

CHEMISTRY 9th (New Book)**CHAPTER NO 4****STOICHIOMETRY****Exercise Multiple Choice Questions**

1.	0.334×10^{23} atoms	2.	Ca_3P_2
3.	6.022×10^{23} amu	4.	CH_2
5.	0.255 moles	6.	3.01×10^{23}
7.	108 g	8.	N_2H_4
9.	Ethane (C_2H_6)	10.	1.32 g

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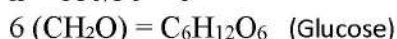
Q#2: Short Question Answer**i. Write down the chemical formula of barium nitride.****Barium Nitride:** Ba_3N_2 **ii. Find out the molecular formula of a compound whose empirical formula is CH_2O and its molar mass is 180.**

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- Empirical formula = CH_2O
- Empirical formula mass of CH_2O = 12 (C) + 2×1 (H) + 16 (O) = **30 g/mol**
- Molecular formula mass = **180 g/mol**

Steps: $n = (\text{molecular mass}) / (\text{formula mass})$

$$n = 180/30 = 6$$

**iii. How many molecules are present in 1.5 g H_2O ?**

- Step 1: Molar mass of H_2O = $2(1) + 16 = 18 \text{ g/mol}$
- Step 2: Moles of H_2O = $1.5 \div 18 = 0.0833 \text{ mol}$
- Step 3: $0.0833 \times 6.022 \times 10^{23} = 5.01 \times 10^{22} \text{ molecules}$

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Final Answer: 5.01×10^{22} molecules of H_2O **iv. Difference between a mole and Avogadro's number:**

Mole	Avogadro's Number
A unit of measurement for amount of substance.	A fixed numerical value: 6.022×10^{23}
Represents a collection of particles (atoms, molecules, ions, etc.).	Represents the number of particles present in one mole.
Symbol: mol .	Symbol: N_A .

v. Write down the chemical equation of the following reaction:



Q #3: Constructed Response Questions

i. Different compounds will never have the same molecular formula but they can have the same empirical formula.

- **Empirical formula** shows the simplest whole-number ratio of atoms in a compound.
- **Molecular formula** shows the actual number of each type of atom.

Examples:

- Glucose $\rightarrow \text{C}_6\text{H}_{12}\text{O}_6$
- Acetic acid $\rightarrow \text{C}_2\text{H}_4\text{O}_2$
- Formaldehyde $\rightarrow \text{CH}_2\text{O}$

All have the same empirical formula: **CH_2O**

ii. Write down the chemical formulas of the following compounds:

Name of compound	Chemical Formula
Calcium Phosphate	$\text{Ca}_3(\text{PO}_4)_2$
Aluminium Nitride	AlN
Sodium Acetate	CH_3COONa
Ammonium Carbonate	$(\text{NH}_4)_2\text{CO}_3$
Bismuth Sulphate	$\text{Bi}_2(\text{SO}_4)_3$

iii. Importance of Avogadro's number in chemistry:

Avogadro's number (6.022×10^{23}) helps count atoms, molecules, or ions by weighing them. It connects the microscopic world of particles to the macroscopic world of grams and moles.

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iv. When 8.657 g of a compound were converted into elements, it gave:

- Carbon = 5.217 g
- Hydrogen = 0.962 g
- Oxygen = 2.478 g

Calculations:

- % C = $(5.217 \div 8.657) \times 100 = 60.26\%$
- % H = $(0.962 \div 8.657) \times 100 = 11.11\%$
- % O = $(2.478 \div 8.657) \times 100 = 28.62\%$

v. How to calculate the masses of products formed in a reversible reaction?

Steps:

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1. Write the balanced chemical equation.
2. Determine initial moles of reactants.
3. Identify the limiting reactant.
4. Assume that x moles of reactants convert to products.
5. Determine the change in concentrations.
6. Apply the equilibrium constant (K_c) to solve for x.
7. Calculate equilibrium moles of products.
8. Convert moles to masses using molar masses.

ZQ #4: Descriptive Questions

1. Which conditions must be fulfilled before writing a chemical equation for a reaction?

Ans: Following conditions must be fulfilled before writing a chemical equation.

- Identification of reactants and products along with their physical state
- Type of reaction i.e. Combustion, synthesis etc.
- Balancing of atoms on both sides of the reaction according to law of conservation of mass. www.ilmkidunya.com

2. Explain the concepts of Avogadro's numbers and mole.

Ans: See answer in Question number 7 & 8

3. How many grams of CO₂ will be produced when react 10 g of CH₄ with excess of O₂ according to the following equation?

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Ans: Moles of CH₄ = $\frac{\text{Mass of CH}_4}{\text{Molar mass of CH}_4} = \frac{10 \text{ g}}{16 \text{ g/mol}} = 0.625 \text{ moles}$

From above equation it is clear that one mole of CH₄ produces one mole of CO₂ so, 0.625 moles of CH₄ will produce 0.625 moles of CO₂

$$\text{Mass of CO}_2 = \text{moles of CO}_2 \times \text{molar mass of CO}_2$$

$$\text{Molar mass of CO}_2 = 12 + 32 = 44 \text{ gmol}^{-1}$$

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$$\text{Mass of CO}_2 = \text{moles of CO}_2 \times \text{molar mass of CO}_2$$

$$\text{Mass of CO}_2 = 0.625 \text{ mole} \times 44 \text{ gmol}^{-1}$$

$$\text{Mass of CO}_2 = 27.5 \text{ g}$$

4. How many moles of coal are needed to produce 10 moles of CO according to the following equation? www.ilmkidunya.com



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Ans: From the above reaction it is clear that 3 moles of Coal produced 3 moles of CO, so 10 moles of Coal produced 10 moles of CO.

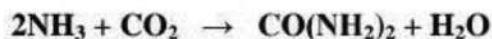
5. **How much SO₂ is needed in grams to produce 10 moles of Sulphur?**



Ans: According to reaction

1 mole of SO₂ produces moles of S = 3 mole

6. **How much ammonia is needed in grams to produce 1kg of urea fertilizer?**



7. **Calculate the number of atoms in the following.**

- (a) 3g of H₂ (b) 3.4 moles of N₂ (c) 10g of C₆H₁₂O₆

Ans: a) We know that

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$$\text{Number of molecules of H}_2 = \frac{\text{Mass of H}_2}{\text{Molar mass of H}_2} \times 6.02 \times 10^{23}$$

$$\text{Number of molecules of H}_2 = \frac{3 \text{ g}}{2.016} \times 6.02 \times 10^{23} = 8.95 \times 10^{23} \text{ molecules}$$

Number of atoms in one molecule = 2

$$\text{Number of atoms in } 8.95 \times 10^{23} \text{ molecule} = 2 \times 8.95 \times 10^{23}$$

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$$= 17.9 \times 10^{23}$$

$$= 1.79 \times 10^{24} \text{ atoms}$$

b) We know that

$$\text{Number of molecules of N}_2 = \text{number of moles} \times 6.02 \times 10^{23}$$

$$\text{Number of molecules of N}_2 = 3.4 \times 6.02 \times 10^{23} = 20.46 \times 10^{23} \text{ molecules}$$

Number of atoms in one molecule = 2

$$\text{Number of atoms in } 20.46 \times 10^{23} \text{ molecule} = 2 \times 20.46 \times 10^{23}$$

$$= 40.92 \times 10^{23}$$

$$= 4.09 \times 10^{24} \text{ atoms}$$

c) We know that

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$$\text{Number of molecules of C}_6\text{H}_{12}\text{O}_6 = \frac{\text{Mass of C}_6\text{H}_{12}\text{O}_6}{\text{Molar mass of C}_6\text{H}_{12}\text{O}_6} \times 6.02 \times 10^{23}$$

$$\text{Number of molecules of C}_6\text{H}_{12}\text{O}_6 = \frac{10 \text{ g}}{180 \text{ g/mol}} \times 6.02 \times 10^{23} = 0.334 \times 10^{23}$$

Number of atoms in one molecule = 24

$$\text{Number of atoms in } 0.334 \times 10^{23} \text{ molecule} = 24 \times 0.334 \times 10^{23}$$

$$= 8.02 \times 10^{23} \text{ atoms}$$