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

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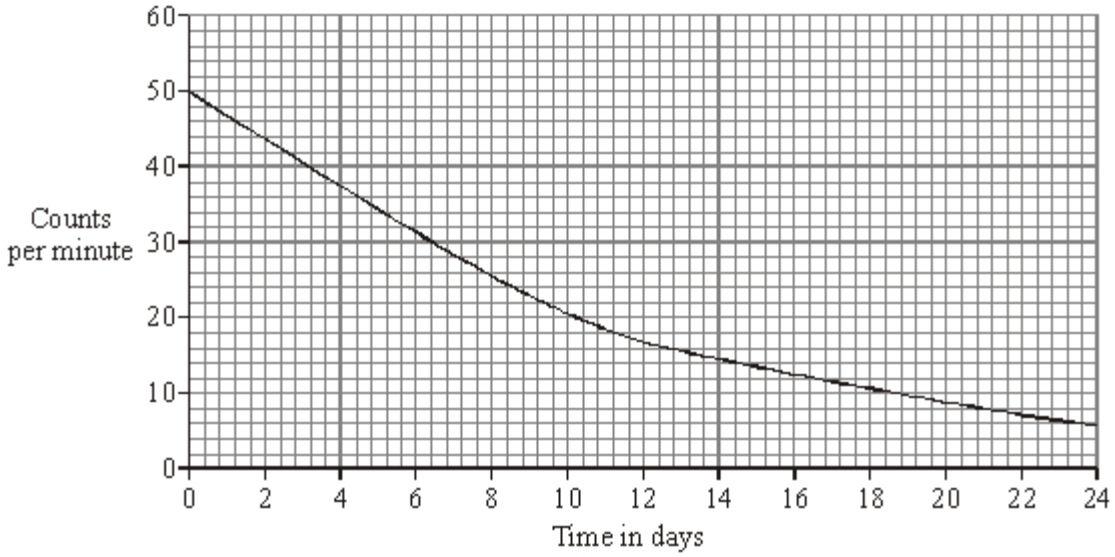
Name of the Student:_____
Max. Marks : 22 Marks **Time : 22 Minutes**

Q1.

Iodine-131 (^{131}I) is a radioactive isotope used in medicine.

The graph shows how the count rate of a sample of iodine-131 changed over 24 days.



(i) Use the graph to calculate the half-life of iodine-131. To obtain full marks you should show clearly how you work out your answer.

_____

_____

_____

Half-life _____ days

(2)

(ii) Iodine-131 is used to destroy cancer cells in the human thyroid gland.

Explain why the length of the half-life of iodine-131 is important in this use.

_____

_____

_____

_____

(2)

(Total 4 marks)

Q2.

(a) (i) Describe the structure of alpha particles.

_____

_____

_____

_____

(2)

(ii) What are beta particles?

_____

_____

_____

(1)

(b) Describe how beta radiation is produced by a radioactive isotope.

_____

(1)

(Total 4 marks)

Q3.

$^{99}_{43}Tc$ (technetium) is produced by the radioactive decay of $^{99}_{42}Mb$ (molybdenum).

What change occurs in the nucleus of a molybdenum atom when this happens?

_____

_____

(Total 1 mark)

Q4.

(a) When an atom of thorium-232 decays, an alpha (α) particle is emitted from the nucleus. An atom of radium is left behind.

An alpha particle consists of two protons and two neutrons.

We can represent this radioactive decay in a special kind of equation:

$$^{232}_{90}Th \longrightarrow {}^{4}_{2}a + {}^{228}_{88}Ra$$

228 ◄- - - number of nucleons (protons + neutrons)

88 ◄- - - number of protons

Thorium-228 is also radioactive.

Atoms of this isotope also decay by emitting an alpha particle and producing an isotope of radium.

Complete the equation for this decay.

$$^{228}_{90}\text{Th} \longrightarrow$$

(4)

(b) An atom of radium-228 decays by emitting a beta (β) particle from the nucleus.

A beta particle is in fact an electron (symbol $^{0}_{-1}\text{e}$).

The effect of this is to change a neutron into a proton.

An atom of actinium remains.

This type of decay can also be represented by an equation:

$$^{228}_{88}\text{Ra} \longrightarrow {}^{0}_{-1}\text{e} + {}^{228}_{89}\text{Ac}$$

228 ◄- - - number of nucleons (protons + neutrons)

89 ◄- - - number of protons

This isotope of actinium is radioactive.

An atom of actinium-228 also decays by emitting a beta particle.

An isotope of thorium is left behind.

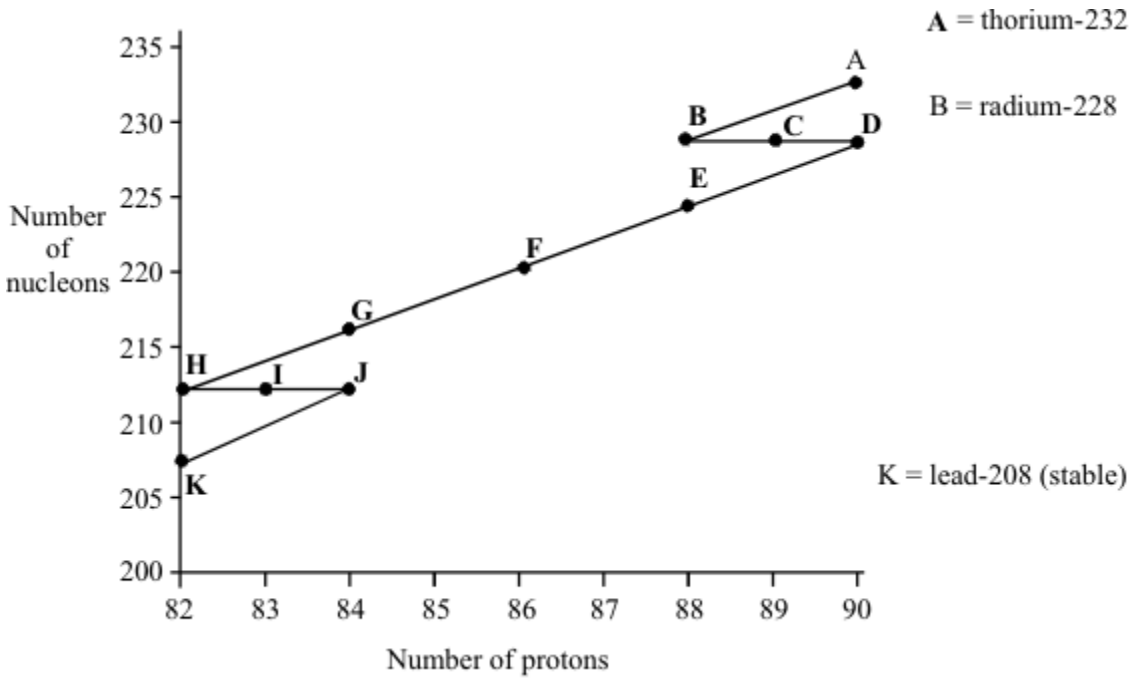
Complete the equation for this decay.

$$^{228}_{89}\text{Ac} \longrightarrow$$

(4)

(c) Thorium-232 eventually decays to the stable isotope lead-208.

All the steps in this process can be shown on a diagram.



(i) Complete the sentences:

During the decay from (A) to (B) a _____ particle is emitted.

During the decay from (B) to (C) a _____ particle is emitted.

During the decay from (E) to (F) a _____ particle is emitted.

During the decay from (I) to (J) a _____ particle is emitted.

(2)

(ii) The table shows how long it takes for half of the atoms of each isotope to decay.

ISOTOPE	TIME FOR HALF TO DECAY
A	billions of years
B	7 years
C	6 years
D	2 years
E	4 days
F	1 minute
G	0.4 seconds
H	10 hours
I	1 hour
J	0.3 microseconds

A rock sample contains:

- many atoms of thorium-232
- even more atoms of lead-208
- hardly any atoms of any of the other isotopes shown on the diagram

Explain this as fully as you can.

_____

_____

_____

_____

_____

(3)
(Total 13 marks)