a suitable word or words in each of the blank spaces. (10)

The release of carbon dioxide comes from the burning of ..... fuels in power stations and in cars and other vehicles.

This burning also releases ..... which dissolves in water in clouds to produce .....

If the combustion of these fuels is not complete another gas called ..... is also released. This gas is very toxic and can combine with ..... in the blood. This prevents the delivery of ..... around the body.

Carbon dioxide may also contribute to the increase in air temperature referred to as ..... . Gases that contribute to this are known as ..... gases.

Some of these gases, such as ..... , are produced by cows and released into the atmosphere. Other gases known as ..... can be released when old refrigerators are destroyed.

**(Total for Question 8 = 10 marks)**

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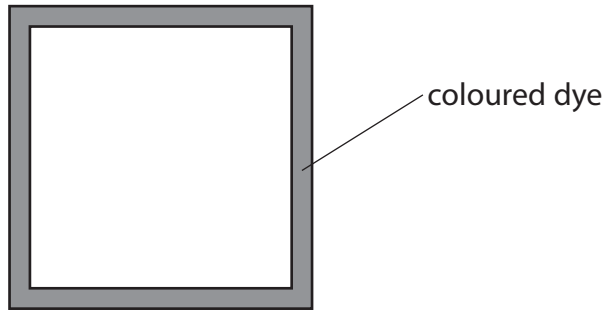
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9 A student carries out an experiment to investigate the factors affecting the rate of diffusion.

(a) In her first experiment

- she makes three agar jelly cubes, one with sides of 4.0 cm, one with sides of 2.0 cm and one with sides of 1.0 cm
- she covers each cube in a solution of a coloured dye for three minutes
- she then cuts the cubes to see how far the dye has diffused

The diagram shows a cross-section through the largest cube after three minutes.



(i) Describe what is meant by the term **diffusion**.

(1)

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(ii) Measure the distance that the dye has diffused into the large cube.

(1)

distance = ..... mm

(iii) Complete the diagram below to show how far the dye will have diffused in the smallest cube after three minutes.

(1)



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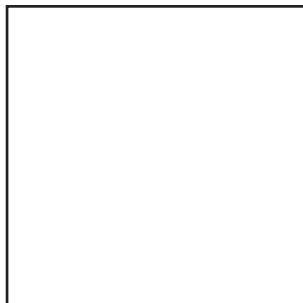
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(b) The student then carries out a second experiment but this time she leaves the cubes in the dye for six minutes.

Draw the results you would expect to see when the largest cube is cut open after six minutes.

(1)



(c) Other factors may affect the rate of diffusion of the dye.

Explain two factors that the student should keep constant in her investigation.

(4)

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(d) Explain how the results of the student's investigation support the idea that large organisms need a circulation system.

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10 Methods of fish farming have changed as more countries become involved in the industry.

(a) Suggest two reasons why more of our fish are supplied by fish farming rather than from traditional fishing.

(2)

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(b) This photograph shows a new type of fish farm which has been developed in Denmark.



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Fish farm in Denmark

This new type of fish farm differs from traditional fish farms because

- it uses water from under the ground instead of from rivers
- it uses fewer antibiotics

(i) Suggest one advantage of using water from under the ground rather than from rivers.

(1)

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(ii) Suggest the advantage of using fewer antibiotics in fish farms.

(2)

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(c) Another advantage of the new type of fish farm is the reduction in waste discharge.

The figures for a new type of fish farm and a traditional fish farm are shown in the table.

Nutrient waste	Mass of discharge in kg per tonne of fish produced		Discharge from new type of fish farm as a percentage of discharge from traditional farm
	traditional fish farm	new type of fish farm	
total nitrate	31.2	20.0	64.1
total phosphate	2.9	1.1	

- (i) Calculate the total phosphate in the waste from the new type of farm as a percentage of the total phosphate in the waste from the traditional farm.

Show your working.

(2)

percentage = ..... %

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(ii) If waste from fish farms is released into rivers it will cause pollution.

Design an investigation to compare the pollution caused by waste released from the new type of fish farm with waste released from a traditional fish farm.

Your answer should include experimental details and be written in full sentences.

(6)

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**(Total for Question 10 = 13 marks)**



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**11** Plants obtain their nutrition by photosynthesis.

(a) Write the balanced chemical symbol equation for photosynthesis.

(2)

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(b) (i) Explain how the rate of photosynthesis is affected by changes to abiotic (non-living) factors throughout the day.

(4)

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(ii) Explain how very high temperatures might reduce the growth of plants.

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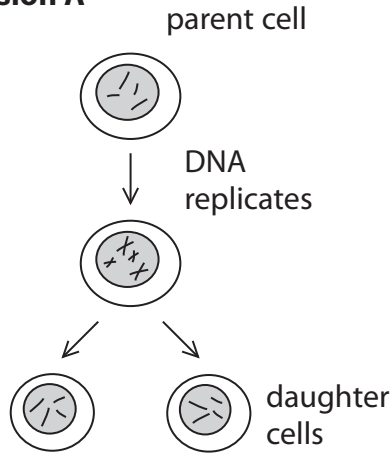
**(Total for Question 11 = 10 marks)**



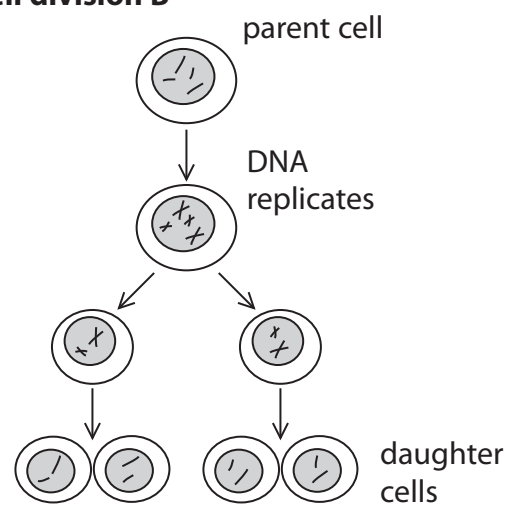
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12 The diagram shows two types of cell division.

**Cell division A**



**Cell division B**



(a) Give the name of cell division A.

(1)

(b) Using the information in the diagram, give two differences between cell division A and cell division B.

(2)

1 .....

2 .....

(c) Name a part of a flowering plant where cell division A occurs and a part where cell division B occurs.

(2)

A .....

B .....

**(Total for Question 12 = 5 marks)**

**TOTAL FOR PAPER = 120 MARKS**

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