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

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Name of the Student:_____
Max. Marks : 20 Marks **Time : 20 Minutes**

Q1.

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

> 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.

_____

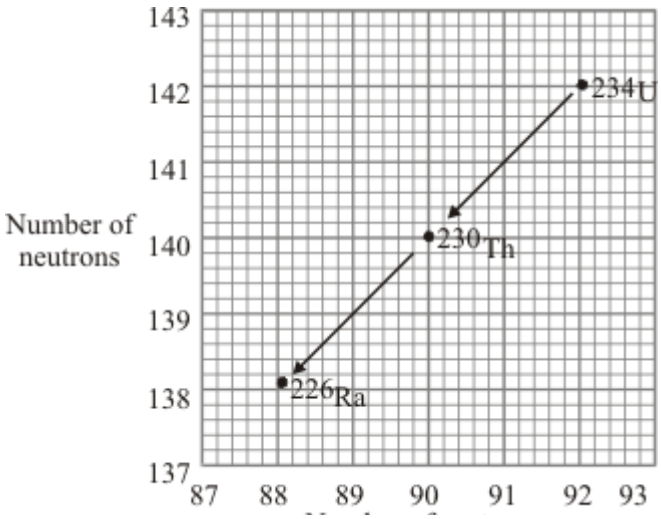
Age of rock = _____ million years

(1)

(Total 2 marks)

Q2.

(a) Uranium-234 (^{234}U) is a radioactive element. The graph shows the number of protons and neutrons in the nuclei of the elements formed when uranium-234 decays.



(i) How does the graph show that uranium-234 (^{234}U) and thorium-230 (^{230}Th) emit alpha particles?

_____

(1)

(ii) What makes uranium and thorium different elements?

_____

(1)

(iii) Radioactive decay may also produce gamma radiation.

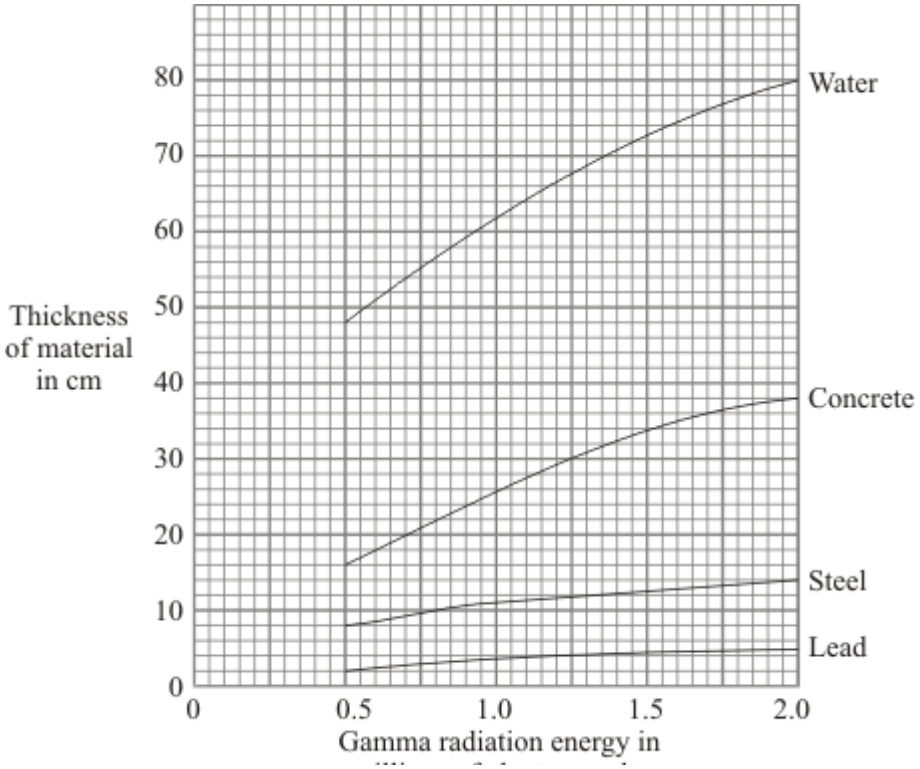
Why does the emission of gamma radiation **not** cause a new element to be formed?

_____

_____

(1)

(b) The graph shows how the thickness of different materials needed to absorb 90% of the gamma radiation emitted by a source depends on the energy of the radiation. The energy of the gamma radiation is given in units called electron-volts.



(i) Which of the materials shown is least effective at absorbing gamma radiation? Use the information in the graph to give a reason for your answer.

_____

_____

(1)

(ii) For gamma radiation of energy 1.5 million electron-volts, how many times more effective is steel than water at absorbing the radiation? Show clearly how you obtain your answer.

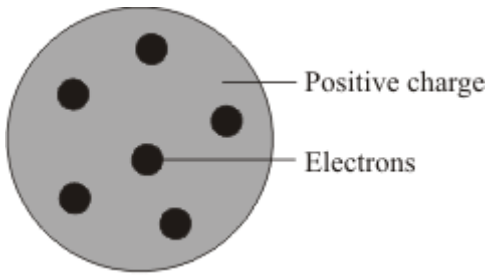
_____

_____

_____

(2)

(c) Scientists in the early twentieth century thought that atoms were made up of electrons scattered inside a ball of positive charge. This was called the 'plum-pudding' model of the atom.



Plum pudding model

Rutherford and Marsden did an experiment, in which a beam of alpha particles was aimed at a thin sheet of gold.

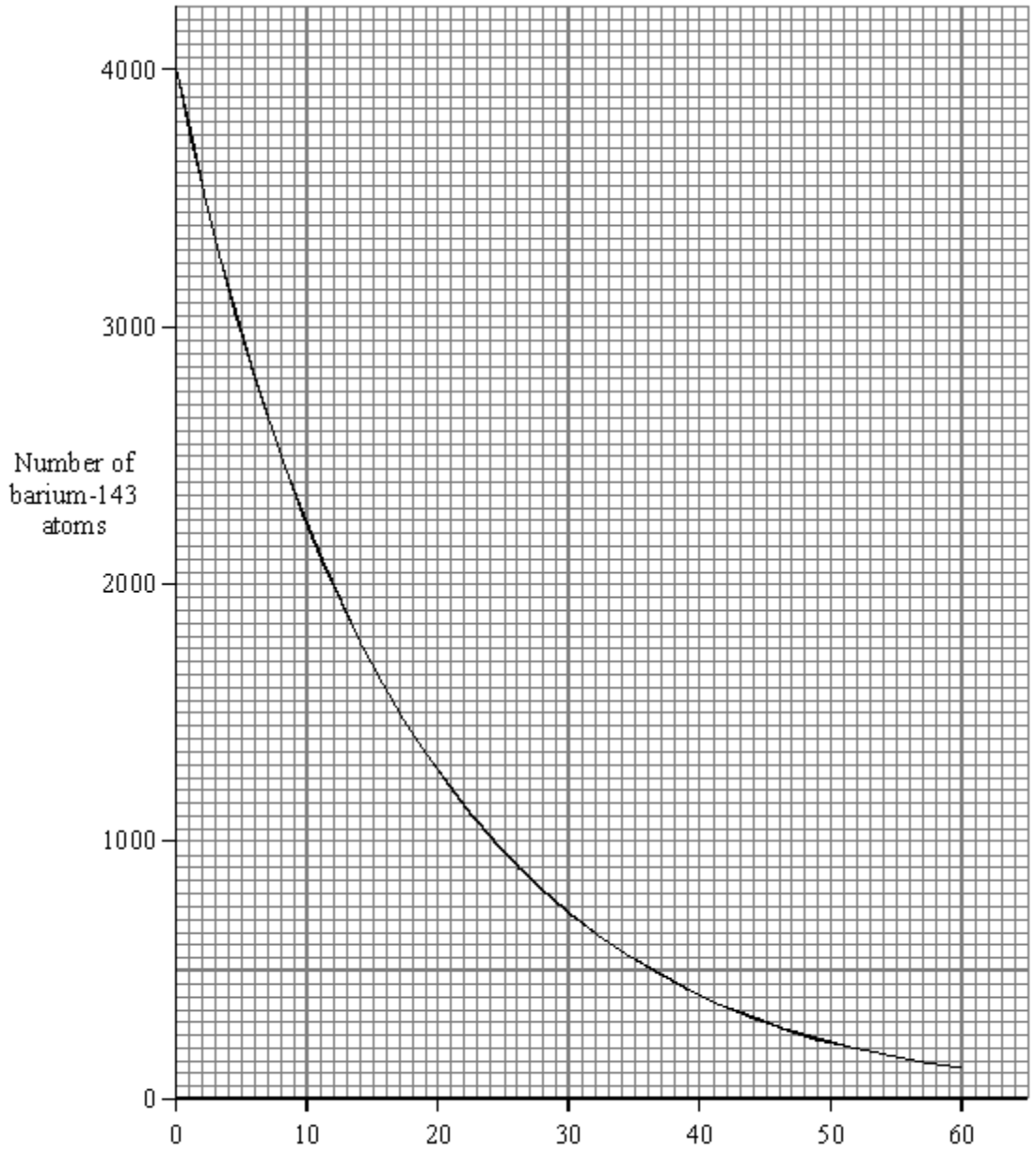
Explain how the results of this experiment led to a new model of the atom.
You may include one or more diagrams in your answer.

(3)

(Total 9 marks)

Q3.

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



(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.

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)