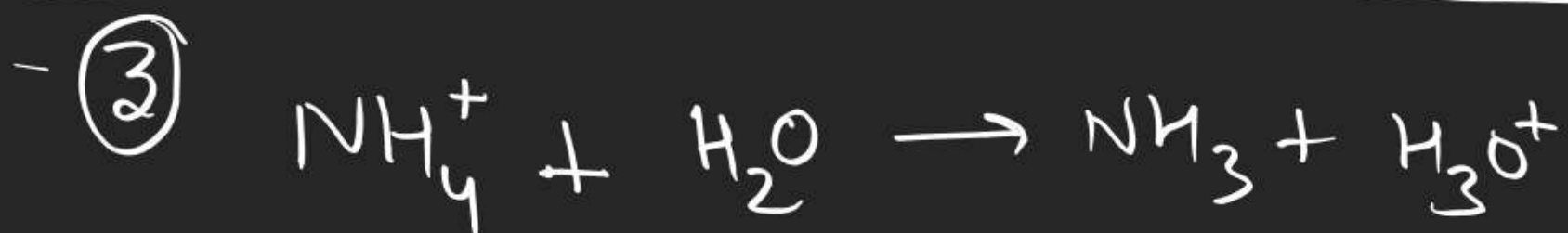
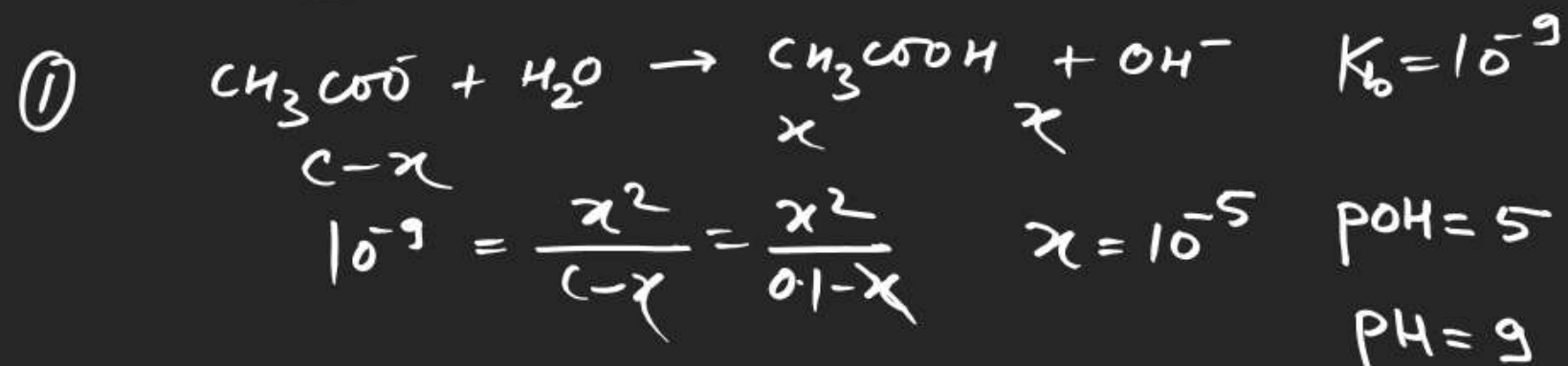


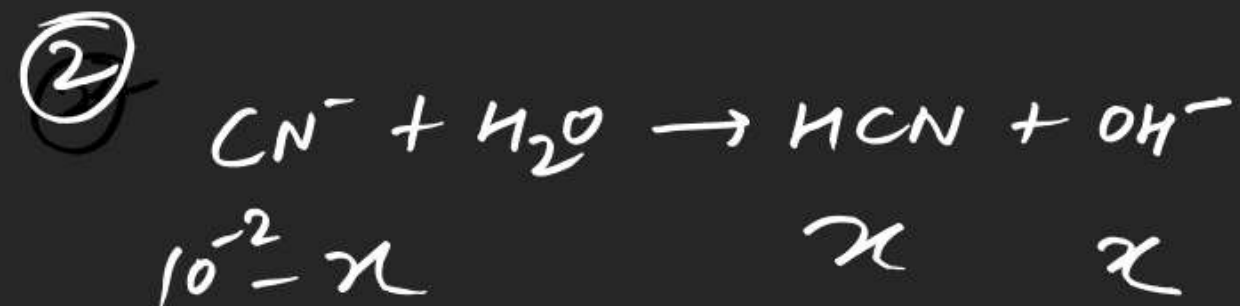
Q. find pH of .



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

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

$$\text{pH} = 5$$



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

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

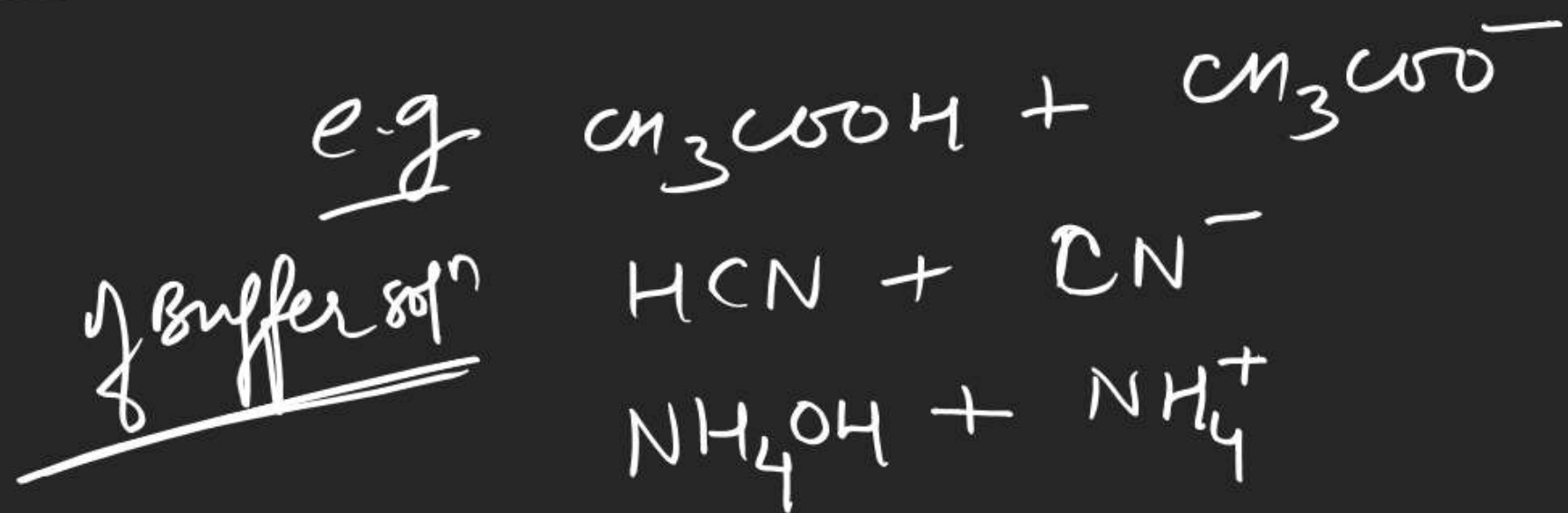
$$x = \frac{-10^{-4} + \sqrt{10^{-8} + 4 \times 10^{-6}}}{2}$$

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

$$x = 9.5 \times 10^{-4}$$

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

for a solution $WA/WB + \text{conjugate base/acid}$



Q. $[\text{CH}_3\text{COOH}] = a$

salt $\rightarrow [\text{CH}_3\text{COONa}] = S$

Acidic Buffer



a

S

x

$a-x$

$S+x$

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

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

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

$$\text{pH} = \text{p}K_a + \log \frac{[\text{Salt}]}{[\text{Acid}]}$$

Henderson eqⁿ

e.g. $[\text{NH}_4\text{OH}] = b$ $[\text{NH}_4\text{Cl}] = S$



$$\begin{array}{ccc} b & S & \\ b-x & s+x & x \end{array}$$

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

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

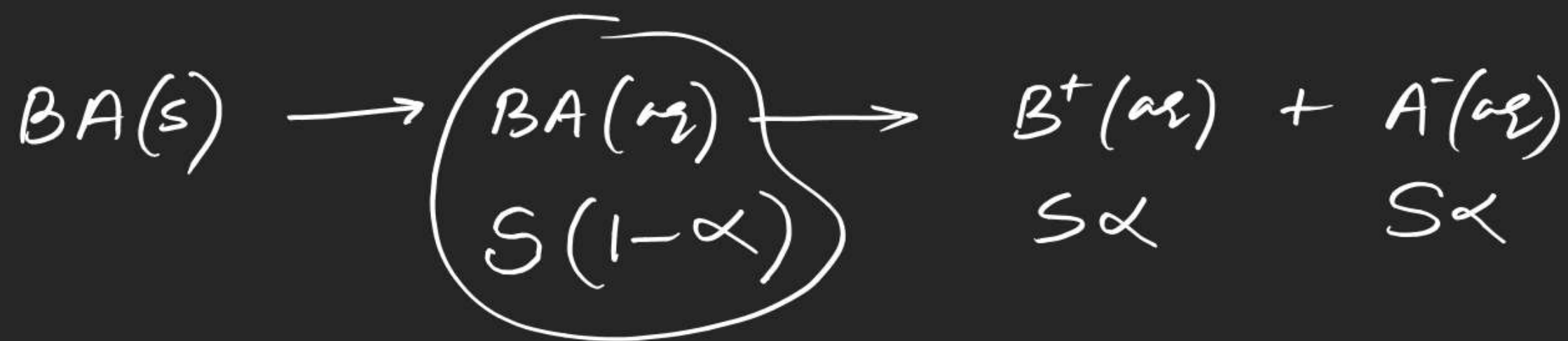
$$\boxed{\text{pOH} = \text{p}K_b + \log \frac{[\text{Salt}]}{[\text{base}]}}$$

Solubility & Solubility product



maximum moles of a solute which can be dissolved in 1 lit solvent is called solubility.

Molarity of ^{or} a saturated solution is called solubility.



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

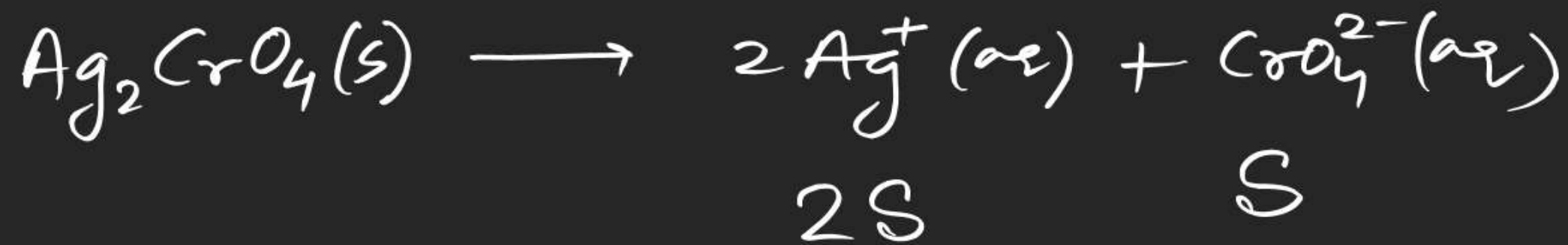


for a give
solute
 K_{sp} depends
only on
temp.

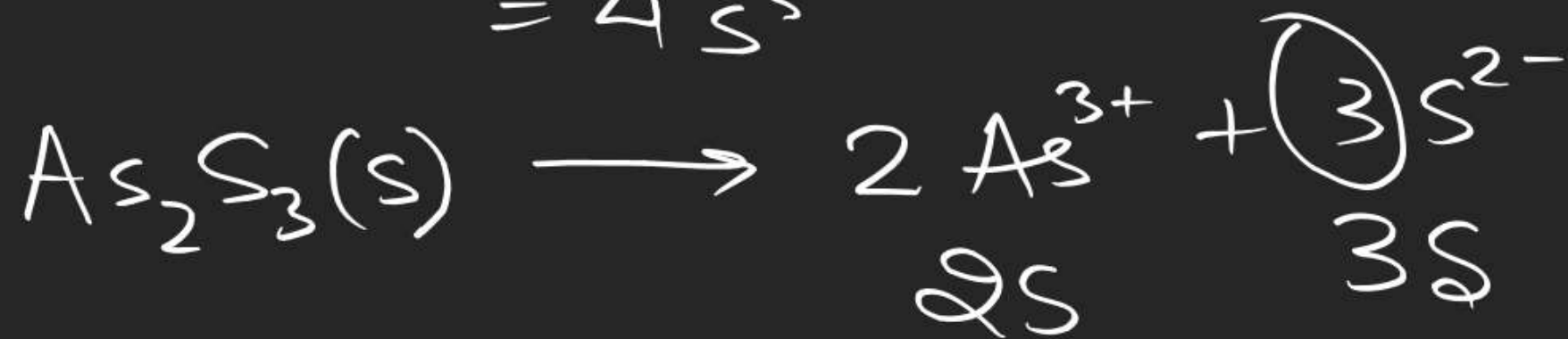
$$\longrightarrow K_{sp} = [B^+][A^-] = S^2$$

Solubility
product

$$K_{sp} \ll 1$$



$$\begin{aligned} K_{sp} &= [\text{Ag}^+]^2 [\text{CrO}_4^{2-}] \\ &= (2S)^2 (S) \\ &= 4S^3 \end{aligned}$$



$$\begin{aligned} K_{sp} &= (2S)^2 (3S)^3 \\ &= 4 \times 27 S^5 = 108 S^5 \end{aligned}$$

Q. find solubility
of Ag_2CrO_4 if
its K_{sp} is 3.2×10^{-11}

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

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

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

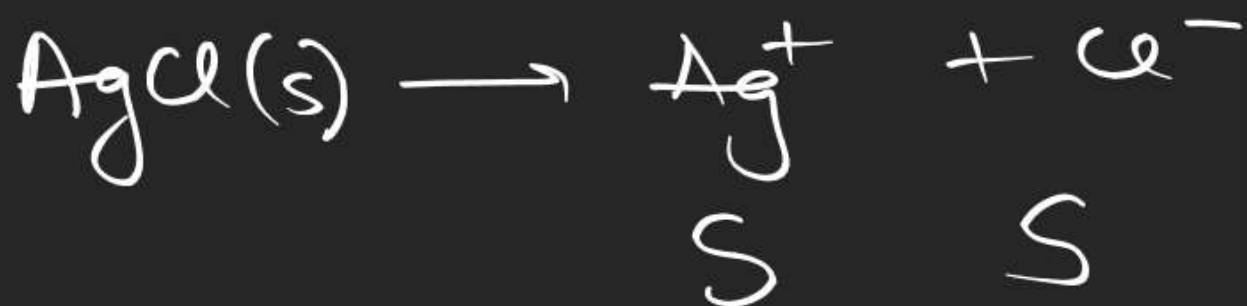
Q. find K_{sp} of $AgCl$ if its saturated solution contains

$1.435 \text{ mg/lit } AgCl$.

$Ag: 108$

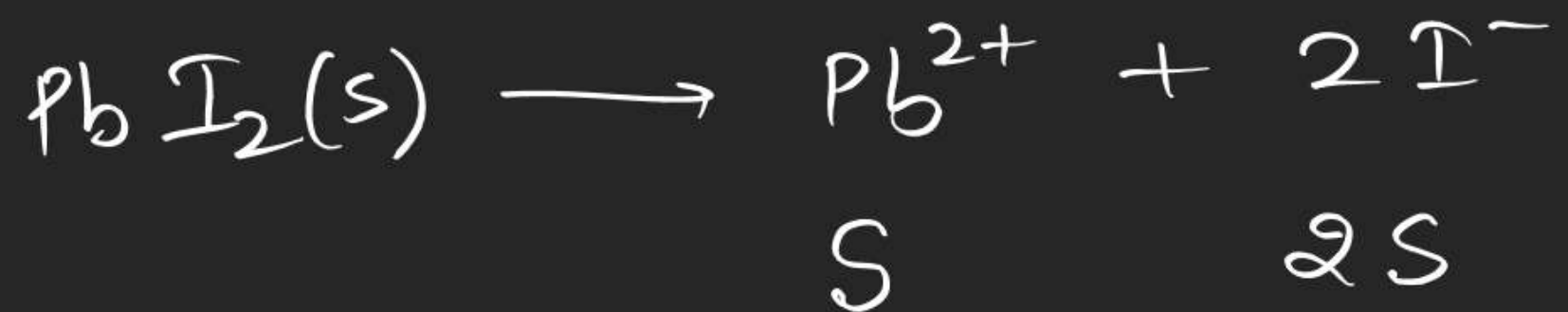
$Cl: 35.5$

$$S = \frac{1.435 \times 10^{-3}}{143.5} = 10^{-5}$$



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

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

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