Analytical Chemistry

1st Class

Seventh lecture. Analytical Chemistry.

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Caculation examples in analytical chemistry

Example (1): How many milligrams are in 0.250 mmole Fe_2O_3 (Ferric oxide).

Solution: $Moles = \frac{W}{M.wt.}$

wt (mg)=mmole×M.wt (mgmmol) =0.250 mmole ×159.7mgmmol =39.9 mg

Example (2): Solution was prepared by dissolving 1.26 g of $AgNO_3$ in a 250 mL volumetric flask and diluted to the mark. Calculate the molarity of the silver nitrate solution. How many millimoles of $AgNO_3$ were dissolved.

No. of moles = $M \times V_{(L)}$

No. of millimoles = $M \times V_{(mL)}$

Solution:

M=wt (g)x 1000/ M.wt (gmol) × V(mL)

M= 1.26 (g)x 1000 / 169.9 (gmol) × 250 (mL)=0.0297 mol/L

Millimoles=M (mmolmL)×V (mL) =0.0297 (mmolmL)×250 mL=7.42 mmole

Example (4): How many grams of Na2SO4 should be weight out to prepare 500 mL of a 0.10 M solution.

$$\mathbf{M = wt\ (g) \times 1000 / M.wt\ (gmol) \times V(mL)}$$

$$\mathbf{0.10\ M = wt\ (g) \times 1000\ (mL) / 142\ (gmol) \times 500\ (mL)}$$

Wt=**7.1 g** (should be weight out to prepare 500 mL of a 0.10 M solution)

Example (5): Prepare 500 of 1.2M HCl If you know the percentage of acid is 37% and the Specific graffiti is 1.2.

$$M = Sp.gr \times \% \times 10 \div M.wt$$

M= 1.2 x 37x 10 /36.5 = 12.164 mol/L (هذه عيارية الحامض المركز)

$$M1 \times V1 = M2 \times V2$$

$$12.164 \times V1 = 1.2 \times 500$$

V1= 49.325 take out this volume and complete it to 500 ml by D.W (يؤخذ هذا الحجم ويكمل الى حد العلامة 500 مليلتر بالماء المقطر)

Example (11): **Prepare 300 mL of 0.108 M of $BaCI_2 .2H_2O$?**

Ba = 137.32, Cl = 35.45, O = 16, H = 1

M. wt. of $BaCI_2 .2H_2O$ is =244.3 g/mol

$$M = \frac{wt.gram\ x\ \ 1000}{Mwt.\ x\ Vml}$$

$$0.108 = \frac{Wt.\ x\ 1000}{244.3\ x\ \ 300}$$

Wt. = 7.9153 grams were dissolved in water and diluted to 300 ml.

Example (12): **How many grams are contained in 500 ml of 0.2 M sodium carbonate**?

Mwt. Na_2CO_3 =106 g/ mol

$$\mathbf{M} = \frac{wt;\ gram\ x\ 1000}{MWt.\ x\ \ Vml} \quad ,$$

$$0.2 = \frac{Wt.\ \ x\ 1000}{106\ \ x\ \ 500}$$

Wt. = 10.6 grams are present in this solution

الفورمالية هي عدد اوزان الصيغة الغرامي للمذاب في لتتر واحد من المحلول هو التركيز الكلي للمادة في المحلول بغض النظر عن شكلها الكيميائي المحدد

$$F = \frac{wt. \quad x \quad 1000}{gfwt. \quad x \quad Vml.}$$

F= No. Fw/ Liter of solution
F= gram of solute / one liter of solution x g.FW
Unit= g. FW/L

Example: 284 g of Na_2SO_4 has been dissolved in water (4 L). Calculate the formality if you know the atomic weight of Na= 23, S=32, O=16.

$$F = \frac{Wet\ x1000}{\text{gfw x V(mL)}}$$

$$F = \frac{284\ X\ 1000}{142\ X\ 4000} = 0.5 \text{ g.FW/L}$$

Example: Exactly 4.57 grams of $BaCl_2 .2H_2O$ were dissolved in Water and diluted to 250 ml. What formal Concentration of barium chloride can get?

formal weight for $BaCl_2 .2H_2 O$ = 244

$$F = \frac{wt. \quad x \quad 1000}{gfwt. \quad x \quad Vml.} \quad , \quad F = \frac{4.57 \quad x \quad 1000}{244 \quad x \quad 250}$$

F = 0.0749

Example: Calculate the w/w% for the solution prepared by dissolving 5 g of $AgNO_3$ in 100 ml of water.

Assumed density of water equal 1 g/ml.

wt. solvent = d x V = 1 x100 = 100 g

wt. solution = 100 + 5 = 105 g

% w/w = 5 /105 x 100 = 4.76 % for $AgNO_3$

Example: Calculate the V/V percentage for solution prepared by mixing 125 ml of methyl alcohol with 500 ml of water

$$(V/V)\,\% = \frac{V_{(solut)}}{V_{(solut)} + V_{(solvent)}} \times 100$$

$$= \frac{125}{(125 + 500)} \times 100 = 20\,\%$$