

7- weight by weight % (w/w) (1)

$$(\% w/w) = \frac{\text{mass of solute (g)}}{\text{mass of solution (g)}} \times 100\%$$

Question (1)

A solution its weight 200g it contains 25g of sodium sulphate Na_2SO_4 Calculate the concentration in weight by weight (% w/w)

$$\% w/w = \frac{\text{wt of solute}}{\text{wt of solution}} \rightarrow \% w/w = \frac{25\text{g}}{200\text{g}} \times 100 = 12.5\%$$

Question (2)

calculate the (% w/w) for a solution prepared from dissolve 5g of AgNO_3 in 100ml of H_2O . Density of water is 1g/ml

$$\text{Density} = \frac{\text{mass}}{\text{volume}} \rightarrow \text{mass of solvent} = 1\text{g/ml} \times 100\text{ml}$$

$$\text{mass of solvent} = 100\text{g}$$

$$\text{wt (g) of solution} = 100\text{g} + 5\text{g} = 105\text{g}$$

$$(\% w/w) = \frac{\text{wt of solute}}{\text{wt of solution}} \times 100 = \frac{5\text{g}}{105\text{g}} \times 100 = 4.76\%$$

Question (Homework)

what is the weight of water required to dissolve 25g of sodium chloride to prepare 8% (w/w) solution.

(2)

Question (3)

If we need to prepare a solution of NaOH with concentration of 20% (w/w) with total weight of solution equals to 2 Kg. How many grams of sodium hydroxide required.

$$\text{Conc. \% (w/w)} = \frac{\text{wt of NaOH (g)}}{\text{wt of solution (g)}} \times 100\% \rightarrow$$

$$\text{wt of sodium hydroxide} = \frac{(\% \text{ w/w}) \times \text{wt of solution (g)}}{100\%} \rightarrow$$

$$\text{wt of NaOH} = \frac{20(\% \text{ w/w}) \times 2000 \text{ g}}{100\%} = 400 \text{ g of NaOH}$$

Question (4)

How many grams of NaCl required to prepare each of the following solutions.

1) 20% (w/w) NaCl in 250 g solution.

2) 2500 ppm NaCl in 250 ml solution

Solution

$$\text{wt of NaCl (g)} = \frac{(\% \text{ w/w}) \times \text{wt of solution (g)}}{100\%}$$

$$\text{wt of NaCl} = \frac{20(\% \text{ w/w}) \times 250 \text{ g}}{100\%} = 50 \text{ g of NaCl}$$

$$2) \text{ Conc. (ppm)} = \frac{\text{wt of solute (mg)}}{\text{volume of solution (L)}} \rightarrow$$

$$\text{wt of NaCl} = 2500 \times 0.25 \text{ L} = 625 \text{ mg} = 0.625 \text{ g}$$

(3)

Weight by Volume % (w/v)

$$\text{Conc. \% (w/v)} = \frac{\text{wt of solute (g)}}{\text{Volume of solution (ml)}} \times 100\%$$

Question (1)

What is the concentration of MgSO_4 prepared from dissolve 30g of MgSO_4 in 500 ml distilled water, expressing concentration in (% w/v), ppm, and (% w/w).

Assume solution density is 1.06 g/ml

$$\text{Conc. \% (w/v)} = \frac{\text{wt of solute}}{\text{Volume of solution}} \times 100\%$$

$$(\% \text{ w/v}) = \frac{30 \text{ g}}{500 \text{ ml}} \times 100 = 6\% \text{ w/v } \text{MgSO}_4$$

$$\text{ppm} = \frac{\text{wt of solute (mg)}}{\text{Volume of solution (L)}} = \frac{30000 \text{ mg}}{0.5 \text{ L}} = 60000 \text{ ppm}$$

$$\% \text{ w/v} = \% \text{ w/w} \times \text{density of solution} \rightarrow$$

$$(\% \text{ w/w}) = \frac{6\%}{1.06} = 5.66\% \text{ (w/w)}$$

Question (2)

How many grams of sodium persulfate $\text{Na}_2\text{S}_2\text{O}_8$ required to prepare a 1L solution of sodium persulfate with concentration of 10% (w/v).

$$(\% \text{ w/v}) = \frac{\text{wt of solute } \text{Na}_2\text{S}_2\text{O}_8}{\text{Volume of solution (ml)}} \times 100\% \rightarrow$$

$$\text{wt of } \text{Na}_2\text{S}_2\text{O}_8 = \frac{(\% \text{ w/v}) \times \text{Volume of solution (ml)}}{100\%} \rightarrow$$

$$\text{wt of Na}_2\text{S}_2\text{O}_8 = \frac{10\% \text{ (w/v)} \times 1000 \text{ ml of Solution}}{100\%} \rightarrow \textcircled{11}$$

$$\text{wt of Na}_2\text{S}_2\text{O}_4 \text{ (g)} = 100 \text{ g of Na}_2\text{S}_2\text{O}_8$$

Question (3)

10 gram barium chloride BaCl_2 is dissolved in 90 g of water, the density of the solution is 1.090 g/ml . Calculate the weight/volume percentage Concentration of the Solution.

$$\text{weigh of Solution} = \text{weigh of Solute} + \text{weigh of Solvent}$$

(BaCl_2) (Water)

$$\text{weigh of Solution} = 10 \text{ g} + 90 \text{ g} = 100 \text{ g}$$

$$\text{Density} = \frac{\text{weigh}}{\text{Volume}} \rightarrow \text{Volume of Solution} = \frac{100 \text{ g}}{1.09 \text{ g/ml}}$$

$$\text{Volume of Solution} = 91.74 \text{ ml}$$

$$\text{(w/v)\%} = \frac{\text{weigh of Solute}}{\text{Volume of Solution}} \times 100$$

$$\text{(w/v)\%} = \frac{10 \text{ g}}{91.74 \text{ ml}} \times 100 = 10.9 \text{ g/100 ml}$$

Question (4)

2L of an aqueous solution of potassium chloride contains 45 g of KCl . What is the weight/volume Percentage Concentration of this solution in g/100 ml .
(Homework).

Q) Volume by Volume % (V/V)

$$\% (V/V) = \frac{\text{Volume of Solute (ml)}}{\text{Volume of Solution (ml)}} \times 100$$

Question (1)

Calculate the % (V/V) for solution was prepared by add 50 ml of C_2H_5OH to 450 ml of H_2O .

Volume of Solution = Volume of solute + Volume of solvent
 Volume of Solution = 50 ml + 450 ml = 500 ml

$$\% (V/V) = \frac{\text{Volume (ml) of Solute}}{\text{Volume of Solution (ml)}} \times 100$$

$$\% (V/V) = \frac{50 \text{ ml}}{500 \text{ ml}} \times 100 = 10\% (V/V)$$

Note: There are relationship between the N, M and % (W/W), % (W/V) as shown below

$$M = \frac{\% (W/W) \times \text{density of solution} \times 10}{m.wt}$$

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$$N = \frac{\% (W/W) \times \text{density of solution} \times 10}{Eq.wt}$$

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