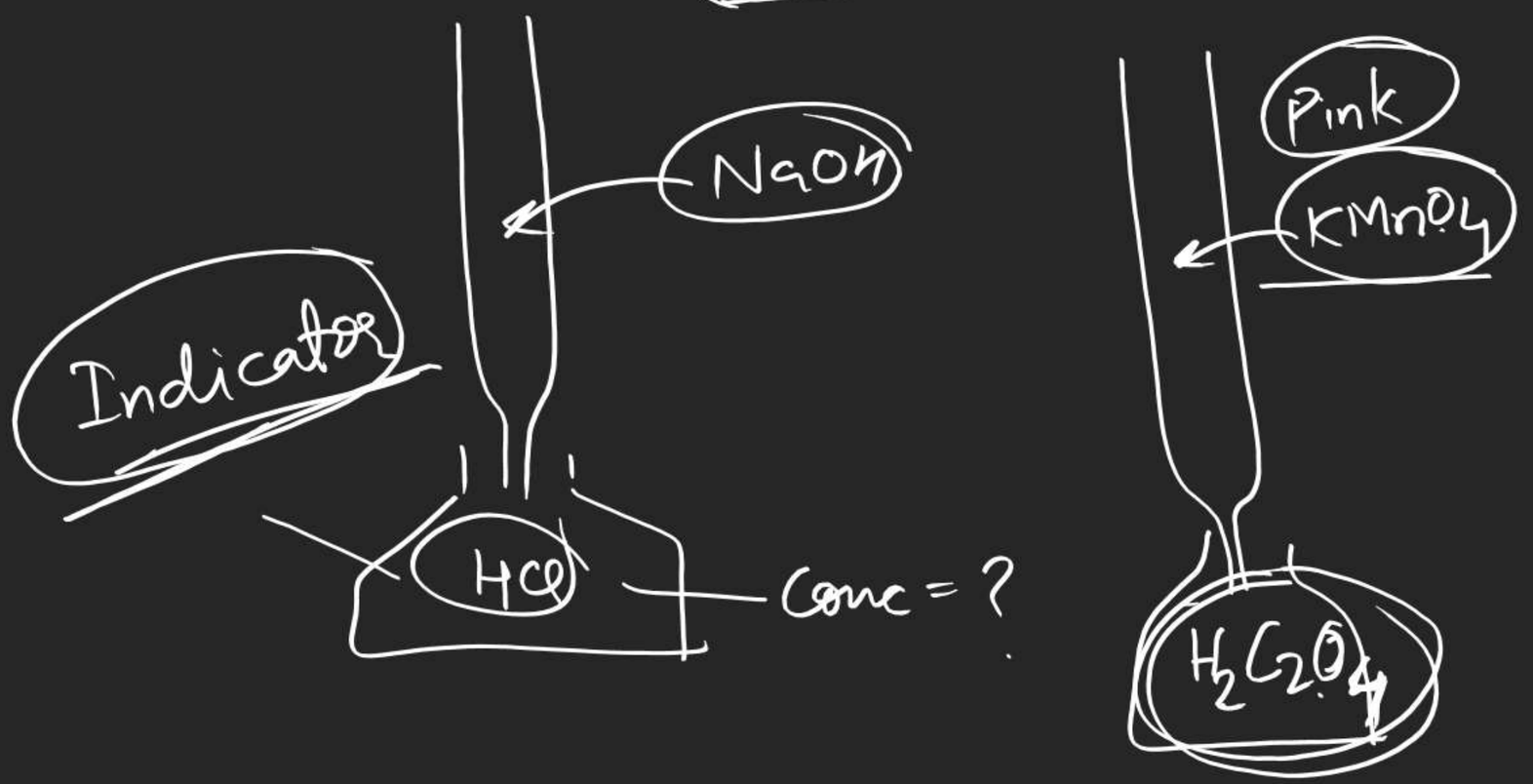
Nishant Jindal

Indicators :→

Titration $M_1 V_1 n_1 = M_2 V_2 n_2$



colourless
Mn^{2+}

	4.4
4	20
4	16
84	400
4	336
887	6400
7	

$\sqrt{20} = 2\sqrt{5}$
$= 2 \times 2.23$
$= 4.46$

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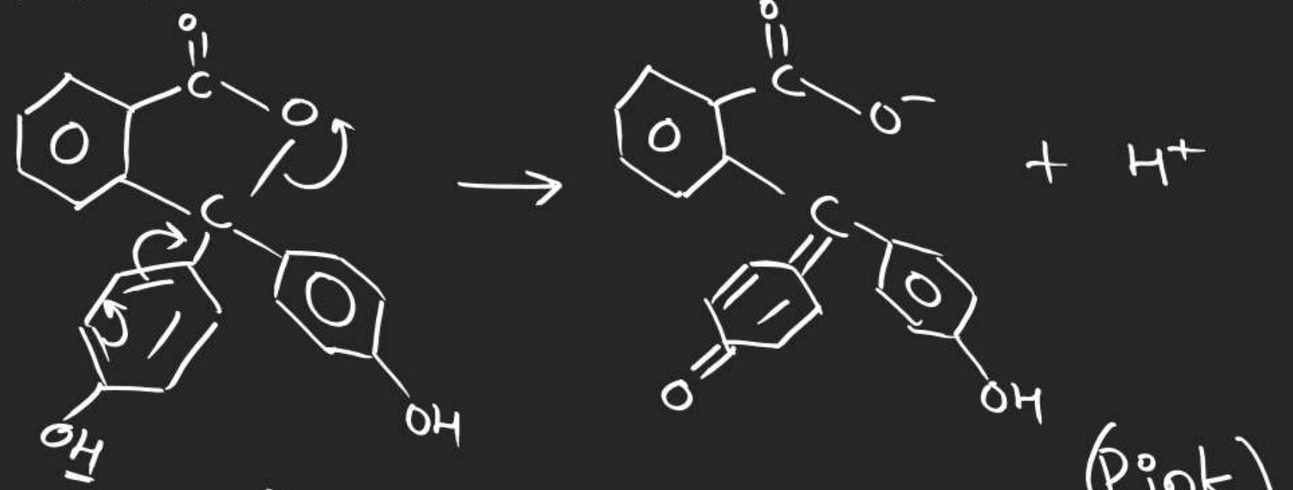
Indicators:→ Indicator are used to determine the end point (equivalence point) of a titration process.

In acid-base titrations indicators are either weak organic acid or base having a characteristic of different colours in ionised and unionised form.



(colourless) phenolpthalein (Pink)

$$HIn \rightarrow H^+ + In^-$$

$$K_{In} = \frac{[H^+][In^-]}{[HIn]}$$

To observe the colour of In^-

$$[In^-]/[HIn] \geq 10$$

$$K_{In} = [H^+] \times \frac{[In^-]}{[HIn]}$$

$$pK_{In} = pH - \log \frac{[In^-]}{[HIn]}$$

$$pH = pK_{In} + \log \frac{[In^-]}{[HIn]}$$

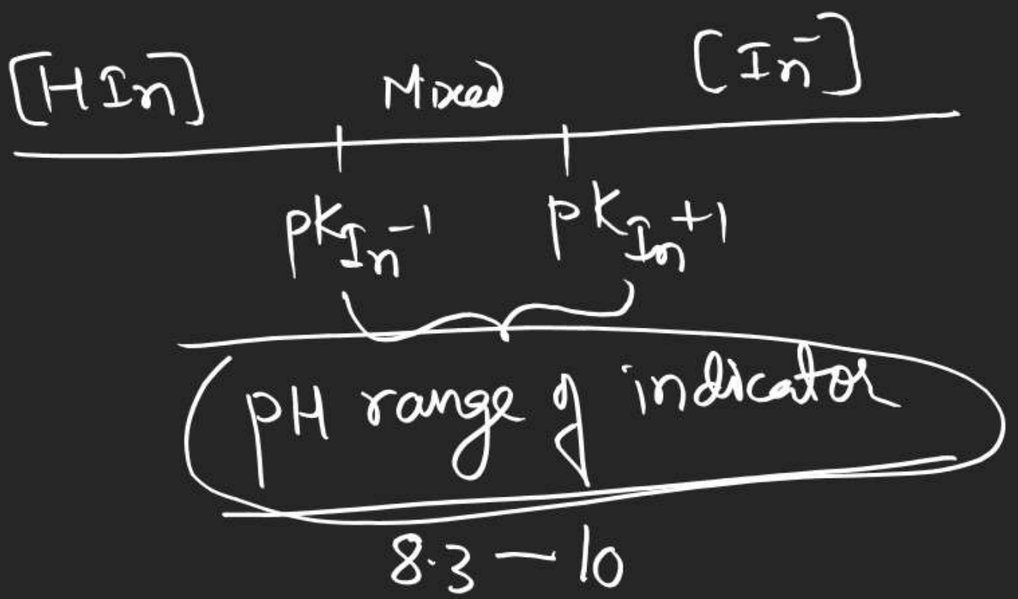
$$pH \geq pK_{In} + 1$$

To observe the colour of HIn

$$[HIn]/[In^-] \geq 10$$

$$pH = pK_{In} - \log \frac{[HIn]}{[In^-]}$$

$$pH \leq pK_{In} - 1$$



phenolpthalein (HPh)	Colourless	8.3 — 10	Pink
Methyl orange	Pinkish Red	3.1 — 4.4	yellow
Methyl red	Red	4.2 — 6.3	Yellow
Litmus	Red	5.5 — 7.5	blue

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Q. 100 ml 0.1M HCl is mixed 0.1M NaOH

Volume of NaOH added	$[H^+]$ or $[OH^-]$	pH
0 ml	$[H^+] = 0.1M$	1
90 ml	$[H^+] = \frac{1}{190} = \frac{1}{1.9} \times 10^{-2}$	$2 - \log \frac{1}{1.9} = 2.3$
99 ml	$[H^+] = \frac{0.1}{199} = \frac{0.1}{2\omega} = \frac{1}{2} \times 10^{-3}$	$3 - \log 1/2 = 3.3$
101 ml	$[OH^-] = \frac{0.1}{201} = \frac{0.1}{2\omega}$	$pOH = 3.3$, $pH = 10.7$

Red 5—7 blue

~~Red 11—13 blue~~

10^{-3}

3.3

Jump

10.7

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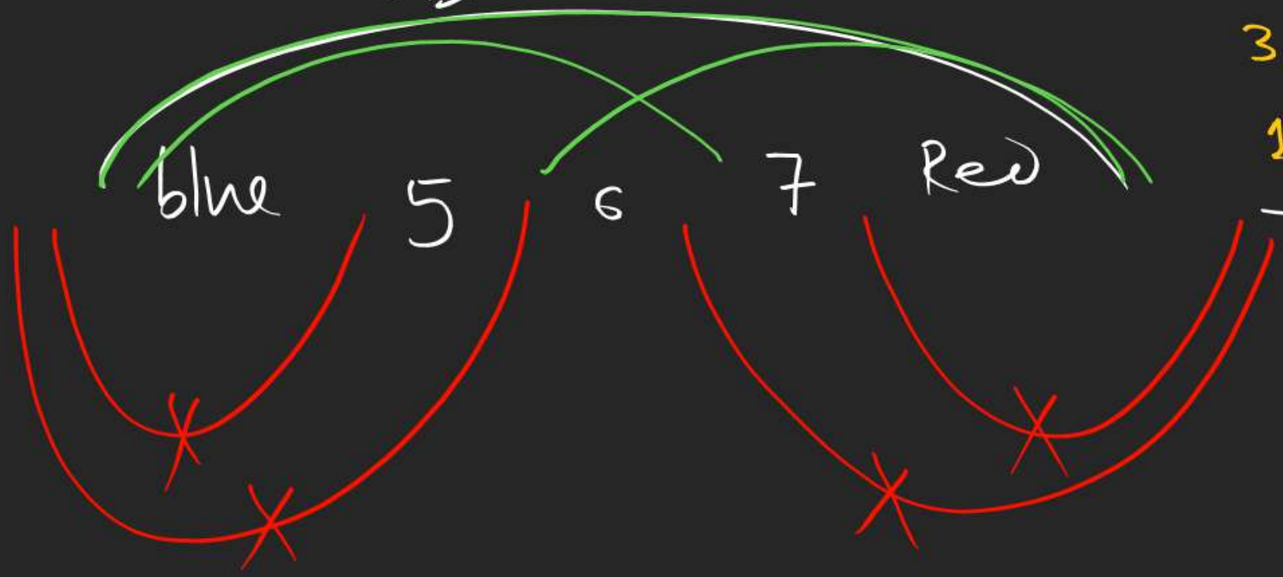
SA → 3

SB → 11

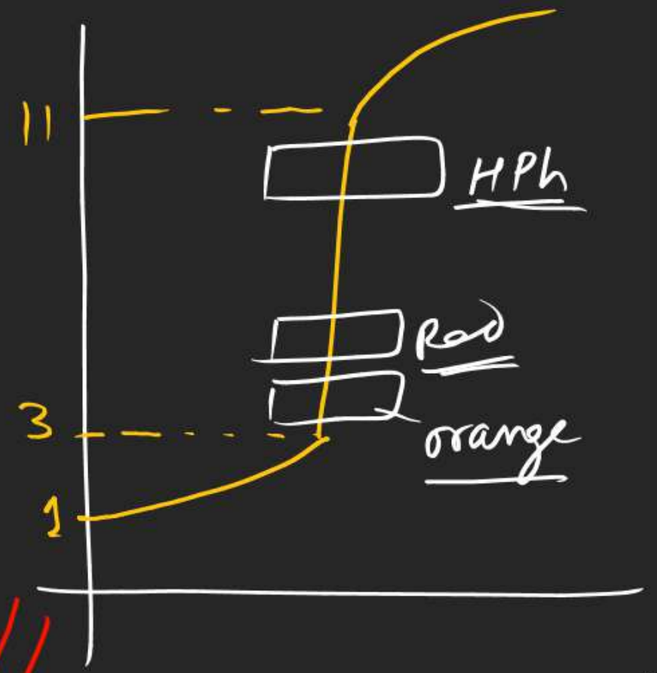
WA → 5·5

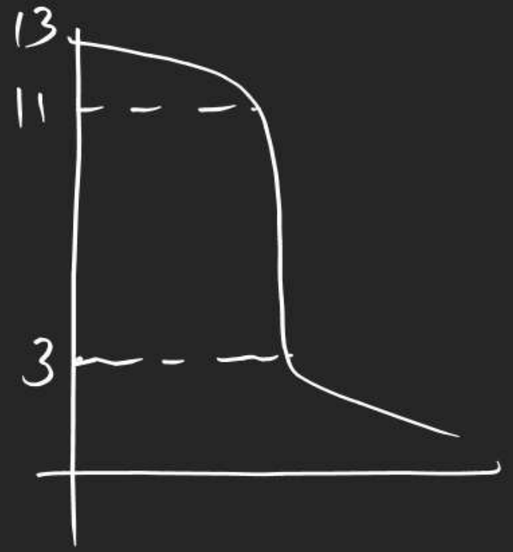
WB → 8·5



① Titration of SA + SB

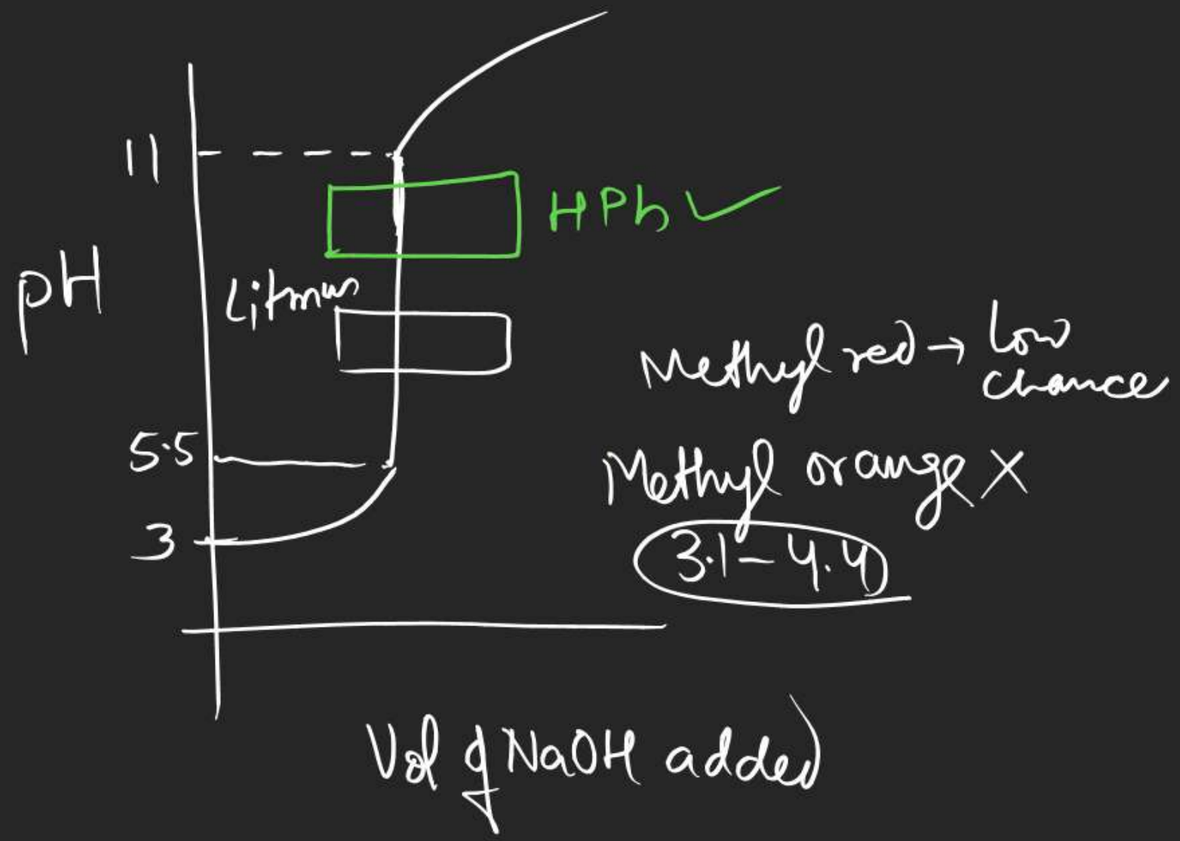
e.g HCl + NaOH





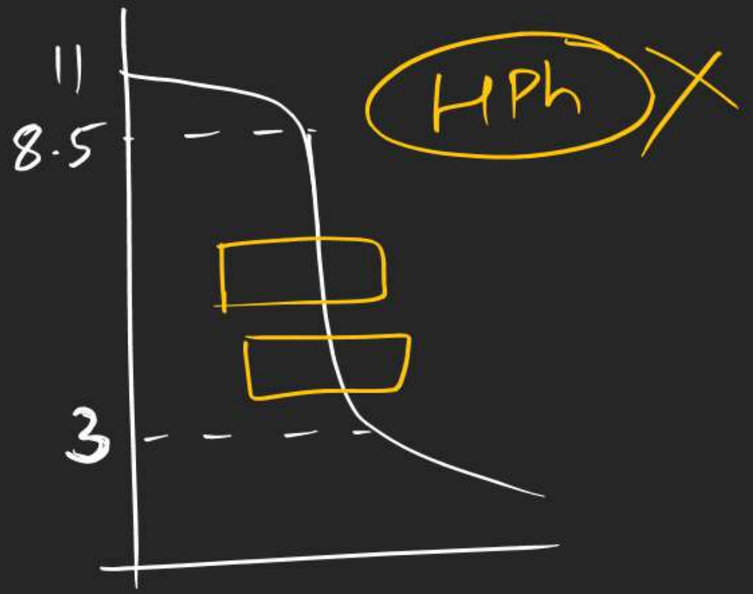
(II) Titration of WA + SB

$CH_3COOH + NaOH$



(III) Titration of WB + SA

$NH_4OH + HCl$



JEE Mains

last 15 question

JEE Adv

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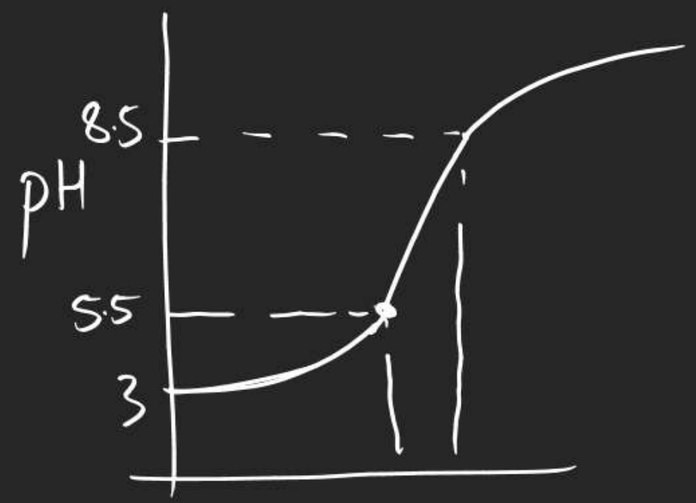
Titration of WA + WB

e.g. CH_3COOH + NH_4OH

Avoid it



Volu NH_4OH

In acid-base titration pH changes suddenly near the equivalence point. This sudden change in pH depends on acid-base pair being titrated

The selection of indicator must satisfy the condition that

" pH-range of indicator must lie within this sudden jump or fall."

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(6) $H_2C_2O_4 \cdot 2H_2O$

$$M = \frac{6.3}{126} \text{ moles} \times \frac{1000}{250}$$

$$M \times 10 \times 2 = 0.1 \times V$$

(14) CO_2, H_2CO_3, $HCO_3^{\ominus}$

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(8)

500ml 0.2M CH_3COOH	500ml 0.2M HCl	$\frac{6\text{ gm}}{\cancel{40}} \times \cancel{1000}$
0.2×500 = 100 mmol	100 mmoles	= 150 mmol NaOH

$$CH_3COOH + NaOH \rightarrow CH_3COONa + H_2O$$

	100	50	0
	50	0	50

(16)

2.5ml 7.5ml

$BOH + HCl \longrightarrow BCl + H_2O$

1 mmol 1 mmol 1 mmol

$2.5 \times \frac{2}{5} = V \times \frac{2}{15}$

$[BCl] = \frac{1}{10} = 0.1M$

7.5 ml = V

$B^+ + H_2O \longrightarrow BOH + H^+$

$\frac{K_w}{K_b} = 10^{-2} = \frac{x^2}{0.1 - x}$

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(21) Rate $= k[\text{ester}][H^+]$

SA / IM

WA / IM $= C$

$[H^+] = 0.01 = x$

$K_a = \frac{x^2}{1-x}$

$Q = m S \Delta T$

1 mol = $P = -57$

$0.1 \times 57 = 2w \times d \times S \times 5.7$

$Q = 2w \times d \times S \times 5.6$

$Q = 5.6$

for 1 mol 56