WORKSHEET 1

CHAPTER 4 – STRUCTURE OF THE ATOM

A. Tick (✓) the correct option.

1. Neutron, a neutral subatomic particle, was discovered by
   a. J J Thomson. b. Goldstein. c. William Crookes. d. Chadwick.
2. The charge on an electron is
   a. -1.602×10^{-19} C b. 1.602×10^{-19} C c. 1.759×10^{11} C d. -1.759×10^{11} C
3. Which of the following is not the property of anode rays?
   a. Anode rays consist of positively charged particles.
   b. Anode rays travel in straight line.
   c. Anode rays are deflected by electric field and they bend towards the positive plate.
   d. Anode rays can produce mechanical effects.
4. Rutherford's alpha particle scattering experiment was performed using foil of which of the following metals?
   a. Copper b. Silver c. Gold d. Platinum
5. The mass number of an element with 13 protons and 12 neutrons is
   a. 13. b. 12. c. 26. d. 25.

B. Fill in the blanks.

1. The e/m ratio for cathode rays is _____
2. The term electron was coined by _____
3. Rutherford's model could not explain the stability of a/an _____
4. The average atomic mass of a chlorine atom is _____
5. Atoms of different elements having different atomic numbers but same mass numbers are known as _____

C. State whether the following statements are true or false.

1. All atoms except hydrogen possess protons.
2. The nature of anode rays depends upon the nature of gas taken in the discharge tube.
3. The charge on a proton is equal in magnitude to the charge on an electron but opposite in sign.
4. The number of valence electrons in chloride ion is 7.
5. Deuterium and tritium are chemically identical.

D. Match the following.

1. Oil drop experiment	experimental evidence for electrical nature of matter
2. J J Thomson	discharge tube experiment

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3. E Goldstein	discovered electron
4. William Crookes	RA Millikan
5. Michael Faraday	discovered proton

E. Answer the following questions.

Very Short Answer Questions

1. What was Thomson's plum-pudding model of an atom?
2. The number of nucleons present in an atom of an element is 26. If the atomic number of the element is 12, find the number of neutrons present in the atom.

Short Answer Questions

1. What were the features of Thomson's model of an atom?
2. How are isotopes different from isobars? Give examples of each.

Long Answer Questions

1. What are the postulates of Bohr's model of an atom?
2. Explain how an isotope of phosphorus is useful in the manufacture of steel from cast iron.

ANSWERS

WORKSHEET 1

A. Tick (✓) the correct option.

1. d
2. a
3. c
4. c
5. d

B. Fill in the blanks.

1. 1.759×10^{11} C kg^{-1}
2. G J Stoney
3. atom
4. 35.5 u
5. isobars

C. State whether the following statements are true or false.

1. F
2. T
3. T
4. F
5. T

D. Match the following.

1. Oil drop experiment	RA Millikan
2. J J Thomson	discovered electron
3. E Goldstein	discovered proton
4. William Crookes	discharge tube experiment
5. Michael Faraday	experimental evidence for electrical nature of matter

E. Answer the following questions.

Very Short Answer Questions

1. Thomson's plum-pudding model was given to describe the structure of an atom. According to this model, an atom is considered to be sphere of uniform positive charge into which the negatively charged electrons are embedded just like raisins are embedded in a plum-pudding.
2. We are given that the number of nucleons present in the atom of the element is 26. So, the mass number of the element is 26. Also, there are 12 protons present in the nucleus of the atom. So, the atomic number of the element is 12. Thus,

$$\text{Number of neutrons} = \text{Mass number} - \text{Atomic number}$$
$$= 26 - 12$$
$$= 14$$

Short Answer Questions

1. The features of Thomson's model of an atom are as follows:
   a. An atom consists of a positively charged sphere and the electrons are embedded in it.
   b. The negative and positive charges are equal in magnitude. So, the atom as a whole is electrically neutral.
2. The isotopes of an element which have the same number of protons but different number of neutrons are called isotopes. Isotopes have the same atomic numbers but different mass numbers. For example, ^{12}C and ^{14}C are isotopes of carbon. They differ in the number of neutrons they possess.

   The atoms of different elements which have the same mass number but different atomic numbers are called isobars.

Long Answer Questions

1. The postulates of Bohr's model of an atom are as follows:

   a. In an atom, the electrons move around the nucleus in certain definite paths called orbits. Such orbits differ from each other in their radii.

   b. Each orbit has a definite energy. These orbits are known as energy levels or energy shells. The orbits of energy shells are numbered as 1, 2, 3, 4,…..or *K*, *L*, *M*, *N*,…… shells starting from the nucleus.

   c. As long as an electron remains in a particular orbit, it does not radiate energy.

   d. An electron loses energy when it jumps from an orbit of higher energy (E_2) to an orbit of lower energy (E_1) and energy equal to $E_2 - E_1$ is given out in the form of electromagnetic radiation. An electron gains energy from surroundings when it jumps from an orbit of lower energy (E_1) to an orbit of higher energy (E_2).

2. Isotope $^{33}_{15}P$ is used in the manufacture of steel from cast iron in order to find out the complete removal of phosphorus from steel. For this purpose, the cast iron containing a small quantity of $^{32}_{15}P$ isotope is used. The disappearance of radioactivity in the molten steel indicates the complete removal of phosphorus from the steel. Radioactive isotopes are used to detect minor cracks in the underground gas-pipelines, oil-pipelines and water-pipelines. A solution of a radioactive substance is introduced in the pipeline. If there is a minor crack in the pipeline, a high level of radiation will be detected at the place of the crack. The wear and tear of engines is found out by incorporating a radioactive isotope of a metal in the piston and measuring the radioactivity of the lubricating oil at various intervals of time. The appearance of radioactivity in the lubricating oil gives an indication that the wear and tear of the piston have started.