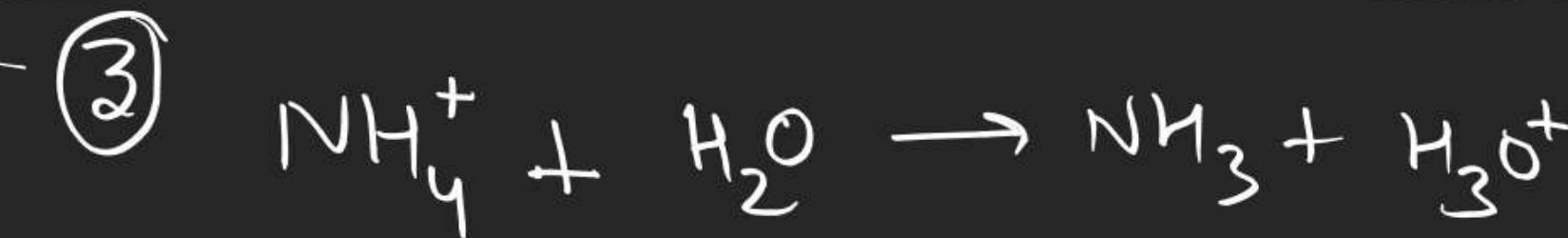
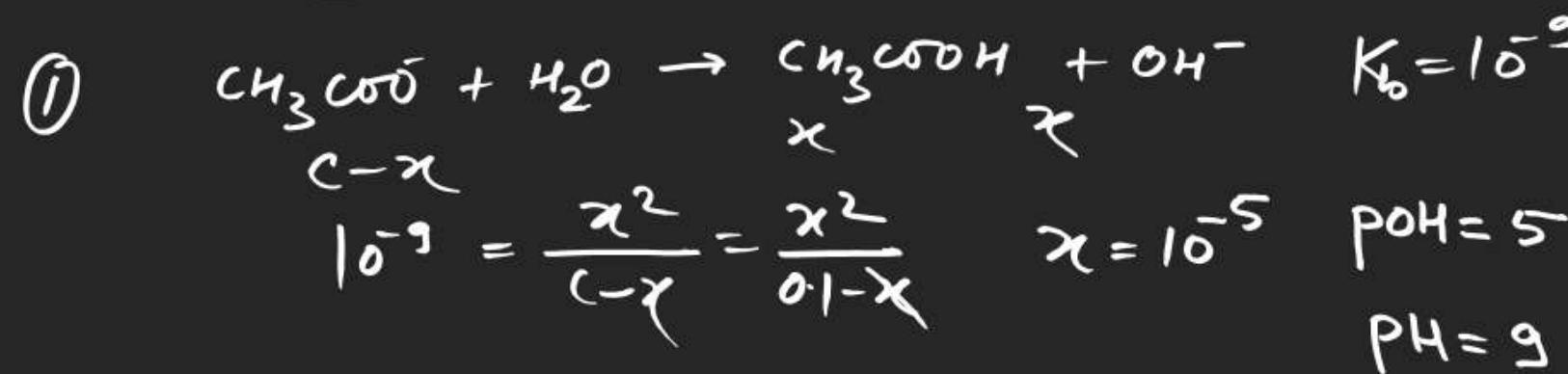
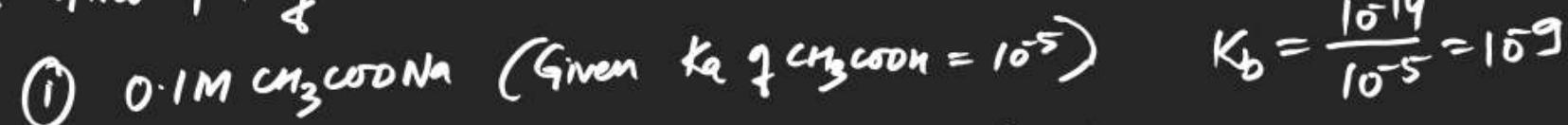


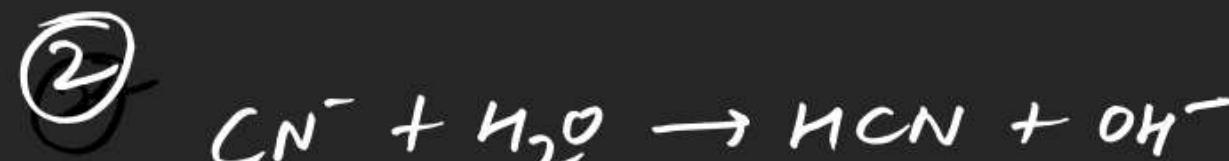
Q. find pH q.



$$K_a = 10^{-9} = \frac{x^2}{0.1-x}$$

$$x = 10^{-5} = [\text{H}^+]$$

$$\therefore \text{pH} = 5$$



$$10^{-2}-x$$

$$\frac{K_w}{K_a} = K_b = 10^{-4} = \frac{x^2}{10^{-2}-x}$$

$$x^2 + 10^{-4}x - 10^{-6} = 0$$

$$x = \frac{-10^{-4} + \sqrt{10^{-8} + 4 \times 10^{-6}}}{2}$$

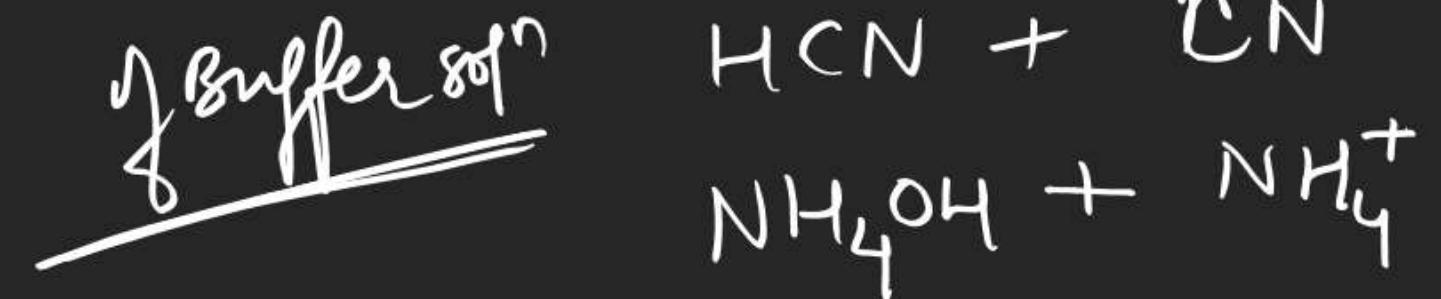
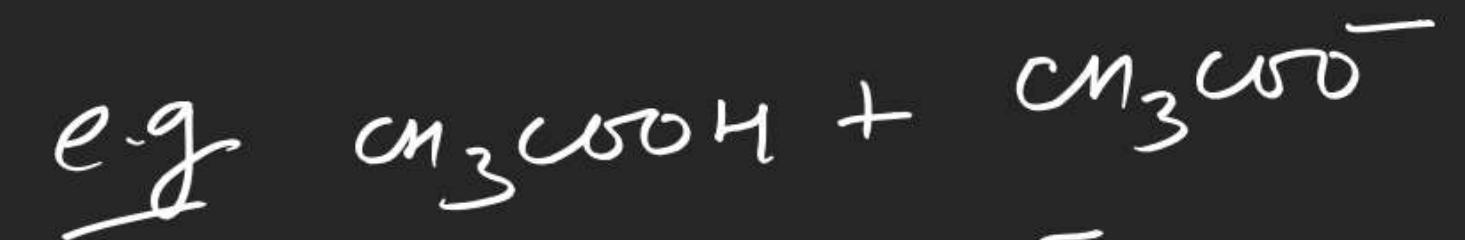
$$= \frac{-10^{-4} + 20 \times 10^{-4}}{2}$$

$$x = 9.5 \times 10^{-5}$$

Buffer solution → Solutions whose pH is not altered to any great extent by addⁿ of small amount of either H^+ or OH^- .

for a solution

$w_A/w_B + \text{conjugate base/acid}$



Q. $[CH_3COOH] = a$

salt $\rightarrow [CH_3COONa] = S$

Acidic
Buffer

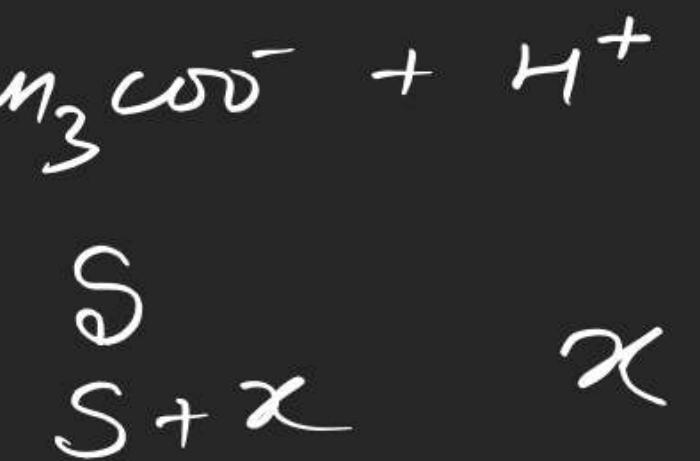


a

$a - x$

$$K_a = \frac{(S+x)(x)}{(a-x)}$$

$$[H^+] = x = \frac{a}{S} \times K_a$$



$$-\log [H^+] = -\log \frac{a}{S} - \log K_a$$

$$PH = pK_a + \log \frac{[Salt]}{[Acid]}$$

Henderson eqn

e.g. $[\text{NH}_4\text{OH}] = b$ $[\text{NH}_4^+] = s$



$$K_b = \frac{(s+x)}{(b-x)} x$$

$$[\text{OH}^-] = K_b \times \frac{b}{s}$$

$\text{pOH} = \text{p}K_b + \log \frac{[\text{salt}]}{[\text{base}]}$

Solubility & Solubility product

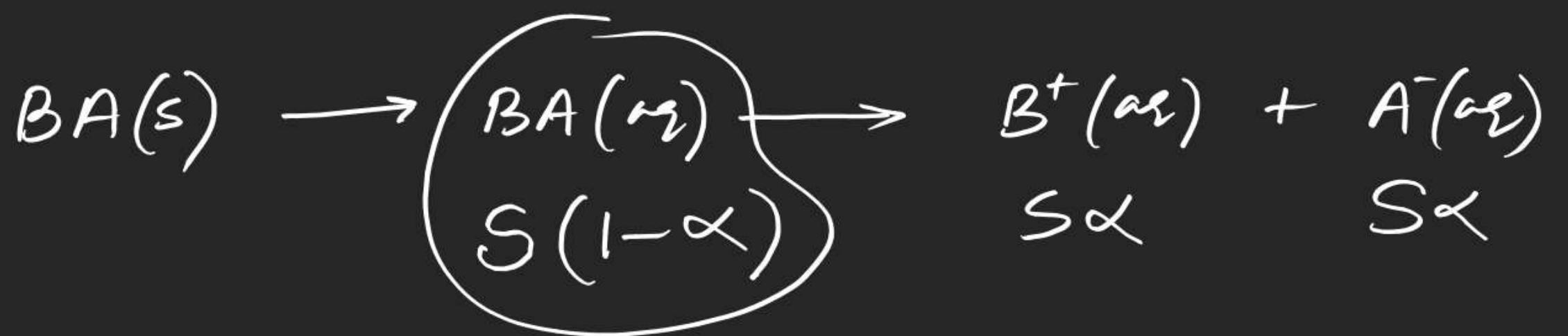


maximum molar mass of a solute which can be dissolved in 1 lit

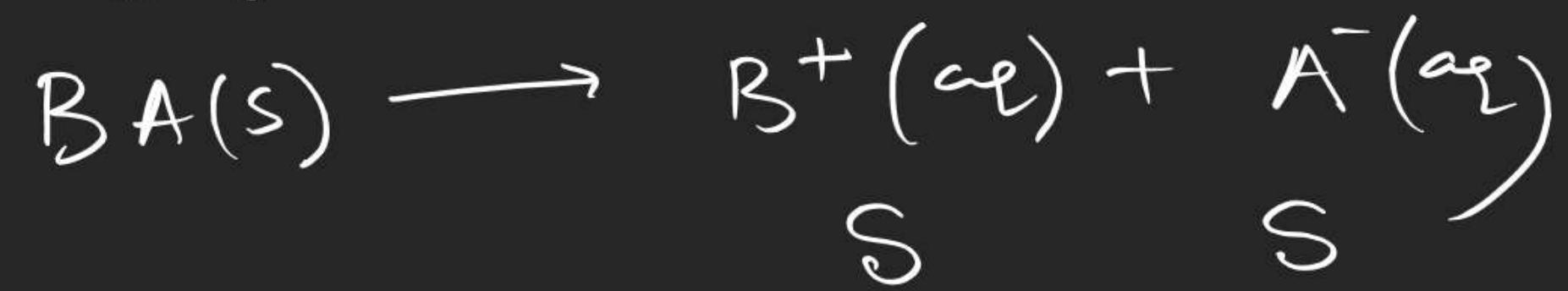
Solvent is called solubility.

or

Molarity of a saturated solution is called solubility.



for sparingly soluble salt ($s \ll 1$) $\Rightarrow \alpha = 1$



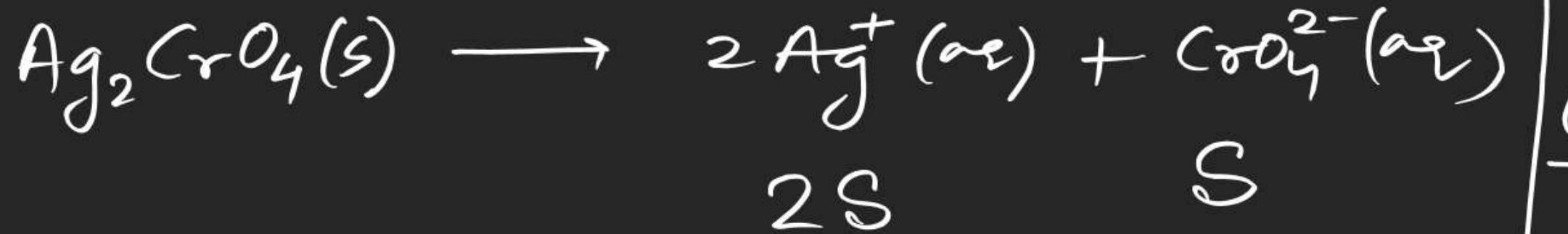
for a given solute
 K_{sp} depends only on temp.

$$\rightarrow K_{sp} = [B^+][A^-]$$

$= s^2$

↑
Solubility product

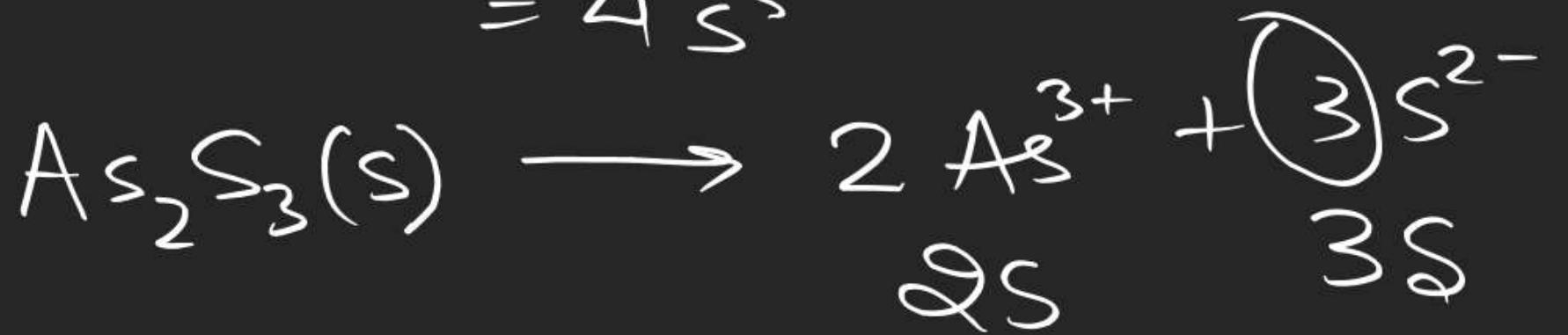
$$K_{sp} \ll 1$$



$$K_{ep} = [Ag^+]^2 [CrO_4^{2-}]$$

$$= (2s)^2 (s)$$

$$= 4 s^3$$



$$K_{sp} = (2s)^2(3s)^3 \\ = 4 \times 27 s^5 = 108 s^5$$

Q. find Solubility
of Ag_2CrO_4 if
its K_{sp} is 3.2×10^{-12}

$$32 \times 10^{-12} = 4s^3$$

$$8 \times 10^{-12} = S^3$$

$$2 \times 10^{-4} = S$$

Q. find K_{sp} of AgCl if its saturated solution contains

1. 435 mg/lit AgCl .

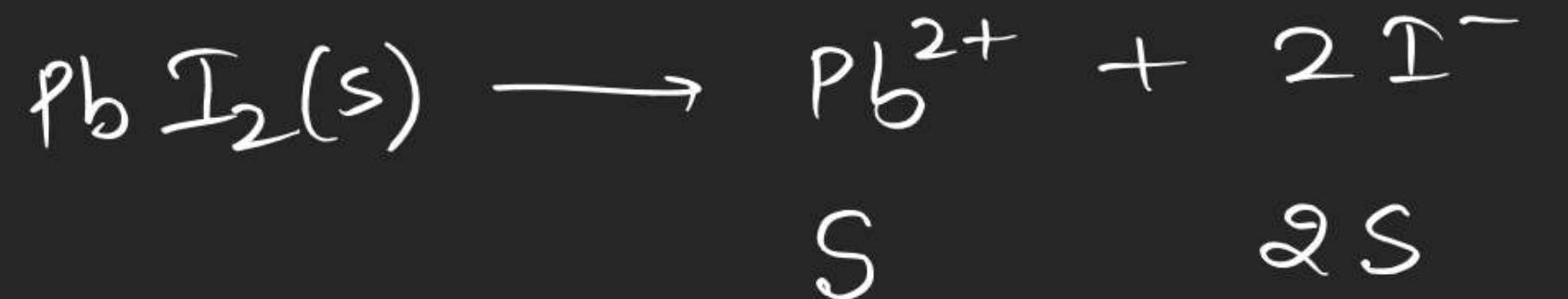
$\text{Ag} : 108$
 $\text{Cl} : 35.5^-$

$$S = \frac{435 \times 10^{-3}}{143.5} = 10^{-5}$$



$$\underline{K_{sp} = S^2 = 10^{-10}}$$

Q. find K_{sp} of PbI_2 if its saturated soln contains $8 \times 10^{-5} M I^-$.



$$2s = 8 \times 10^{-5}$$

$$s = 4 \times 10^{-5}$$

$$\begin{aligned}
 K_{sp} &= (s)(2s)^2 \\
 &= 4s^3 \\
 &= 4 \times (4 \times 10^{-5})^3 \\
 &= 4^4 \times 10^{-15} \\
 &= 256 \times 10^{-15}
 \end{aligned}$$

S-I

25, 27, 28, 31

S 9 - 63