الباب الثالث
المحاليــــــل

البـاب الثالـث
المحاليــل

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.

:

.

(Solute)

(Solvent)

.

صفات المحاليل Properties of Solutions :

(Immiscible)   (Miscible)

.(Partial miscible)

.

(Homegenous mixture)

.

(Ehylacetate)

7.9%

7.9%

.

.

.

.

–   –

–   .   –

.

$CuSO_4$

.

.

<div dir="rtl">

:

1-

.

2-

3- .

4- .

5- .

أنواع المحاليل Types of Solutions :

:

.

:

:

1- **Ture Solutions** :

.

2- **Suspended Solutions** :

</div>

- 77 -

.

‫3-‬ : **Colloidal Solutions**

.

.

:

:

‫1-‬ : **Saturated Solutions**

.

.

Solubility

:

.

.

.

‫2-‬ : **UnSaturated   Solutions**

.

.

- **78** -

3- **Super Saturated Solutions** :

.

.

.

1- **Gram – atomic weight**

.

2- **Gram – molecular weight**

(mole)

.

:

(HCI) :

36.5 = 35.5 +1 = HCI = H + CI

(NaOH) :

40 = 1 + 16+23 = NaOH = Na + O +H

3- − **Gram –ion**

.

:

AgNO₃ −

(108) وزن الفضة – ...

(62) ... .

$$AgNO_3 = Ag+ + NO_3^-$$

$$14 + (16 \times 3) \quad 62 = 108 + 14 + (16 \times 3) \quad 108 + \quad = 170$$

4- ... **Gram – equivalent Weight**

(...) ... :

= ... ÷ ...

(Na) ... **23**

8 ... **16**

2. ...

... **55.8** ...

$Fe_2(SO_4)_3$ ... **18.6** .

5- ... :

: ... :

(1.008) ...

$$= \frac{\text{وزن صيغته الجزيئية}}{\text{عدد ذرات } H \text{ القابلة للاحلال}}$$

: ...

• ... **Monobasic acids** ... **HCI , HNO_3**

- 80 -

$$CH_3COOH,$$

- Dibasic acids : H_2SO_3 , H_2S , H_2SO_4

$$\frac{98}{2} = 49$$

- Tribasic acids : H_3PO_4

: :

(OH) .

$$= \quad \div$$

:

$$HCl + NH_4OH \rightarrow NH_4Cl + H_2O$$

$$= \frac{16 + (1\times5) + 14}{1} = 35$$

$$Ca(OH)_2 + H2SO_4 \rightarrow CaSO_4 + 2H_2O \quad :$$

- 81 -

$$37 = \frac{(1\times2)+(16\times2)+40}{2} =$$

:   :

.

AgNO₃   NaCI   :

NaNO₃

CaCO₃   Na₂SO₄   :

BaSO₄

.

المحاليل الغروية Collodial Solutions :

.
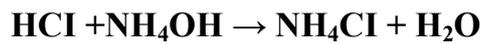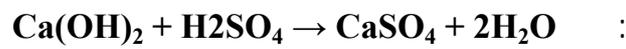
(Submicroscopic)

.

.

.

Colloidal

( )

dispersion

0.1

500

:

:

60.000

Tyndall .

– –

(Reflect)

.

.

Brownian

motion

.

.

أنـواع الغرويــات :

.

: :

(1 **Aerosols** . (2 **Emulsions** .

(3 **Sols** . (4 **Gels** .

:

Deoderants   .

:

.

:

.

:

.

:

.

Homopolar

Hetero Polar   .

:

. As_2S_3 :

Solvation

.

(OH)

(NH$_2$)   (COOH)–

:

) Hydrophobic

(   ) **Hydrophilic**   (

:

Condensation methods   **Dispersion methods**

(   )

:

Tannic acid

.

تخثر المحاليل الغروية :

.

HCI

:

$$AsCI_3 + 3H_2S \rightarrow A_s2S_3 + 6H^+ + 6CI2^-$$

M^{+3}

.

.

.

.

تنقية المحاليل الغروية :

.

(Dialysis)   :

.

.

.

:   (Serum)

قابلية المحاليل الغروية على امتصاص المواد الغريبة :

(Adsorption)

.

(Silica   gel)

.

. –

.

استعمـالات المحاليـل الغرويـة :

.

:

.

:

-1

.

-2

.

-3

-4

.

-5

.

:

:

-1

.

.

-2

3- .

طرق التعبير عن تراكيز المحاليل :

.

.

:

المولاريــة Molarity (M) :

( )

(M)

.

(40) ( )

(1 M)

(20)

(2/1 M) .

(20)

(4) • (100)

(0.04) (1) :

1 (1 M) = ÷

$$= \dfrac{40\text{جم}}{\text{لترواحد}} = \dfrac{20}{\rule{3cm}{0.4pt}}$$

$$= \dfrac{\rule{3cm}{0.4pt}}{\rule{3cm}{0.4pt}} = \dfrac{Wt.}{M.Wt.}$$

Wt **M.Wt**

.

$$(M) = \dfrac{\rule{4cm}{0.4pt}}{\rule{4cm}{0.4pt}}$$

$$M = \dfrac{1000}{Vml} \times \dfrac{Wt.}{M.Wt.} \qquad :$$

(V) (M)

(3).

:

4.9 H_2SO_4 400 .

:

$= 98$

$$M = \dfrac{Wt.}{M.Wt.} \times \dfrac{1000}{Vml} = \dfrac{4.9}{98} \times \dfrac{1000}{400} = 0.125$$

:

0.85% .

- 92 -

$$\frac{(W)}{(V)}$$

100 :

$$\frac{0.85}{100} \times 1000 = 8.5$$

$$= 8.4$$

:

$$M = \frac{Wt.}{M.Wt.} \times \frac{1000}{Vml} = \frac{0.85}{58.4} \times \frac{1000}{100} = 0.145$$

المولاليـة : Molality (M) :

: (1000)

(m) 6 (m 6)

6 (1000) .

$$(m) = \frac{}{1000}$$

:

23 500 .

.

$$= \frac{Wt.}{M.Wt.}$$

$$\frac{23}{56} = 0.5 \quad (m) \quad = \frac{}{1000}$$

- 93 -

$$= 0.5 \times \frac{1000}{500} = 1$$

العياريـة Normality (N) :

التعريف:

(N).

مثال:

36.5

.

40

49 .

$$(N) = \overline{\hspace{6cm}}$$

$$\frac{Wt.}{eq.Wt.} = \frac{(\ )}{\hspace{3cm}} =$$

$$(N) = \overline{\hspace{4cm}}$$

أي: $\hspace{3cm} = \hspace{2cm} \times$

أي: $\quad N = \dfrac{Wt.}{eq.Wt.} \times \dfrac{1000}{Vml}$

. H_2SO_4

98 .

- 94 -

(2N)   2 .

(2N)

(1M) .

250

Na_2CO_3 0.2 .

:

$$N = \frac{Wt.}{eq.Wt.} \times \frac{1000}{Vml}$$

$$= 53$$

$$Wt^{\cdot} = \frac{53 \times 250 \times 0.2}{1000} = 2.65 \qquad 0.2 = \frac{Wt^{\cdot}}{53} \times \frac{1000}{250}$$

:

.

:

$$N = \text{————————} = \frac{2}{1} = 2$$

.

HCI

$$H^+$$

$$. \ H^+$$

$$(\qquad) \qquad\qquad\qquad H_2SO_4$$

$$. \ H^+$$

$$(\qquad) \ NaOH$$
$$(\qquad) \ HCl$$
$$. \ (\qquad) \ H_2SO_4$$

$$:$$

$$(\qquad) \quad N_1 \, V_1 \ = \ N_2 V_2 \quad (\qquad)$$

$$:$$

$$(\quad 2)$$
$$. \ (\quad 0.3 \ ) \qquad\qquad 60$$

$$:$$

$$:$$

$$N_1 \, V_1 = N_2 V_2 \qquad\qquad 2 \times V_1 = 0.3 \times 60$$

$$V_1 = \frac{0.3 \times 60}{2} \ = \ 9$$

:

$$(\quad) \quad M = \frac{Wt\cdot}{M.Wt\cdot \times V}$$

$$Wt\cdot = M \times M.Wt\cdot \times V$$

$$(\quad) \quad N = \frac{Wt.}{eq.Wt.\times V}$$

$$Wt\cdot = N \times eq.Wt\cdot \times V$$

:

$$M \times M.Wt\cdot \times V = N \times eq.Wt\cdot \times V$$

$$M \times M.Wt\cdot = N \times eq.Wt\cdot$$

$$eq.Wt \quad = \frac{M.Wt\cdot}{n} \quad \frac{\text{الوزن الجزيئي}}{n} =$$

(n) :

$$\therefore M \times M.Wt\cdot = N \times \frac{M.Wt\cdot}{n}$$

:

0.2 .

:

$$Bi(NO_3)_3 = \frac{1}{3}$$

$$N = 3 \times M$$

$$= 0.2 \times 3 = 0.6$$

- 97 -

:

$$\int \frac{\times}{}$$

:

1.84

. **H₂SO₄** **96.7**

$$= \quad 36.3 \frac{0.967 \times 1.84}{0.49} \quad =$$

الفورماليــة : Formality (F)

:

. **(F)**

.

$$= F \qquad \qquad \div$$

.

$$F = \frac{Wt \cdot g \cdot}{FW} \times \frac{1000}{Vm1} \qquad :$$

FW **Wt·**

. **V**

- 98 -

.

.

:

0.1F **500**

FW **KOH** :

56 = 1 +16 + 39

$$F = \frac{Wt^{\cdot}}{FW} \times \frac{1000}{Vm1}$$

$$Wt^{\cdot} = \frac{F \times FW \times Vm1}{1000} = \frac{0.1 \times 56 \times 500}{1000} = \quad 2.8$$

1- **W/W** :

100 .

20% **20**

NaCl **80** :

$$20\% \; NaCl \frac{20}{100} = \frac{جم \; 20}{جم \; (80+20)}$$

$$\% = \frac{وزن \; المذاب}{وزن \; المذاب + وزن \; المذيب}$$

- 99 -

2–   W/V :

/   /   .

(ppm)

Parts per million or per Billion (ppb) .

/   .

/   .

= % ×   .

%   W/V .

:

(20)

.

:

$$ppm = (\frac{ملجرام}{1000مل}) × \quad (\quad)$$

$$= \frac{20}{100} × \quad 1500 \quad = 30$$

نسبة الحجم إلى الحجم V/V :

:

$$\% \ V/V = \frac{حجم \ السائل \ المذاب \ (مل)}{حجم \ المحلول \ (مل)} × 100$$

- 100 -

:

(50)   (450)   .

:

$= 450 + 50 = 500$.

$\dfrac{50}{500} \times 100 = 10 \%$.

❋ ❋ ❋

- 101 -

"الأسئـلـة"

1- .

2- .

3-

4- .

5- .

6- :

 - . - . -

 - .

7-

 .

❊ ❊ ❊