1 Most elements have some *isotopes* which are *radioactive*.

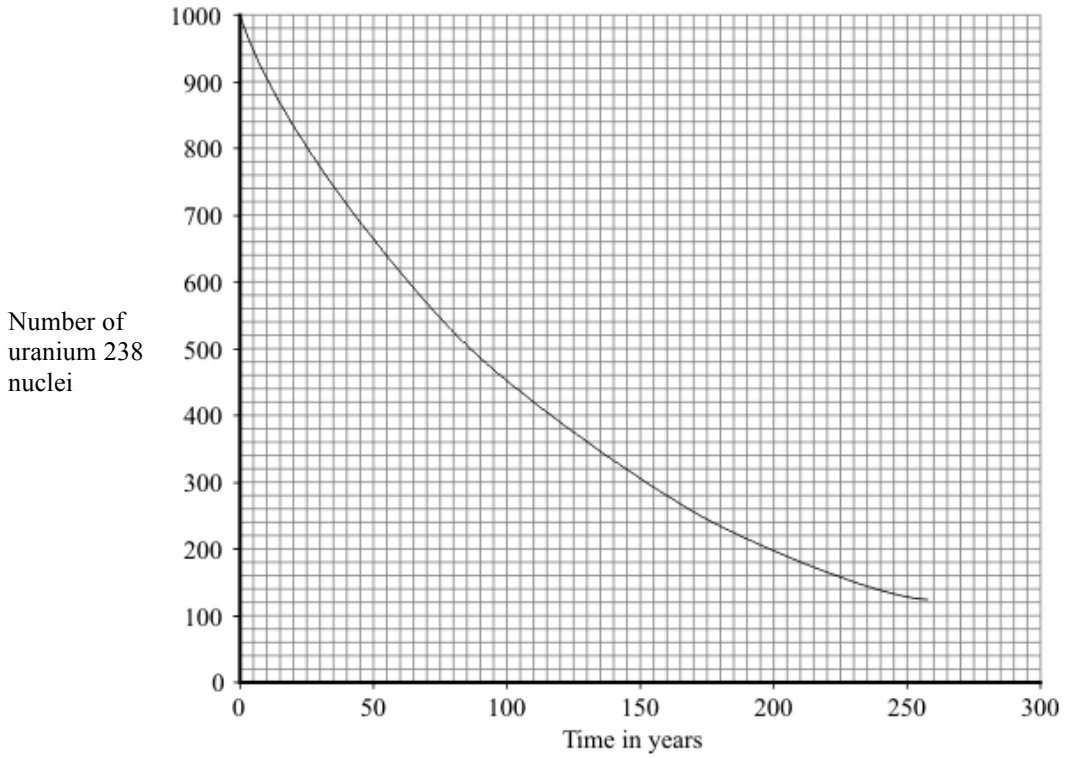
What is meant by the term radioactive?

.....

.....

(1 mark)

1 (a) The graph shows how the number of nuclei in a sample of the radioactive isotope Uranium-238 changes with time.



1 (a) (i) Use the graph to find the half-life of uranium-238.

Show clearly on the graph how you obtain your answer.

Half-life = ... years

(2 marks)

This question continues on the next page.

1 (a) (ii) Complete the following table for an atom of uranium-238.

Mass number	238
Number of protons	92
Number of neutrons	

$^{238}_{92}\mathbf{U}$ $^{234}_{90}\mathbf{Th}$

1 (a) (iii) An atom of uranium-238 decays to form an atom of thorium-234

What type of radiation, alpha, beta or gamma, is emitted by uranium-238?

.....

(1 mark)

1 (a) (iv) Why does an atom that decays by emitting alpha or beta radiation become an atom of a different element?

.....

.....

.....

(1 mark)

1 (b) An atom of actinium-228 decays by emitting a beta particle, β. A neutron in the nucleus changes into a proton and an electron. The electron is ejected, while the neutron remains.

An isotope of thorium is left behind.

Complete the equation for this decay.

$$^{228}_{89}\mathrm{Ac} \longrightarrow \square\!\!\square + \mathrm{Th} + \beta$$

(2 marks)

(Total 7 marks)

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