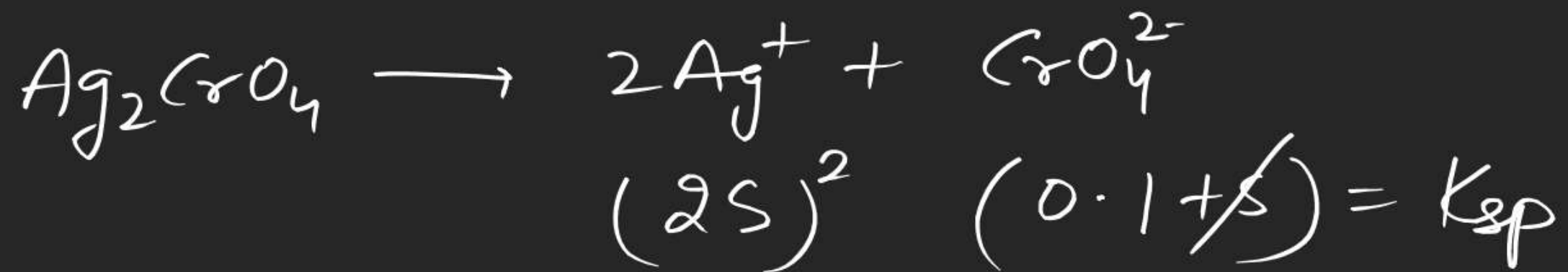


O-I 94-95

S-I 71-72

$$(70) \quad K_{sp} = 4s^3 = 4 \times (10^{-3})^3 = 4 \times 10^{-9}$$



(67)

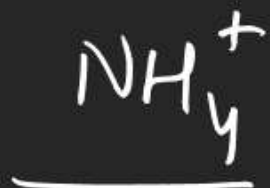
$$4(s_1 + s_2)^3 = 13.5 \times 10^{-9}$$

$$(s_1 + s_2)^3 = 3.375 \times 10^{-9}$$

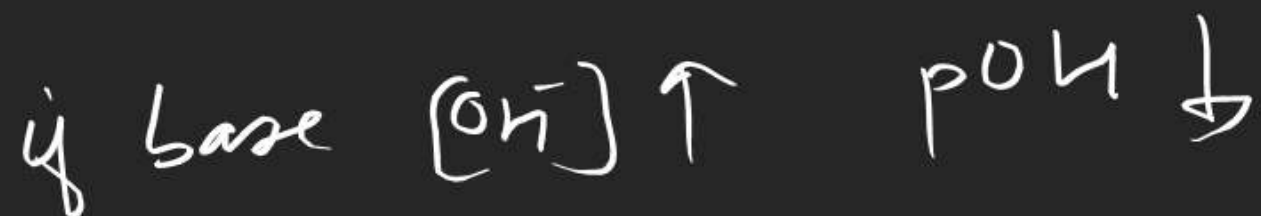
$$s_1 + s_2 = 1.5 \times 10^{-3}$$

$$\underline{[F^-] = 3 \times 10^{-3}}$$

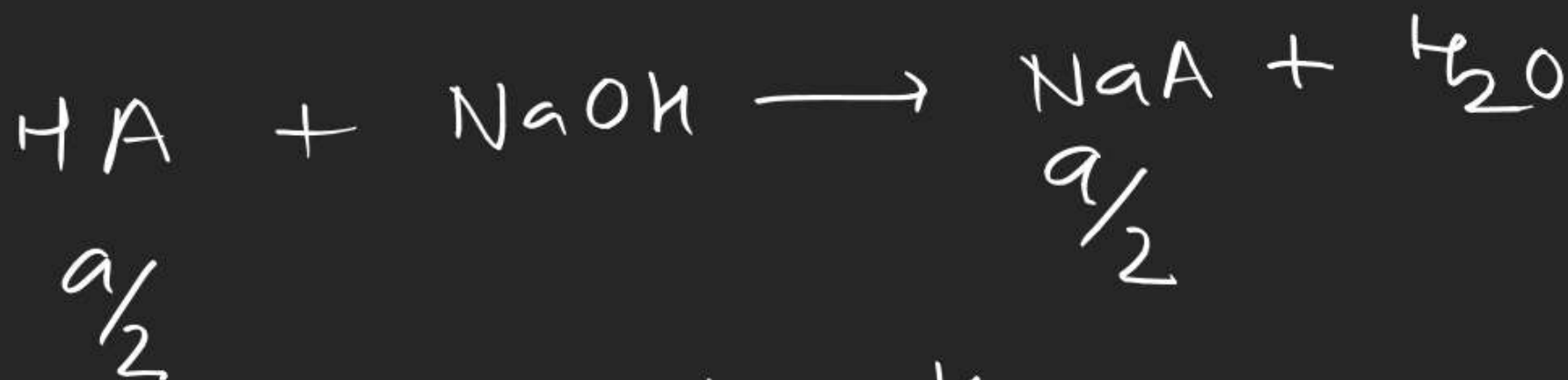
2 (D)



(3)



(4)



$$\underline{\text{pH} = \text{pK}_a}$$

(5) ^a 70°C



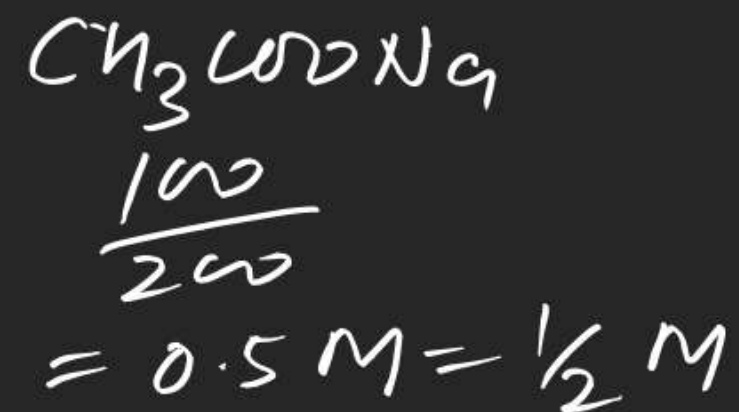
$$\text{pH} < 7$$

$$\text{let } K_w = 10^{-12}$$

$$\text{pH} = 6$$

$$\text{pH} + \text{pOH} = 12$$

(21)



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

$$[\text{OH}^-] = \sqrt{\frac{1}{2} \frac{K_w}{K_a}}$$

$$\begin{aligned} \text{pOH} &= \frac{1}{2} \left(\text{p}K_w - \log \frac{1}{K_a} - \log \frac{1}{2} \right) \\ &= \frac{1}{2} (\text{p}K_w - \text{p}K_a + \log 2) \end{aligned}$$





$$\frac{100 \times 0.1}{500} \quad \frac{400 \times 0.2}{500 \times 10}$$

$$2 \times 10^{-2}$$

$$16 \times 10^{-2}$$

$$15 \times 10^{-2}$$

$$10^{-2}$$

$$\left(2S\right)^2 \left(15 \times 10^{-2} + \cancel{S}\right) = 1.5 \times 10^{-11}$$

$$[\text{Ag}^+]^2 = \frac{10^{-10}}{100}$$

$$(92) \quad \frac{10^{-5}}{100} = 10^{-7}$$

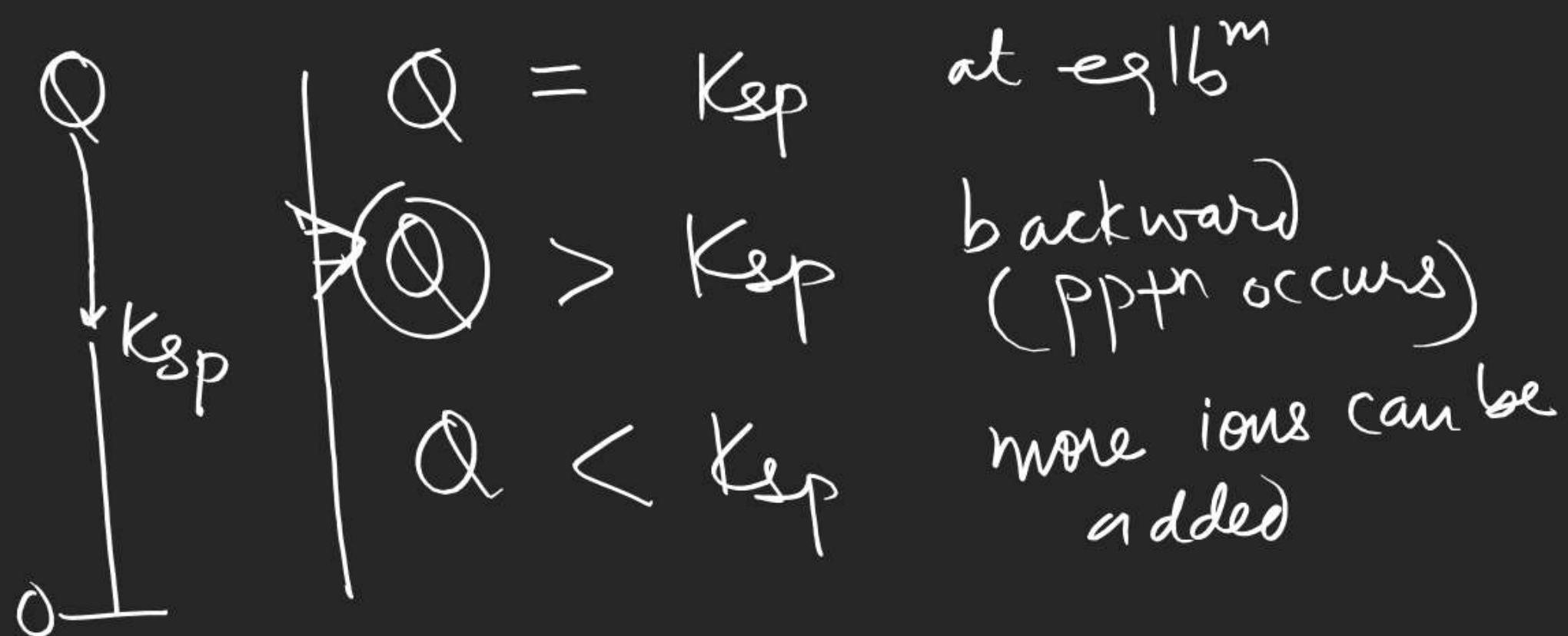
Application of K_{sp} (Precipitation)



$$Q = [Ag^+][Cl^-] = Q$$

at eqbm

$$[Ag^+][Cl^-] = Q = K_{sp}$$



$$\underline{[Ag^+][Cl^-] = K_{sp}}$$

Calculation of conc. of ions after pptⁿ :-

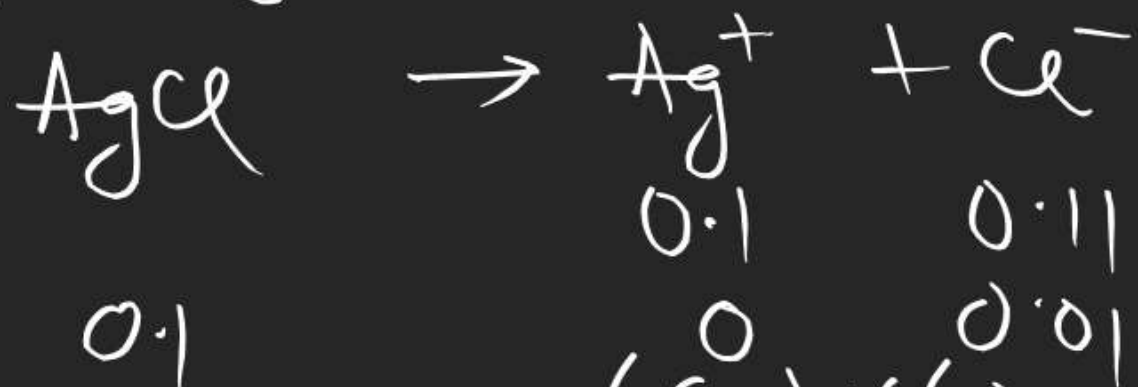
Case-I If amount added is given



$$\boxed{[\text{Ag}^+] = 10^{-8}}$$

$$\underset{\substack{0 \\ (S)}}{(S)} \times \underset{\substack{(b-a) \\ b-a+S}}{(b-a+S)} = K_{sp}$$

Q. find final conc. of each ion if 0.11 mol Cl^- are added to
1 lit 0.1 M Ag^+ solⁿ $K_{sp}(\text{AgCl}) = 10^{-10}$



$$\underset{\substack{0 \\ (S)}}{(S)} \times \underset{\substack{0.01 \\ 0.01+S}}{(0.01+S)} = 10^{-10}$$

Q.

200 ml 0.3M AgNO_3 + 300 ml 0.5M NaCl

$$K_{sp} = 10^{-10}$$



$$\frac{200 \times 0.3}{500}$$

$$= 1.2 \times 10^{-1}$$

0

$$\frac{300 \times 0.5}{500}$$

$$3 \times 10^{-1}$$

$$1.8 \times 10^{-1}$$

$$[\text{Ag}^+]$$

$$= \frac{1}{18} \times 10^{-8}$$

$$= \frac{5}{9} \times 10^{-9}$$

$$10^{-10} = \textcircled{S} \times \underline{\underline{(1.8 \times 10^{-1} + S)}}$$

$$\frac{1}{1.8} \times 10^{-9} = S$$

Case-II If final conc of one ion is given

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

Q. find final conc of each ion if Cl^- are added to (2 lit)
0.1 M Ag^+ soln such that Cl^- conc. become 0.2 M.

$$K_{sp}(AgCl) = 10^{-10}$$

$$[Ag^+][0.2] = 10^{-10}$$

Selective pptⁿ

$10^{-12} M$

$10^{-13} M$

$10^{-14} M$

$10^{-15} M$

$10^{-20} M$

$[Ag^+] = 10^{-9}$

$K_{sp} = 10^{-10}$



✓

$0.1 M$

$[Ag^+] = 10^{-13}$

$K_{sp} = 10^{-14}$



10^{-5}

10^{-2}

✓

$0.1 M$

$0.1 M$

$0.1 M$

$0.1 M$

$[Ag^+] = 10^{-16}$

$K_{sp} = 10^{-17}$



10^{-8}

$10^{-5} M$

$10^{-4} M$

$10^{-3} M$

$10^{-2} M$

$0.1 M$

$0.1 M$

$[Ag^+][I^-] = 10^{-17}$

$[Ag^+](0.1) = 10^{-17}$

$[Ag^+][Br^-] = 10^{-14}$

$$K_{sp} = 10^{-10}$$

$$[Cl^-]$$

$$K_{sp} = 10^{-13}$$

$$[CrO_4^{2-}] = 0.1M$$

Ag^+ are added which $\overset{= 0.1M}{\text{will ppt first}}$

$$\underline{[Ag^+] (0.1) = 10^{-10}}$$

$$[Ag^+]^2 [CrO_4^{2-}] = 10^{-13}$$

$$[Ag^+] = 10^{-6}$$

Q. find conc of Cl^- ion when CrO_4^{2-} starts ppting.