Write your name here

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Biology

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

Tuesday 12 January 2016 – 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.
- 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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Answer ALL questions.

1 The photograph shows a mammal called a mountain hare.



©Author: Alan Wolfe

Mountain hares eat plants.

Foxes, cats and eagles are predators that eat mountain hares.

(a) (i) Use this information to draw a food web.

(2)

(ii) Give the name used to describe animals that eat plants.

(1)

.....

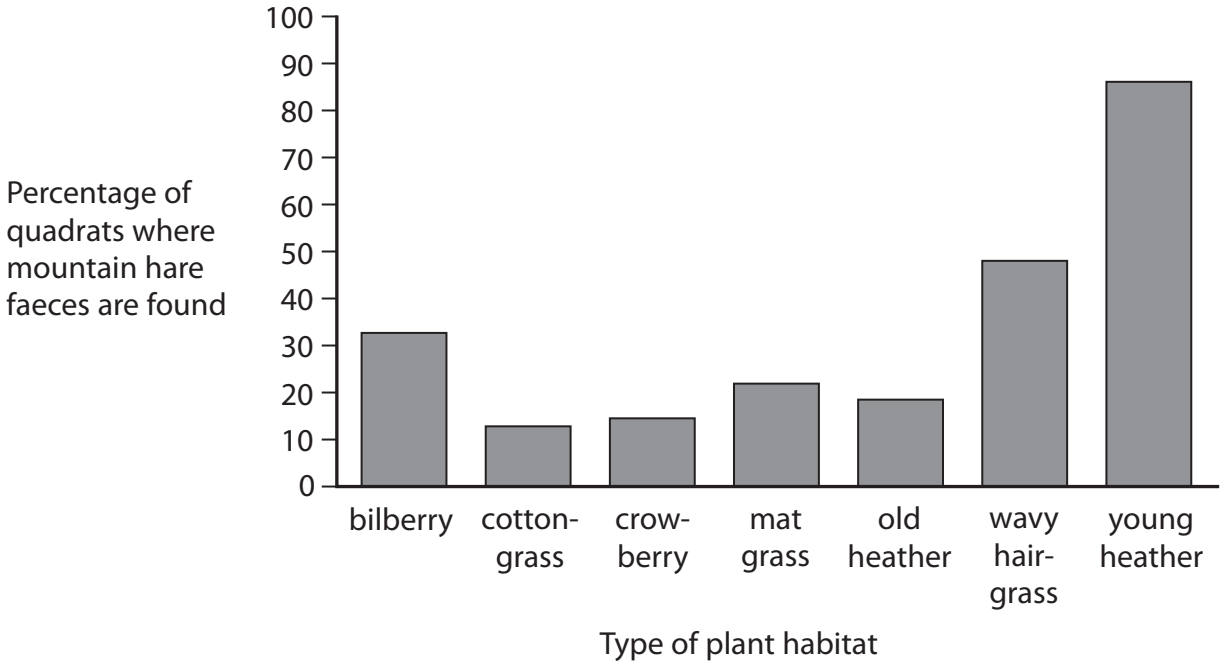
(b) Scientists want to find out which type of plant habitat mountain hares prefer.

They use quadrats to sample seven habitats.

Each habitat contains a different type of plant.

The scientists calculate the percentage of quadrats in each habitat where mountain hare faeces are found.

The graph shows the results.



(i) Name the type of plant habitat that the mountain hares like best.

(1)

.....

(ii) Suggest three reasons why mountain hares may prefer to eat the plants in some habitats rather than plants in other habitats.

(3)

1 .....

.....

2 .....

.....

3 .....

.....

(c) The scientists use 700 quadrats in one plant habitat and find that 224 quadrats contain mountain hare faeces.

(i) Calculate the percentage of quadrats containing mountain hare faeces in this habitat.

Show your working.

(2)

percentage of quadrats = ... %

(ii) Name the type of plant habitat where the scientists collected these results.

(1)

.....

(d) The scientists use a large number of quadrats to make sure the data collected is reliable.

Describe a procedure they should follow to make sure the data collected using quadrats is valid.

(1)

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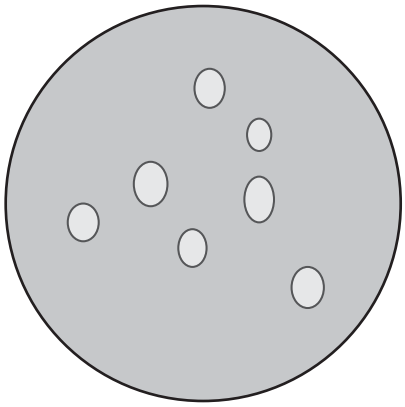
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(Total for Question 1 = 11 marks)

2 A student adds oil (lipid) to water.

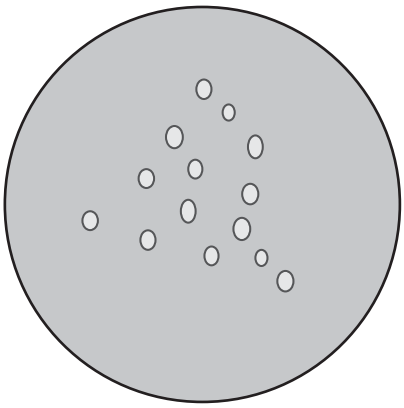
He then puts drops of the mixture onto a microscope slide.

The diagram shows oil droplets floating on the water, as seen using a microscope.

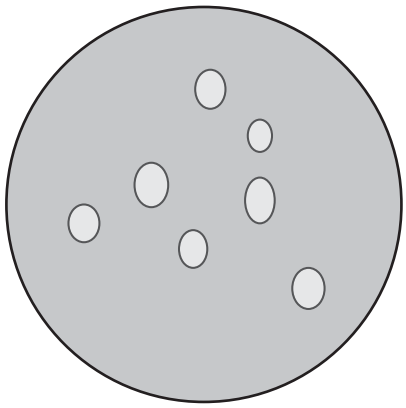


The student then adds different solutions to four separate samples of oil droplets floating on the water.

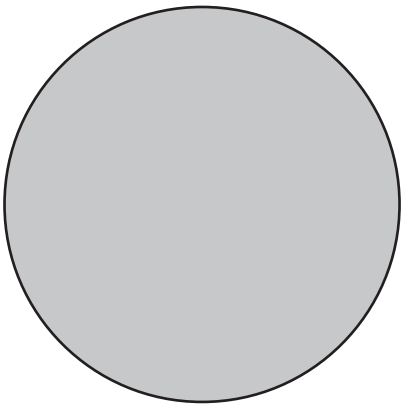
Diagrams A, B and C show the possible appearance of the oil droplets after each solution is added.



A



B



C

(a) (i) The table lists the solutions added to the oil and water mixture.

Complete the table to show which diagram the mixture would look like after each solution is added.

You may use each letter once, more than once or not at all.

One has been done for you.

(3)

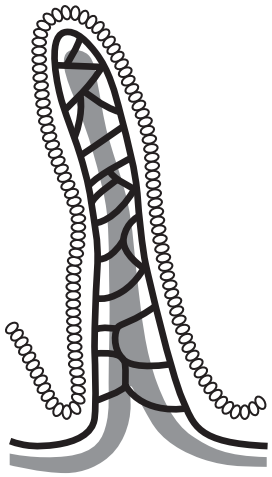
Solution added	Diagram
bile	
bile and lipase	C
boiled lipase	
bile and protease	

(ii) Explain why no droplets are seen after bile and lipase solution is added to the oil and water mixture.

(4)

(b) Starch is digested in the small intestine. The small intestine contains many structures that absorb glucose.

The diagram shows one of these structures.



(i) Name this structure.

(1)

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(ii) Explain how this structure is adapted to absorb glucose.

(5)

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(Total for Question 2 = 13 marks)

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3 Listeriosis is an illness caused by eating food containing the bacterium *Listeria*.

(a) The diagram shows the cell wall of one of these bacteria. Other structures found in the bacterium are not shown.

Draw and label three other structures that would be found in the bacterium.

(3)



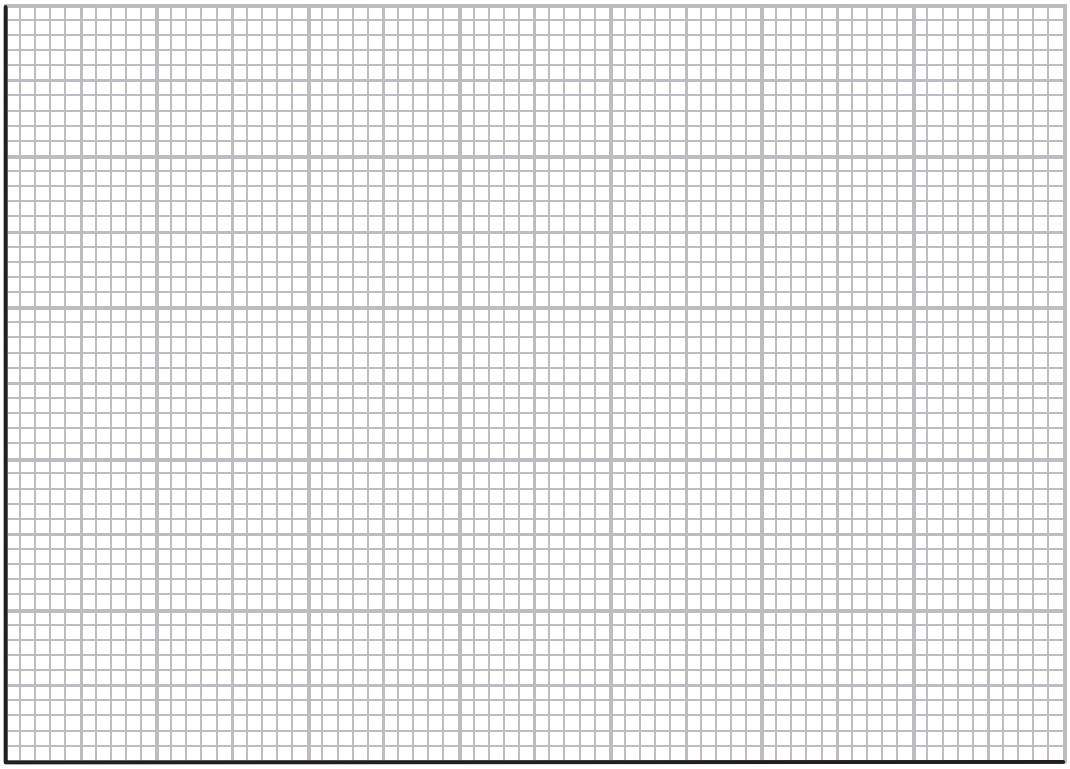
(b) Many different foods have been found to contain *Listeria*.

A study was carried out in the USA over a two-year period. The table shows the number of people who became ill with listeriosis after eating different types of food. It also shows the number of people who died as a result of becoming ill with listeriosis.

Type of food eaten	Number of people who became ill	Number of people who died
coleslaw	52	11
milk	105	5
cheese	364	80
processed meat	458	98
fresh meat	494	96

(i) Plot a bar graph to show the number of people who became ill and the number of people who died from listeriosis after eating the different types of food.

(5)



(ii) The likelihood of a person dying from listeriosis depends on which food the bacterium came from.

Use the information in the table to determine which type of food is most likely to cause a bacterial infection that leads to death.

Show your working.

(2)

type of food .....

(c) Explain how the immune system protects most people from becoming ill with listeriosis.

(5)

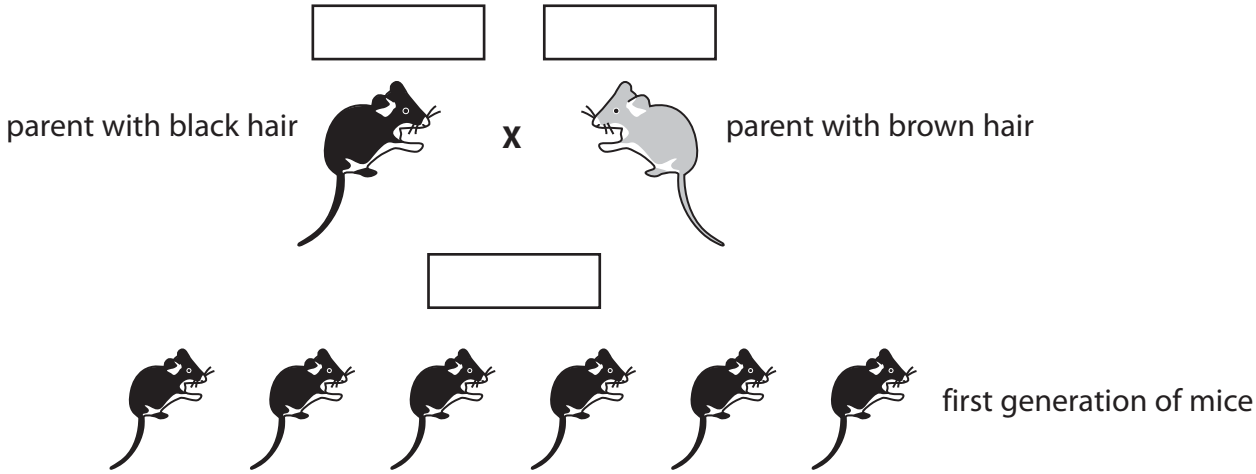
(Total for Question 3 = 15 marks)

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4 Mice can have black hair or brown hair in their fur.

The allele for black hair (B) is dominant to the allele for brown hair (b).

A homozygous black haired mouse mated with a homozygous brown haired mouse to produce the first generation of offspring. The cross is shown in the diagram.



(a) Complete the diagram by writing the genotype of each parent and the offspring in the boxes.

(2)

(b) The first generation mice mated with each other and produced a second generation.

Complete the Punnett square to show the gametes involved and the genotypes of the possible second generation mice.

(2)

male \ female		

(c) The passage describes part of the process of reproduction in mice.

Complete the passage by writing a suitable word in each blank space.

(6)

The male mouse produces gametes called ..... that swim to the female gamete. Each gamete has the haploid number of chromosomes, which is 20 in mice. The gametes join in a process called ..... . The single cell produced is called a ..... and contains the ..... number of chromosomes.

This cell divides by ..... into an embryo. Each cell in the embryo contains ..... chromosomes.

(Total for Question 4 = 10 marks)

5 Plants can be genetically modified (GM) to make them resistant to pests.

Describe an investigation that could be carried out to find out if GM plants produce a better yield than normal plants.

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

(6)

(Total for Question 5 = 6 marks)

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6 Photosynthesis is the process by which plants obtain nutrition.

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

(2)

.....

(b) Leaves can be tested for starch to show that photosynthesis has taken place.

This is the method given in a biology textbook.

1. Remove the leaf you want to test from the plant.
2. Half fill a 250 cm^3 beaker with water and boil the water using a Bunsen burner.
3. Using a pair of forceps, hold the leaf in the boiling water for 20 seconds.
4. Turn the Bunsen burner off.
5. Using the forceps, push the leaf to the bottom of a boiling tube and cover it with ethanol.
6. Place the boiling tube in the beaker of very hot water. The ethanol will boil.
7. When the leaf is colourless, remove it from the boiling tube and wash it in cold water for a few seconds.
8. Place the leaf flat on a white tile.
9. Add dilute iodine solution with a pipette, making sure the whole leaf is covered.
10. Any starch present will react with the iodine solution.

(i) Explain a safety precaution that should be taken when carrying out this test.

(2)

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.....

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(ii) State the purpose of step 3.

(1)

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.....

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(iii) State the purpose of step 6.

(1)

(c) Experiments can be done to demonstrate that light, chlorophyll and carbon dioxide are needed for photosynthesis.

Testing leaves for starch is the final step in these experiments.

Explain what other steps need to be taken to demonstrate that each of these factors is needed for photosynthesis.

(i) light

(2)

(ii) chlorophyll

(2)

(iii) carbon dioxide

(2)

(Total for Question 6 = 12 marks)

7 Yeast can be used to make beer. This process takes place in anaerobic conditions.

(a) (i) Name the group of organisms that includes yeast.

(1)

.....

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

(1)

.....

.....

(iii) Write the word equation for anaerobic respiration in yeast.

(2)

.....

(b) After the beer is made it is put into sterile bottles.

(i) Describe how the bottles can be sterilised.

(1)

.....

.....

(ii) Why is it important to use sterile bottles?

(1)

.....

.....

(c) The food source for the yeast cells comes from barley grains that are allowed to germinate.

(i) Name the enzyme that digests the starch in the barley.

(1)

.....

(ii) Name the substance produced when the starch is digested.

(1)

.....

(d) During the production of beer the number of live yeast cells initially increases, but then decreases towards the end of the process.

Explain why the number of live yeast cells decreases towards the end of the process.

(2)

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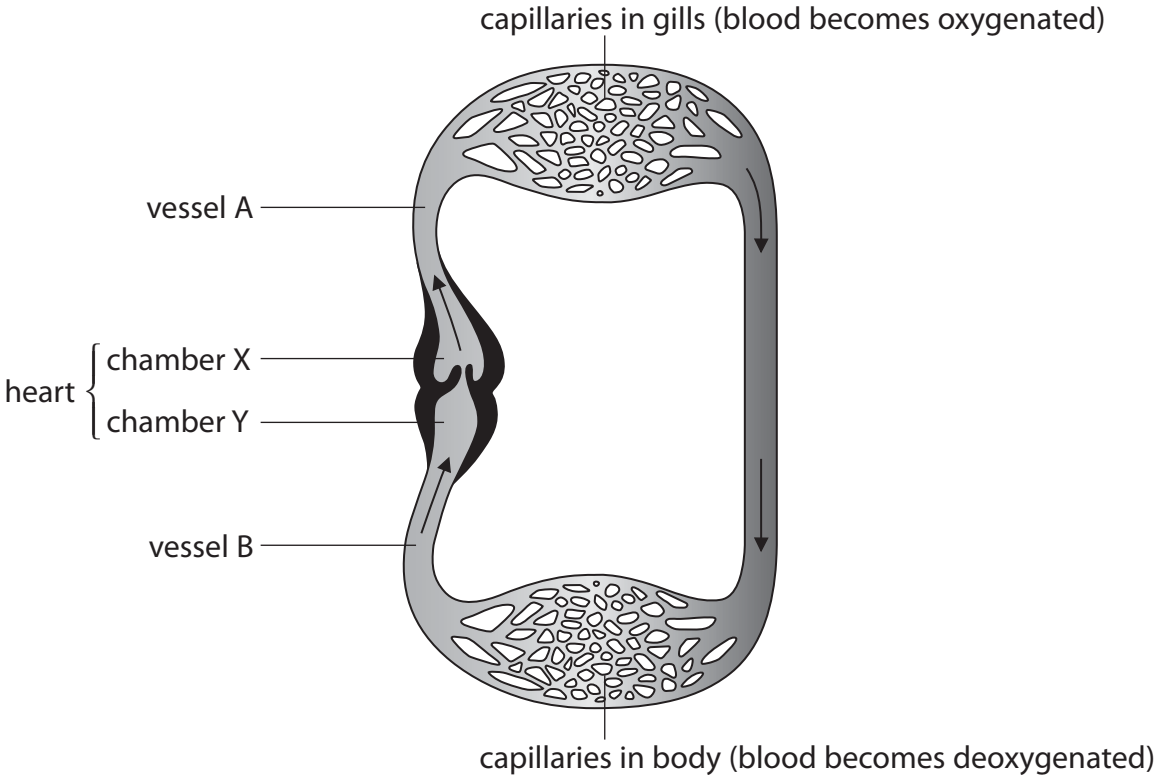
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(Total for Question 7 = 10 marks)

8 The diagram shows the heart and circulation system of a fish.



(a) The circulation system and heart structure of a fish have similarities and differences to those of a human.

Use your knowledge of human circulation and heart structure to answer these questions.

(i) What type of blood vessel is vessel A?

(1)

.....

(ii) What type of heart chamber is chamber Y?

(1)

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(iii) Describe how the structure of a fish heart differs from that of a human heart.

(3)

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(b) The concentrations of the gases in the blood leaving the fish heart are different from the concentrations of the gases in the blood leaving the human heart in the aorta.

Explain the differences in the concentrations of gases.

(4)

(c) Explain why the pressure of the blood returning to the fish heart is lower than the pressure of the blood returning to the human heart.

(2)

(Total for Question 8 = 11 marks)

9 Plants can reproduce sexually or asexually.

Plants that reproduce sexually can be pollinated by insects or by wind.

(a) State three ways in which the structure of insect-pollinated flowers differs from the structure of wind-pollinated flowers.

(3)

1 .....

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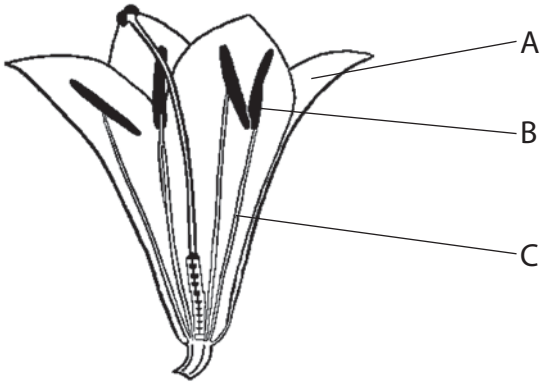
2 .....

.....

3 .....

.....

(b) The diagram shows a flower from a plant.



Name the structures labelled on the diagram.

(3)

A .....

B .....

C .....

(c) The flower in the diagram is insect-pollinated.

An insect carrying pollen lands on the flower.

Describe the events that lead to seed formation.

(5)

(Total for Question 9 = 11 marks)

10 The world's rainforests could completely vanish in a hundred years at the current rate of deforestation.

(a) Suggest two reasons why humans are removing rainforest.

(2)

1 .....

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2 .....

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(b) (i) Explain how deforestation can change the balance of gases in the atmosphere.

(2)

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(ii) Suggest how deforestation can change the soil structure.

(2)

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(c) Suggest how countries can reduce the impact of deforestation.

(2)

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(Total for Question 10 = 8 marks)

11 Bacteria, fungi and protoctists can cause disease and have features common to all living organisms.

Viruses can cause disease but are not classified as living.

(a) (i) Explain why viruses are not classified as living.

(2)

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.....

(ii) Name a disease caused by a virus.

(1)

.....

(b) A new group of pathogens called prions was discovered in the 1980s.

Prions are simple proteins.

All known prion diseases can be fatal because the immune system does not recognise prions as foreign.

Suggest two ways in which prions differ from viruses.

(2)

1 .....

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2 .....

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(Total for Question 11 = 5 marks)

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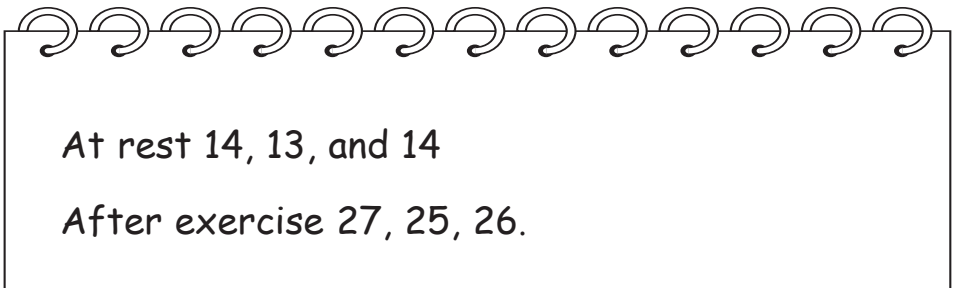
12 A group of students investigate the effect of exercise on breathing rate.

They measure their breathing rate at rest by counting breaths per minute.

They then exercise by running on the spot.

After exercise they measure their breathing rate by counting breaths per minute.

These are their results.



(a) Display these results in a table.

(2)

(b) Explain why breathing rate is higher after exercise.

(4)

(c) Explain how the students could improve their investigation.

(2)

(Total for Question 12 = 8 marks)

TOTAL FOR PAPER = 120 MARKS

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