NUCLEAR RADIATIONS AND ISOTOPES 1

Q:1 (a) The table gives information about the radioactive isotope, radon-222.

mass number	222
atomic number	86
radiation emitted	alpha particle

(a)(i) Complete the following sentence.

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

(2 marks)

(a)(ii) Radon-222 is an isotope of radon.How many protons are there in an atom of radon-222?

. _____ (1 mark)

(a) (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.

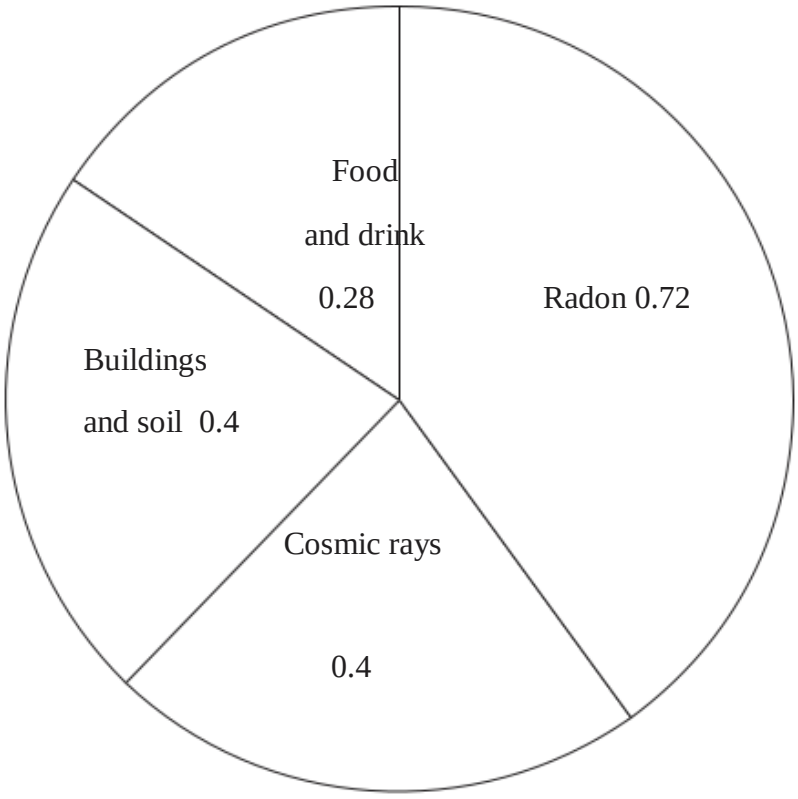
How is the structure of the nucleus of a polonium-218 atom different from the structure of the nucleus of a radon-222 atom?

_____

(1 mark)

(b) The pie chart shows the average radiation dose that a person in the UK receives each year from natural background radiation.

The doses are measured in millisieverts (mSv).



(b)(i) Calculate the proportion of natural background radiation that comes from radon.

Show clearly how you work out your answer.

_____

_____

Proportion of radon = _____

(2 marks)

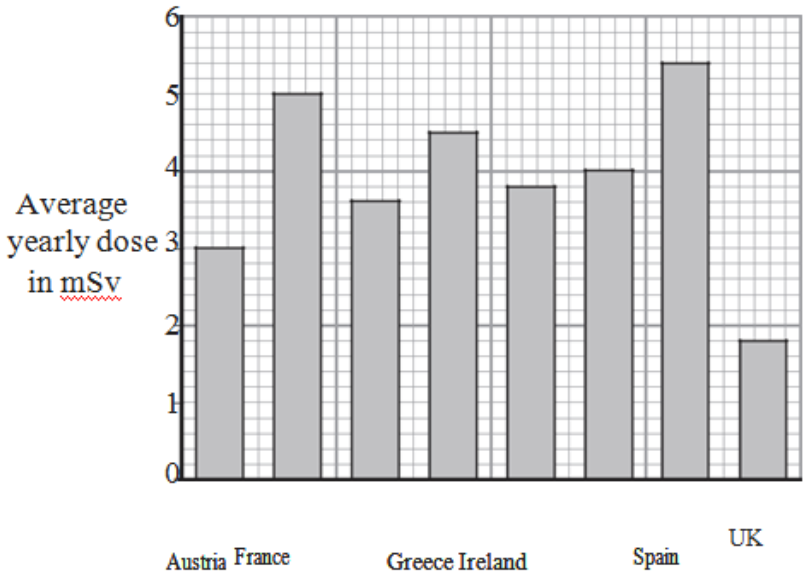
(b)(ii) Not all background radiation is from natural sources.

Name one source of background radiation that is not natural.

_____

(1 mark)

(c) The bar chart shows the average yearly dose from natural background radiation in different European countries.



(c) (i) How many times bigger is the average annual background dose in Germany compared to the UK?

_____

(1 mark)

(c) (ii) The following table gives the effects of different radiation doses on the human body.

Radiation dose in mSv	Effects
10 000	Immediate illness; death within a few weeks
1 000	Radiation sickness; unlikely to cause death
50	Lowest dose with evidence of causing cancer

A family goes to Germany for a two-week holiday. Should they be concerned about the higher level of background radiation in Germany?

Draw a ring around your answer.

Yes No

Explain your answer.

_____

_____

_____

(2 marks)

Q:2 (a)Complete the following table for an atom of uranium-238

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) 238 234

An atom of uranium-238 (92 U) decays to form an atom of thorium-234 (90 Th).

92 90

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

_____

(1 mark)

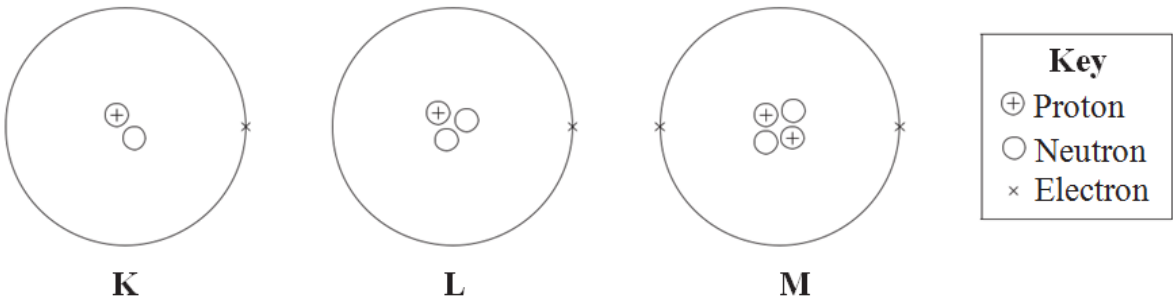
(c)(ii) Why does an atom that decays by emitting alpha or beta radiation become an atom of a different element?

_____

_____

(1 mark)

Q:3 (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.

23090 Th 22688 Ra + Radiation

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

_____

Explain the reason for your answer.

_____

_____

_____

(3 marks)

Q:4 (a)Uranium atoms do not always have the same number of neutrons.

What are atoms of the same element that have different numbers of neutrons called?

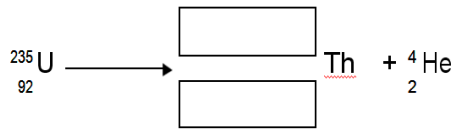
_____

(1 mark)

(b)By emitting an alpha particle, an atom of uranium-235 decays into an atom of thorium.An alpha particle, which is the same as a helium nucleus, is represented by $^{4}_{2}He$ the symbol

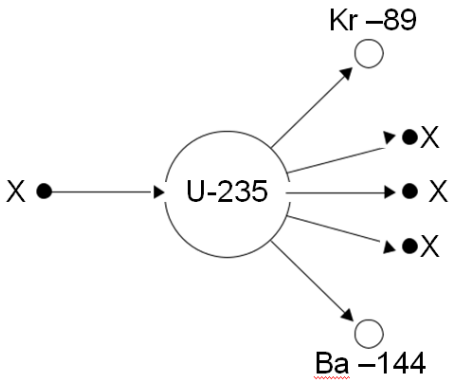
The decay can be represented by the equation below.

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



(2 marks)

(c) The diagram shows an atom of uranium-235 being split into several pieces.



(c) (i)Name the process shown in the diagram.

_____

(1 mark)

(c) (ii) Name the particles labelled X.

_____

(1 mark)

(d)Uranium-235 is used as a fuel in some nuclear reactors.

Name another substance used as a fuel in some nuclear reactors.

_____

(1 mark)

TOTAL MARKS=27