Oxford Cambridge and RSA

GCSE Physics A (Gateway)

J249/02 Physics A P5-P8 and P9 (Foundation Tier)

Question Set 16

1 (a) A radioactive isotope has a half-life of 6 hours.

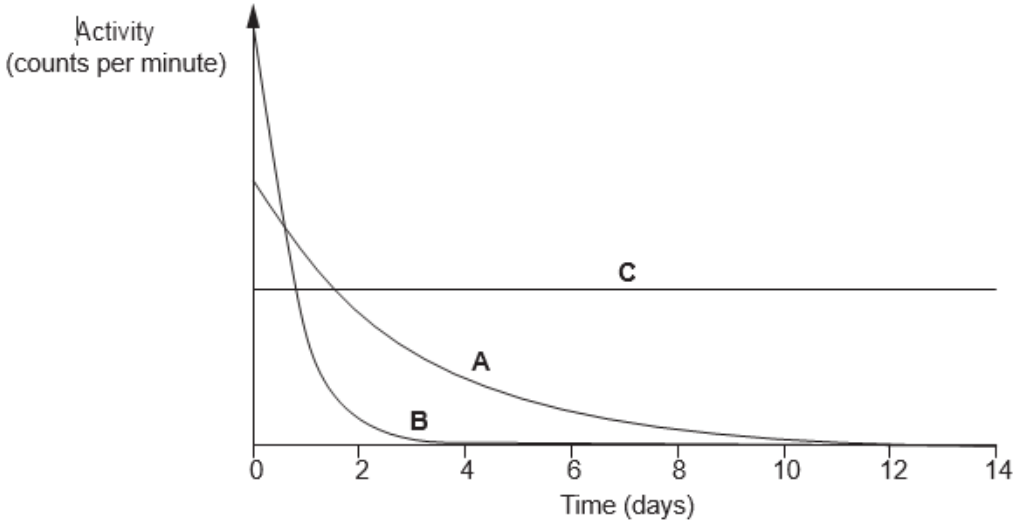
50 g of the isotope are put in a container.

What mass of the isotope is left after 6 hours?

50 ÷ 2 = 25

Mass = ... 25 ..... g **[1]**

(b) This is a graph showing the radiation emitted from samples of three different isotopes **A**, **B** and **C**.



(i) Which isotope, **A**, **B** or **C**, takes the longest time to decay?

Tick (✓) **one** box.

A ☐

B ☐

C ☑

[1]

(ii) Two scientists discuss the isotopes in the graph.

Scientist 1	Scientist 2
'I think isotope **A** is more hazardous than **B**. **A** has a higher activity than **B**.'	'I think isotope **B** is more hazardous than **A**. **B** has a longer half-life than **A**.'

Do you agree with the views of scientist 1 and scientist 2?

Use the graph and ideas about radioactivity and half-life to explain your answer.

I disagree with scientist 1 as A has a lower initial activity than B and I disagree with scientist 2 as B has a shorter half life than A as evidenced by its rapid decay (steep downwards curve). **[4]**

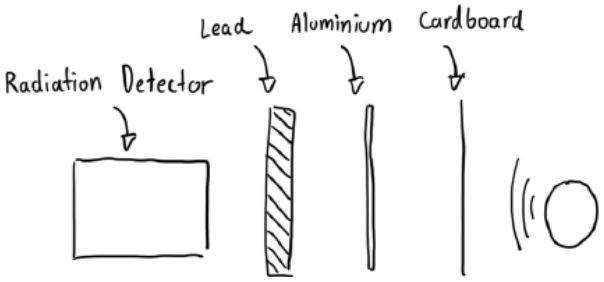
(iii) **Scientist 1** wants to identify the type of radiation emitted by isotope **A**.

This is a list of equipment **Scientist 1** has in his laboratory:

- radiation detector
- piece of thick lead
- piece of cardboard
- piece of aluminium.

Describe how **Scientist 1** does the experiment and explain how they can work out the type of radiation emitted.

You may include a diagram in your answer.



Setup the equipment as shown in the diagram. First, place only the cardboard between the isotope and the detector. If radiation is no longer detected then the radiation is alpha radiation. If it is detected then add in the aluminium. If no radiation is detected then the radiation is beta. Finally, if radiation is still detected then add in the lead, if low radiation is then detected then the radiation is gamma radiation.

[4]

(c) This is a diagram to show a nuclear fusion reaction:

(i) Explain why this is nuclear fusion.

Two lighter atoms are joined together to form a heavier atom.

[1]

(ii) It is difficult for nuclear fusion reactions to occur on Earth.

Explain why nuclear fusion reactions occur in the Sun.

They occur due to the high temperatures and pressures present in the sun. These allow atoms to overcome repulsive forces between them in order to fuse.

[2]

(iii) What will happen to our Sun when it runs out of hydrogen?

It will expand and form a red giant.

[1]

(d) Some scientists say nuclear fission is renewable. Other scientists say it is non-renewable.

Suggest why the scientists disagree.

Because the energy itself is renewable, but the material used for fission is non-renewable.

[1]

Total Marks for Question Set 16: 15