



#### IV. Long Answer Type Questions

Question 1. Give an activity to understand the implications of Rutherford's  $\alpha$ -particle scattering experiment by a gold foil.

Answer: To understand the implications of Rutherford's  $\alpha$ -particle scattering experiment:

Activity: Let a child stand in front of a wall with his eyes closed. Let him throw stones at the wall from a distance. He will hear sound for each strike of stone on the wall. This is like a nucleus of the atom. But if a blind-folded child has to throw stones at a barbed-wire fence, most of the stones would not hit the fencing and no sound would be heard.

This is because there are lots of gap in the fence which allows the stone to pass through them. This is like empty space in an atom through which  $\alpha$ -particles will pass through. Based on the above activity and similar reasoning Rutherford concluded the  $\alpha$ -particle scattering experiment as:

- (1) Most of the space inside the atom is empty as  $\alpha$ -particles passed through the foil.
- (2) Very few particles deflected from their path, this show that positive charge occupies less space.
- (3) A very small fraction of  $\alpha$ -particles are deflected by  $180^\circ$ , this shows that all the positive charge and mass of the gold atom were concentrated in a very small volume within the atom.

Question 2. What are isotopes? State its characteristics, give uses of isotopes?

Answer: Atoms of same element with same atomic number but different mass number are isotopes.

Characteristics:

- (1) Physical properties of the isotopes are different e.g. mass, density.
- (2) Chemical properties of the isotopes are same due to same number of electrons.

Uses:

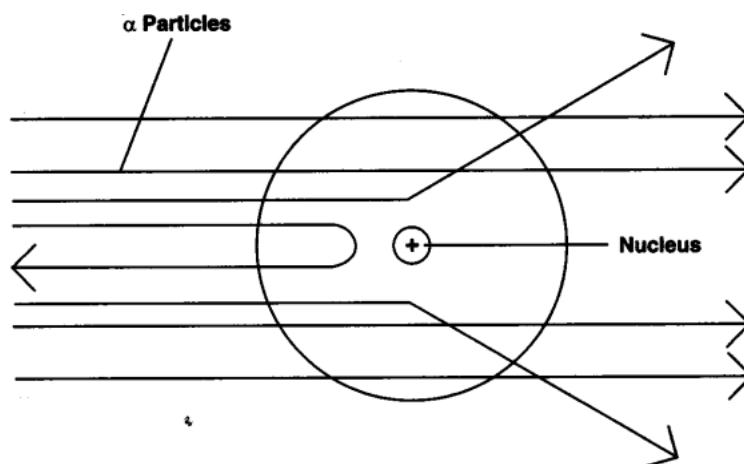
- (1) Uranium isotope is used as a fuel in nuclear reactor (U-235).
- (2) Cobalt isotope is used for treatment of cancer (Co-60).
- (3) Iodine isotope is used in the treatment of goitre.

Question 3. Explain Rutherford's  $\alpha$ -particle scattering experiment and give its observation and conclusion drawn.

Answer: Rutherford's  $\alpha$ -particle scattering experiment:

Fast moving  $\alpha$ -particles were made to fall on a thin gold foil.

Particles have + 2 charge and  $4u$  mass, and considerable amount of energy.



Observations:

- (1) Most of the  $\alpha$ -particles passed straight through the foil.
- (2) Some of the  $\alpha$ -particles were deflected by small angles by the foil.
- (3) One out of every 12000 particles rebounded.

Conclusion from observation:

- (1) Most of the space inside the foil is empty.
- (2) Positive charge of atom occupies very less space.
- (3) Mass of the atom is concentrated in the centre with all positive charge concentrated in small volume within the atom.

Question 4. Establish the relationship between atomic number, mass number, isotopes, isobars and valency of an atom.

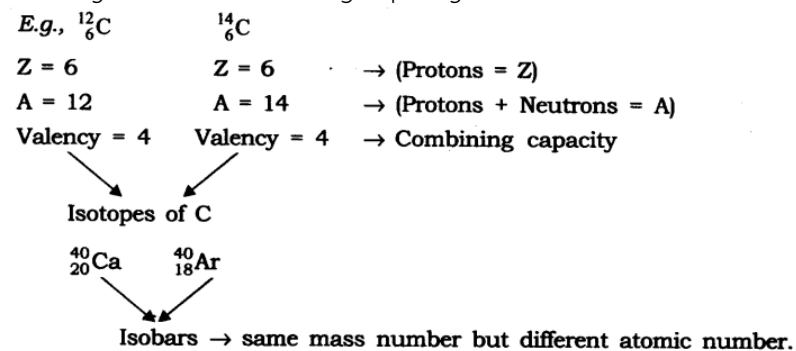
Answer: Atomic number — Gives the number of protons (Z)

Mass number — Gives the number of protons and neutrons (A)

Isotopes — When atoms of same element have same number of protons (Z) but different number of a neutrons (s) such atoms are called isotopes.

Isobars — When atom of different element have same mass number (A) but different atomic number (Z) such atoms are called isobars.

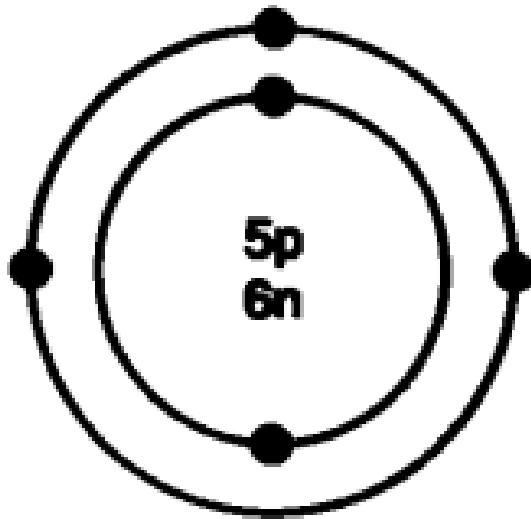
Valency — It is the combining capacity of an atom.



V. Value - Based Questions

Question 1. Aryan could not solve the following question in the group; his group mate explained him and solved his difficulty. The question was as follows:

What information do you get from the given figure about the atomic number, mass number and valency of the given atom X'.



- (a) What is the answer for-the above question?  
 (b) Name the element X'.  
 (c) What value of Aryan's friend is reflected in this behaviour?
- Answer: (a) The atomic number is 5.  
 The mass number is 11.  
 The valency is 3.  
 (b) The element X' is boron.  
 (c) Aryan's friend showed the value of helping and caring nature.

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