

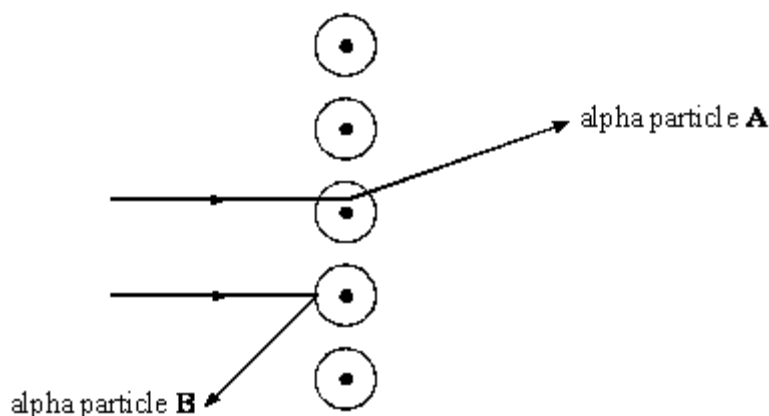
Name of the Student: _____

Max. Marks : 24 Marks

Time : 24 Minutes

Q1.

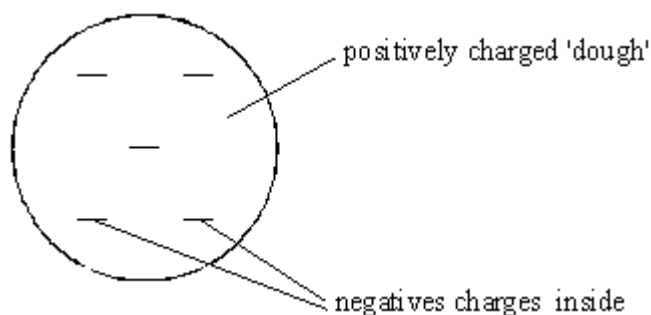
The diagram below shows the paths of two alpha particles A and B into and out of a thin piece of metal foil.



- (a) The paths of the alpha particles depend on the forces on them in the metal. Describe the model of the atom which is used to explain the paths of alpha particles aimed at thin sheets of metal foil.

(3)

- (b) Scientists used to believe that atoms were made up of negative charges embedded in a positive 'dough'. This is called the 'plum pudding' model of the atom. The diagram below shows a model of such an atom.



- (i) Explain how the 'plum pudding' model of the atom can explain why alpha particle A is deflected through a very small angle.

(2)

- (ii) Explain why the 'plum pudding' model of the atom can not explain the large deflection of alpha particle **B**.

(3)

- (c) We now believe that atoms are made up of three types of particles called protons, neutrons and electrons.

Complete the table below to show the relative mass and charge of a neutron and an electron. The relative mass and charge of a proton have already been done for you.

PARTICLE	RELATIVE MASS	RELATIVE CHARGE
proton	1	+1
neutron		
electron		

(2)

- (d) The diagrams below show the nuclei of four different atoms **A**, **B**, **C** and **D**.

Key: ○ – proton ● – neutron



nucleus **A**



nucleus **B**



nucleus **C**



nucleus **D**

- (i) State the mass number of C.

- (ii) Which two are isotopes of the same element?

_____ and _____

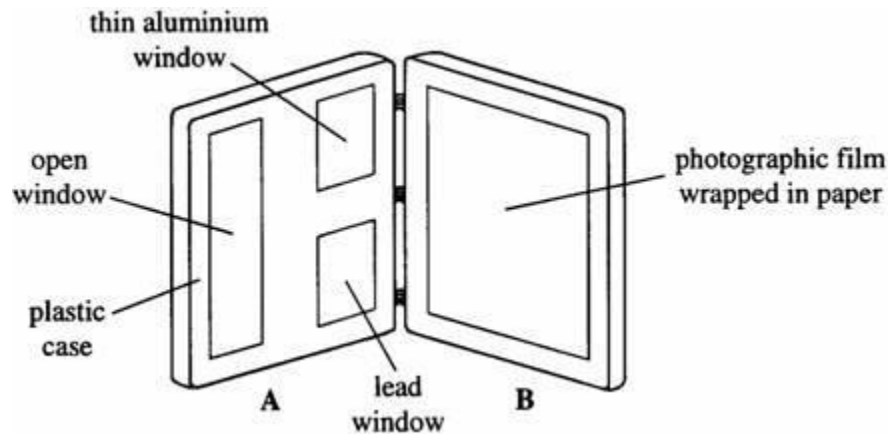
Explain your answer.

(4)

(Total 14 marks)

Q2.

The diagram shows a film badge worn by people who work with radioactive materials. The badge has been opened. The badge is used to measure the amount of radiation to which the workers have been exposed.



- (a) The detector is a piece of photographic film wrapped in paper inside part **B** of the badge. Part **A** has “windows” as shown.

Complete the sentences below.

When the badge is closed

- (i) _____ radiation and _____ radiation can pass through the open window and affect the film.

(1)

- (ii) Most of the _____ radiation will pass through the lead window and affect the film.

(1)

- (b) Other detectors of radiation use a gas which is ionised by the radiation.

- (i) Explain what is meant by *ionised*.

(1)

- (ii) Write down **one** use of ionising radiation.

(1)

- (c) Uranium-238 has a very long half-life. It decays via a series of short-lived radioisotopes to produce the stable isotope lead-204.

Explain, in detail, what is meant by:

- (i) *half-life*,

(1)

- (ii) *radioisotopes*.

(2)

- (d) The relative proportions of uranium-238 and lead-204 in a sample of igneous rock can be used to date the rock.

A rock sample contains three times as many lead atoms as uranium atoms.

- (i) What fraction of the original uranium is left in the rock?

(Assume that there was no lead in the original rock.)

(1)

- (ii) The half-life of uranium-238 is 4500 million years.

Calculate the age of the rock.

Age _____ million years

(2)

(Total 10 marks)