Nishant Jindal

Concentration terms

% W/W

(14) 100 gm solution 98 gm H_2SO_4

$\frac{100}{1.8}$ ml = 1 mol H_2SO_4

(18) $n_{H_2O} = 0.5$ = 9 gm

$n_{NaCl} = 0.5$ mol = 0.5×58.5 gm

$M = \frac{0.5}{9} \times 1000$

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Concentration terms

(20)

½ M NaOH	+	V ml $H_2O(l)$	=	(200 + V) ml ⅒ M NaOH
200 ml				

$200 \times \frac{1}{2} + 0 = \frac{1}{10} \times (200 + V)$

$800 = V$

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(11) M d = ? % w/w = 30%

6.9 M KOH

1000 ml solution contains 6.9 mol KOH

" " 6.9 × 56 gm KOH

1000 d gm " "

$$\%\ w/v = \frac{6.9 \times 56}{1000\,d} \times 100$$

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Concentration terms

(14) 2M NH_4Cl $d = 3.107$ gm/ml

1000 ml solution 2 mol NH_4Cl

3.107×1000 gm = 3107 gm

$= 2 \times 53.5$ gm $= 107$ gm

$W_{solvent} = 3000$ gm

$$m = \frac{2}{3000} \times 1000 = \frac{2}{3}$$

2m NH_4Cl

NH_4^+ Cl^-

2m 2m

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Concentration terms

20% w/w

20% w/v

20 gm/lit

20 ppm

2 M

2 m

0.2 mol fraction

(16) 1.9 ppm Li

10^6 gm soln ——— 1.9 gm Li

$W_{solvent} = 10^6 - 1.9 = 10^6$

$\therefore m = \frac{1.9/7}{10^6} \times 1000$

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Concentration terms

(6) 15 lit, 2M HCl + 5 lit, 2M H_2SO_4 = 20 lit

$[H^+] = x$

$[Cl^-] = y$

$[SO_4^{2-}] = z$

$[Cl^-]$ $30\,mol + 0 = 20 \times y$ $\quad y = 3/2 = 1.5$

$[SO_4^{2-}]$ $0 + 10 = 20 \times z$ $\quad z = 0.5$

$[H^+]$ $30 + 10 \times 2 = 20 \times x$ $\quad x = 50/20 = 2.5$

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Concentration terms

Case-II If there is chemical Rxn on mixing (20 lit)

5 lit		15 lit		Acidic or basic
10M HCl	+	2M NaOH	=	$[H^+]$ $[OH^-]$
				$[Cl^-]$
				$[Na^+]$

$$HCl_{(aq)} + NaOH_{(aq)} \longrightarrow NaCl_{(aq)} + H_2O_{(l)}$$

$$H^+(aq) + Cl^-(aq) + Na^+(aq) + OH^-(aq) \rightarrow Na^+(aq) + Cl^-(aq) + H_2O(l)$$

$$H^+(aq) + OH^-(aq) \rightarrow H_2O(l)$$

Concentration terms

$HCl + NaOH \longrightarrow NaCl + H_2O$

50 mol	30 mol	0	
20 mol	0	30 mol	30 mol

H^+	Cl^-	Na^+
20 mol	20 + 30 = 50 mol	30 mol
20 lit	20 lit	20 lit

$[H^+] = 1\ M$

$[Cl^-] = 2.5\ M$

$[Na^+] = 1.5\ M$

$[OH^-] = 0$

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Concentration terms

5 lit
10M HCl + 15 lit
2M NaOH → 20 lit
[Cl⁻]
[Na⁺]

[Cl⁻] 50 + 0 = [Cl⁻] × 20 [Cl⁻] = 2.5

[Na⁺] 0 + 30 = [Na⁺] × 20 [Na⁺] = 1.5

H^+ + OH^- → H_2O

H^+: 50, 20
OH^-: 30, 0
H_2O: 30

$[H^+] = 20/20 = 1M$

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Concentration terms

precipitation Rxn

$NaCl(aq)$

Na^+ Cl^-

$Ba(NO_3)_2$

Ba^{2+} NO_3^-

$Ag^+ + Cl^- \longrightarrow AgCl\,(ppt)$

$Ag^+ + Br^- \longrightarrow AgBr\,(ppt)$

$Ba^{2+} + SO_4^{2-} \longrightarrow BaSO_4\,(ppt)$

$Na^+ + Cl^- \longrightarrow X$

$Ag^+ + NO_3^- \longrightarrow X$

$Ba^{2+} + NO_3^- \rightarrow X$

$[NO_3^-]$ $\quad 20 + 0 = [NO_3^-] \times 10$

$[Ba^{2+}]$ $\quad 0 + 18 = [Ba^{2+}] \times 10$

Concentration terms

4 lit, 5M $AgNO_3$ (Ag^+ NO_3^-) + 6 lit, 3M $BaCl_2$ (Ba^{2+} Cl^-) =

$[Ag^+] = 0$

$[Cl^-] = 16/10 = 1.6$

$[Ba^{2+}] = 1.8$

$[NO_3^-] = 2$

$AgNO_3(aq) + BaCl_2(aq) \rightarrow AgCl(ppt) + Ba(NO_3)_2$

$Ag^+ + Cl^- \rightarrow AgCl(ppt)$

20 mol $\quad$ 36 mol

0 $\quad$ 16 mol $\quad$ 20

(LR)

$$2AgNO_3 + BaCl_2 \longrightarrow AgCl\,(ppt) + Ba(NO_3)_2$$

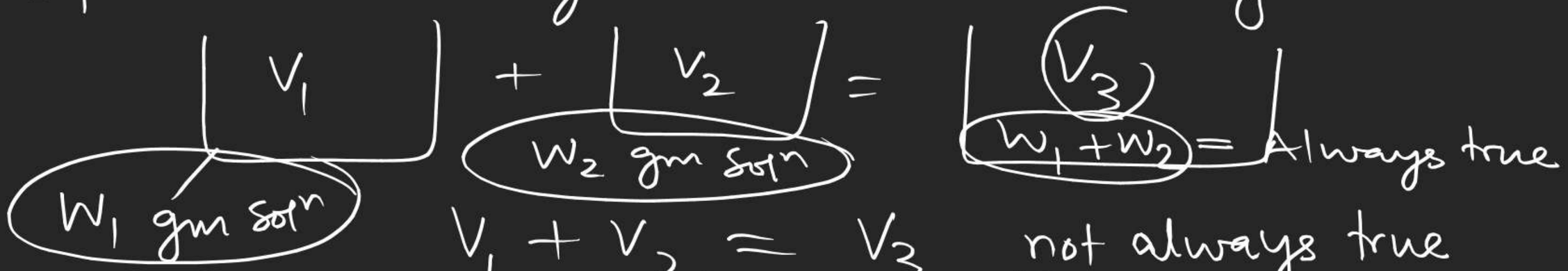
$2AgNO_3$	$BaCl_2$	$Ba(NO_3)_2$
20	18	10
0	18 − 10 = 8	

$BaCl_2$: 8 mol

$Ba(NO_3)_2$: 10 mol

Ba^{2+}	Cl^-	NO_3^-
18 mol	16 mol	20 mol

If there is change in volume on mixing



$V_1 + V_2 = V_3$ not always true

If $V_3 \neq V_1 + V_2$ How to calculate final volume

$$\text{Volume of final solution} = \frac{\text{mass of final soln}}{\text{density of final soln}}$$

$$= \frac{W_1 + W_2}{d_{final}}$$

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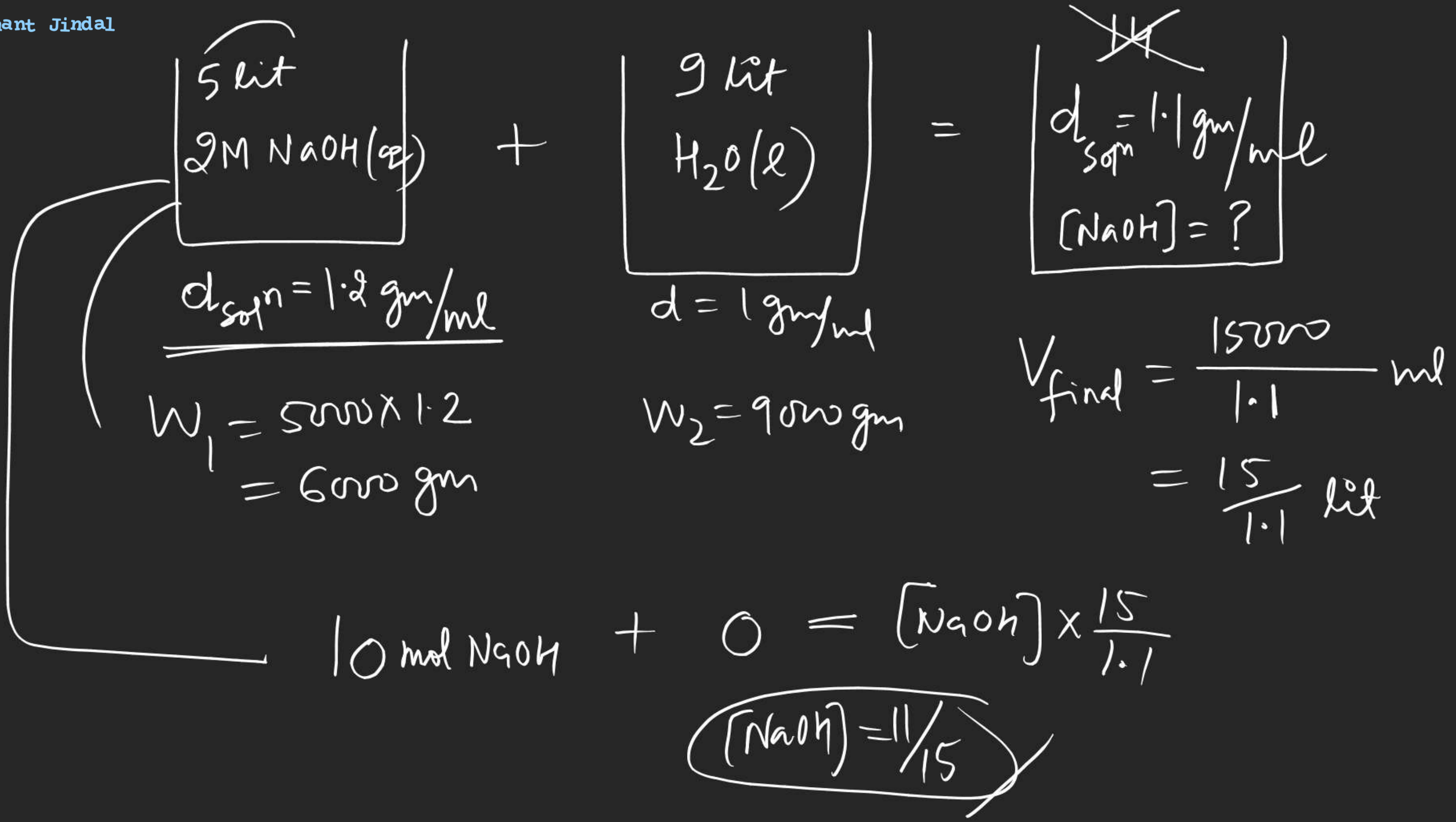

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O-I 22 — 25

S-I 17 — 26

O-II 7, 8, 9, 11, 13, 14

] 11th