

**Chapter-4 | Structure of the Atom Worksheet-1****Multiple Choice Questions**

- The discovery of the electron was made by**
(a) Rutherford (b) J. J. Thomson
(c) Chadwick (d) Bohr
- Canal rays consist of**
(a) Electrons
(b) Neutrons
(c) Positively charged particles
(d) Neutral particles
- The nucleus of an atom was discovered through**
(a) Cathode ray experiment (b) Oil drop experiment
(c) Gold foil experiment (d) Discharge tube experiment
- Most of the mass of an atom is concentrated in the**
(a) Electrons (b) Shells
(c) Nucleus (d) Orbits
- Which sub-atomic particle has no charge?**
(a) Proton (b) Electron
(c) Positron (d) Neutron
- According to Bohr's model, electrons**
(a) Move randomly (b) Remain stationary
(c) Revolve in fixed energy levels (d) Are embedded in positive charge
- The maximum number of electrons that can be present in the K-shell is**
(a) 8
(b) 18
(c) 2
(d) 32
- Atoms of the same element having different mass numbers are called**
(a) Isobars (b) Isotopes
(c) Ions (d) Molecules
- The atomic number of an element is equal to the number of**
(a) Neutrons
(b) Nucleons
(c) Electrons and neutrons
(d) Protons

10. Which isotope is used in the treatment of cancer?

- (a) Uranium-235
- (c) Iodine-131

- (b) Carbon-14
- (d) Cobalt-60

Fill in the blanks :

- 11. The positively charged centre of an atom is called the _____.
- 12. The mass number of an atom is the sum of _____ and _____.

True / False

- 13. Electrons are present inside the nucleus of an atom.
- 14. Isotopes of an element have the same chemical properties.

Very Short Type Questions

- 15. Define atomic number.
- 16. Name the three sub-atomic particles present in an atom.

Short Type Questions

- 17. State any two limitations of Rutherford's atomic model.
- 18. Why do noble gases show zero valency?

Essay Type Questions

- 19. Describe Rutherford's alpha-particle scattering experiment and explain how it led to the discovery of the nucleus.
- 20. Explain Bohr's model of the atom and how it helped in understanding atomic structure.

HOTS

- 21. **Assertion (A):** Most of the space inside an atom is empty.
Reason (R): Most alpha particles passed straight through the gold foil without deflection.
 - a) Both A and R are true and R is the correct explanation of A
 - b) Both A and R are true but R is not the correct explanation of A
 - c) A is true but R is false
 - d) A is false but R is true

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Worksheet-1
Answer & Solution

1. (b) J. J. Thomson
2. (c) Positively charged particles
3. (c) Gold foil experiment
4. (c) Nucleus
5. (d) Neutron
6. (c) Revolve in fixed energy levels
7. (c) 2
8. (b) Isotopes
9. (d) Protons
10. (d) Cobalt-60
11. Nucleus
12. Protons, Neutrons
13. False
14. True
15. Atomic number is the number of protons present in the nucleus of an atom.
16. Electron, proton and neutron.
17. Rutherford's model could not explain the stability of the atom. It also failed to explain the arrangement of electrons around the nucleus.
18. Noble gases have completely filled outermost shells, so they neither gain nor lose electrons and therefore show zero valency.
19. Ernest Rutherford conducted the alpha-particle scattering experiment to study the internal structure of an atom. In this experiment, fast-moving alpha particles were directed at a very thin gold foil. It was observed that most of the alpha particles passed straight through the foil without any deflection. Some particles were deflected through small angles, while a very few were deflected back towards the source. From these observations, Rutherford concluded that most of the space inside an atom is empty, which explains why most particles passed through undeflected. The deflection of some particles indicated the presence of a positively charged region occupying very little space. The rare backward deflections showed that almost all the mass and positive charge of the atom are concentrated in a tiny, dense central region called the nucleus. Based on this experiment, Rutherford proposed the nuclear model of the atom. According to this model, an atom consists of a small, positively charged nucleus at the centre, with electrons revolving around it in circular paths. However, the model could not explain atomic stability, as revolving electrons should lose energy and fall into the nucleus. Despite this limitation, the experiment was significant because it led to the discovery of the nucleus and paved the way for future atomic models.

20. Bohr proposed his atomic model to overcome the drawbacks of Rutherford's model. According to Bohr's model, electrons revolve around the nucleus only in certain fixed circular paths called energy levels or shells. These shells are designated as K, L, M, N and so on. Each shell has a definite amount of energy associated with it.

Bohr stated that electrons do not radiate energy while revolving in these fixed orbits, which explains the stability of atoms. Energy is absorbed or emitted only when an electron jumps from one energy level to another. When an electron moves to a higher energy level, it absorbs energy, and when it returns to a lower energy level, it releases energy.

Bohr's model also explained the distribution of electrons in different shells. It helped in understanding atomic number, valency and chemical reactivity of elements. Although Bohr's model could not explain the spectra of heavier atoms, it was successful in explaining the structure of hydrogen atom and provided a clearer picture of atomic structure. Thus, Bohr's model was an important step in the development of modern atomic theory.

21. Correct option: a

Explanation: Since most alpha particles passed straight through the gold foil, it proved that most of the space inside an atom is empty.