

Stoichiometry - I

Date Planned : __ / __ / __	CBSE Pattern	Expected Duration : 90 Min
Actual Date of Attempt : __ / __ / __	Level - 0	Exact Duration : _____

Very Short Answer Type (1 Mark)

- What will be the mass of one atom of C-12 in grams?
- Calculate the mass percent of calcium, phosphorus and oxygen in calcium phosphate $\text{Ca}_3(\text{PO}_4)_2$.
- Calculate the number of atoms in (A) 0.25 mole atoms of carbon (B) 0.20 mole molecules of oxygen.
- How many molecules and atoms of phosphorus are present in 0.1 moles of P_4 molecules?
- Calculate the number of atoms of hydrogen, oxygen and sulphur in 0.2 mole of sulphuric acid (H_2SO_4).
- How many atoms of each type are present in 143 g of washing soda ($\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$).

Short Answer Type-I (2 Marks)

- How many significant figures should be present in the answer of the following calculations?
 (A) $\frac{0.02856 \times 298.15 \times 0.112}{0.5785}$ (B) 5×5.364 (C) $0.0125 + 0.7864 + 0.0215$
- A compound on analysis was found to contain C = 34.6 %, H = 3.85 % and O = 61.55 %. Calculate its empirical formula.
- How many moles of methane are required to produce 22 g of CO_2 on combustion?
- Dinitrogen and dihydrogen react with each other to produce ammonia according to the chemical equation
 $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightarrow 2\text{NH}_3(\text{g})$
 (A) Calculate the mass of ammonia produced if 2.00×10^3 g dinitrogen reacts with 1.00×10^3 g dihydrogen.
 (B) Will any of the two reactants remain unreacted?
 (C) If yes, which one and what would be its mass?
- What volumes of 10 M HCl and 3 M HCl should be mixed to get 1L of 6 M HCl solution?
- A compound contains 42.3913 % K, 15.2173 % Fe, 19.5652 % C and 22.8260% N. The molecular mass of the compound is 368 u. Find the molecular formula of the compound.
- Calculate the amount of carbon dioxide that could be produced when (A) 1 mole of carbon is burnt in air.
 (B) 1 mole of carbon is burnt in 16 g of dioxygen. (C) 2 moles of carbon are burnt in 16 g of dioxygen.

Short Answer Type-II (3 Marks)

- The reactant which is entirely consumed in reaction is known as limiting reagent. In the reaction $2\text{A} + 4\text{B} \rightarrow 3\text{C} + 4\text{D}$, when 5 moles of A react with 6 moles of B, then
 (i) which is the limiting reagent? (ii) calculate the moles of C formed?

15. A vessel contains 1.6 g of dioxygen at STP (273.15K, 1 atm pressure). The gas is now transferred to another vessel at constant temperature, where pressure becomes half of the original pressure. Calculate
(A) Volume of the new vessel. (B) Number of molecules of dioxygen.
16. Calculate the amount of carbon dioxide that could be produced when
(A) 1 mole of carbon is burnt in air.
(B) 1 mole of carbon is burnt in 16 g of dioxygen.
(C) 2 moles of carbon are burnt in 16 g of dioxygen.
17. Calculate the atomic mass (average) of chlorine using the following data:
- | Isotope | % Natural abundance mass | Atomic mass (a.m.u.) |
|------------------|--------------------------|----------------------|
| ^{35}Cl | 75.77 | 34.9689 |
| ^{37}Cl | 24.23 | 36.9659 |
18. Calculate the average atomic mass of hydrogen using the following data :
- | Isotope | % Natural abundance | Atomic mass (amu) |
|--------------|---------------------|-------------------|
| ^1H | 99.985 | 1 |
| ^2H | 0.015 | 2 |
19. Calcium carbonate reacts with aqueous HCl to give CaCl_2 and CO_2 according to the reaction given below:

$$\text{CaCO}_3(\text{s}) + 2\text{HCl}(\text{aq}) \rightarrow \text{CaCl}_2(\text{aq}) + \text{CO}_2(\text{g}) + \text{H}_2\text{O}(\text{l})$$
What mass of CaCl_2 will be formed when 250 mL of 0.76 M HCl reacts with 1000 g of CaCO_3 ? Name the limiting reagent. Calculate the number of moles of CaCl_2 formed in the reaction.

Long Answer Type (5 Marks)

20. If 4 g of NaOH dissolves in 36 g of H_2O , calculate the mole fraction of each component in the solution.
Also, determine the molarity of solution (specific gravity of solution is 1g mL^{-1}).
21. A crystalline compound when heated became anhydrous by losing 51.2 % of the mass. On analysis, the anhydrous compound gave the following percentage composition: Mg = 20.0 %, S = 26.66 % and O = 53.33 %, Calculate the molecular formula of the anhydrous compound and crystalline compound. The molecular mass of anhydrous compound is 120 u.
22. (a) A solution is prepared by dissolving 3.65 g of HCl in 500 mL of the solution. Calculate the normality of the solution.
(b) Calculate the volume of this solution required to prepare 250 mL of 0.05 N solution.
23. A compound on analysis was found to contain the following composition: Na = 14.31%, S = 9.97%, O = 69.50 % and H = 6.22 % Calculate the molecular formula of the compound assuming that the whole of hydrogen in the compound is present as water of crystallization. Molecular mass of the compound is 322.
24. Chlorine is prepared in the laboratory by treating manganese dioxide (MnO_2) with aqueous hydrochloric acid according to the reaction: $4\text{HCl}(\text{aq}) + \text{MnO}_2(\text{s}) \rightarrow \text{MnCl}_2(\text{aq.}) + \text{Cl}_2(\text{g}) + 2\text{H}_2\text{O}(\text{l})$. How many grams of HCl react with 5.0 g of manganese dioxide?
25. Calculate the concentration of nitric acid in moles per litre in a sample which has a density, 1.41 g mL^{-1} and mass percent of nitric acid in it being 69 %.