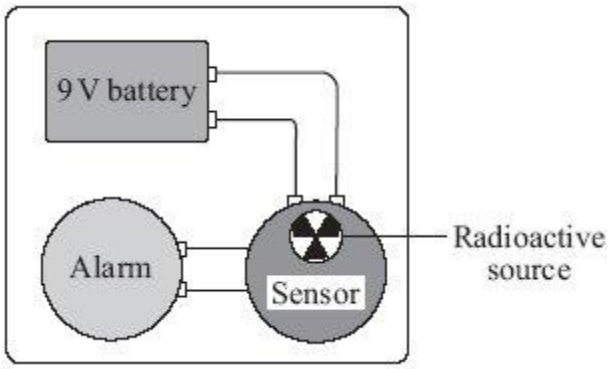
Practice Question Set For GCSE
Subject : Physics
Paper-1 Topic: Atomic Structure (High Demand)

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Name of the Student:_____
Max. Marks : 22 Marks **Time : 22 Minutes**

Q1.

(a) The diagram shows the parts of a smoke detector. The radioactive source emits alpha particles.



The alpha particles ionise the air inside the sensor which causes a small electric current. Any smoke getting into the sensor changes the current. The change in current sets the alarm off.

(i) The smoke detector would **not** work if a radioactive source that emitted only gamma rays was used.

Why not?

_____

_____

(1)

(ii) Curium-242 is a radioactive isotope with a half-life of 160 days. It emits alpha particles.

Why is curium-242 **not** suitable for use inside smoke detectors?

_____

_____

(1)

(iii) Curium-242 and curium-244 are two of the isotopes of the element curium.

How is an atom of curium-242 different from an atom of curium-244?

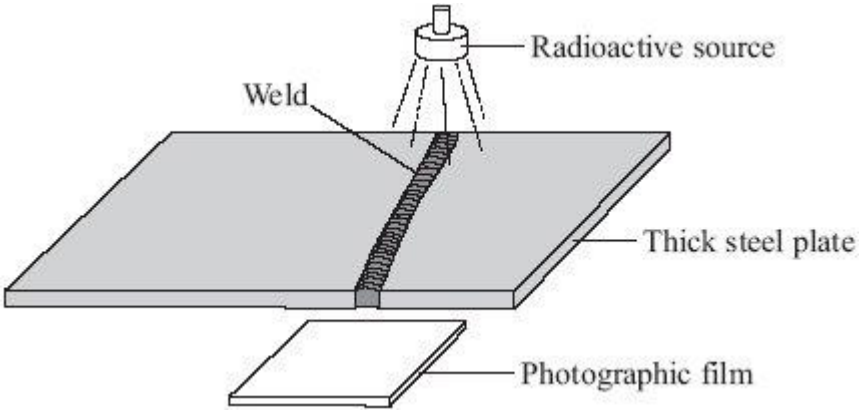
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_____

(1)

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(b) Sections of steel are often joined by welding them together. The diagram shows how a radioactive source can be used to check for tiny cracks in the weld.



Cracks in the weld will be shown up on the photographic film below the thick steel plate.

(i) Which type of source, alpha, beta or gamma, should be used to check the weld?

_____

(1)

(ii) Give a reason why the other two types of source **cannot** be used.

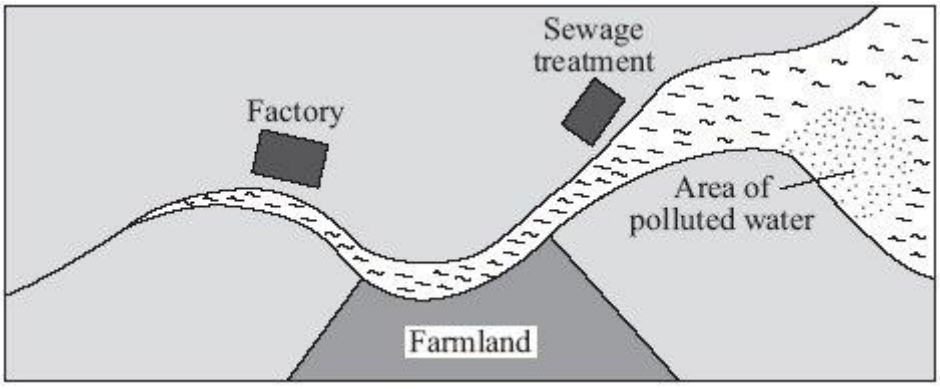
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(1)

(c) The diagram shows a map of a river and its estuary.

Environmental scientists have found that the water flowing into one part of the river estuary is polluted. To find where the pollution is coming from, the scientists use a radioactive isotope, gold-198.



(i) Explain how the gold-198 is used to find where the pollution is coming from.

_____

_____

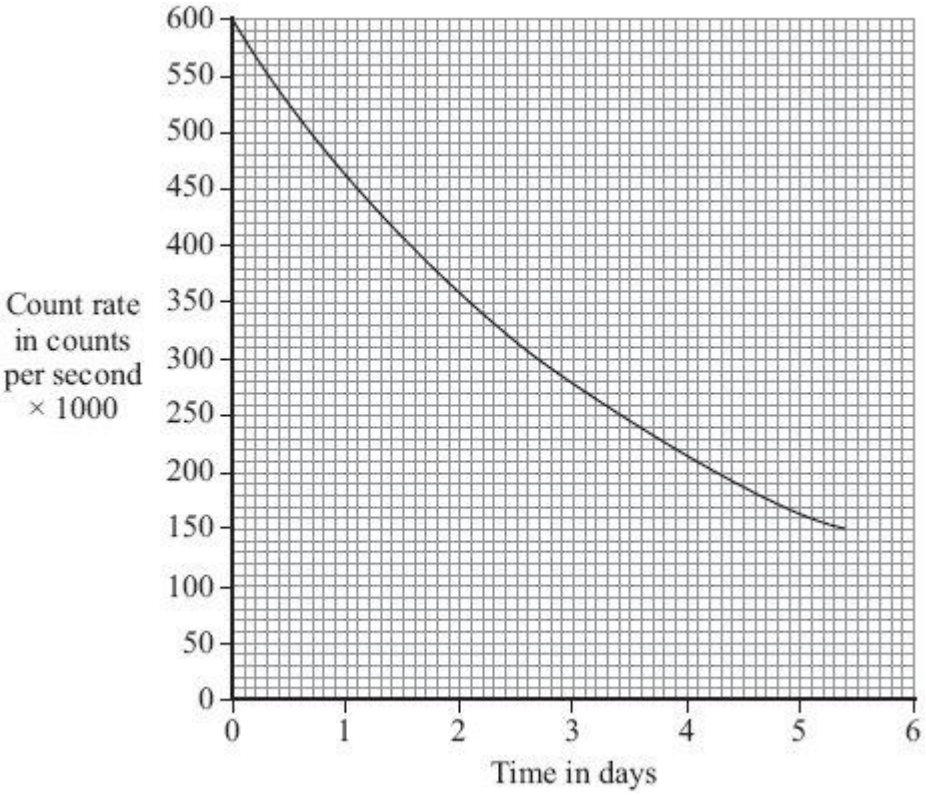
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_____

(2)

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(ii) The graph shows how the count rate from a sample of gold-198 changes with time.



Use the graph to calculate the half-life of gold-198.

Show clearly on the graph how you obtain your answer.

_____

_____

Half-life = _____ days

(2)

(Total 9 marks)

Q2.

A beta particle is a high-energy electron.

(i) Which part of an atom emits a beta particle?

_____

(1)

(ii) How does the composition of an atom change when it emits a beta particle?

_____

(1)

(Total 2 marks)

Q3.

Read the information in the box and then answer the questions.

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Igneous rocks contain potassium-40. This is a radioactive isotope. It has a half-life of 1300 million years.

Potassium-40 decays into argon-40 which is stable.

Argon escapes from molten rock. Any argon found in an igneous rock must have been produced since the rock solidified.

A sample of an igneous rock has one atom of potassium-40 for every three atoms of argon-40.

(i) What fraction of the potassium-40 has not yet decayed?

_____

(1)

(ii) Calculate the age of the rock.

_____

Age of rock = _____ million years

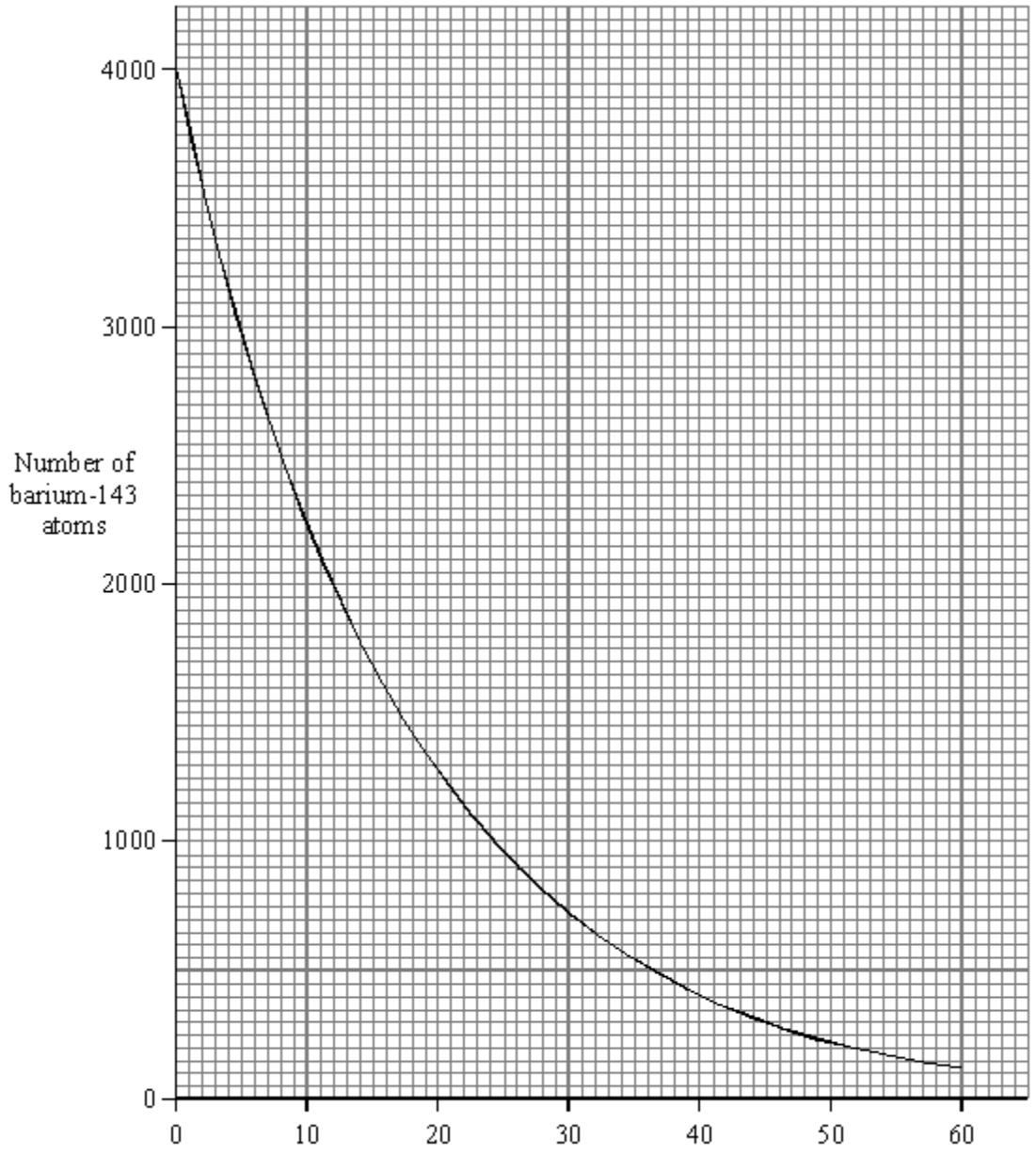
(1)

(Total 2 marks)

Q4.

(a) The graph shows how a sample of barium-143, a radioactive *isotope* with a short *half-life,* decays with time.

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(i) What is meant by the term *isotope?*

_____

_____

(1)

(ii) What is meant by the term *half-life*?

_____

_____

(1)

(iii) Use the graph to find the half-life of barium-143.

Half-life = _____ seconds

(1)

(b) Humans take in the radioactive isotope carbon-14 from their food. After their death, the proportion of carbon-14 in their bones can be used to tell how long it is since they died.

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Carbon-14 has a half-life of 5700 years.

(i) A bone in a living human contains 80 units of carbon-14. An identical bone taken from a skeleton found in an ancient burial ground contains 5 units of carbon-14. Calculate the age of the skeleton. Show clearly how you work out your answer.

_____

_____

_____

Age of skeleton = _____ years

(2)

(ii) Why is carbon-14 unsuitable for dating a skeleton believed to be about 150 years old?

_____

_____

(1)

(c) The increased industrial use of radioactive materials is leading to increased amounts of radioactive waste. Some people suggest that radioactive liquid waste can be mixed with water and then safely dumped at sea. Do you agree with this suggestion? Explain the reason for your answer.

_____

_____

_____

_____

_____

_____

_____

_____

(3)

(Total 9 marks)

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