WORKSHEET 2

CHAPTER 4 – STRUCTURE OF THE ATOM

A. Tick (✓) the correct option.

1. The mass of an electron is
   (a) 9.1×10^{-31} kg. (b) 9.1×10^{-30} kg. (c) 9.1×10^{-28} kg. (d) 9.1×10^{-27} kg.
2. The maximum number of electrons that can be accommodated in a shell of orbit number n is given by the formula
   (a) n^2. (b) $2n$. (c) $2n^2$. (d) $n + 1$.
3. Which of the following subatomic particles is not present in a hydrogen atom?
   (a) Proton (b) Neutron (c) Electron (d) None of these
4. The number of electrons present in an atom of an element with atomic number 12 and mass number 23 is
   (a) 12. (b) 13. (c) 6. (d) 11.
5. An element has atomic number 16. Its valency is
   (a) 4. (b) 2. (c) 6. (d) 0.

B. Fill in the blanks.

1. Cathode rays, when passed through a strong magnetic field, are deflected towards the _____ charged plate in their path.
2. Anode rays are also known as _____ rays.
3. The distribution of electrons in different energy shells of an atom is governed by the _____ scheme.
4. An atom is electrically neutral because the number of protons is equal to the number of _____
5. Calcium and argon are _____

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

1. The first experimental evidence for the existence of electrons was given by J J Thomson.
2. The famous oil-drop experiment was performed by Michael Faraday.
3. The charge on an electron is equal in magnitude to the charge on a proton.
4. The electronic configuration of Na^+ ion is 2, 8.
5. The valency of aluminium in Al_2O_3 is 2.

D. Match the following.

1. Nucleons	positively-charged body present in the centre of the atom
2. Neutron	valency of zero
3. Nucleus	no charge

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4. Number of neutrons — Mass number – Atomic number
5. Noble gases — Protons + Neutrons

E. Answer the following questions.

Very Short Answer Questions

1. Give any two properties of cathode rays.
2. An element with mass number 22 has 10 protons. Calculate the number of neutrons present in it.

Short Answer Questions

1. Compare electron, proton and neutron in terms of
   a. Mass in grams.
   b. Relative charge.
   c. Location in the atom.
2. Tabulate the differences between isotopes and isobars.

Long Answer Questions

1. What were the conclusions of Rutherford's experiment?
2. Give the uses of isotopes in the field of medicines.

ANSWERS

WORKSHEET 1

A. Tick (✓) the correct option.

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

B. Fill in the blanks.

1. positively
2. canal
3. Bohr-Bury
4. electrons
5. isobars

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

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

D. Match the following.

1. Nucleons	Protons + Neutrons
2. Neutron	no charge
3. Nucleus	positively charge body present in the centre of the atom
4. Number of neutrons	Mass number – Atomic number
5. Noble gases	valency of zero

E. Answer the following questions.

Very Short Answer Questions

1. The properties of cathode rays are

   a. Cathode rays travel in straight lines.

   b. Cathode rays are deflected by an electric field.

2. We are given that the mass number of the element is 22 and the number of protons present in the element is 10. Since,

   $$\text{Mass number} = \text{Number of protons} + \text{Number of neutrons}$$

   Therefore,

   $$\text{Number of neutrons} = \text{Mass number} - \text{Number of protons}$$
   $$= 22 - 10$$
   $$= 12$$

   Thus, the number of neutrons present in the element is 12.

Short Answer Questions

1. The following table gives the mass, charge and location of each fundamental subatomic particle in an atom.

Fundamental Particle	Mass in g	Relative charge	Location in atom
Proton	1.673×10^{-24}	+ 1	Nucleus
Neutron	1.676×10^{-24}	0	Nucleus
Electron	9.1×10^{-28}	– 1	Outside nucleus

2.

Isotopes	*Isobars*
Isotopes are atoms of the same element.	Isobars are atoms of different elements.
Isotopes have same atomic number.	Isobars have different atomic numbers.
Isotopes have different mass numbers.	Isobars have same mass numbers.

Long Answer Questions

1. The conclusions of Rutherford's experiment were:

   a. Since most of the α-particles passed through the gold foil without any deflection, the major part of space in an atom is empty.

   b. Since very few α-particles are deflected by small angles, the deflection is due to enormous repulsive force between positively charged α-particles and positive body present within the atom. The α-particles coming close to this positive body get deflected by small angles. This positively charged body inside the atom was named as nucleus.

   c. Since some α-particles were deflected back at 180° after head-on collision with this positive body and α-particles are heavy particles, the positive body must be heavy.

   d. Since only a very few α-particles got deflected back, the heavy positive body occupies a very small volume as compared to the total volume of the atom. The radius of the nucleus is around 10^{-13} cm while that of the atom is 10^{-8} cm. That means that if the radius of the nucleus is 1 cm, then the radius of the atom would be 1 km.

   e. Since the α-particles have appreciable mass and they are deflected by the nucleus, the nucleus of an atom has an appreciable mass.

2. Isotopes are used for the treatment of various diseases. For example,

   a. Isotopes $^{60}_{27}Co$, $^{225}_{88}Ra$ and $^{198}_{79}Au$ are used in the treatment of cancer.

   b. Isotope $^{32}_{15}P$ is used for locating cancer. It is used for the treatment of blood cancer (leukaemia). It is also used for patients suffering from bone fracture to find absorption of phosphorus in their bones.

   c. Isotopes $^{73}_{33}As$ and $^{131}_{53}I$ are used for locating brain tumor.

   d. Isotope $^{131}_{53}I$ is used for the detection of thyroid disorder and its treatment.

   e. Isotope $^{24}_{11}Na$ is used for detection of blood clots in the circulatory system.

   f. Isotope $^{59}_{26}Fe$ is used for the diagnosis of anaemia.