

Stoichiometry - I

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

Very Short Answer Type (1 Mark)

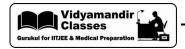
- **1.** What will be the mass of one atom of C-12 in grams?
- $\textbf{2.} \qquad \text{Calculate the mass percent of calcium, phosphorus and oxygen in calcium phosphate } \text{Ca}_3(\text{PO}_4)_2\,.$
- **3.** Calculate the number of atoms in (A) 0.25 mole atoms of carbon (B) 0.20 mole molecules of oxygen.
- **4.** How many molecules and atoms of phosphorus are present in 0.1 moles of P_4 molecules?
- **5.** Calculate the number of atoms of hydrogen, oxygen and sulphur in 0.2 mole of sulphuric acid (H_2SO_4) .
- **6.** How many atoms of each type are present in 143 g of washing soda (Na₂CO₃·10H₂O).

Short Answer Type-I (2 Marks)

- 7. 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
- **8.** A compound on analysis was found to contain C = 34.6 %, H = 3.85 % and O = 61.55 %. Calculate its empirical formula.
- **9.** How many moles of methane are required to produce 22 g of CO_2 on combustion?
- 10. Dinitrogen and dihydrogen react with each other to produce ammonia according to the chemical equation $N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$
 - (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?
- 11. What volumes of 10 M HCl and 3 M HCl should be mixed to get 1L of 6 M HCl solution?
- **12.** 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.
- **13.** 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)

- 14. The reactant which is entirely consumed in reaction is known as limiting reagent. In the reaction $2A + 4B \rightarrow 3C + 4D$, 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
^{2}H	0.015	2

19. Calcium carbonate reacts with aqueous HCl to give $CaCl_2$ and CO_2 according to the reaction given below:

 $CaCO_3(s) + 2HCl(aq) \rightarrow CaCl_2(aq) + CO_2(g) + H_2O(l)$

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 $1g\ mL^{-1}$).
- 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.
- 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: $4HCl(aq) + MnO_2(s) \rightarrow MnCl_2(aq.) + Cl_2(g) + 2H_2O(l)$. 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 %.