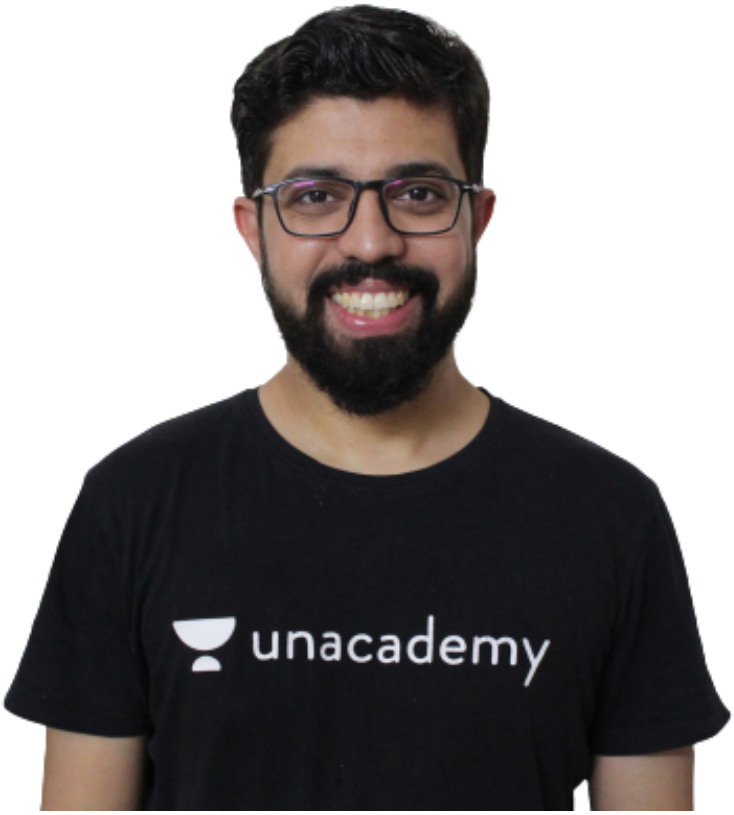
Mole Concept

DPP-4



Ashish Bibyan
B.Tech (IIT Delhi)
Referral Code: ABSIRLIVE

1. Potassium permanganate ($KMnO_4$) reacts with oxalic acid ($H_2C_2O_4$) in aqueous sulfuric acid according to the following equation:

$$2\ KMnO_4 + 5\ H_2C_2O_4 + 3\ H_2SO_4 \longrightarrow 2\ MnSO_4 + 10\ CO_2 + 8\ H_2O + K_2SO_4$$

How many milliliters of a 0.250 M $KMnO_4$ solution are needed to react completely with 3.225 g of oxalic acid?

2. When 150.0 mL of 2.000 M NaOH was added to 100.0 mL of a sulfuric acid solution, it required 43.0 mL of 0.5000 M HCl to neutralize the excess base. What was the original concentration of H_2SO_4?

3. How many mL of 3.00 M HCl should be added to react completely with 16.8 g of $NaHCO_3$? $HCl + NaHCO_3 \rightarrow NaCl + CO_2 + H_2O$.

4. How many mL of water must be added to 200 mL of 0.65 M HCl to dilute the solution to 0.20 M?

5. What concentration of NaCl finally results from the mixing of 2.00 L of 4.00 M NaCl with 3.00 L of 1.50 M NaCl plus sufficient water to dilute the solution to 10.0 L?

6. What is the volume of the solution that would result by diluting 70.00 mL of 0.0913 M NaOH to a concentration of 0.0150 M?

7. How would one prepare exactly 3.00 L of 1.00 M NaOH by mixing portions of stock solutions of 2.50 M NaOH and 0.400 M NaOH?

8. Determine the molar concentration of each ionic species in solution after each of the following operations:

(a) 200 mL of 2.0 M NaCl is diluted to 500 mL.

(b) 200 mL of 2.0 M $BaCl_2$ is diluted to 500 mL

(c) 200 mL of 3.00 M NaCl is added to 300 mL of 4.0 M NaCl

(d) 200 mL of 2.0 M $BaCl_2$ is added to 400 mL of 3.0 M $BaCl_2$ and 400 mL of water

(e) 300 mL of 3.0 M NaCl is added to 200 mL of 4.0 M $BaCl_2$.

9. What volume of 95.0% alcohol by weight (density 0.809 g/cm^3) must be used to prepare 150 cm^3 of 30.0% alcohol by weight (density 0.957 g/cm^3)?

10. The odor of skunks is caused by chemical compounds called thiols. These compounds, of which butanethiol ($C_4H_{10}S$) is a representative example, can be deodorized by reaction with household bleach (NaOCl) according to the following equation:

$$2C_4H_{10}S + NaOCl(aq) \rightarrow C_8H_{18}S_2 + NaCl\,(aq) + H_2O\,(aq)$$

How many grams of $C_4H_{10}S$ can be deoxidised reaction with 5ml of 0.0985 M NaOCl solution.

11. Calcium carbonate reacts with aqueous HCl to give $CaCl_2$ and CO_2 according to the reaction $CaCO_3\,(s) + 2\ HCl\,(aq) \rightarrow CaCl_2\,(aq) + CO_2(g) + H_2O\ (\ell)$

What mass of $CaCO_3$ is required to react completely with 25 mL of 0.75 M HCl ?

(NCERT Problem)

12. Methyl benzoate is prepared by the reaction between benzoic acid and methanol, according to the equation

$$C_6H_5COOH + CH_3OH \rightarrow C_6H_5COOCH_3 + H_2O$$

Benzoic acid Methanol Methyl benzoate

In an experiment 24.4 gm of benzoic acid were reacted with 70.0 L of CH_3OH. The density of CH_3OH is 0.79 g/L. The methyl benzoate produced had a mass of 21.6 g. What is the percentage yield of product ?

(a) 91.7% (b) 79.4% (c) 71.5% (d) 21.7%

13. A sample of H_2SO_4 (density 1.8 g/ml) is 90% by weight. What is the volume of the acid that has to be used to make 1 litre of 0.2 M H_2SO_4?

(a) 16 mL (b) 10 mL (c) 12 mL (d) 18 mL

14. 100 ml 5 M $AgNO_3$ when reacts with 200 ml 5M of NaCl, the concentration of Na^+ in the resulting solution is (Given, density of resulting solution=1g/cc)

(a) 10/3 (M) (b) 12/3 (M)

(c) 76.666 mg/mg of sol^n. (d) 7.6666 ppm

ANSWERS

1. 57.28mL **2.** 1.3925 M **3.** 66.67 mL **4.** 450 mL **5.** 1.25 M

6. 426 ml **7.** 2.14L of 0.4M solution

8. **(a)** 0.8M Na^+, 0.8M Cl^-, **(b)** 0.8M Ba^{2+}, 1.6M Cl^-, **(c)** 3.6M Na^+, 3.6M Cl^-

(d) 1.6M Ba^{2+}, 3.2M Cl^-, **(e)** 1.8M Na^+, 1.6M Ba^{2+}, 5M Cl^-.

9. 56.03mL **10.** 0.08865g **11.** 0.9375 g **12.** (b) **13.** (c)

14. (a)