SPECIMEN MATERIAL

GCSE
COMBINED SCIENCE: SYNERGY

F

Foundation Tier Paper 1F

Specimen 2018 Time allowed: 1 hour 45 minutes

Materials

For this paper you must have:
- a ruler
- a calculator
- the periodic table (enclosed)
- the Physics equation sheet (enclosed).

Instructions
- Answer all questions in the spaces provided.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information
- There are 100 marks available on this paper.
- The marks for questions are shown in brackets.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.
- When answering questions 08.6, 10.2 and 11.1 you need to make sure that your answer:
  - is clear, logical, sensibly structured
  - fully meets the requirements of the question
  - shows that each separate point or step supports the overall answer.

Advice
- In all calculations, show clearly how you work out your answer.

Please write clearly, in block capitals.

Centre number ☐☐☐☐☐ Candidate number ☐☐☐☐

Surname ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

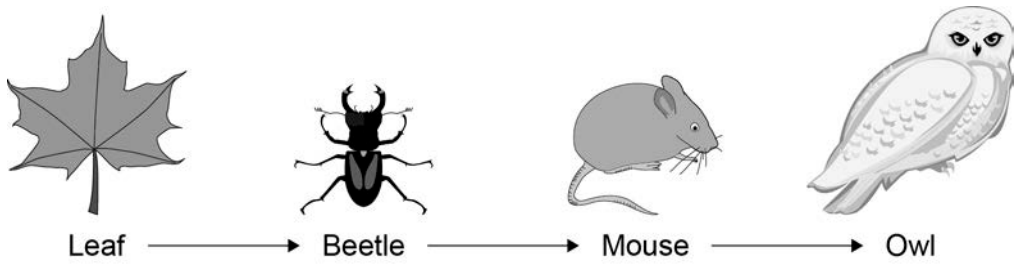
Forename(s) ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Candidate signature _____

0 1 Feeding relationships can be shown using food chains.

Figure 1 shows a food chain for organisms in a habitat.

Figure 1



0 1 . 1 What is the **producer** in the food chain?

[1 mark]

Tick **one** box.

- Beetle ☐
- Leaf ☐
- Mouse ☐
- Owl ☐

0 1 . 2 Name the **primary consumer** in the food chain.

[1 mark]

0 1 . 3 What is the group of leaves, beetles, mice and owls in a habitat called?

[1 mark]

Tick **one** box.

- Community ☐
- Ecosystem ☐
- Population ☐
- Species ☐

0 1 . 4 What are two **abiotic** factors that can affect the food chain?

[2 marks]

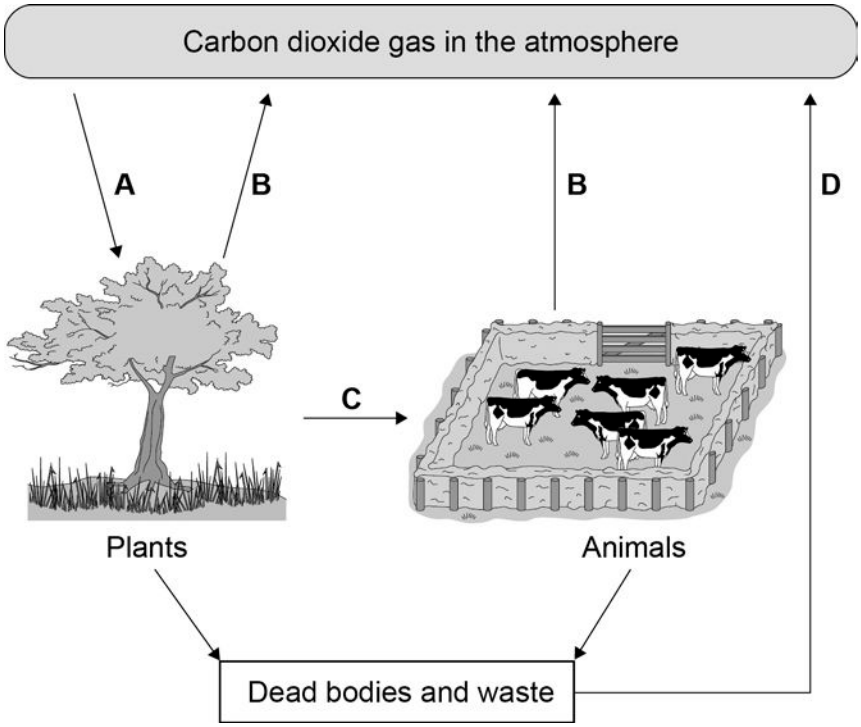
Tick **two** boxes.

- Availability of food ☐
- Light intensity ☐
- New diseases ☐
- New predators ☐
- Wind direction ☐

Turn over for the next question

0 2 **Figure 2** shows the carbon cycle.

Figure 2



Use information from **Figure 2** to answer the questions.

0 2 . 1 In process **A**, carbon dioxide in the atmosphere is taken into plants.

What is process **A**?

[1 mark]

Tick **one** box.

Evaporation ☐

Fossilisation ☐

Photosynthesis ☐

Respiration ☐

0 2 . 2 In process **B**, carbon dioxide is released from plants and animals into the atmosphere.

What is process **B**?

[1 mark]

Tick **one** box.

- Burning ☐
- Feeding ☐
- Photosynthesis ☐
- Respiration ☐

0 2 . 3 In which process is carbon passed from one organism to another?

[1 mark]

Tick **one** box.

- **A** ☐
- **B** ☐
- **C** ☐
- **D** ☐

0 2 . 4 What will happen to the concentration of carbon dioxide in the atmosphere if lots of trees are cut down?

[1 mark]

Question 2 continues on the next page

0 2 . 5 Greenhouse gases cause global warming.

Carbon dioxide is a greenhouse gas.

Name **two** other greenhouse gases.

[2 marks]

1 _____

2 _____

0 2 . 6 When living organisms die the dead material decays and is broken down.

The process of decay returns carbon dioxide to the atmosphere.

What type of organism causes decay?

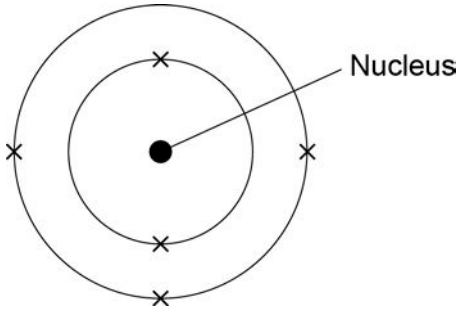
[1 mark]

_____

Turn over for the next question

0 3 **Figure 3** shows an atom of boron.

Figure 3



0 3 . 1 When the mass of the boron atom is calculated, the mass of the electrons is ignored.

Why is the mass of the electrons ignored?

[1 mark]

0 3 . 2 How many electrons are there in the boron atom?

[1 mark]

0 3 . 3 What is the electrical charge on the nucleus of the boron atom?

[1 mark]

Tick **one** box.

+1 ☐

+5 ☐

+6 ☐

+11 ☐

0 3 . 4 The mass number of boron is 11.

Use **Figure 3** to calculate the number of neutrons in the nucleus of the boron atom.

Explain how you worked out the answer.

[3 marks]

Number of neutrons = _____

Explanation _____

_____

_____

0 3 . 5 Phosphorus has a mass number of 31 and has 16 neutrons.

What percentage of the mass number of phosphorus is the number of neutrons?

Give your answer to two significant figures.

[2 marks]

_____

_____

Percentage = _____

Turn over for the next question

0 4 Density can be explained using the particle model.

0 4 . 1 What is the unit of density (ρ)?

[1 mark]

Tick **one** box.

joules, J ☐

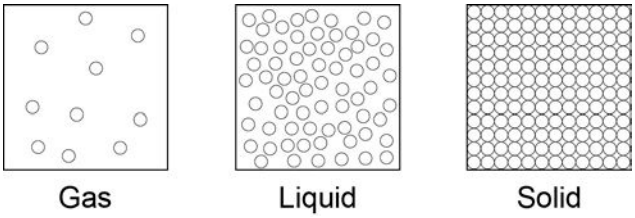
joules per kilogram, J/kg ☐

kilograms, kg ☐

kilograms per metre cubed, kg/m^3 ☐

0 4 . 2 **Figure 4** shows particles of the same substance in three states of matter.

Figure 4



Use **Figure 4** to explain why the solid has the highest density.

[2 marks]

0 4 . 3 Complete the sentences.

Use answers from the box.

[2 marks]

downwards	**kinetic**	**nuclear**	**potential**	**randomly**	**slowly**

The particles in a gas are constantly moving.

The particles move _____ .

When the temperature of the particles in a gas is increased

the particles have more _____ energy .

0 4 . 4 A gas is put into a closed container.

The container and the gas inside it are heated.

What will happen to the pressure inside the container?

[1 mark]

_____

Turn over for the next question

0 5 Sexual reproduction in humans involves the joining together of an egg cell and a sperm cell.

The sex of an embryo is decided by the chromosomes they inherit from their mother and father.

0 5 . 1 Where in the cell are the chromosomes?

[1 mark]

Tick **one** box.

- Cell membrane ☐
- Cytoplasm ☐
- Nucleus ☐
- Ribosomes ☐

0 5 . 2 Draw **one** line from each type of cell to the number of chromosomes in the cell.

[2 marks]

Type of cell	Number of chromosomes
	23
Sperm cell	26
	46
Embryo cell	52
	69

0 5 . 3 A man and a woman decide to have a child.

Complete the genetic diagram in **Figure 5**.

[2 marks]

Figure 5

		Parent	
		X	**X**
Parent	**X**	XX	
	Y		

0 5 . 4 On **Figure 5**, circle a male child.

[1 mark]

0 5 . 5 What is the chance of the man and woman having a boy?

[1 mark]

Tick **one** box.

1 in 2 ☐

1 in 3 ☐

1 in 4 ☐

1 in 8 ☐

Turn over for the next question

There are no questions printed on this page

0 6 Pathogens are microorganisms that cause infectious disease.

0 6 . 1 Draw **one** line from each disease to the way the disease is spread.

[3 marks]

Disease	Way the disease is spread
	Animals that draw blood
Cholera	Drinking contaminated water
Cold	Droplets in the air when people cough or sneeze
Malaria	Eating food that is contaminated
	Breathing air polluted with carbon dioxide

0 6 . 2 One way the human body protects itself against the entry of pathogens is by producing antimicrobial chemicals.

Antimicrobial chemicals kill pathogens.

Give **two** other ways the human body protects itself against the **entry** of pathogens.

[2 marks]

1 _____

_____

2 _____

_____

0 6 . 3 Measles is a childhood disease caused by a microorganism.

Measles is **not** treated by antibiotics.

Give the reason why.

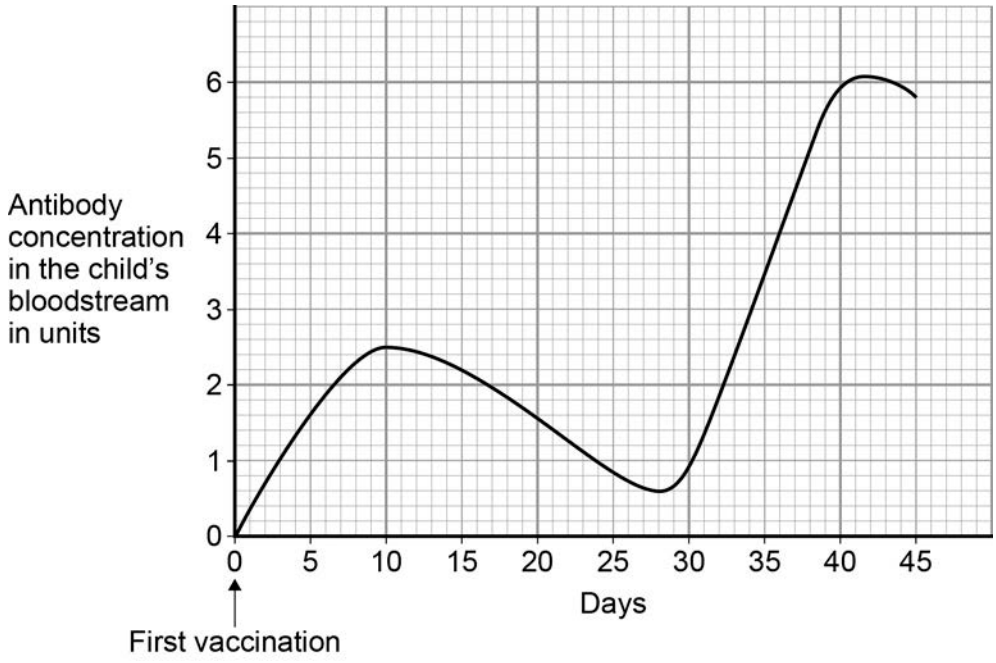
[1 mark]

Vaccinations help people become immune to infections.

In 2013, 92% of children in the UK had two vaccination injections against measles.

Figure 6 shows how the concentration of antibodies in the blood changes after each measles vaccination.

Figure 6



0 6 . 4 Suggest what day the second vaccination was given.

[1 mark]

0 6 . 5 What is the highest concentration of antibodies produced by the first vaccination?

[1 mark]

0 6 . 6 How will the number of children getting measles change as more children are vaccinated against measles?

Give a reason for your answer.

[2 marks]

Change

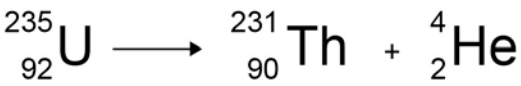
Reason

Turn over for the next question

0 7 This question is about radioactive decay.

0 7 . 1 **Figure 7** shows a nuclear equation for the decay of an atom of uranium.

Figure 7



Use information from **Figure 7** to complete **Table 1**.

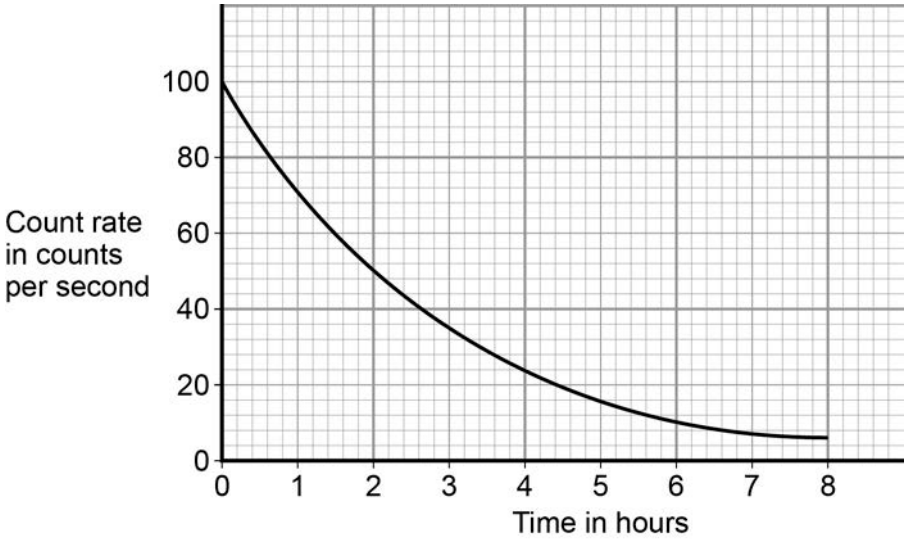
[3 marks]

Table 1

	U	**Th**
Mass number	235	
Number of protons		90
Number of neutrons	143	

Figure 8 shows how the count rate from a radioactive isotope changes with time.

Figure 8



0 7 . 2 What is the half-life of the radioactive isotope?

Explain why you chose that value.

[2 marks]

Half-life = _____ hours

Explanation _____

_____

Question 7 continues on the next page

0 7 . 3 When a radioactive isotope decays it can produce beta particles.

What is a beta particle?

[1 mark]

Tick **one** box.

A high-speed electron ☐

A neutron and an electron ☐

A neutron and a proton ☐

A helium nucleus ☐

0 7 . 4 Beta particles can cause cancer.

Complete the sentences.

Use words from the box.

[2 marks]

benign	**controlled**	**differentiated**	**malignant**	**slow**	**uncontrolled**

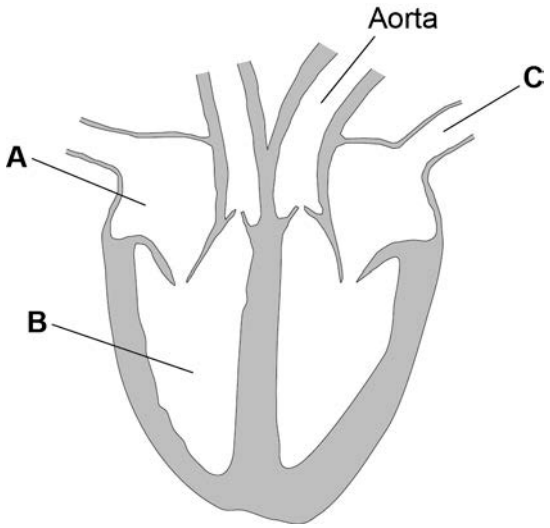
Tumours form when cell division is _____ .

Tumours that do not invade other tissues are called _____ .

Turn over for the next question

0 8 **Figure 9** shows a diagram of the human heart.

Figure 9



0 8 . 1 Name parts **A** and **B**.

[2 marks]

A _____

B _____

0 8 . 2 What is the function of blood vessel **C**?

[1 mark]

Tick **one** box.

To take blood from the heart around the body ☐

To take blood from the body to the heart ☐

To take blood from the heart to the lungs ☐

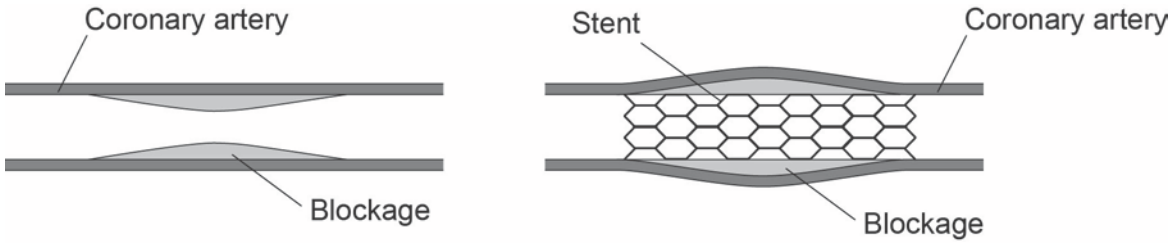
To take blood from the lungs to the heart ☐

Coronary heart disease (CHD) develops when layers of fatty material build up in the coronary artery.

One treatment for CHD is to insert a stent into the coronary artery.

Figure 10 shows a stent in a coronary artery.

Figure 10



0 8 . 3 Explain why the stent helps to prevent a heart attack.

[4 marks]

Question 8 continues on the next page

Look at **Table 2**.

Table 2

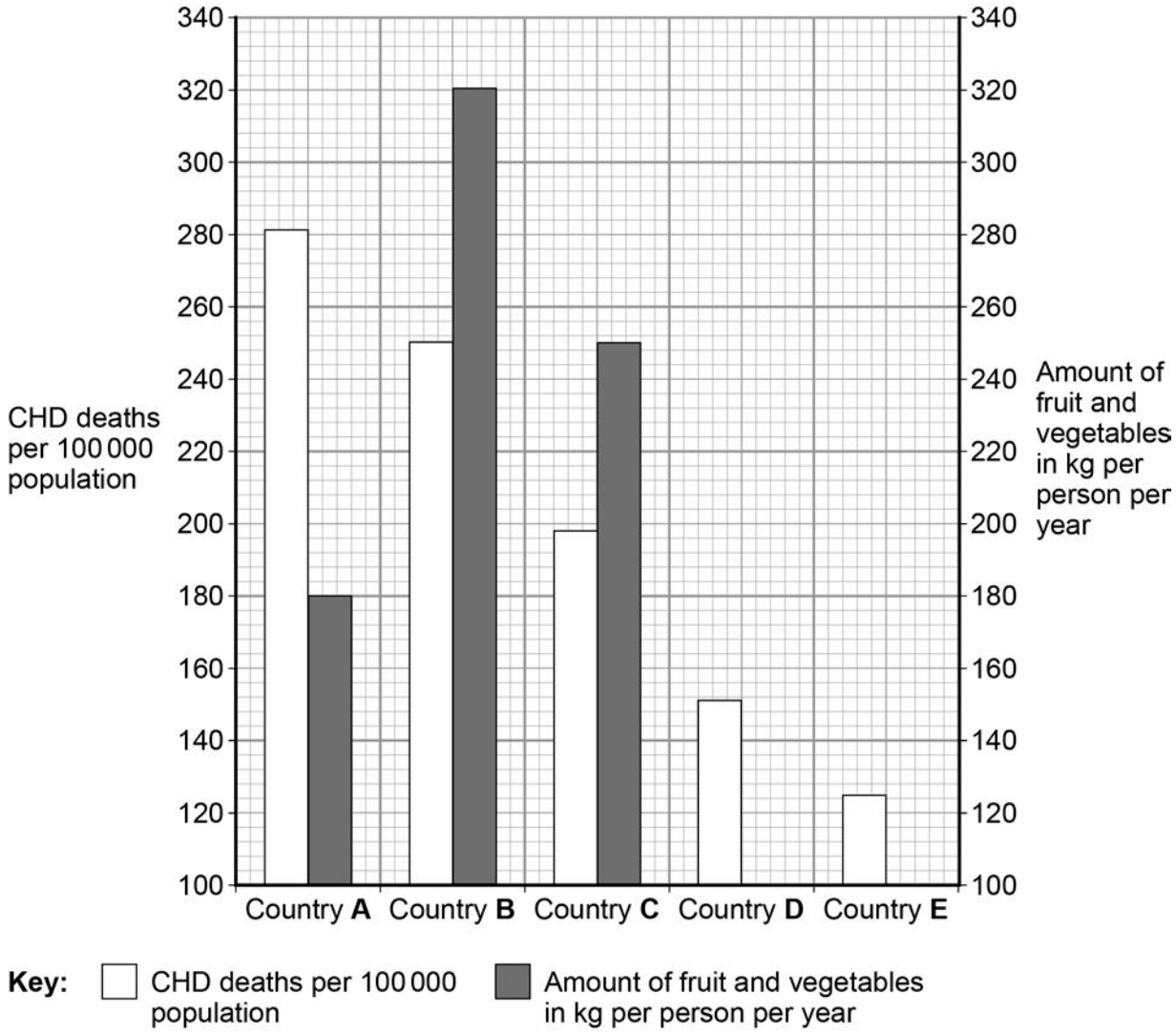
Country	Number of deaths from CHD per 100 000 population per year	Amount of fruit and vegetables eaten in kg per person per year
A	285	180
B	250	320
C	198	250
D	151	220
E	125	244

0 8 . 4 Plot the missing bars for countries **D** and **E** on **Figure 11**.

Use data from **Table 2**.

[2 marks]

Figure 11



0 8 . 5 People in country **B** are more likely to die from CHD than people in country **E**.

How many more times as likely are people to die from CHD in country **B** than in country **E**?

[1 mark]

0 8 . 6 A student concluded:

'The factor that causes CHD is not eating enough fruit and vegetables.'

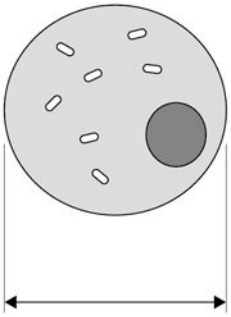
Evaluate the student's conclusion.

Use data from **Figure 11**, and your own knowledge, in your answer.

[6 marks]

0 9 **Figure 12** shows a cell viewed through a light microscope.

Figure 12



The size of the real cell is 0.03 mm.

0 9 . 1 Calculate the magnification of the microscope.

Use **Figure 12** to help you answer.

[2 marks]

Magnification = _____

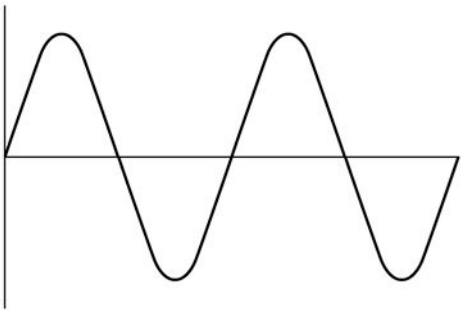
Question 9 continues on the next page

A light microscope uses light waves to observe objects.

Light waves can be modelled using water waves.

Figure 13 shows a water wave.

Figure 13



0 9 . 2 Give **one** similarity between a light wave and a water wave.

[1 mark]

0 9 . 3 Write down the equation that links frequency, wave speed and wavelength.

[1 mark]

0 9 . 4 The wave in **Figure 13** has a wavelength of 75 cm.

The wave moves at a speed of 1.6 m/s.

Calculate the frequency of the wave.

[4 marks]

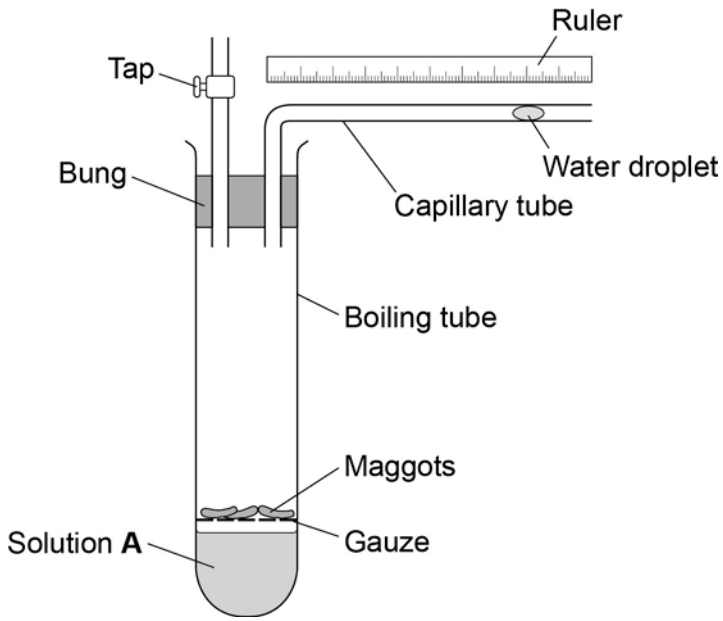
Frequency = _____ Hz

Turn over for the next question

1 0 A student investigates the rate of respiration in maggots.

Figure 14 shows the equipment he uses.

Figure 14



1 0 . 1 Why does the student put the maggots on gauze?

[1 mark]

1 0 . 2 When maggots respire they take in a gas from the air and release a different gas.

Solution **A** absorbs the gas released.

At the start of the investigation the student records the distance of the water droplet from the bend in the capillary tube.

Explain what happens to the water droplet as the maggots respire.

[4 marks]

Question 10 continues on the next page

Table 3 shows the results the student calculated.

Table 3

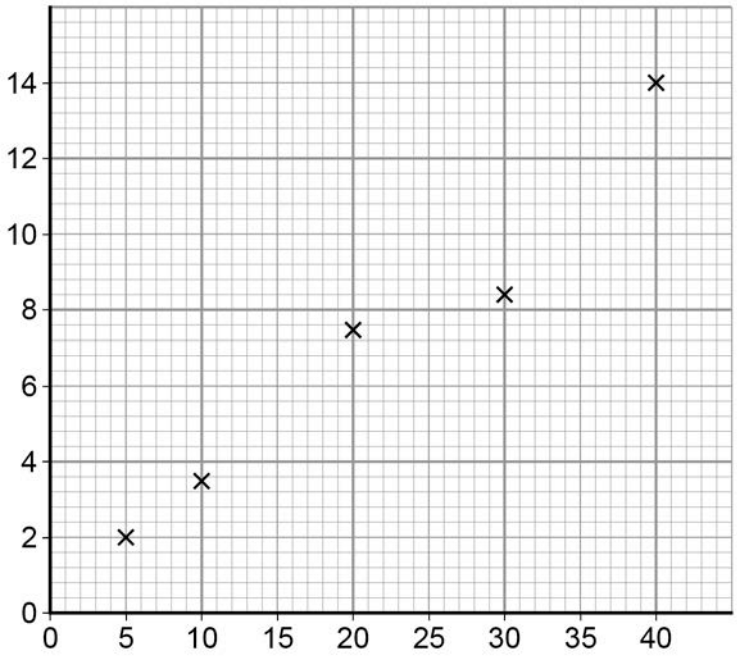
Temperature in °C	Rate of respiration in units
5	2.2
10	3.5
20	7.5
30	8.4
40	14.0

1 0 . 3 The student uses his results to plot the graph in **Figure 15**.

Label the *x* and *y* axis.

[1 mark]

Figure 15



1 0 . 4 How could the student find out if the result at 30 °C is anomalous?

[1 mark]

1 0 . 5 Suggest what the value at 30 °C should be to fit the pattern of the graph.

[1 mark]

Turn over for the next question

1 1 All life on Earth depends on water.

Figure 16 shows an iceberg floating on the sea.

Figure 16

1 1 . 1 Explain how the water molecules in the iceberg could end up as water in a lake.

[4 marks]

1 1 . 2 Rainwater collects in rivers and lakes.

Water in rivers and lakes contains materials that make the water unsafe to drink.

Describe how the water from rivers and lakes is treated to make it safe to drink.

[4 marks]

Turn over for the next question

There are no questions printed on this page

1 2 Statins are drugs used to treat coronary heart disease (CHD).

New drugs must be trialled before they can be licensed for use.

Some scientists trialled two different types of statin.

The scientists:

- conducted the trial on 325 patients with a history of CHD in their family
- used a double-blind trial method
- measured the change in blood cholesterol levels over two years
- measured the change in thickness of an artery wall over two years.

1 2 . 1 During the trials the statins are tested for side effects.

Give **two** other reasons why the statins are trialled before use.

[2 marks]

1 _____

_____

2 _____

_____

1 2 . 2 Describe how the double-blind method is used in this trial.

[2 marks]

_____

_____

_____

_____

Question 12 continues on the next page

1 2 . 3 The results of drug trials are **peer reviewed** before they are published.

Why are peer reviews important in drug trials?

[1 mark]

Tick **one** box.

To calculate the best dose ☐

To check the drug works ☐

To make sure the scientist gets credit ☐

To prevent false claims ☐

Table 4 shows the results of the trial.

Table 4

	Drug A	**Drug B**
Number of patients who died during the trial	1	2
Number of patients who reported aching muscles	16	17
Number of patients who reported mild abdominal cramps	18	16
Change in blood cholesterol level in percentage	–50.5	–41.2
Change in thickness of artery wall in mm	–0.0033	+0.032

1 2 . 4 Drug **A** is more effective than Drug **B**.

Give **two** reasons that support this conclusion.

Use information from **Table 4**.

[2 marks]

1 _____

_____

2 _____

_____

1 2 . 5 A scientist concludes that Drug **A** is a safer drug than Drug **B.**

Give **two** reasons why this is **not** a valid conclusion.

[2 marks]

_____

_____

_____

_____

END OF QUESTIONS