SPECIMEN MATERIAL

GCSE
COMBINED SCIENCE: SYNERGY

H

Higher Tier Paper 1H

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 02.3, 03.1 and 10.3 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 _____

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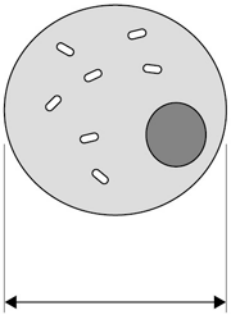
0 1 **Figure 1** shows a cell viewed through a light microscope.

Figure 1



The size of the real cell is 0.03 mm.

0 1 . 1 Calculate the magnification of the microscope.

Use **Figure 1** to help you answer.

[2 marks]

Magnification = _____

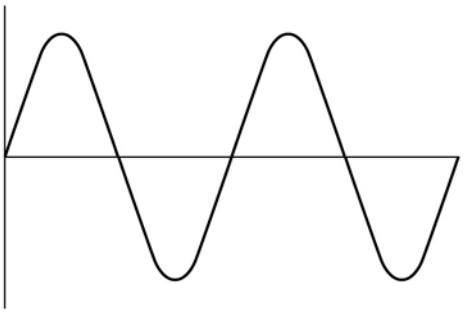
Question 1 continues on the next page

A light microscope uses light waves to observe objects.

Light waves can be modelled using water waves.

Figure 2 shows a water wave.

Figure 2



0 1 . 2 Give **one** similarity between a light wave and a water wave.

[1 mark]

0 1 . 3 Write down the equation that links frequency, wave speed and wavelength.

[1 mark]

0 1 . 4 The wave in **Figure 2** 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]

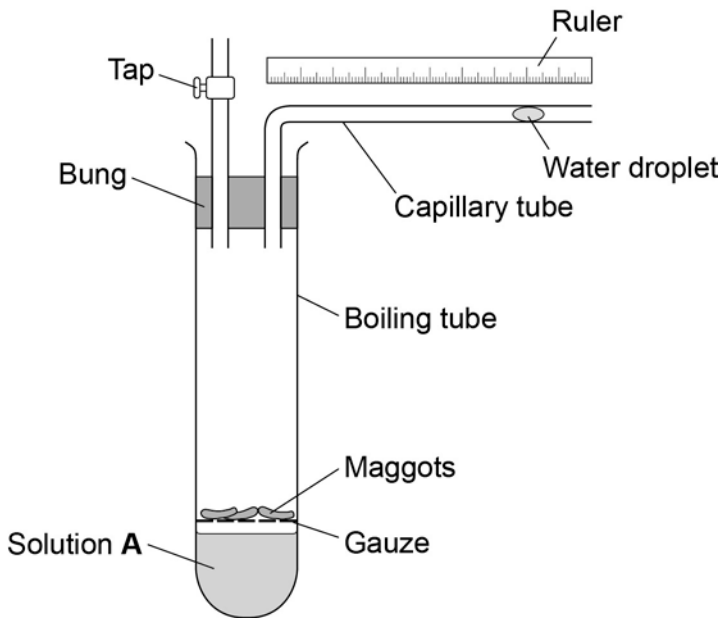
Frequency = _____ Hz

Turn over for the next question

0 2 A student investigates the rate of respiration in maggots.

Figure 3 shows the equipment he uses.

Figure 3



0 2 . 1 Why does the student put the maggots on gauze?

[1 mark]

0 2 . 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 2 continues on the next page

Table 1 shows the results the student calculated.

Table 1

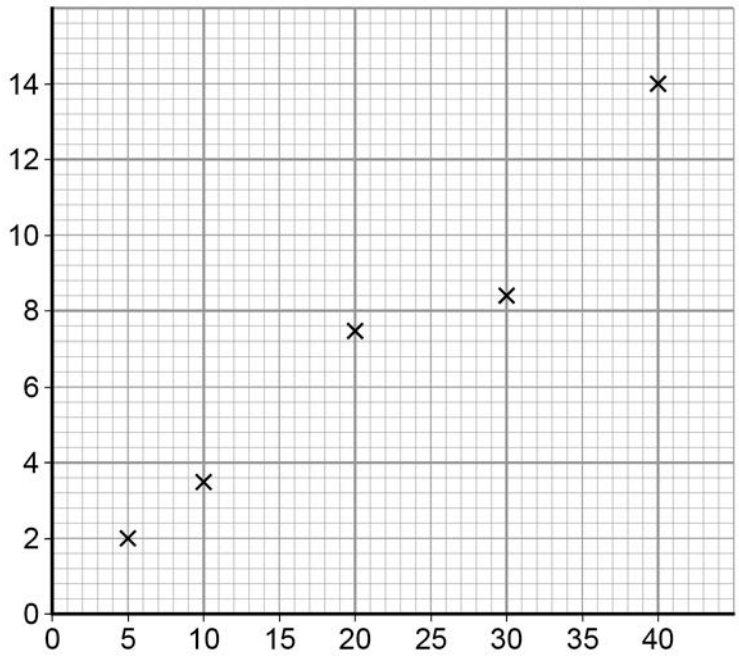
Temperature in °C	Rate of respiration in units
5	2.2
10	3.5
20	7.5
30	8.4
40	14.0

0 2 . 3 The student uses his results to plot the graph in **Figure 4**.

Label the *x* and *y* axis.

[1 mark]

Figure 4



0 2 . 4 How could the student find out if the result at 30 °C is anomalous?

[1 mark]

0 2 . 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

0 3 All life on Earth depends on water.

Figure 5 shows an iceberg floating on the sea.

Figure 5

0 3 . 1 Explain how the water molecules in the iceberg could end up as water in a lake.

[4 marks]

0 3 . 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

0 4 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.

0 4 . 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 _____

_____

0 4 . 2 Describe how the double-blind method is used in this trial.

[2 marks]

_____

_____

_____

_____

Question 4 continues on the next page

0 4 . 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 2 shows the results of the trial.

Table 2

	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

0 4 . 4 Drug **A** is more effective than Drug **B**.

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

Use information from **Table 2**.

[2 marks]

1 _____

_____

2 _____

_____

0 4 . 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]

_____

_____

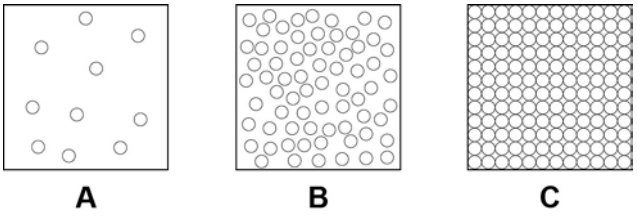
_____

_____

Turn over for the next question

0 5 **Figure 6** shows a simple model of the three states of matter.

Figure 6



0 5 . 1 What is the correct equation to work out the density of a material?

[1 mark]

0 5 . 2 A student explains density to his teacher using the particle model in **Figure 6**.

His teacher says there are limitations to the model.

Give **two** limitations of the particle model in **Figure 6**.

[2 marks]

1

2

0 5 . 3 When the gas in a container with a fixed volume is heated, the pressure increases as the temperature increases.

Explain why the pressure increases.

Use the model in **Figure 6** to help you.

[4 marks]

Turn over for the next question

0 6 Coronary heart disease (CHD) can be caused by many factors.

Table 3 shows data related to CHD for five countries.

Table 3

Country	Number of deaths from CHD per 100 000 population per year	Percentage of the population who smoke tobacco	Percentage of the population who drink alcohol heavily	Amount of fruit and vegetables eaten in kg per person per year
A	285	36	19	180
B	251	63	34	404
C	186	47	36	251
D	149	23	34	218
E	128	27	12	222

0 6 . 1 Name **one** risk factor for CHD that is **not** shown in **Table 3**.

[1 mark]

0 6 . 2 A student concludes that the main cause of CHD is not eating enough fruit and vegetables.

Give **three** reasons why the student's conclusion is **not** correct.

Use information from **Table 3**.

[3 marks]

0 6 . 3 Explain how the build-up of fatty material can damage the heart.

[4 marks]

0 6 . 4 Describe how statins can help to reduce deaths from CHD.

[2 marks]

Turn over for the next question

0 7 Hormones are released from glands.

0 7 . 1 Which gland produces hormones to control other glands in the endocrine system?
[1 mark]

Tick **one** box.

Adrenal ☐

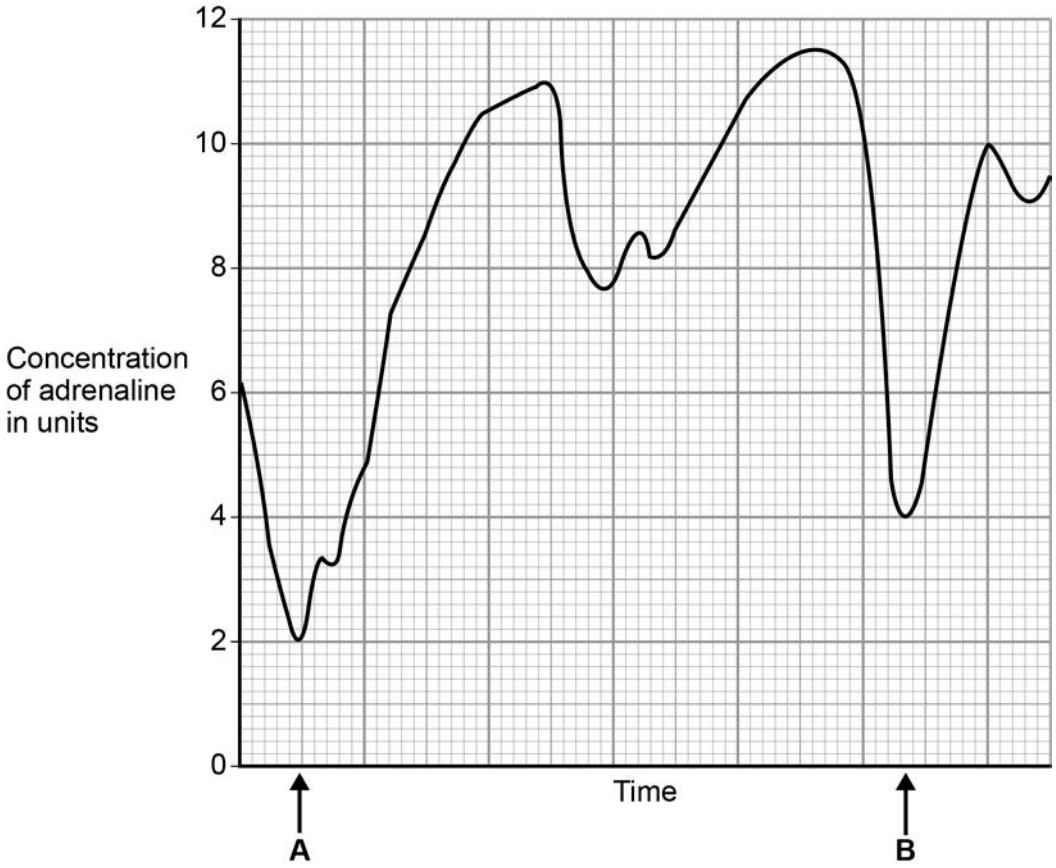
Ovary ☐

Pituitary ☐

Thyroid ☐

Figure 7 shows the level of adrenaline in a man's bloodstream while he was watching a 12-minute film.

Figure 7



0 7 . 2 Calculate the percentage increase in adrenaline after point **B**.

[2 marks]

Percentage increase in adrenaline = _____

0 7 . 3 Suggest why the percentage increase in adrenaline after point **B** is different from the percentage increase after point **A**.

[2 marks]

0 7 . 4 Adrenaline causes changes in the body to prepare for a 'fight or flight' response.

What changes in the man's body are caused by adrenaline?

[2 marks]

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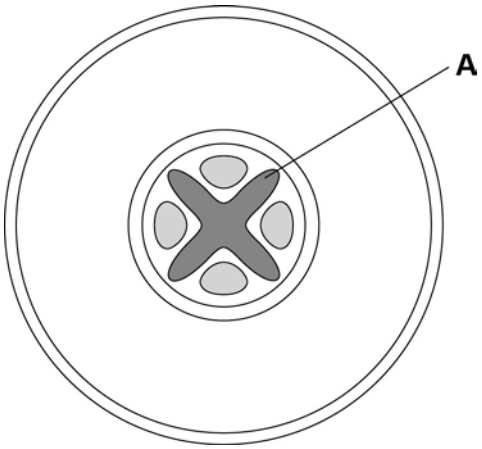
0 8 **Figure 8** shows a cross-section through a plant root.

Figure 8



0 8 . 1 What is tissue **A**?

[1 mark]

Question 8 continues on the next page

0 8 . 2 A student is given samples of two fluids.

One fluid is from the phloem of a plant and one from the xylem of a plant.

The student is asked to work out which fluid is from the phloem and which is from the xylem.

She measures the pH and the concentrations of sugar, nitrate ions and potassium ions of each fluid.

Table 4 shows the student's results.

Table 4

	Fluid A	**Fluid B**
pH	7.3	5.6
Sugar in mg/cm^3	118	1.18
Nitrate ions in mg/cm^3	10	600
Potassium ions in µg/cm^3	1.18	2500

Which fluid is from the phloem, and which is from the xylem?

Explain your answer.

Use the information from **Table 4**.

[4 marks]

0 8 . 3 In fluid **A**, how many times greater is the concentration of sugar than the concentration of potassium ions?

[2 marks]

0 8 . 4 The concentration of potassium ions in the soil is 3.9 μg/cm^3

The concentration of potassium ions in the root tissue is 2500 μg/cm^3

Explain why the concentration is so much higher in the roots than in the soil.

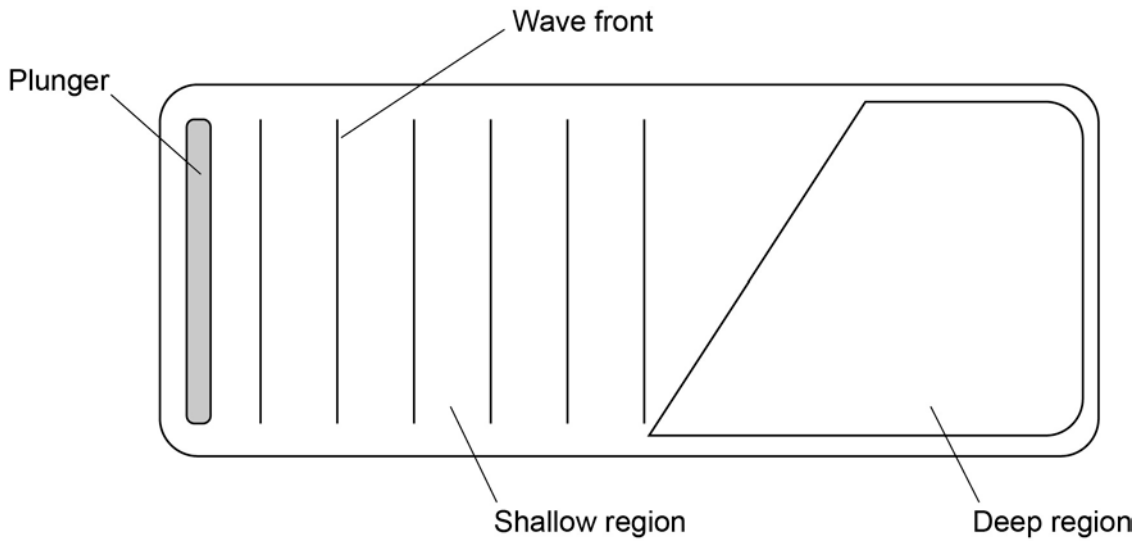
[3 marks]

Turn over for the next question

0 9 Some students did an investigation to study the behaviour of waves.

Figure 9 shows a ripple tank that they used to model the behaviour of waves.

Figure 9



0 9 . 1 Complete the wave fronts on **Figure 9**.

Show how the wave is refracted as it passes from the shallow region into the deep region.

[1 mark]

0 9 . 2 Explain what happens to the waves as they pass into the deep region.

[2 marks]

0 9 . 3 The waves generated on the surface of the water are transverse waves.

Describe the differences between longitudinal waves and transverse waves.

You may include labelled diagrams to help your answer.

[3 marks]

Question 9 continues on the next page

0 9 . 4 Some students investigate the properties of the waves generated in **Figure 9**.

Student **A** says 'the waves move water from one end of the tank to the other'.

Student **B** says 'that's wrong. Only the waves move, not the water'.

Suggest what the students could do to decide which of them is correct.

[2 marks]

0 9 . 5 Another student uses a ripple tank where all the water is the same depth.

She measures the wavelength of each wave as 0.34 m.

The period of each wave is 0.42 s.

Calculate the speed of the wave.

Use the correct equation from the Physics Equation Sheet.

Give the unit.

Give your answer to three significant figures.

[5 marks]

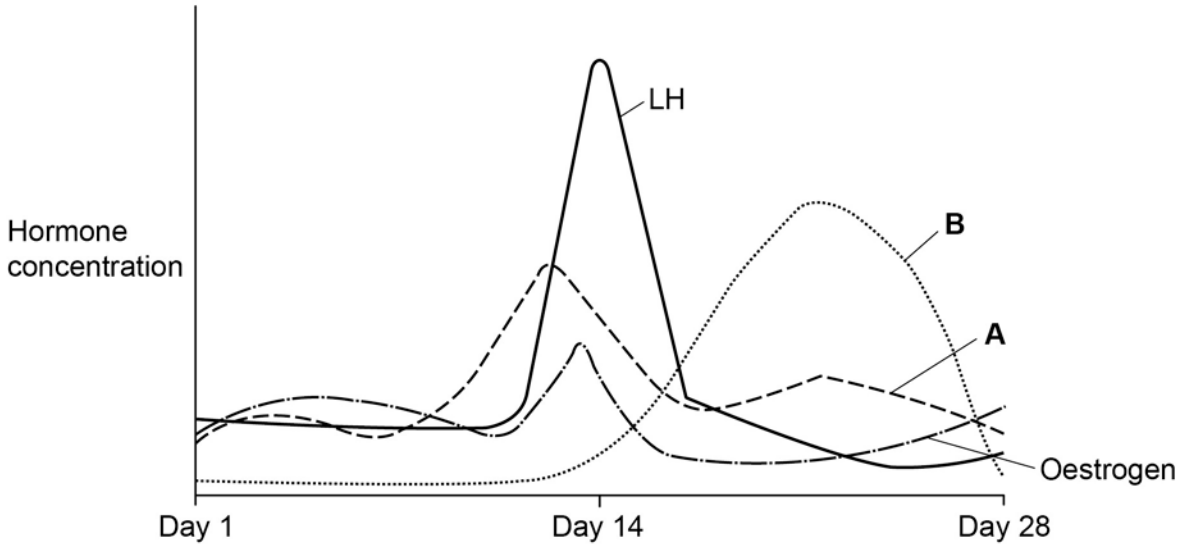
Speed = _____

Unit = _____

Turn over for the next question

1 0 **Figure 10** shows how the concentrations of the reproductive hormones in the blood of a woman change over 28 days.

Figure 10



1 0 . 1 Name hormones **A** and **B**.

[2 marks]

A _____

B _____

1 0 . 2 Use information from **Figure 10** to explain what happens on Day 14.

[2 marks]

1 0 . 3 In Vitro Fertilisation (IVF) treatment can be used to help women become pregnant.

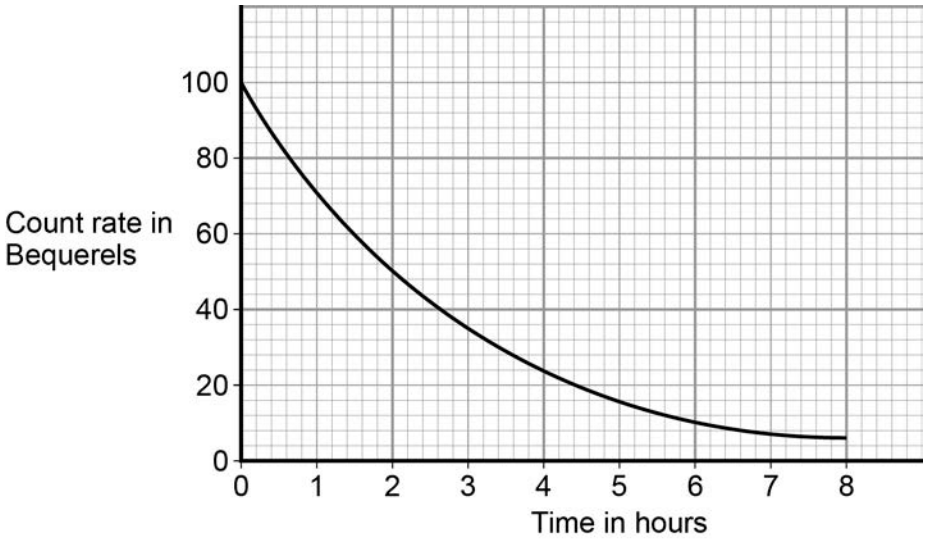
IVF uses some of the hormones shown in **Figure 10**.

Explain why IVF increases the chance of some women becoming pregnant.

[6 marks]

1 1 **Figure 11** shows how the activity of a radioactive isotope changes over an 8 hour period of time.

Figure 11



1 1 . 1 Predict how long it will take for the count rate to fall from 100 to 1.56 Bequerels.

[2 marks]

Time = _____ hours

1 1 . 2 Lead-210 is a radioactive isotope that decays to an isotope of mercury by alpha decay.

Complete the nuclear equation to show the alpha decay of lead-210.

[3 marks]

$$__^{210}Pb \longrightarrow __^{__}_{80}Hg + __^{__}__$$

1 1 . 3 Explain how ionising radiation can have hazardous effects on the human body.

[5 marks]

END OF QUESTIONS

There are no questions printed on this page

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