

## UNIT: 4 ATOMIC STRUCTURES

CLASS: VII

SUBJECT: SCIENCE

### I. Choose the appropriate answer.

- The basic unit of matter is \_\_\_\_\_  
a. element      **b. atom**      c. molecule      d. electron
- The sub-atomic particle which revolves around the nucleus is \_\_\_\_\_  
a. atom      b. neutron      **c. electron**      d. proton
- \_\_\_\_\_ is positively charged.  
**a. Proton**      b. Electron      c. Molecule      d. Neutron
- The atomic number of an atom is the \_\_\_\_\_  
a. number of neutrons      **b. number of protons**  
c. total number of protons and neutrons      d. number of atoms
- Nucleons comprises of \_\_\_\_\_  
a. protons and electrons      b. neutrons and electrons  
**c. protons and neutrons**      d. neutrons and positron

### II. Fill in the blanks.

- The smaller particles found in the atom is called Subatomic particles.
- The nucleus has Protons and Neutrons.
- The Electrons revolve around the nucleus.

4. If the valency of carbon is 4 and that of hydrogen is 1, then the molecular formula of methane is CH<sub>4</sub>.

5. There are two electrons in the outermost orbit of the magnesium atom. Hence, the valency of magnesium is 2.

### III. Match the following.

- |                                |   |                                  |
|--------------------------------|---|----------------------------------|
| 1. Valency                     | - | Electrons in the outermost orbit |
| 2. Neutral particle            | - | Neutron                          |
| 3. Iron                        | - | Fe                               |
| 4. Hydrogen                    | - | Monovalent                       |
| 5. Positively charged Particle | - | Proton                           |

### IV. State true or false. If false, correct the statement.

- |  |              |
|--|--------------|
| 1. The basic unit of an element is molecule. | <b>False</b> |
| 2. The electrons are positively charged.     | <b>False</b> |
| 3. An atom is electrically neutral.          | <b>True</b>  |
| 4. The nucleus is surrounded by protons.     | <b>False</b> |

### V. Complete the analogy.

- Sun : Nucleus :: Planets : Electrons
- Atomic number : Number of protons :: Mass number : Number of protons and neutrons.
- K: Potassium :: C : Carbon.

**VI. Consider the following statements and choose the correct option.**

**1. Assertion: An atom is electrically neutral.**

**Reason: Atoms have equal number of protons and electrons.**

- ❖ Both Assertion and reason are true and reason is the correct explanation of assertion.

**2. Assertion: The mass of an atom is the mass of its nucleus.**

**Reason: The nucleus is at the centre.**

- ❖ Both Assertion and reason are true and reason is the correct explanation of assertion.

**3. Assertion: The number of protons or the number of neutrons is known as atomic number.**

**Reason: The mass number is the sum of protons and neutrons.**

- I. Assertion is false but the reason is true statement .
- II. Correct statement : The number of protons and neutrons is mass number.

**VII. Answer very briefly.**

**1. Define – Atom.**

An atom is the smallest particle of a chemical element that retains its chemical properties.

**2. Name the sub-atomic particles.**

Proton, Electron, Neutrons.

**3. What is atomic number?**

The number of electrons or protons in an atom is called the atomic number of that atom. It is represented by the letter Z.

#### 4. What are the characteristics of proton?

##### Proton (p)

The proton is the positively charged particle and it is located at the nucleus. Its positive charge is of the same magnitude as that of the electron's negative charge.

#### 5. Why neutrons are called neutral particles?

Neutrons are the particles in an atom that have a neutral charge ( no charge ). They are not positive like protons. They are not negative like electrons. So they are called as neutral particles.

### VIII. Answer briefly.

#### 1. Distinguish isotopes from isobar.

##### Isotopes

Atoms of element can have different number of neutrons. Such atoms will have same atomic number but different mass numbers. These atoms are called isotopes. For example Hydrogen has three isotopes Hydrogen ( ${}_1\text{H}^1$ ), Deuterium ( ${}_1\text{H}^2$ ), Tritium ( ${}_1\text{H}^3$ ).

##### Isobars

Atoms that have the same mass number but different atomic numbers are called isobars. Example: Calcium ( ${}_{20}\text{Ca}^{40}$ ), Argon ( ${}_{18}\text{Ar}^{40}$ ).

#### 2. What are isotones? Give one example.

Isotones are the atoms of different elements with same number of neutrons.

$${}_6\text{C}^{13} \text{ Neutrons} = 13 - 6 = 7$$

$${}_{7}\text{C}^{14} \text{ Neutrons} = 13 - 6 = 7$$

### 3. Differentiate mass number from atomic number.

- The number of electrons or protons in an atom is called the atomic number of that atom. It is represented by the letter Z
- EX: In a helium atom, there are two protons in the nucleus and two electrons revolving in the orbit around the nucleus. So, the atomic number (z) of helium is 2.
- The mass number (A). It is equal to the sum of the number of protons (p) and number of neutrons (n) in the nucleus. Atomic mass or Mass number = Number of Protons + Number of Neutrons.
- EX: In a sodium atom, there are 11 Protons and 12 neutrons. Hence, its mass number (A) is 23 (11 + 12).

### 4. The atomic number of an element is 9. It has 10 neutrons. Find the element from the periodic table. What will be its mass number ?

The element is Fluorine its mass number  $A = n + p = 10 + 9 = 19$

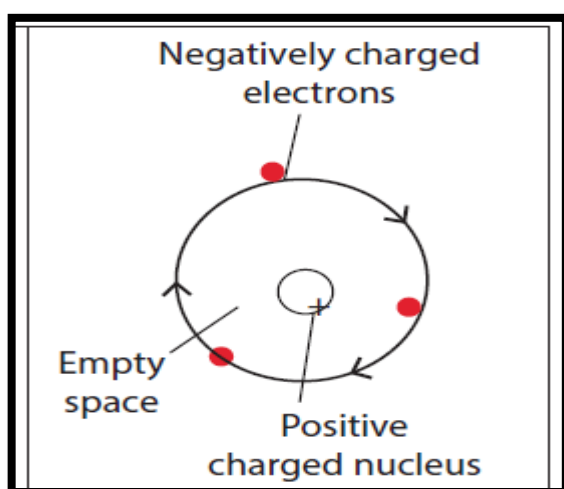
Mass number of Fluorine = 19

## IX. Answer in detail.

1. Draw the structure of an atom and explain the position of the sub-atomic particles.

Atom consist of three sub-atomic. Particles :

- Protons,
- Electrons,
- Neutrons



- I. The nucleus at the centre of the atom has positive charge. Most of the mass of the atom is concentrated in the nucleus.
- II. The negatively charged electrons revolve around the nucleus in specific orbits.
- III. In comparison with the size of the atom, the nucleus is very very small.

2. The atomic number and the mass number of an element is 26 and 56 respectively. Calculate the number of electrons, protons and neutrons in its atom. Draw the structure.

$$\text{Atomic number } A = 26$$

Mass number  $A = 56$

No. of protons  $P = ?$

No. of Electrons  $N = ?$

Name of the element is iron (Fe)

No. of proton ( $p$ ) = 26

Mass number  $A = n + p$

$$56 = n + 26$$

$$n = 56 - 26$$

No. of neutrons  $n = 30$

In an element No. of protons and No. of electrons is equal.

No of electrons = no. of protons = 26.

### 3. What are nucleons? Why are they called so? Write the properties of the nucleons.

The mass of an atom depends on the number of protons and neutrons in the nucleus. Protons and Neutrons are the two types of particles in the nucleus of an atom. They are called nucleons.

#### Properties of Nucleons:

- Nucleons (Proton and Neutrons) have same mass as if they were identical particles that differ only in their electric charge.
- The proton carries a charge +1 and the Neutron is neutral.
- The force that holds the nucleus together is very short range.

#### 4. Define valency. What is the valency of the element with atomic number 8? What is the compound format by this element with hydrogen?

- Valency is defined as the combining capacity of an element.
- Valency of the element with atomic number : 8
- Name of the element Oxygen : 0

Atomic number : 8

Valency : 2

Water ( $H_2O$ ) is the oxide of hydrogen and most familiar oxygen compound.

#### X. Higher Order Thinking Skills.

1. An atom of an element has no electron. Will that atom have any mass or not? Can an atom exist without electron? If so then give example.

- ❖ Atoms with no electron will have mass, because mass depends on number of protons and neutrons though it has no electron.
- ❖ Atoms can exist without electrons, matter is build out of neutrons, protons(+) and electrons (-) .Matter becomes stable only if it is electrically neutral.
- ❖ So atoms without electrons do exist and must have their own states (charged or uncharged transferred back and forth in their environment)

Example:  $He^{2+}$ . It has 2 protons and 2 neutrons but no electron



**2. What is common salt? Name the elements present in it. Write the formula of common salt. What are the atomic number and the mass number of the elements? Write the ions in the compound.**

- Common salt is mostly sodium chloride. The ionic compound with the formula NaCl, representing equal proportions of sodium and chlorine .
- Element present in common salt: sodium & chlorine.
- Formula of common salt: NaCl atomic number and mass number of NaCl: atomic number of Na = 11 Atomic number of Cl = 17 mass number of Na =23.

Mass number of Cl = 35

- Ions present in the compound: sodium ion Na<sup>+</sup> and chloride ion Cl<sup>-</sup>.