Write your name here

Surname	Other names

Edexcel Certificate
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Centre Number | | | | | |

Candidate Number | | | | |

Biology

Unit: KBI0/4BI0
Science (Double Award) KSC0/4SC0
Paper: 1B

Thursday 23 May 2013 – Morning
Time: 2 hours

Paper Reference
KBI0/1B 4BI0/1B
KSC0/1B 4SC0/1B

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.
- Keep an eye on the time.
- 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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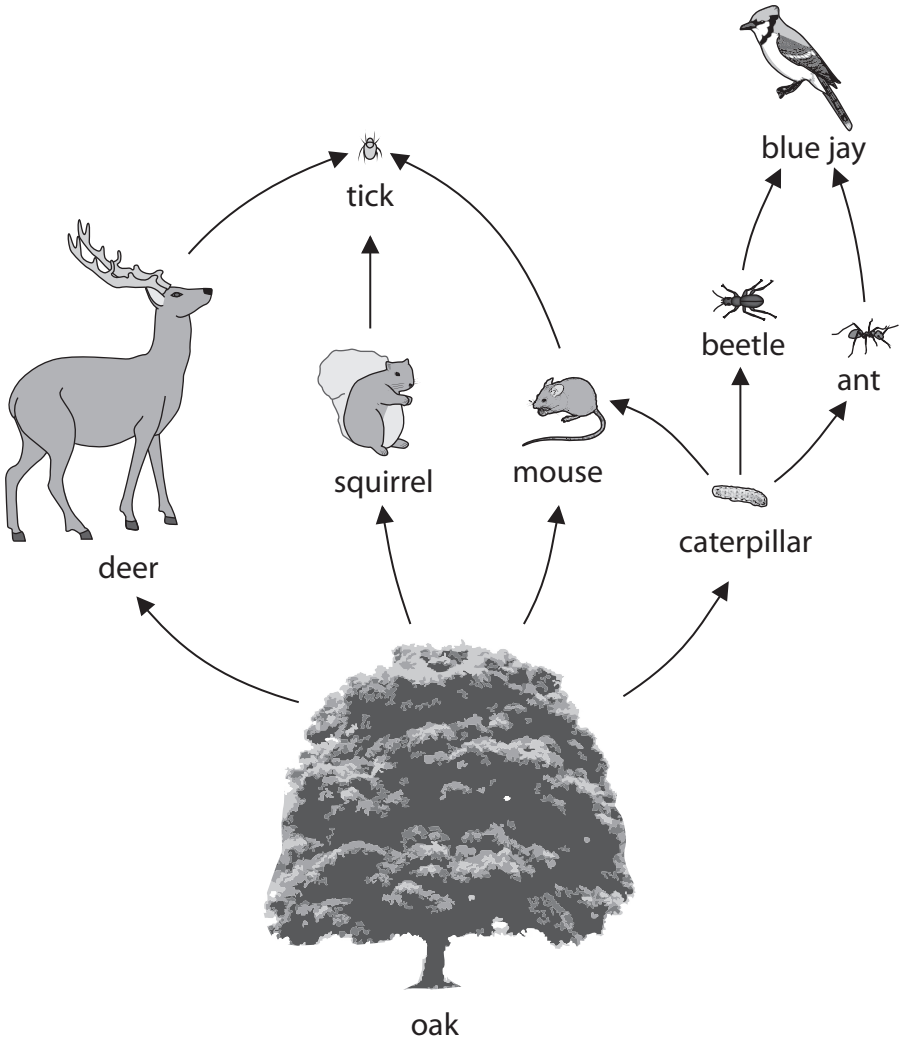
P 4 1 5 5 2 A 0 1 2 8

PEARSON

Answer ALL questions.

1 The diagram shows part of a food web in an oak forest.



(a) Use the information in the food web to complete the statements in the table. The first one has been done for you.

(4)

Statement	Number
the number of animals is	8
the number of producers is	
the number of herbivores is	
the number of secondary consumers is	
the number of food chains is	

(b) (i) What effect would a decrease in the population size of caterpillars have on the population size of blue jays?

(1)

.....

(ii) What is meant by the term **population**?

(1)

.....

(c) The tick feeds on deer by sucking their blood.

Name two different molecules that are found in the blood of deer that the tick could feed on.

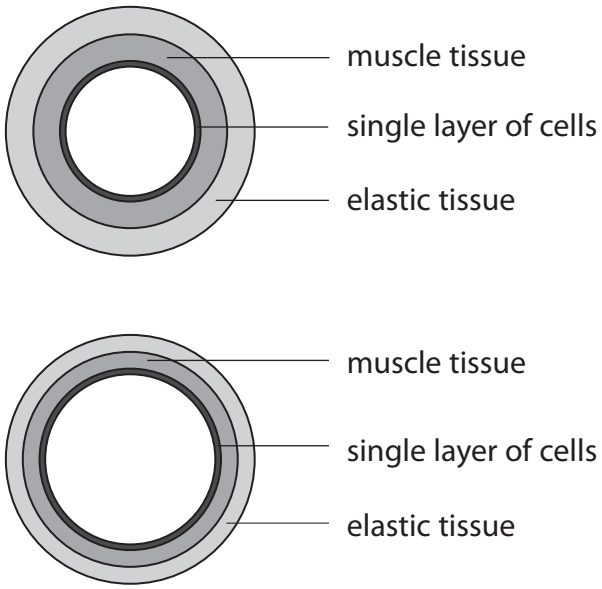
(2)

1 .....

2 .....

(Total for Question 1 = 8 marks)

2 The diagrams show sections through an artery and a vein.



(a) Use the information in the diagrams and your own knowledge to give three ways in which the structure of an artery differs from the structure of a vein.

(3)

1 .....

.....

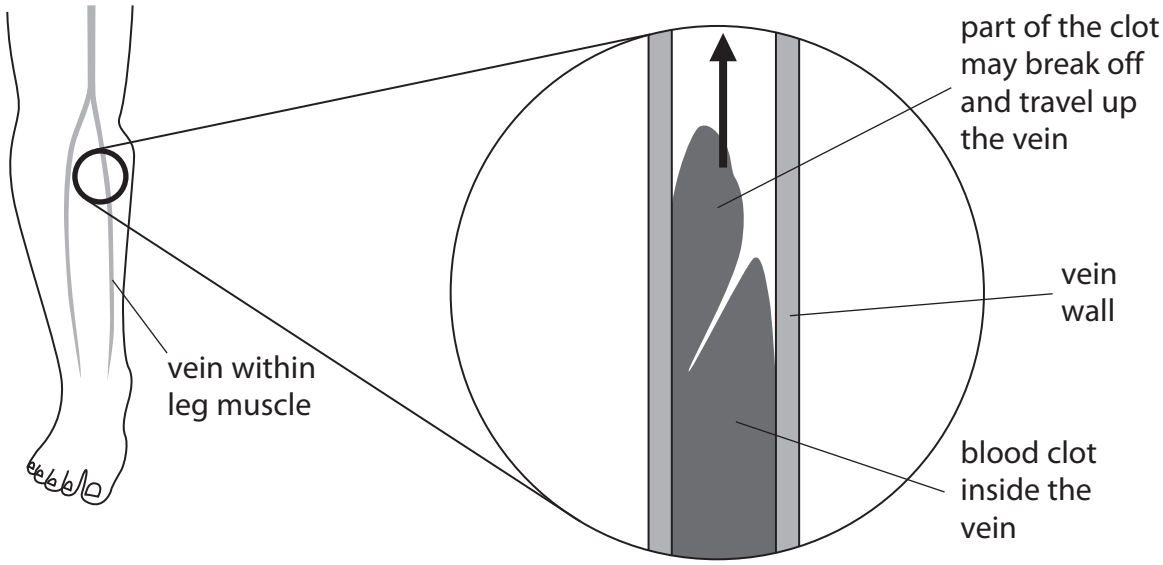
2 .....

.....

3 .....

.....

(b) Lack of movement by sitting still for long periods of time makes blood flow very slowly in a vein. Blood that flows slowly is more likely to clot than blood that flows normally. This problem is known as deep vein thrombosis (DVT). In DVT, the clot usually occurs in a leg vein as shown in the diagram.



DVT is dangerous because sometimes part of the clot breaks off and travels to the lung, blocking small blood vessels and causing death.

(i) Suggest why blood flow in a leg vein is slow when there is lack of movement.

(2)

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(ii) Name the blood cells responsible for transporting oxygen.

(1)

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(iii) Suggest why a clot that blocks the small blood vessels in the lungs can cause death.

(2)

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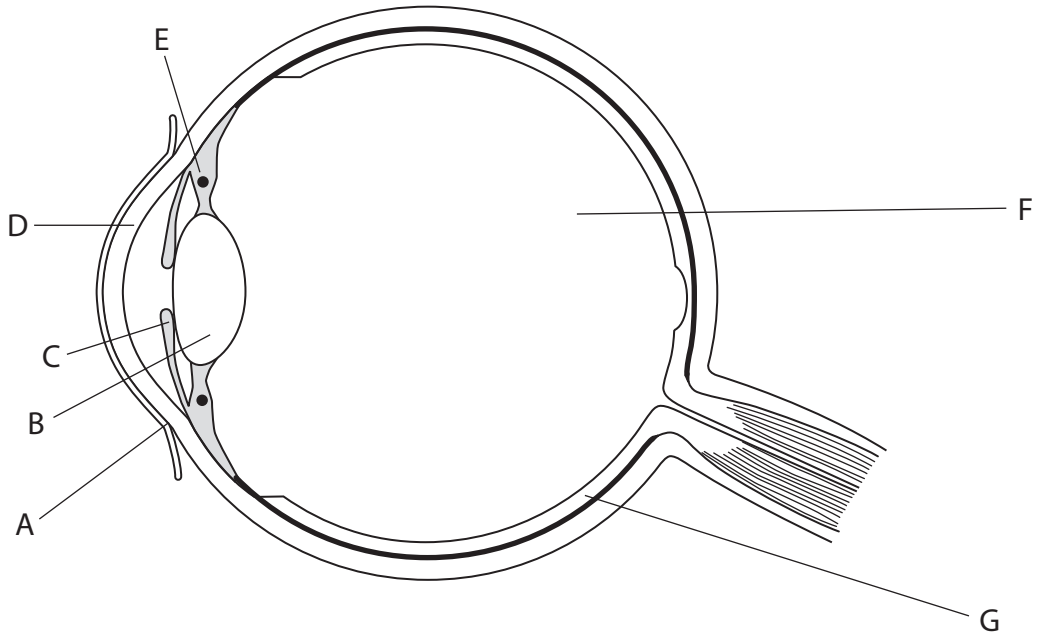
(Total for Question 2 = 8 marks)

3 The diagram shows a section through the human eye. Different parts of the eye have been labelled A to G.



The table lists some health problems that affect the eye and describes how they are caused.

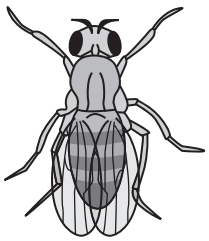
Complete the table by choosing the correct label letter for the part of the eye linked with each health problem. The first one has been done for you.

(4)

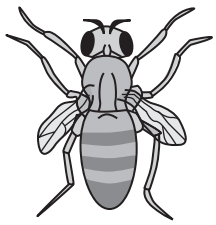
Health problem	Description	Label letter
conjunctivitis	infection of the conjunctiva	A
cataract	a cloudy lens	
blindness	a detached retina	
glaucoma	increased fluid pressure	
myopia	a change in the shape of the cornea	

(Total for Question 3 = 4 marks)

4 In fruit flies, the length of the wings is controlled by a gene with two alleles. The allele for long wings (**L**) is dominant to the allele for short wings (**l**). The diagram shows a long-winged fruit fly and a short-winged fruit fly.



long-winged fruit fly



short-winged fruit fly

(a) Complete the table by writing the genotype, the description of genotype and the phenotype of the fruit flies.

(3)

Genotype	Description of genotype	Phenotype
LL	homozygous dominant	
Ll	heterozygous	
		short-winged

(b) Two heterozygous fruit flies mated. The number of long-winged and short-winged offspring produced are shown below.

Long-winged offspring	Short-winged offspring
612	204

Tick **one** box to show the number of these offspring that is likely to be heterozygous.

(1)

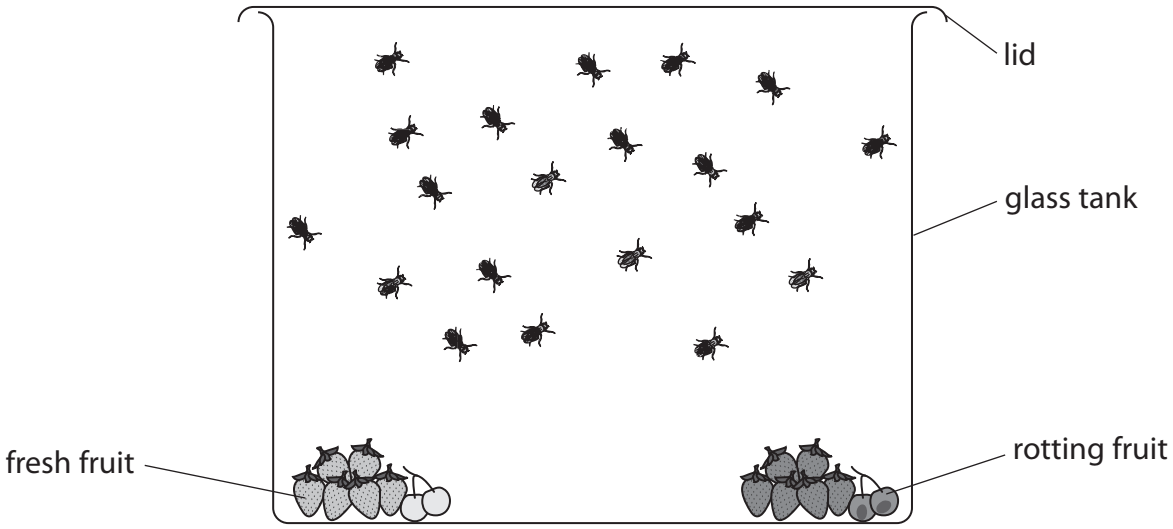
Number	Tick
204	
408	
612	
816	

(c) Yeast cells feed on rotting fruit. Fruit flies feed on these yeast cells.

Use this information to draw a food chain in the space below.

(2)

(d) A student wanted to find out if fruit flies are attracted to rotting fruit. He set up this apparatus.



He released 20 fruit flies into the glass tank. After ten minutes, he counted the number of fruit flies found near the fresh fruit and the number found near the rotting fruit. The table shows his results.

Number of fruit flies counted after ten minutes	
near fresh fruit	near rotting fruit
4	16

(i) Name two factors that the student should control in this investigation.

(2)

1 .....

2 .....

(ii) Do you think the student's results are reliable?

Give a reason for your answer.

(1)

.....

.....

.....

(Total for Question 4 = 9 marks)

5 A school in Uganda made a large freshwater pond so that their students could investigate the factors that fish need to grow well in a fish farm.

(a) Suggest how the students should maintain the water quality in their pond.

(2)

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(b) Suggest how the students could control predation in their pond.

(2)

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(c) Suggest how the students could control disease in their pond.

(2)

(d) Suggest the feeding methods the students should use in their pond.

(2)

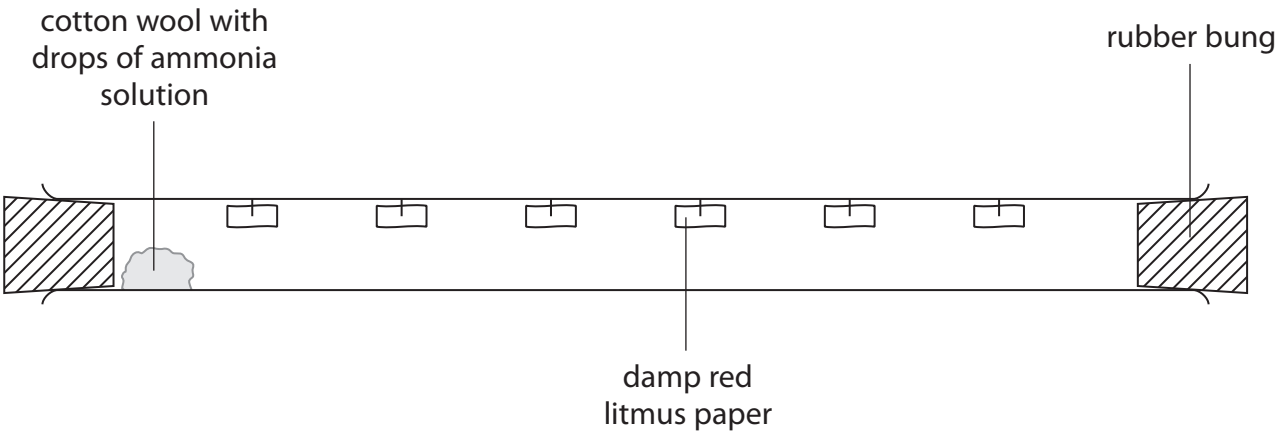
(Total for Question 5 = 8 marks)

6 Lily investigated the effect of concentration of a substance on the rate of diffusion.

In a fume cupboard she set up a glass tube with small squares of damp red litmus paper spaced at 4 cm intervals along its length.

She added 1 drop of ammonia solution to some cotton wool and used tweezers to place the cotton wool at one end of the tube. She closed the tube with a bung. She timed how long it took for each square of litmus paper to change colour.

She then set up an identical tube and repeated the experiment, but this time she used 3 drops of ammonia solution.



Her results are shown in the table.

Number of drops of ammonia solution	Time taken for litmus paper to change colour in seconds					
	4 cm	8 cm	12 cm	16 cm	20 cm	24 cm
1	7	13	19	26	32	37
3	3	7	10	13	16	20

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

(2)

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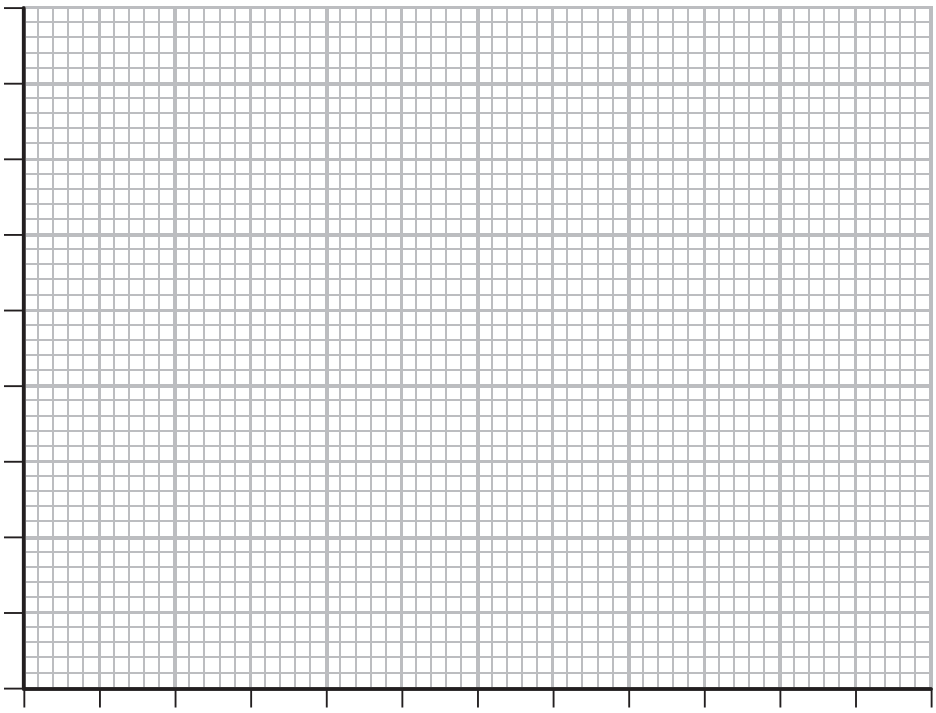
(b) Plot these results on the grid. Use straight lines to join the points.

(6)



(c) Describe the results shown by the graph.

(2)

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(d) Calculate the average rate of diffusion, in centimetres per second of ammonia, from the 3 drops of ammonia solution between the litmus papers at 4 cm and 24 cm. Show your working.

(2)

Answer ..... cm/s

(e) Explain the difference in the rate of diffusion between the experiment using 1 drop of ammonia and the experiment using 3 drops of ammonia.

(1)

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.....

(f) Suggest how Lily could modify her experiment to investigate the effect of temperature on the rate of diffusion.

(2)

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(Total for Question 6 = 15 marks)

7 The passage describes the consequences of air pollution.

Complete the passage by writing a suitable word or words on each dotted line.

(10)

The release of the gas sulfur ..... into the atmosphere

is an example of air pollution because the gas dissolves in water in air

to form ..... rain. This rain can kill trees on land

and fish in lakes.

Another gas that pollutes the air is ..... monoxide. This gas

combines with ..... in red blood cells and makes it more

difficult for them to carry out their function.

Other gases that pollute the atmosphere are greenhouse gases such as .....

and nitrous oxide from the burning of ..... fuels,

and ..... from the digestive system of cattle.

These gases increase the ..... effect and may lead to a problem

known as ..... in which the air temperature may rise.

This rise in air temperature may destroy the place where a species lives

known as its ..... .

(Total for Question 7 = 10 marks)

8 The photograph shows an organism called lichen growing on the surface of a tree.

© Norbert Nagel

Lichens are unusual because they consist of a fungus and an algae living together.

(a) The fungus grows hyphae that help it feed by saprotrophic nutrition.

Explain what is meant by the term **saprotrophic nutrition**.

(2)

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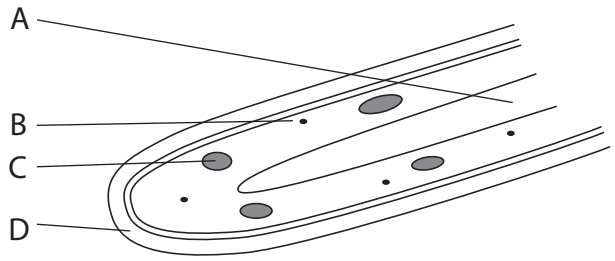
(b) The diagram shows a fungal hypha with parts labelled A to D.



(i) Which letter labels the part made from chitin?

(1)

.....

(ii) Which letter labels the part made from glycogen?

(1)

.....

(c) Algae are green organisms that carry out photosynthesis.

(i) Name the molecule that makes algae look green.

(1)

.....

(ii) Write the word equation for photosynthesis.

(2)

.....

(Total for Question 8 = 7 marks)

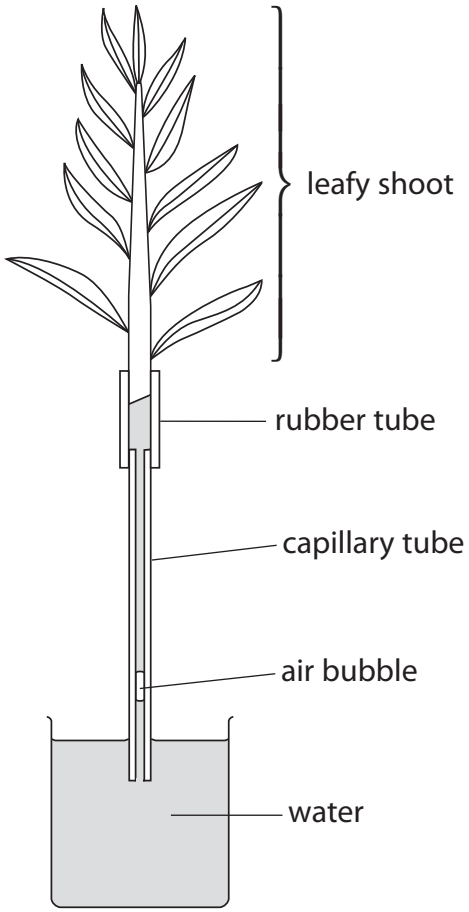
9 The use of a pesticide may result in an increase in the number of pest organisms that are resistant to the pesticide.

Use your knowledge of natural selection to explain the increase in the number of pest organisms that are resistant to the pesticide.

(5)

(Total for Question 9 = 5 marks)

10 Steven wanted to measure the rate of water loss from a leafy shoot. He set up this apparatus in normal laboratory conditions.



(a) Name the apparatus Steven used.

(1)

.....

(b) Name the process by which a plant loses water.

(1)

.....

(c) Describe how Steven should set up the apparatus and how he should then use it to estimate the rate of water loss from the leafy shoot.

(4)

(d) Steven carried out three further experiments. He used the same plant, but changed one condition in each experiment.

The table shows the percentage change in rate of water loss for each condition when compared to Steven's original experiment.

Condition	Percentage change in rate of water loss (%)
wind increased	+23
light intensity reduced	−40
half of the leaves removed	−48

Explain the change in water loss when

(i) wind was increased

(2)

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(ii) light intensity was reduced

(1)

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.....

.....

(iii) half of the leaves were removed.

(2)

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(e) Suggest how Steven could increase the wind around the leafy shoot.

(1)

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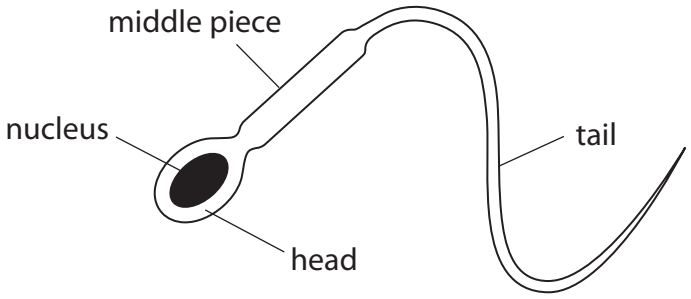
(Total for Question 10 = 12 marks)

11 The diagram shows a human sperm cell.



(a) How many chromosomes are there in the nucleus?

(1)

.....

(b) Respiration takes place in the middle piece of the sperm cell.

Explain why respiration is important to a sperm cell.

(2)

.....

.....

.....

(c) A sample of semen contains 40 million sperm cells. Only sixty percent of these sperm cells are capable of swimming.

Calculate how many sperm cells in this semen sample are capable of swimming.

Show your working.

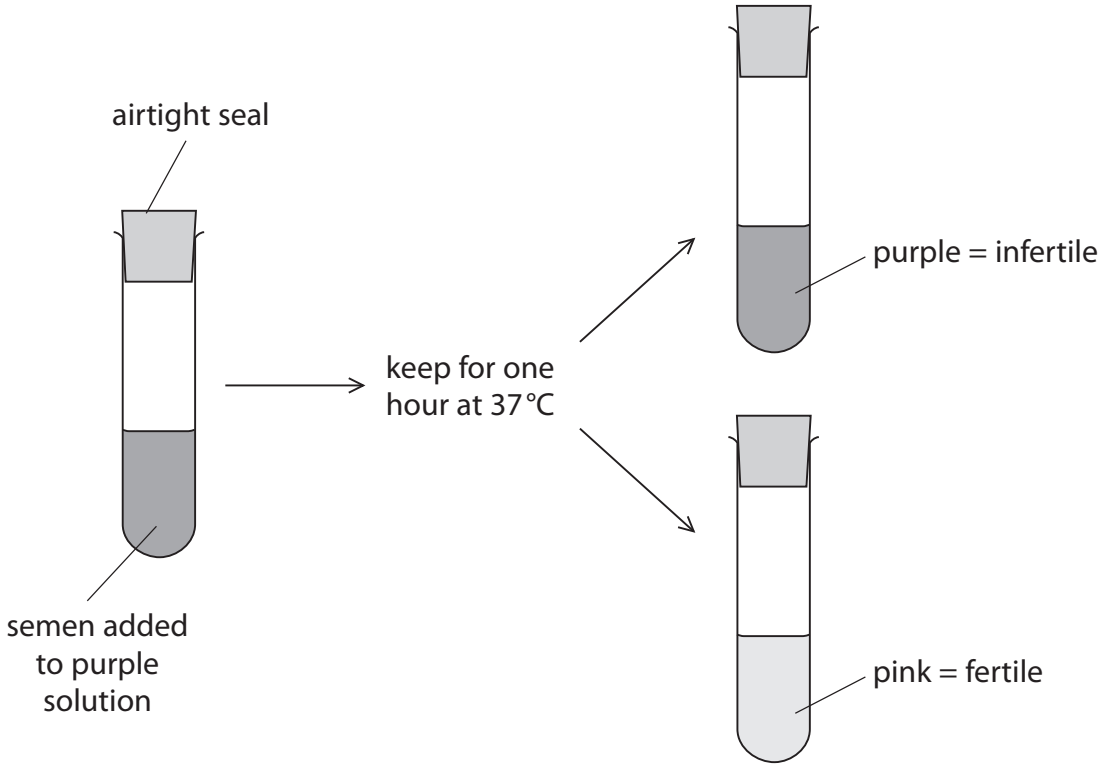
(2)

Answer .....

(d) Some men are infertile because they do not produce enough sperm cells or the sperm cells they produce are not good swimmers.

There is a test that can be used to find out if a man is infertile. Semen is added to a solution in a test tube. The test tube is then sealed.

The solution stays purple if oxygen is present and changes to pink if oxygen is absent. The diagram shows how the test works.



(i) A man used this test and the solution remained purple. What does this suggest about the man's sperm? Explain your answer.

(2)

.....

.....

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.....

(ii) Suggest two reasons why the results of the test might not be correct.

(2)

1 .....

.....

2 .....

.....

(Total for Question 11 = 9 marks)

12 The immune system responds to infection using white blood cells. A phagocyte is one type of white blood cell.

(a) (i) Draw and label a phagocyte.

(3)

(ii) Give one way that the structure of this cell differs from a red blood cell.

(1)

(b) Describe how white blood cells are used by the body to defend against infection.

(5)

(Total for Question 12 = 9 marks)

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13 (a) Describe the stages that are used to genetically modify a bacterium that is able to manufacture human growth hormone.

(5)

(b) BST is a hormone that increases milk yield in cows.

(i) Explain what is meant by the term **hormone**.

(2)

(ii) In some countries BST from genetically modified bacteria has been injected into cows to improve milk production.

In other countries selective breeding has been used to improve milk production.

Describe how selective breeding could be used to increase milk production.

(3)

(Total for Question 13 = 10 marks)

TURN OVER FOR QUESTION 14

14 Commercial flower growers keep their plants in greenhouses under artificial light.

Describe an investigation to find out if the length of time that plants are exposed to light affects how long it takes for flowers to appear.

(6)

(Total for Question 14 = 6 marks)

TOTAL FOR PAPER = 120 MARKS