Mole Concept

DPP-5 Solutions

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1. **1 : 2**

Sol. $H_2SO_4 + 2NaOH \rightarrow Na_2\ SO_4 + 2H_2O$

$H_3PO_4 + NaOH \rightarrow NaH_2PO_4 + H_2O$

Ratio of weights of H_2SO_4 to H_3PO_4

eqt mass of H_2SO_4 = 98/2 = 49

eqt mass of H_3PO_4 = 98/1 = 98

Ratio = 1 : 2

2. **32**

Sol. Cl has an equivalent weight of 35.5

Equivalent weight of S in SCl_2

$= \dfrac{\text{Atomic mass of S}}{\text{valency factor}} = \dfrac{32}{2} = 16$

Equivalent wt. of S in S_2Cl_2 = $\dfrac{32}{1} = 32$

3. **CuCl**

Sol. Equivalent wt. of copper chloride

= Eq. wt. of Cl + Eq. wt. of Cu

$\Rightarrow 99.5 = 35.5 + \dfrac{63.5}{x}$

$\Rightarrow x = 1$

$\Rightarrow$ Compound is CuCl.

4. **56, 3.36 Litres**

Sol. Equivalents of sulphuric acid = Equivalents of metal = Equivalents of Hydrogen

$\Rightarrow \dfrac{14.7}{49} = \dfrac{16.8}{M} \Rightarrow M = 56$

$\Rightarrow$ Equivalents of hydrogen = $\dfrac{\text{volume}}{\text{Eq. volume}}$

$\therefore \quad \dfrac{14.7}{49} = \dfrac{V}{11.2}$

$\Rightarrow \quad V = 3.36L$

5. **(a) 13.7 mL, (b) 28.0L**

Sol. Let volume of solution = 'V' L

(a) $\text{Normality} = \dfrac{\text{equivalents of solute}}{\text{volume of solution (L)}}$

$0.232 = \dfrac{3.17 \times 10^{-3}}{V}$

$\Rightarrow V_{solution}$ = 13.7 mL

(b) $0.232 = \dfrac{6.5}{V}$

V = 28.0L

6. **(a) 2, (b) 0.5, (c) 0.1**

Sol. (a) No. of equivalents = 1 × 2 = 2 eqts

(b) No. of equivalents = 1 × 0.5 = 0.5 eqts

(c) No. of equivalents = 0.5 × 0.2 = 0.1 eqts

7. **(a) 12.5mL (b) 3.07g**

Sol. **(a)** Let volume of H_2SO_4 = V*l*

eqts of H_2SO_4 = eqts of NaOH.

$\Rightarrow 5 \times V = \dfrac{2.5}{40}$

$\Rightarrow V = 12.5$ m*l*

(b) Mass of pure H_2SO_4

$= 12.5 \times 10^{-3} \times 5 = \dfrac{\text{wt.}}{49}$

$\Rightarrow$ wt. = 3.07g

8. **43.0 mL**

Sol. moles of H_2SO_4 = $\dfrac{93.2}{98}$

$V_{solution}$ = $\dfrac{100}{1.835}$ mL

$\text{Molarity} = \dfrac{93.2 \times 1.835 \times 1000}{98 \times 100}$

= 17.45 M

Normality = 17.45 × 2 = 34.9N

$N_1V_1 = N_2V_2$

34.9V = 3 × 0.5

V = 43 mL

9. **29 mL**

Sol. Moles of HCl = $\dfrac{38}{36.5}$

$V_{solution}$ = $\dfrac{100}{1.19}$mL

$\text{Molarity} = \dfrac{38 \times 1.19 \times 1000}{36.5 \times 100}$

= 12.389 M

Normality = Molarity (Z = 1)

$N_1V_1 = N_2V_2$

$12.389V = 18 \times \dfrac{1}{50}$

V = 29 mL.

10. **0.0556N, 2.22 mg/mL**

Sol. Applying normality Eqn.

$N_1V_1 = N_2V_2$

$\Rightarrow 50 \times N = 27.8 \times 0.1$

$\Rightarrow N = 0.0556$

1000 mL has = 0.0556 eqts

1 mL has = $\dfrac{0.0556}{1000}$ eqts

$= 5.56 \times 10^{-5}$ eqts

$\dfrac{w}{40} = 5.56 \times 10^{-5}$

w = 2.22×10^{-3}g = 2.22 mg/mL

11. **203.8 g/eq**

Sol. Let equivalent wt. of acid = E g

No. of equivalents of acid = $\frac{1.243}{E}$

$\Rightarrow \frac{1.243}{E} = \frac{31.72}{1000} \times 0.1923$

$\Rightarrow x = 203.8\ g/eq.$

12. **(a)**

Sol. 18 g = N_A

36 g = $2N_A$

13. **(b)**

Sol. 3/2 moles of O_2 combines with = 2 moles g Al

$\Rightarrow$ net = 2 × 27 = 54 g

14. **(c)**

Sol. 2 moles of Al react with 3/2 moles of O to give 1 mol of Al oxide.

15. **(a)**

Sol. 18 mL = 6.02×10^{23} molecules

0.0018 mL = 6.02×10^{19}

16. **(d)**

Sol. $3\ BaCl_2 + 2Na_3PO_4 \rightarrow Ba_3(PO_4)_2 + 6\ NaCl$

0.5 mol 0.2 mol

3 mol $BaCl_2$ = 2 mol Na_3PO_4

0.5 mol $BaCl_2 = \frac{2}{3} \times 0.5 = 0.33$ mol Na_3PO_4

$\Rightarrow$ Na_3PO_4 = LR

2 mol $Na_3PO_4 \equiv$ 1 mol $Ba_3(PO_4)_2$

0.2 mol $Na_3PO_4 \equiv$ 0.1 mol $Ba_3(PO_4)_2$

17. **(b)**

Sol. (b) 5 × 28 = 140 g

(c) 0.1 × 108 = 10.8 g

(d) 6 g

18. **(c)**

Sol. 18 g = 6.02×10^{23} atoms

$\Rightarrow 10 \times 6.02 \times 10^{23}$ ions

19. **(d)**

Sol. 18 mL $\equiv N_A$ molecules

$1\ L \equiv \frac{N_A}{18} \times 1000 = 55.55\ N_A$