Name of the Student:_____

Max. Marks : 19 Marks **Time : 19 Minutes**

Q1.

Figure 17 shows a Geiger-Müller (GM) tube used for measuring radioactivity.

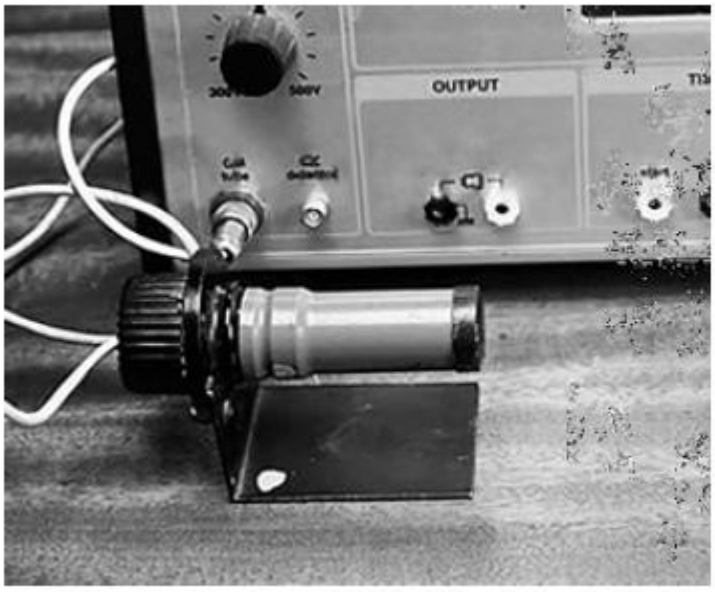

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Figure 17

* A radioactive rock is placed near to the front of a Geiger-Müller (GM) tube.

A radioactivity count-rate is first made in air.

The count-rate is measured again with each of three different absorbers between the rock and the GM tube.

Figure 19 shows the count-rates measured.

absorber	count-rate in counts per minute
3 cm of air	1272
thin sheet of paper	931
3 mm thick sheet of aluminium	328
2 cm thick sheet of lead	21

Figure 19

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A scientist has an idea that the rock emits three different types of radiation.

Explain how the data in this table supports the scientist's idea.

(6)

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(Total for question = 6 marks)

Q2.

* Some scientists carry out an experiment to measure the radioactivity from a source to be used in a factory.
They measure the background radiation before and after their experiment.
They take the background count at the same place as they do their experiment.

Explain how this procedure helps to make sure that the results of the experiment are valid.

(6)

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Q3.

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The teacher moves the radiation detector to different distances from the radioactive source.

The teacher determines the mean detector reading at each distance from the source.

The teacher plots the results on graph paper, as shown in Figure 8.

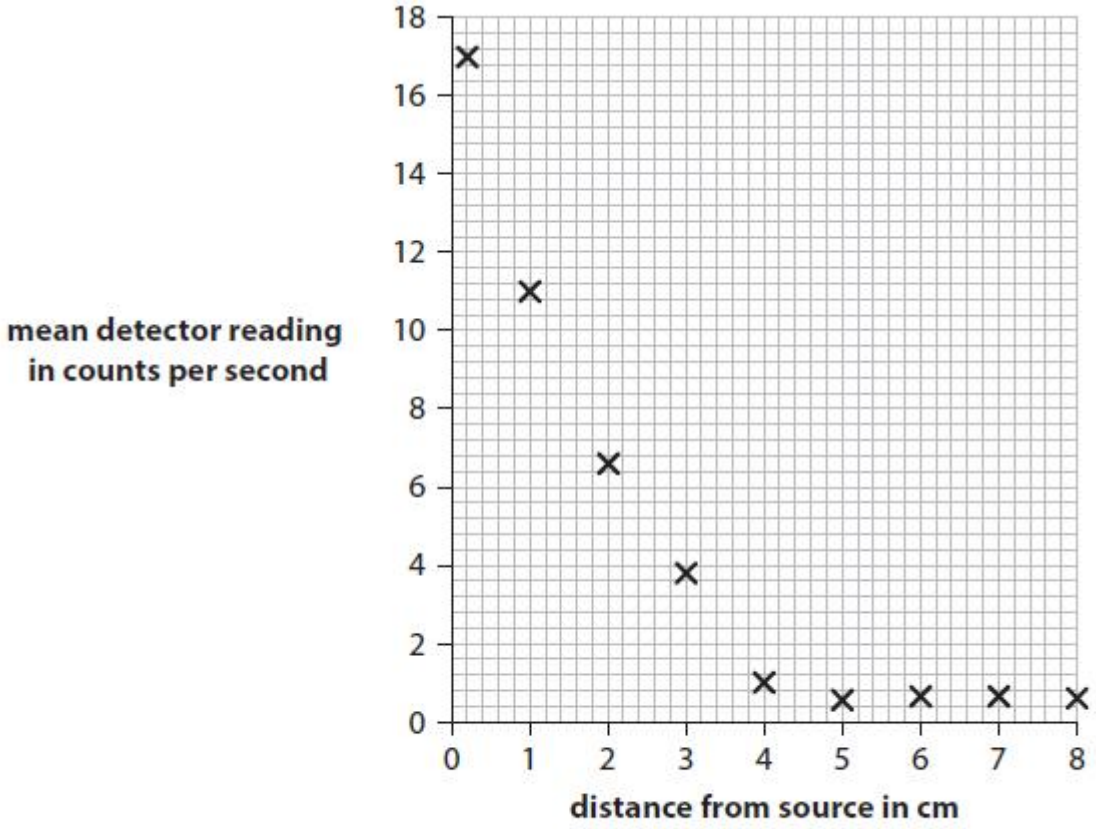

Figure 8

(i) The source emits alpha radiation **only**.

Explain how the graph in Figure 8 shows that the source only emits alpha radiation.

(2)

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(ii) Give a reason why the mean detector reading in Figure 8 does not fall to zero in this experiment.

(1)

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(Total for question = 3 marks)

Q4.

An atom has a central nucleus containing neutrons and protons.

Electrons orbit the nucleus.

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One isotope of carbon is carbon‑14.

$$^{14}_{6}C$$

(i) State the number of protons in one atom of carbon‑14.

(1)

number of protons = ...

(ii) State the number of neutrons in one atom of carbon‑14.

(1)

number of neutrons = ...

(iii) Figure 4 shows a graph for the decay of the radioactive isotope carbon‑14.

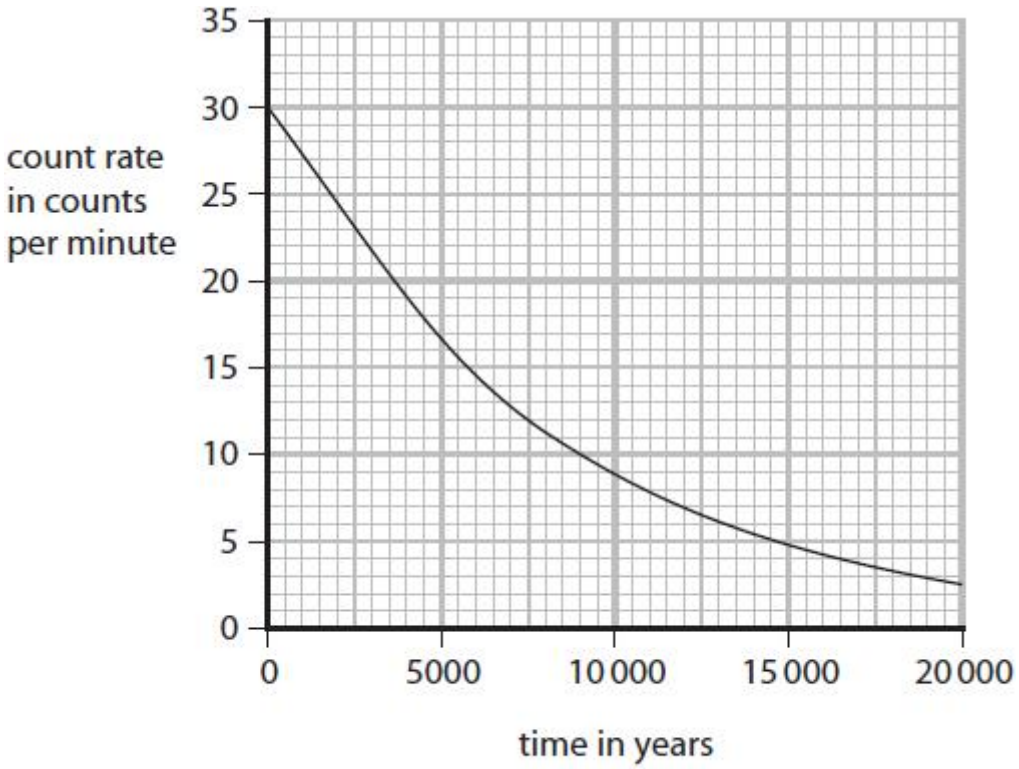

Figure 4

Use the graph to estimate the half‑life of carbon‑14.

(2)

half‑life = ... years

(Total for question = 4 marks)

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