Dpp-16 Stepwise Solutions
Full-1 [NEET+JEE] • Some Basic Concepts of Chemistry

Naruto Uzumaki: "I'm always going to believe in myself. That's the one thing that will never change."
Even if the world doubts you... don't stop believing in yourself. That is your real strength.

Q1. One mole of an ideal gas at STP occupies:

Conceptual Approach : STP (273 K, 1 atm) par 1 mol ideal gas ka volume $\approx 22.4\,\text{L}$.

Final Answer: (B) 22.4 L.

Q2. At STP, 2.24 L of a gas weighs 1.6 g. The molar mass is:

Conceptual Approach : STP par 22.4 L = 1 mol. To 2.24 L = 0.1 mol.

Steps: $M = \dfrac{\text{mass}}{\text{moles}} = \dfrac{1.6}{0.1} = 16$ g/mol.

Final Answer: (A) 16 g/mol.

Q3. Number of protons in 4.9 g of H_2SO_4:

Conceptual Approach : Molar mass = 98. Molecules $= \dfrac{4.9}{98}N_A = 0.05N_A$. Each H_2SO_4 has total protons $= 2(1) + 16 + 4(8) = 50$.

Steps: Total protons $= 0.05N_A \times 50 = 2.5N_A \approx 1.51 \times 10^{24}$.

Final Answer: $\boxed{\approx 1.5 \times 10^{24}}$. *(Options me exact match nahi — see Errata.)*

Q4. Total electrons in 1.15 g of NaCl (Na 23, Cl 35.5):

Conceptual Approach : NaCl per formula unit electrons $= 11 + 17 = 28$. Moles $= \dfrac{1.15}{58.5} = 0.01966$.

Steps: Units $= 0.01966\,N_A \Rightarrow e^- = 28 \times 0.01966\,N_A \approx 3.31 \times 10^{23}$.

Final Answer: $\boxed{\approx 3.3 \times 10^{23}}$. *(Closest option missing — see Errata.)*

Q5. Mass of 1 atom of oxygen (O = 16):

Conceptual Approach : 1 atom mass $= \dfrac{16\,\text{g}}{N_A}$.

Final Answer: (A) 2.66×10^{-23} g.

Q6. Molecules in 5.6 g of N_2:

Conceptual Approach : $M = 28 \Rightarrow n = \dfrac{5.6}{28} = 0.2$ mol; molecules $= 0.2N_A$.

Final Answer: $\boxed{\approx 1.2 \times 10^{23}}$. *(Options seem for 5.6 L, not g — see Errata.)*

Q7. Molarity of 9.8 g H_2SO_4 in 1 L solution:

Conceptual Approach : $M = \dfrac{\text{moles}}{\text{L soln}}$. Moles $= 9.8/98 = 0.1$.

Final Answer: (B) 0.1 M.

Q8. Molality of 5 g NaOH in 500 g water:

Conceptual Approach : Molality $m = \dfrac{\text{moles solute}}{\text{kg solvent}}$. NaOH $M = 40$.

Steps: $n = \dfrac{5}{40} = 0.125$, solvent $= 0.500$ kg $\Rightarrow m = 0.125/0.5 = 0.25$.

Final Answer: (C) 0.25 m.

Q9. Convert 0.5 M NaOH to molality (density = 1.04 g/mL):

Conceptual Approach : 1 L soln mass = 1040 g; solute = 0.5 mol = 20 g; solvent $= 1040 - 20 = 1020$ g $= 1.02$ kg.

Steps: $m = \dfrac{0.5}{1.02} \approx 0.49$.

Final Answer: (A) ≈ 0.48–0.49 m.

Q10. 20% w/w NaOH, density = 1.2 g/mL. Molarity?

Conceptual Approach : 100 g solution $\Rightarrow$ 20 g NaOH $= 0.5$ mol; volume $= 100/1.2 = 83.33$ mL $= 0.08333$ L.

Steps: $M = 0.5/0.08333 = 6.0$.

Final Answer: (B) 6.0 M.

Q11. 100 mL 1 M HCl diluted to 250 mL: new molarity?

Conceptual Approach : Dilution: $M_1V_1 = M_2V_2$.

Steps: $1 \times 0.100 = M_2 \times 0.250 \Rightarrow M_2 = 0.4$.

Final Answer: (C) 0.4 M.

Q12. Mix 200 mL 0.5 M HCl with 300 mL 0.2 M HCl. Final molarity?

Conceptual Approach : Add moles, divide by total volume.

Steps: $n = 0.2 \times 0.5 = 0.1 + 0.3 \times 0.2 = 0.06 \Rightarrow 0.16$ mol; $V = 0.5$ L.

Final Answer: (B) $0.16/0.5 = 0.32$ M.

Q13. Litres of O_2 (STP) to burn 4 g H_2:

Conceptual Approach : $2H_2 + O_2 \rightarrow 2H_2O$. 4 g $H_2 = 2$ mol $\Rightarrow O_2 = 1$ mol.

Final Answer: (B) 22.4 L.

Q14. Mass of CO_2 from burning 44 g CH_4 (excess O_2):

Conceptual Approach : $CH_4 \rightarrow CO_2$ 1:1 in moles. $n(CH_4) = 44/16 = 2.75$.

Steps: $m(CO_2) = 2.75 \times 44 = 121$ g.

Final Answer: $\boxed{121\text{ g}}$. *(Options inconsistent — see Errata.)*

Q15. 2 g H_2 reacts with 32 g O_2. Limiting reagent?

Conceptual Approach : Stoichiometry $2H_2 : O_2$. $n(H_2) = 1$ mol; $n(O_2) = 1$ mol. Need 2 mol H_2 per 1 mol $O_2 \Rightarrow H_2$ short.

Final Answer: (A) H_2 is limiting.

Q16. 5 g Ca with 10 g O_2. Limiting reagent & moles of CaO?

Conceptual Approach : $2Ca + O_2 \rightarrow 2CaO$. $n(Ca) = 5/40 = 0.125$; $n(O_2) = 10/32 = 0.3125$.

Steps: Ca limiting; moles CaO = 0.125.

Final Answer: (C) Ca, 0.125 mol.

Q17. The % yield if theoretical = 10 g, actual = 8 g:

Conceptual Approach : $\%\text{yield} = \dfrac{\text{actual}}{\text{theoretical}} \times 100$.

Final Answer: (C) 80%.

Q18. 10 g impure $CaCO_3$ gives 2.24 L CO_2 (STP). % purity?

Conceptual Approach : 2.24 L $\Rightarrow$ 0.1 mol $CO_2 \Rightarrow$ 0.1 mol $CaCO_3 = 10$ g pure eqv.

Final Answer: $\boxed{100\%}$. *(Options don't include 100% — see Errata.)*

Q19. An organic compound: 40% C, 6.7% H, 53.3% O. Empirical formula?

Conceptual Approach : % $\rightarrow$ moles: 40/12, 6.7/1, 53.3/16 $\Rightarrow$ 3.33 : 6.7 : 3.33 $\Rightarrow$ 1 : 2 : 1.

Final Answer: (A) CH_2O.

Q20. C = 75%, H = 25%. Empirical formula?

Conceptual Approach : $75/12 = 6.25$, $25/1 = 25 \Rightarrow 1 : 4$.

Final Answer: (C) CH_4.

Q21. Mass % of oxygen in H_2O:

Conceptual Approach : Total = 18. O = 16 $\Rightarrow 16/18 = 88.9\%$.

Final Answer: (D) 88.9%.

Q22. Mass % of sulphur in H_2SO_4:

Conceptual Approach : $M = 98$, S = 32 $\Rightarrow 32/98 = 32.65\%$.

Final Answer: (A) $\approx 32.6\%$.

Q23. Avg. atomic mass of Cl (35 at 75%, 37 at 25%):

Conceptual Approach : Weighted average: $0.75 \times 35 + 0.25 \times 37 = 35.5$.

Final Answer: (B) 35.5.

Q24. Avg. atomic mass of B (10B 20%, 11B 80%):

Conceptual Approach : $0.2 \times 10 + 0.8 \times 11 = 10.8$.

Final Answer: (C) 10.8.

Q25. Vapour density of a gas with $M = 44$ g/mol:

Conceptual Approach : VD $= M/2$.

Final Answer: (B) 22.

Q26. A gaseous oxide has VD = 22. Molecular mass?

Conceptual Approach : $M = 2 \times \text{VD} = 44$.

Final Answer: (C) 44.

Q27. Law: "Mass can neither be created nor destroyed":

Conceptual Approach : **Law of conservation of mass** (Lavoisier).

Final Answer: (B).

Q28. Two oxides of nitrogen contain 30 g O with 14 g and 28 g N. Law illustrated:

Conceptual Approach : Same element ke multiple compounds me small whole-number ratios $\Rightarrow$ multiple proportion.

Final Answer: (C) Law of multiple proportion.

Q29. Equivalent weight of H_2SO_4 (acid–base):

Conceptual Approach : Basicity $= 2 \Rightarrow$ Eq. wt $= 98/2 = 49$.

Final Answer: (B) 49.

Q30. Equivalent weight of $KMnO_4$ in acidic medium (M = 158):

Conceptual Approach : Acidic medium me n-factor $= 5 \Rightarrow$ Eq. wt $= 158/5 = 31.6$.

Final Answer: (A) 31.6.

Notes / Errata (to prevent student confusion):

- **Q3:** Correct proton count $\approx 1.5 \times 10^{24}$ (no exact option). Each H_2SO_4 has 50 protons.
- **Q4:** Correct total electrons $\approx 3.3 \times 10^{23}$ (no matching option).
- **Q6:** Given data says "5.6 g N_2" $\Rightarrow$ molecules $\approx 1.2 \times 10^{23}$. Options look like the common case "5.6 L" ($= 0.25$ mol $\Rightarrow 1.5 \times 10^{23}$).
- **Q14:** From 44 g CH_4, $m(CO_2) = 121$ g. Options don't include 121 g.
- **Q18:** Data gives purity = 100% (not in options).