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Exam Preparation and Free Resources

Name of the Student:_____

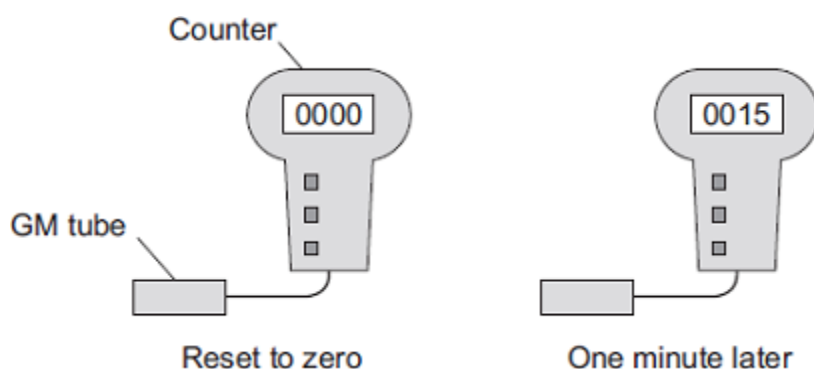**Max. Marks : 20 Marks**   **Time : 20 Minutes**

Q1.

(a)   A teacher used a Geiger-Müller (GM) tube and counter to measure the *background radiation* in her laboratory.

The teacher reset the counter to zero, waited one minute and then took the count reading. The teacher repeated the procedure two more times.

(i)   Background radiation can be either from natural sources or from man-made sources.

Name **one man-made** source of background radiation.

_____

(1)

(ii)   The three readings taken by the teacher are given in the table.

Count after one minute
15
24
18

The readings given in the table are correct.

Why are the readings different?

_____

_____

(1)

(b)   Some scientists say they have found evidence to show that people living in areas of high natural background radiation are less likely to develop cancer than people living in similar areas with lower background radiation.

The evidence these scientists found does not definitely mean that the level of background radiation determines whether a person will develop cancer.

Suggest a reason why.

_____

_____

(1)

(c)   An atom of the isotope radon-222 emits an alpha particle and decays into an atom of polonium.

An alpha particle is the same as a helium nucleus. The symbol below represents an alpha particle.

$$^{4}_{2}\text{He}$$

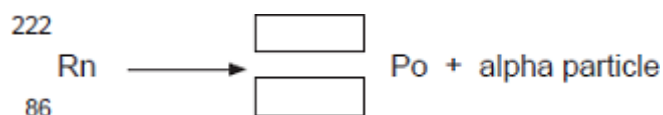(i)   How many protons and how many neutrons are there in an alpha particle?

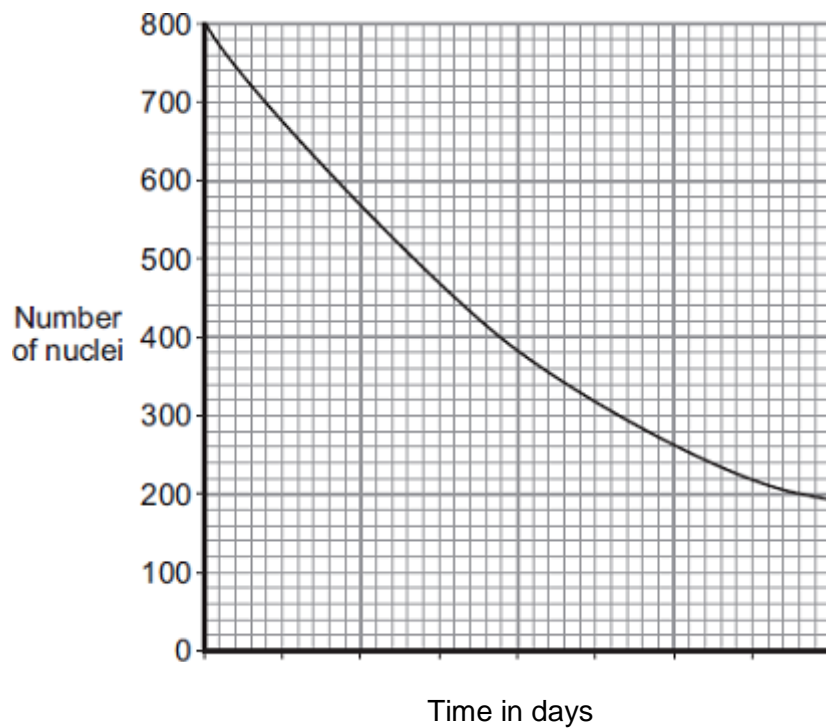Number of protons = _____

Number of neutrons = _____

(2)

(ii) The decay of radon-222 can be represented by the equation below.

Complete the equation by writing the correct number in each of the **two** boxes.

$$^{222}_{86}\text{Rn} \longrightarrow \boxed{}_{\boxed{}}\text{Po} + \text{alpha particle}$$

(2)

(d)   The graph shows how, in a sample of air, the number of radon-222 nuclei changes with time.

Use the graph to find the half-life of radon-222.

Show clearly on the graph how you obtain your answer.

Half-life = _____ days

(2)

(Total 9 marks)

Q2.

There are many different isotopes of gold. The isotope, gold-198, is radioactive.
An atom of gold-198 decays by emitting a beta particle.

(a)   Complete the following sentences.

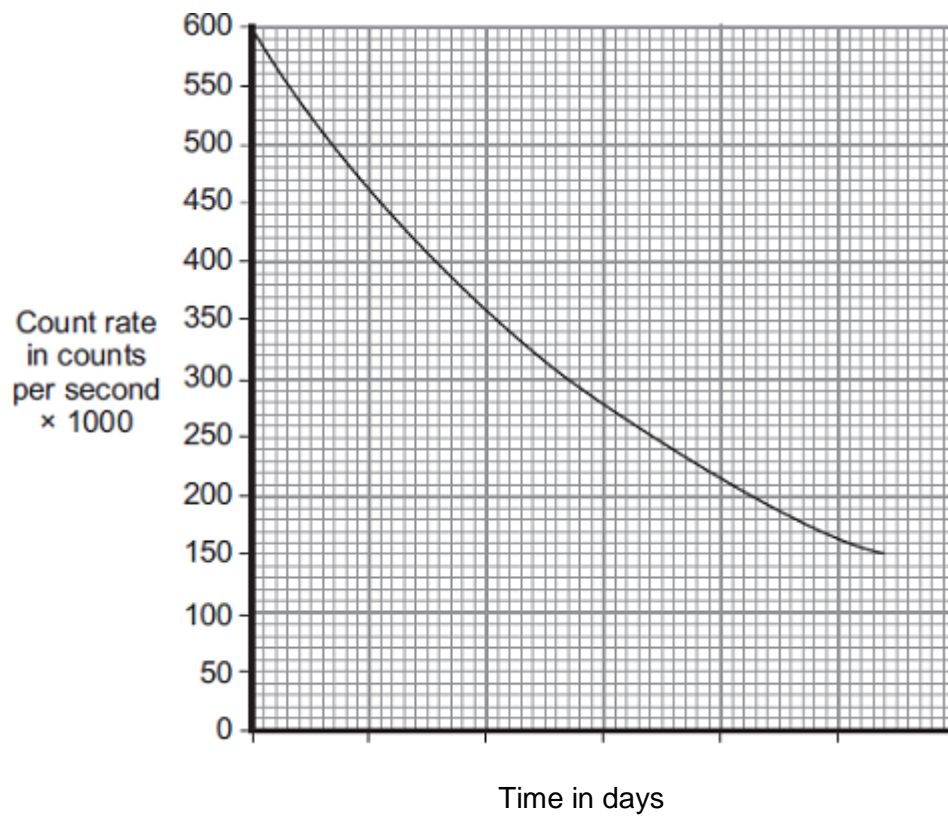All atoms of gold have the same number of _____

and the same number of _____ .

The atoms from different isotopes of gold have different numbers of _____ .

A beta particle is an _____ emitted

from the _____ of an atom.

(3)

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

Time in days

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)

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

Environmental scientists have found that 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.
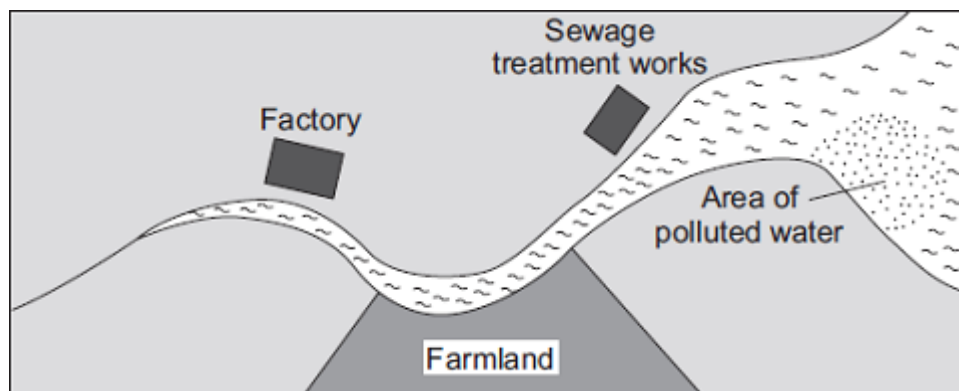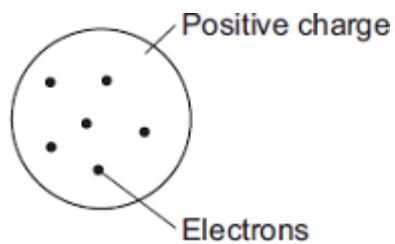

The gold-198 is used to find where the pollution is coming from.
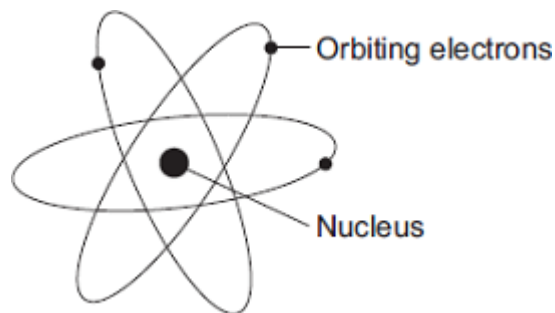
Explain how.

_____

_____

_____

_____

(2)
(Total 7 marks)

Q3.

In the early part of the 20th century, scientists used the 'plum pudding' model to explain the structure of the atom.

Following work by Rutherford and Marsden, a new model of the atom, called the 'nuclear' model, was suggested.

Describe the differences between the two models of the atom.

_____

_____

_____

_____

_____

_____

_____

_____

(Total 4 marks)