

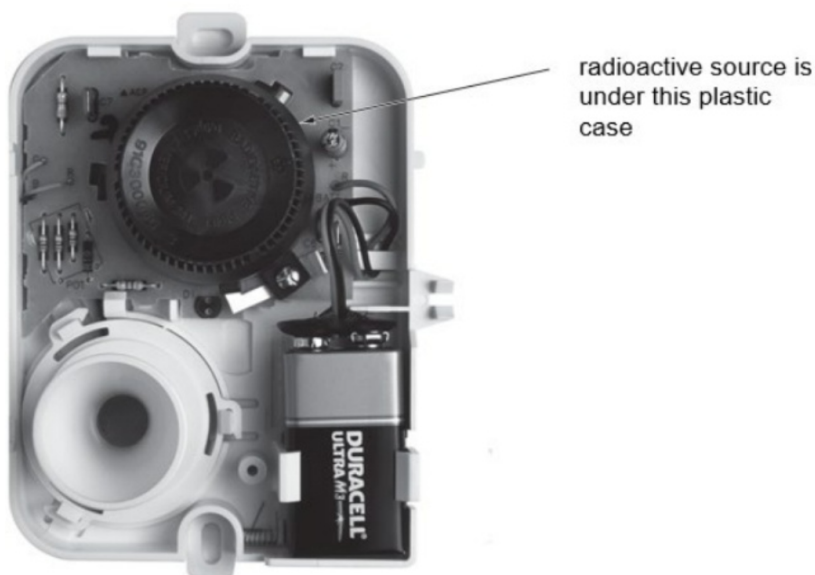
GCSE Physics B (Twenty First Century Science)
J259/02 Depth in physics (Foundation Tier)

Question Set 14

1

Americium is a radioactive material that emits alpha radiation.

Americium-241, an isotope, is used in many domestic smoke alarms. The radioactive source in the smoke alarm is under a **plastic** case.



- (a) Suggest why the alpha radiation from the source cannot do any harm when you are close to the smoke alarm. [1]

It is absorbed by the plastic case.

- (b) Explain how you could use a radiation measuring device in the laboratory to show that the smoke alarm is safe. [2]

Place it near the alarm and no change in radiation.

- (c) Ling makes the following comment.

Ling

You can use a gamma source instead of an alpha source in the smoke alarm.

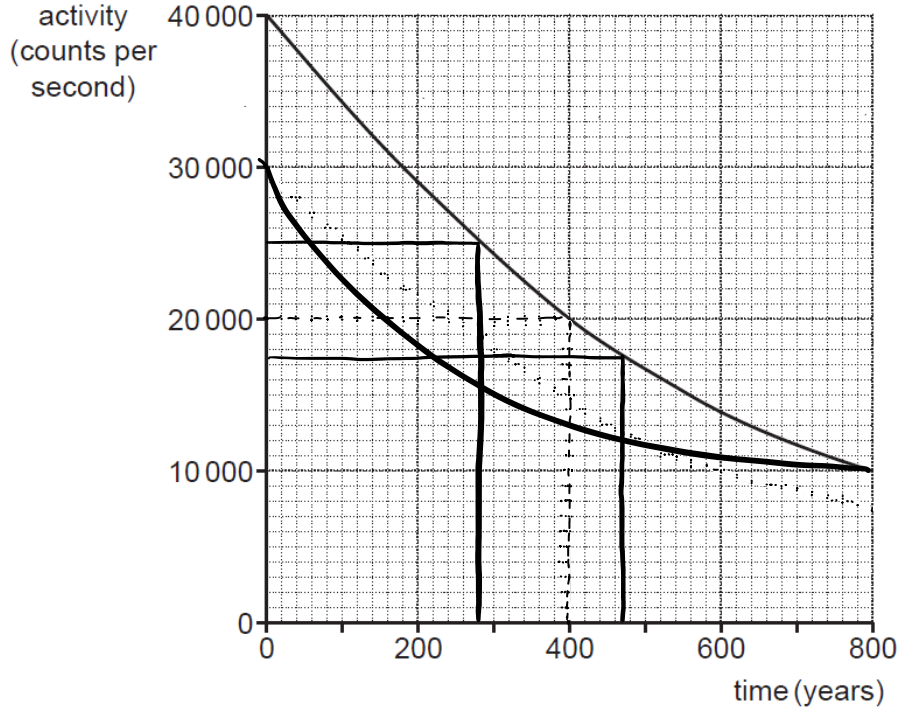
This will be safe and do us no harm.



Discuss why Ling's suggestion is **not** sensible. [2]

Gamma will pass through the plastic case and can cause damage to us.

- (d) Ling finds the activity against time graph for a different radioactive alpha source from the Internet.



- (i) Use the graph to determine the half-life of the alpha source.

Show your working on the graph.

Half-life = 280 years [2]

- (ii) The initial activity of the source is 40 000 counts per second.

What is the activity of the source after a time equal to 2 half-lives?

Activity = 17500 counts per second [3]

- (iii) On the graph axes above, sketch a graph for another sample of the alpha source that has an initial activity of 30 000 counts per second. [3]

Total Marks for Question Set 14: 13

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