

A.Fazil M.Sc., B.Ed., PGT CHEMISTRY  
(Jaisakthi Mt., Hr., Sec., School, Palacode)

## 7. Atoms and Molecules

### I. Short Answer questions:

#### 1. Define Relative atomic mass.

- Relative atomic mass of an element is the ratio between the average mass of its isotopes to 1 / 12th part of the mass of a carbon – 12 atom.
- It is denoted as  $A_r$ .

$$\text{Relative atomic mass} = \frac{\text{Average mass of the isotopes of the element}}{1/12^{\text{th}} \text{ of the mass of one Carbon- 12 atom}}$$

#### 2. Define Atomicity.

- The number of atoms present in the molecule is called atomicity.

#### 3. Give any two examples for heteroatomic molecules.

- HCl
- NaCl.

#### 4. State Avogadro Hypothesis.

- The Avogadro's law states that "equal volume of all gases under similar conditions of temperature and pressure contain the equal number of molecules".
- Mathematically  $V \propto n$

#### 5. Define Atomic number and Mass number.

- The atomic number of an element is the number of protons or number of neutrons and electrons present in it.
- The mass number is the sum of the number of protons and neutrons in an atom.

#### 6. Define molecule.

- A molecule is a combination of two or more atoms held together by the strong chemical force of attraction.

#### 7. What is homo atomic molecule? Give two examples.

- If the molecule is made of similar kind of atoms, then it is called homoatomic molecule.
- Example ;  $H_2$ ,  $Cl_2$

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**8. What is a heteroatomic molecule? Give two examples.**

- The molecule that consists of atoms of different elements is called a heteroatomic molecule.
- Example : HCl, H<sub>2</sub>O

**9. Consider the following and classify them on the basis of their atomicity.**

**H<sub>2</sub>, CCl<sub>4</sub>, O<sub>3</sub>, BF<sub>3</sub>, HCl, HNO<sub>3</sub>, C<sub>12</sub>H<sub>22</sub>O<sub>11</sub>, NO, Cl<sub>2</sub>, He, Au, P<sub>4</sub>**

- Monoatomic molecule – He, Au
- Homo diatomic molecule – H<sub>2</sub>, Cl<sub>2</sub>
- Homo triatomic molecule – O<sub>3</sub>
- Homo polyatomic molecule – P<sub>4</sub>
- Hetero diatomic molecule – HCl, NO
- Hetero polyatomic molecule – CCl<sub>4</sub>, BF<sub>3</sub>, HNO<sub>3</sub>, C<sub>12</sub>H<sub>22</sub>O<sub>11</sub>.

**10. What are the applications of Avogadro's Law?**

- It explains Gay – Lussac's law.
- It helps in the determination of atomicity of gases.
- The molecular formula of gases can be derived using Avogadro's law.
- It determines the relation between molecular mass and vapour density.
- It helps to determine the gram molar volume of all gases, (i.e, 22.4 litres at S.T.P).

**II. Long Answer question:**

**1. Explain the classification of molecules based on atomicity.**

- In accordance with the number of atoms present in the molecules, they are classified as monoatomic, diatomic, triatomic and polyatomic molecules showing that they contain one, two, three or more than 3 atoms respectively.

Atomicity	Number of atoms per molecule	Example
Monoatomic molecule	1	Helium (He), Neon (Ne) metals (Fe, Cu)
Diatomic molecule	2	Hydrogen (H <sub>2</sub> ), Chlorine (Cl <sub>2</sub> )
Triatomic molecule	3	Ozone (O <sub>3</sub> )
Polyatomic molecule	>3	Phosphorous (P <sub>4</sub> ), Sulphur (S <sub>8</sub> )

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**2. What are the differences between atoms and molecules?**

Atom	Molecule
An atom is the smallest particle of an element	A molecule is the smallest particle of an element or compound.
Atom does not exist in the free state except in a noble gas	The molecule exists in the free state
Except some of the noble gas, other atoms are highly reactive	Molecules are less reactive
Atom does not have a chemical bond	Atoms in a molecule are held by chemical bonds
Example: Na	Example: N <sub>2</sub>