Subject : Physics

Paper-1 Topic: GCSE Triple Science Atomic Structure (High Demand Questions)

Name of the Student:_____

Max. Marks : 18 Marks   **Time : 18 Minutes**

Q1.

Polonium-210 $\left(^{210}_{84}Po\right)$ is a radioactive isotope that decays by emitting alpha radiation.

(a)   Complete the decay equation for polonium-210

$$^{210}_{84}Po \longrightarrow \boxed{}Pb + {}^{4}_{2}He$$

                                                                                                    (2)

(b)   Explain why contamination of the inside of the human body by a radioactive material that emits alpha radiation is highly dangerous.

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                                                                                                    (3)

(c)   A sample of polonium-210 was left for 414 days.

After this time it had a mass of 1.45×10^{-4} g

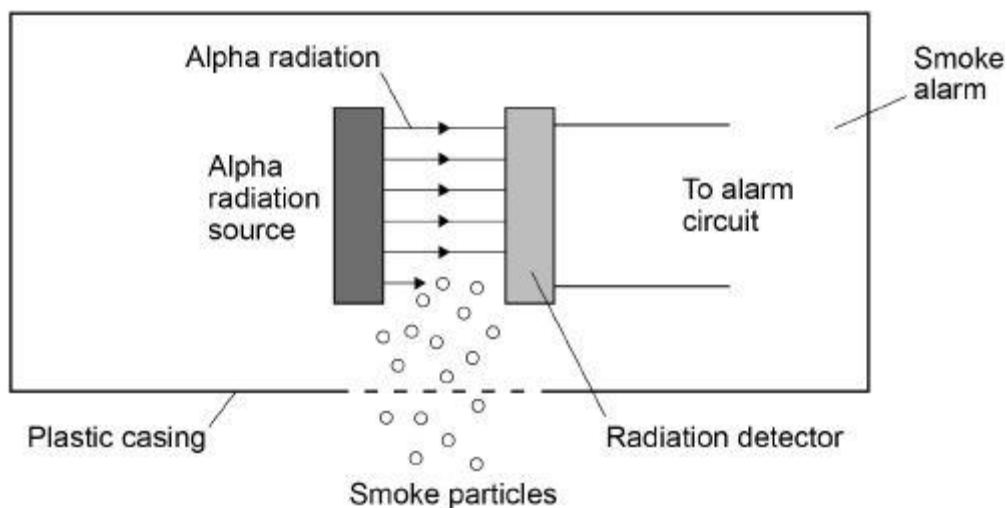The half-life of polonium-210 is 138 days.

Calculate the initial mass of the sample.

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Initial mass = _____ g

(3)

(Total 8 marks)

Q2.

Smoke alarms contain an alpha radiation source and a radiation detector.

Figure 1 shows part of the inside of a smoke alarm.

Figure 1

(a)   The smoke alarm stays off while alpha radiation reaches the detector.

Why does the alarm switch on when smoke particles enter the plastic casing?

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(1)

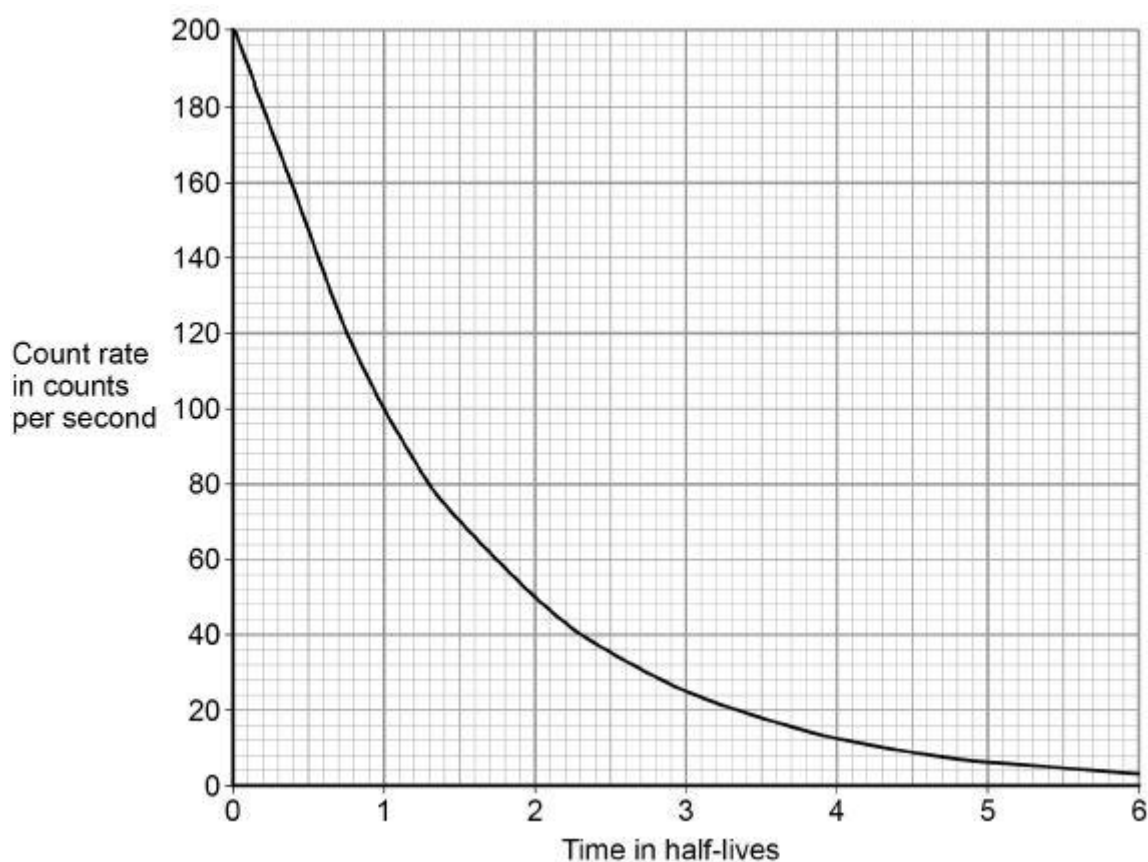(b)   Why is it safe to use a source of alpha radiation in a house?

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(1)

(c)   The smoke alarm would not work with a radiation source that emits beta or gamma radiation.

Explain why.

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(2)

(d)   **Figure 2** shows how the count rate detected from the radiation source in the smoke alarm changes with time.

Figure 2

The smoke alarm switches on when the count rate falls to 80 counts per second.

Explain why the radiation source inside the smoke alarm should have a long half-life.

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(2)

(e)   **Figure 3** shows a patient who has been injected with a radioactive source for medical diagnosis.

Figure 3

Radiation detector

Explain the ideal properties of a radioactive source for use in medical diagnosis.

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(4)
(Total 10 marks)