

Chapter: 5

Q.1 Fill in the blank and rewrite the completed statements

2

- 1 The valency of hydrogen is 'one' as per the molecular formula H_2O . Therefore, valency of 'Fe' turns out to be as per the formula Fe_2O_3 .

a) three b) two
c) four d) one

Ans The valency of hydrogen is 'one' as per the molecular formula H_2O . Therefore, valency of 'Fe' turns out to be **three** as per the formula Fe_2O_3 .

- 2 Electron, proton, neutron are the types of in an atom.

Ans Electron, proton, neutron are the types of **subatomic particles** in an atom.

Q.2 Match the pair

2

1	Column - A	Column - B
	i. Electron	a. Neutral
	ii. Neutron	b. Atoms
		c. Negatively charged

Ans	i. Electron	Negatively charged
	ii. Neutron	Neutral

2	Column - A	Column - B
	i. Proton	a. Negatively charged
	ii. Electron	b. Neutral
		c. Positively charged

Ans	i. Proton	Positively charged
	ii. Electron	Negatively charged

Q.3 Multiple Choice Questions (Activity)

3

- 1 The electron shell is nearest to the nucleus.

a) K b) L
c) M d) N

Ans The electron shell **K** is nearest to the nucleus.

- 2 An electron carries a charge.

a) positive b) negative
c) neutral d) none of the above

Ans An electron carries a **negative** charge.

- 3 The electronic configuration of magnesium is 2,8,2. From this it is understood that the valence shell of Magnesium is

- a) K b) L
c) M d) N

Ans The electronic configuration of magnesium is 2,8,2. From this it is understood that the valence shell of Magnesium is **M**.

Q.4 Answer in one sentence

5

1 Define : Atomic mass number (A)

Ans Atomic mass number is the total number of protons and neutrons present in an atom.

2 Define: Atom

Ans An atom is the smallest particle of an element which retains its chemical identity in all the physical and chemical changes.

3 Define : Atomic number (Z)

Ans Atomic number is the number of protons or electrons present in an atom.

4 Define : Isotope

Ans Atoms of same element having same atomic number but different atomic mass number are called isotopes.

5 Define : Moderator in nuclear reactor

Ans To control the chain reaction in the nuclear reactor, it is necessary to decrease the speed and number of neutrons. Graphite or heavy water is used as moderator for reducing the speed of neutrons.

Q.5 Complete the given flow chart / table / diagram

2

1 Deduce from the datum provided

Datum	To deduce	Answer
$^{23}_{11}\text{Na}$	Neutron number
$^{12}_6\text{C}$	Mass number
$^{37}_{17}\text{Cl}$	Proton number
$^{79}_{35}\text{Br}$	Atomic number

Ans

Datum	To deduce	Answer
$^{23}_{11}\text{Na}$	Neutron number	23 - 11 = 12
$^{12}_6\text{C}$	Mass number	12
$^{37}_{17}\text{Cl}$	Proton number	17
$^{79}_{35}\text{Br}$	Atomic number	35

Q.6 Give scientific reasons

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1 Atomic mass number is a whole number.

Ans i. Atomic mass number is the total number of protons and neutrons present in an atom.
ii. The mass number is denoted by the symbol 'A'.
iii. Number of protons and neutrons in the nucleus are always a whole number and not a fraction.
iv. Hence, atomic mass number is a whole number.

2 Atoms are stable though negatively charged electrons are revolving within it.

Ans i. According to the Bohr's atomic model, the electrons revolving around the atomic nucleus lie in the concentric circular orbits at certain distance from the nucleus.
ii. Energy of an electron is constant while it is in a particular orbit.
iii. When an electron jumps from one orbit to another, it either absorbs or emits energy equal to the difference of its energy level.

iv. Hence, atoms are stable though negatively charged electrons are revolving within it.

3 Atom is electrically neutral.

- Ans**
- In an atom of an element, the number of electrons in the outer orbits is equal to the number of protons in the nucleus.
 - Protons are positively charged while the electrons are negatively charged and neutrons are electrically neutral.
 - The total number of protons is equal to the total number of electrons.
 - Therefore, electrical charges are balanced and the atom as a whole is electrically neutral.

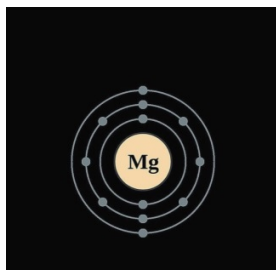
4 All the mass of an atom is concentrated in the nucleus.

- Ans**
- In an atom of an element, protons and neutrons are present in the atomic nucleus while the electrons revolve around the nucleus in different orbits.
 - The mass of a proton is approximately equal to 1 Dalton and is also equal to the mass of a neutron.
 - The mass of an electron is 1800 times less than that of a hydrogen atom and hence is negligible compared to that of the proton and neutron.
 - Therefore, in an atom, all the mass is concentrated in the nucleus.

Q.7 **Draw / Label the diagram**

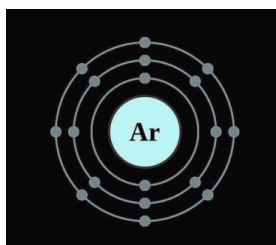
1 Diagrammatic sketch of electronic configuration of Magnesium

Ans



2 Diagrammatic sketch of electronic configuration of Argon

Ans



Q.8 **Answer the following**

1 What is meant by atomic mass number? Explain how the atomic number and mass number of carbon are 6 and 12 respectively.

- Ans**
- The total number of protons and neutrons in an atom is the atomic mass number of that element. The mass number is denoted by the symbol 'A'.
 - Atomic number is the number of electrons or protons present in an atom. Atomic number is denoted by the symbol 'Z'.
 - For a Carbon atom, the mass number and atomic number is denoted as $^{12}_6\text{C}$.
 - There are 6 protons and 6 electrons in the carbon atom and hence its atomic number is 6.
 - Atomic mass number of Carbon atom is 12 and so there are 6 neutrons (12-6) in its nucleus.

2 What is the difference in the atomic models of Thomson and Rutherford?

- Ans**
- According to the Thomson's model of an atom, the positive charge is distributed throughout the atom and the negatively charged electrons are embedded in it.
 - According to Rutherford's nuclear model for atom, the positively charged nucleus is at the centre of the atom and negatively charged particles called electrons revolve around the nucleus.
 - Thus, Thomson's model does not state any details about the nucleus while Rutherford's model of atom states the presence of nucleus in the centre of the atom.

Q.9 **Answer the following in detail**

4

6

10

1 What is meant by subatomic particle? Give brief information of three subatomic particles with reference to electrical charge, mass and location.

Ans i. Subatomic particle is a unit matter that is smaller than an atom or found inside an atom
ii. The three subatomic particles are proton, electron and neutron respectively.

Proton:

- i. Proton is a positively charged subatomic particle in the atomic nucleus and is represented by the symbol 'p'.
- ii. Each proton carries a positive charge of $+1e^-$ ($1e^- = 1.6 \times 10^{-19}$ coulomb)
- iii. Mass of one proton is approximately 1 u (Dalton).

Neutron:

- i. Neutron is an electrically neutral subatomic particle in the atomic nucleus and is represented by the symbol 'n'.
- ii. Neutrons do not carry any charge.
- iii. The mass of a neutron is approximately 1 u (Dalton), which is almost equal to that of a proton.

Electron:

- i. Electron is a negatively charged subatomic particle and is represented by the symbol 'e'.
- ii. Electrons revolve in the discrete orbits around the nucleus.
- iii. Each electron carries one unit of negative charge ($-1e^-$).
- iv. Mass of an electron is 1800 times less than that of a hydrogen atom. Therefore, the mass of an electron can be treated as negligible.

2 What is meant by valency of an element? What is the relationship between the number of valence electrons and valency?

Ans i. Valency means the number of chemical bonds formed by an atom.
ii. Valency of an atom is determined by the configuration of its outermost shell.
iii. Therefore, the outermost shell is called the valence shell and the electrons in the outermost shell are called valence electrons.
iv. Thus, valency of an element is same as the number of its valence electrons, if this number is four or less than four.
v. On the other hand, when an element has four or more valence electrons, the number of electron by which the octet is short of completion is the valency of that element.
vi. For example: For Sodium atom having electronic configuration (2,8,1), the valency is one because it will give away one electron to achieve a stable octet state
Similarly, For oxygen having electronic configuration (2,6), the valency is two because it needs two more electrons to achieve a stable octet.