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1.

Given, 96% (W/W) H_2SO_4, Specific gravity 1.84
Mol. Wt of $H_2SO_4 = 98$, gram-equiv-wt = 49

$\therefore$ 1 ml conc. H_2SO_4, contains $= 0.96 \times 1.84$ gm of H_2SO_4,

$\therefore$ 100ml conc. H_2SO_4, contains $= 0.96 \times 01.84 \times 1000$
$= 1766.4$ gm of H_2SO_4

$\therefore$ 49 gm of H_2SO_4 in 1000ml Solution $= 1.0$ N H_2SO_4
$\therefore$ 1766.4 gm H_2SO_4 in 100 ml $= (1 \times 1766.4\text{gm})/49\text{gm}$
$= 36.05$ N H_2SO_4
(Ans)

2.

$Mg(OH)_2 \leftrightarrow Mg^{+2} + 2OH^-$

equilib conc. X X $2X$

$NaOH \leftrightarrow Na^+ + OH^-$

0.1 0.1 0.1M

Complete ionization of the salt in aqueous Solution is assumed.

Therefore, Total concentration of OH^- in the Solution is assumed.

Therefore. solution =
0.1 M (from NaOH) + 2X M (from $Mg(OH)_2$)

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As $Mg(OH)_2$ is sparingly Solution Soluble, x is negligibly small.

$\therefore [OH^-] = (0.1 + 2x)M \cong 0.1M$

$\therefore K_{sp} = [Mg^{+2}][OH^-]^2$,

or, $1.8 \times 10^{-11} = (x)(0.1)^2 M$

or, $x = 1.8 \times 10^{-9} M$

$\therefore$ The solubility of $Mg(OH)_2$ in 0.1 M NaOH solution is 1.8×10^{-9} M. (Ans).

3.

	H_2SO_4	$\leftrightarrow$	$2H^+$	$+ SO_4^-$
equilib. Conc.	1M		2M ($2H_3O^+$)	1M

If H_2SO_4 in 1M Solution ionizes. Completely, $[H_3O^+]$ will be 2M.

Therefore in a 0.02 M H_2SO_4 Solution.

$[H_3O^+] = 2 \times 0.02 = 0.04$ M

$\therefore [OH^-] = K_W / [H_3O^+] = (1 \times 10^{-14}) / 0.04$

$= 2.5 \times 10^{-13}$ M

$\therefore pH = -\log[H_3O^+] = -\log(0.04) = 1.40$

$\therefore pOH = -\log[OH^-] = -\log(2.5 \times 10^{-13})$

$= 12.60$ (Ans)

4.

$CuCl_2$ is a sparingly soluble salt

Let x is the solubility of $CuCl_2$ in mole liter^{-1}

The following equilibrium exits in its saturated solution:

$$CuCl_2 \leftrightarrow Cu^{2+} + 2Cl^-$$
$$x \qquad x \qquad 2x$$

Equlibrium concentration,

therefore, solubility product,

$$K_{sp} = [Cu^{2+}][Cl^-]^2$$

or, $3.2 \times 10^{-7} = [x][2x]^2$

or, $4x^3 = 3.2 \times 10^{-7}$

$x = 4.3 \times 10^{-3}$ mole liter^{-1}

(Ans)

5.

Applying the kohlarawsek's law,

$$\lambda_\alpha(NH_4OH) = \lambda_\alpha(NH_4Cl) + \lambda_\alpha(OH^-) - \lambda_\alpha(Cl^-)$$
$$= 130 + 174 - 66 = 238$$

(Ans)

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Conductometric Titration

(I) Titration of a strong acid against a strong base.

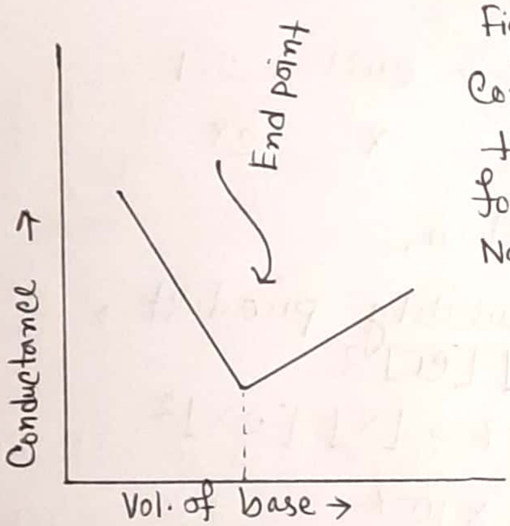

Figure: Conductometric titration curve for HCl and NaOH

(II) Titration of a weak acid against a strong base.

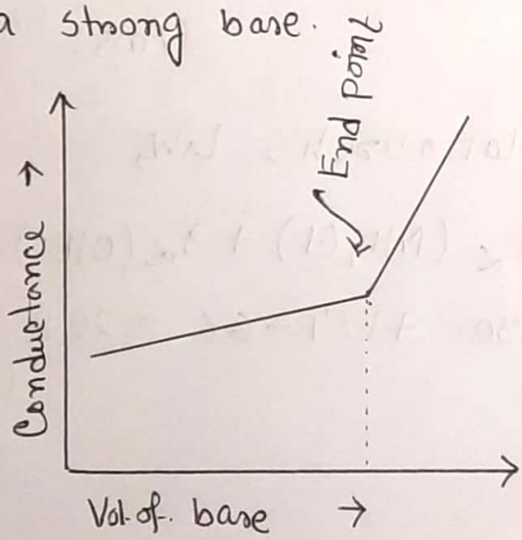

Figure: Conductometric titration curve for CH_3COOH and NaOH.

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(III) Titation of a strong acid against a weak base.

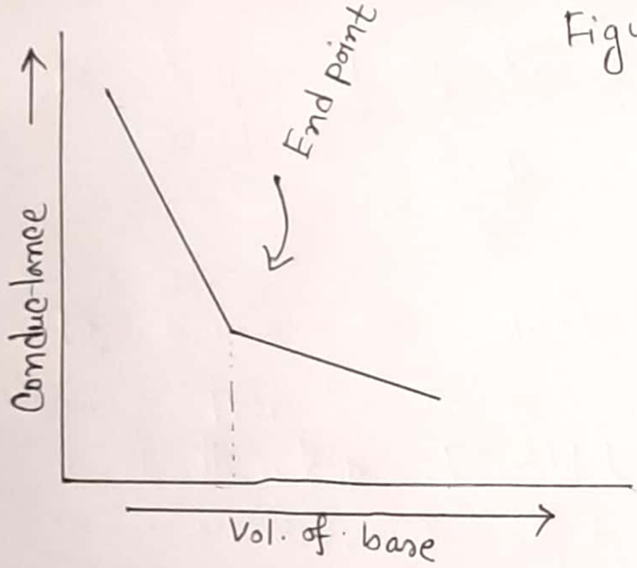

Figure: Conductometric titration Curve for HCl and NH_4OH.

(IV) Titration of a weak acid against a weak base.

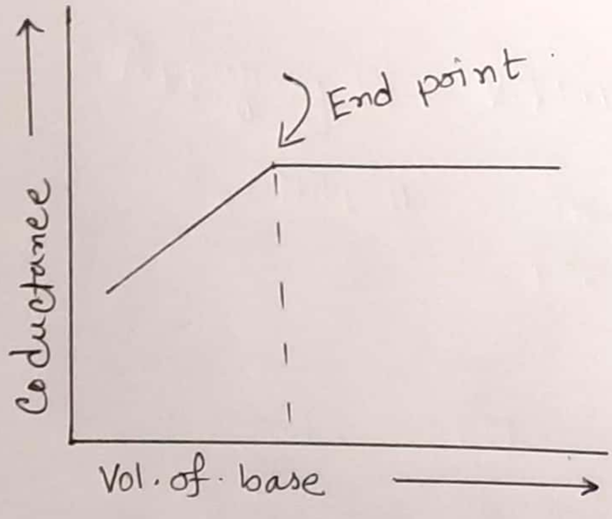

Figure: Condactometric titration Curve for CH_3 and NH_3OH.