Chapter 4 – Atomic Structure

Question 1.

Fill in the blanks.

(a) Dalton **said** that atoms could not be divided

(b) An ion which has a positive charge is called a **cation**

(c) The outermost shell of an atom is known as **valence shell**

(d) The **nucleus** of an atom is very hard and dense.

(e) Neutrons are **neutral** particles having mass equal to that of protons.

(f) Isotopes are the atoms of **an** element having the same atomic number but a different mass number.

Question 2.

Write 'true' or 'false' for the following statements:

(a) An atom on the whole has a positive charge.

False

(b) The maximum number of electrons in the first shell can be 8.

False

(c) The central pad of the atom is called nucleus.

True.

Question 3.

Give the following a suitable word/phrase.

(a) The sub-atomic particle with negative charge and negligible mass.

Solution: Neutron

(b) Protons and neutrons present in the nucleus.

Solution: Mass number

(c) The electrons present in the outermost shell.

Solution: Valency

(d) Arrangement of electrons in the shells of an atom.

Solution: Orbits or Valence shells

(e) The number of protons present in the nucleus of an atom.

Solution: Atomic number

(f) The sum of the number of protons and neutrons of an atom.

Solution: Mass number

(g) Atoms of same element with same atomic number but a different mass number.

Solution: Isotopes

(h) The smallest unit of an element which takes part in a chemical reaction.

Solution: Atom

Question 4.

Multiple Choice Questions

(a) The outermost shell of an atom is known as

1. valency

2. valence electrons

3. nucleus

4. valence shell

Answer: 2. valence electrons

(b) The number of valence electrons present in magnesium is

1. two

2. three

3. four

4. five

Answer: 1. two

(c) The sub atomic particle with negative charge is

1. proton

2. neutron

3. electron

4. nucleon

Answer: 3. electron

(d) If the atomic number of an atom is 17 and mass number is 35 then number of neutron will be

1. 35

2. 17

3. 18

4. 52

Answer: 3. 18

(e) The number of electrons in an atom is equal to number of

1. protons in a neutral atom

2. neutrons in a neutral atom

3. nucleons in a neutral atom

4. none of the above

Answer: 1. protons in a neutral atom

(f) The sum of number of protons and number of neutrons present in the nucleus of an atom is called its

1. mass number

2. atomic number

3. number of electrons

4. all of the above

Answer: 1. mass number

Question 5.

Name three fundamental particles of the atom. Give the symbol with charge, on each particle.

Solution:

The fundamental particles of the atom are: electrons, protons and neutrons.

Particle	Symbol	Charge
Electron	e^-	-1 or -1.602× 10^{-19} c. where-1 represent its one unit negative electrical charge
Proton	p^+	+1or 1.602× 10^{-19}c.where1 represents one unite +ve electrical charge.
Neutron	n^0	0

Question 6.

Define the following terms:

(a) Atomic number

(b) Mass number

(c) Nucleons

(d) Valence shell

Solution:

(a) Atomic number: The number of protons present in an atom is known as Atomic number. It is denoted by Z. Example: An atom of oxygen contains 8 protons. Therefore its atomic number is 8.

(b) Mass number: The sum of the number of protons and neutrons present in the nucleus of an atom is known as the Mass number, and it is denoted by A.

I.e. Mass number = Number of protons + Number of neutrons.

(c) Nucleons: The protons and neutrons collectively are known as nucleons.

(d) Valence Shell: The outermost shell of an atom is known as its valence shell.

Question 7.

Mention briefly the salient features of Dalton's atomic theory (five points).

Solution:

Salient features of Dalton's atomic theory:

1. The matter has very small and indivisible particles called atoms; it can neither be created nor be destroyed.

2. The atoms of an element are alike in all aspects, i.e. size, mass, density, chemical properties but they differ from the atoms of other elements.

3. Atoms of an element combine in small numbers to form molecules of the element.

4. Atoms of one element combine with atoms of another element in a simple number ratio to form molecules of compounds.

5. Atoms are the smallest units of matter that can take part in a chemical reaction during which the only rearrangement of atoms takes place.

Question 8.

(a) What are the two main features of Rutherford's atomic model?

(b) State its one drawback.

Solution:

(a) According to Rutherford's model, an atom consists of

- The centrally located nucleus
- The outer circular orbits

A positively charged mass is located centrally called nucleus. The entire mass of the atom is concentrated in it. It is the densest part of the atom. Its size is very small as compared to the atom as a whole.

Electrons revolve in circular orbits in the space available around the nucleus. An atom is electrically neutral, i.e., the number of protons and electrons present in an atom are equal.

(b) The Rutherford's atomic model could not explain the stability of the atom as it is like a solar system, the sun is at the centre, and the planets revolve around it, in an atom the electrons revolve around the centrally located nucleus containing protons.

Question 9.

What are the observations of the experiment done by Rutherford to determine the structure of an atom?

Solution:

Following were the observations made by Rutherford:

- Most of the alpha particle passed straight through the foil without any deflection from their path.
- Only a small fraction of alpha particles were deflected from their actual path by small angles.
- Only a few particles bounced back.

Question 10.

State the mass number, the atomic number of neutrons and electronic configuration of the following atoms.

$^{12}_{6}C$ $^{16}_{8}O$ $^{19}_{9}F$ $^{20}_{1}Ne$ $_{13}Al^{27}$ $_{17}Cl^{35}$

Also, draw atomic diagrams for them.

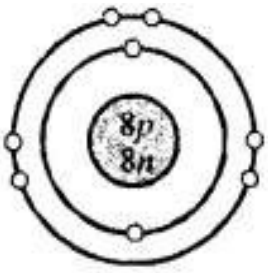
Solution:

Name of elements	Atomic number	Atomic mass	No. of proton	No. of electrons	No. of neutrons	Electronic configuration
$^{12}_{6}C$	6	12	6	6	6	2, 4

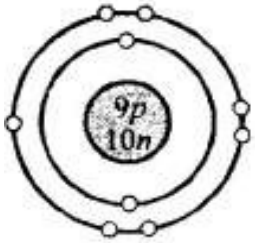
$^{16}_{8}O$	8	16	8	8	8	2, 6
$^{19}_{9}F$	9	19	9	9	10	2, 7
$^{20}_{10}Ne$	10	20	10	10	10	2, 8
$_{13}Al^{27}$	13	27	13	13	14	2, 8, 3
$_{17}Cl^{35}$	17	35	17	17	18	2, 8, 7

Carbon - $^{12}_{6}C$

Oxygen$^{16}_{8}O$

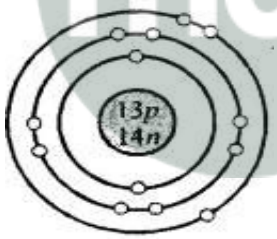


Fluorine - $^{19}_{9}F$



Neon - ${}^{20}_{1}Ne$

Aluminium - ${}_{13}Al^{27}$



Chlorine - ${}_{17}Cl^{35}$