

Radioactivity 1

1.

Complete the following sentences.

- a) Neutral atoms have charge.
 - b) A charged atom is called an
 - c) A neutral atom has the same number of and
 - d) If an electron is removed from a neutral atom, the atom becomes charged.
-

2.

Indicate whether these sentences are **true** or **false**.

True **False**

- a) The total number of neutrons in an atom is called the atomic number.
 - b) The total number of protons and neutrons in an atom is called the mass number.
 - c) Atoms of the same element with the same number of neutrons are called isotopes.
 - d) Radioactive decay speeds up at higher temperatures.
 - e) Radioactive decay is a random process — you can't predict when it will happen.
-

3.

Match up each description with the correct type of radiation.

Alpha particle

2 neutrons and 2 protons — the same as a helium nucleus.

Beta particle

A type of electromagnetic radiation.

Gamma radiation

An electron from the nucleus.

4.

Write the nuclear equations for the following decay processes.

- a) An atom of thorium-234 ($^{234}_{90}\text{Th}$) emits a beta particle and becomes an atom of protactinium (Pa).
.....

- b) An atom of radon-222 ($^{222}_{86}\text{Rn}$) emits an alpha particle and becomes an atom of polonium (Po).
.....
-

5.

The table gives information about the radioactive isotope, radon-222.

mass number	222
atomic number	86
radiation emitted	alpha particle

(i) Complete the following sentence.

The mass number is the total number of..... and
..... inside an atom.

(2 marks)

(ii) Radon-222 is an isotope of radon.

How many protons are there in an atom of radon-222?

.....

(1 mark)

(iii) When an atom of radon-222 emits an alpha particle, the radon-222 changes into an atom of polonium-218.

An alpha particle consists of 2 protons and 2 neutrons.

How is the structure of the nucleus of a polonium-218 atom different from the structure of the nucleus of a radon-222 atom?

.....

(1 mark)

6.

(a) Complete the following table for an atom of uranium-238 (${}_{92}^{238}\text{U}$).

mass number	238
number of protons	92
number of neutrons	

(1 mark)

(b) Complete the following sentence.

The name given to the number of protons in an atom is the proton number or the

.....

(1 mark)

(c) An atom of uranium-238 (${}_{92}^{238}\text{U}$) decays to form an atom of thorium-234 (${}_{90}^{234}\text{Th}$).

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

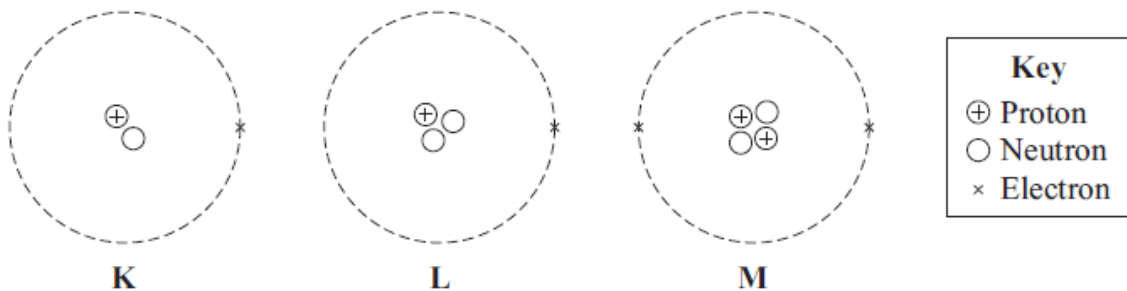
.....
(1 mark)

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

.....
.....
(1 mark)

7.

(a) The diagram represents 3 atoms, **K**, **L** and **M**.



(a) (i) Which **two** of the atoms are isotopes of the same element?

..... and
(1 mark)

(a) (ii) Give a reason why the **two** atoms that you chose in part (a)(i) are:

(1) atoms of the same element
.....

(2) different isotopes of the same element.

 (2 marks)

(b) The table gives some information about the radioactive isotope thorium-230.

mass number	230
atomic number	90

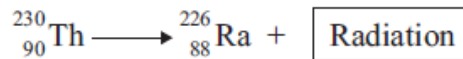
(b) (i) How many electrons are there in an atom of thorium-230?

 (1 mark)

(b) (ii) How many neutrons are there in an atom of thorium-230?

 (1 mark)

(c) When a thorium-230 nucleus decays, it emits radiation and changes into radium-226.



What type of radiation, alpha, beta or gamma, is emitted by thorium-230?

Explain the reason for your answer.

