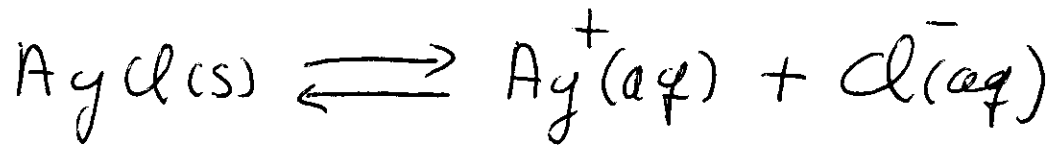


SOLUBILITY PRODUCT



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

$$= 1.6 \times 10^{-10} \quad \text{AT } 25^\circ\text{C}$$

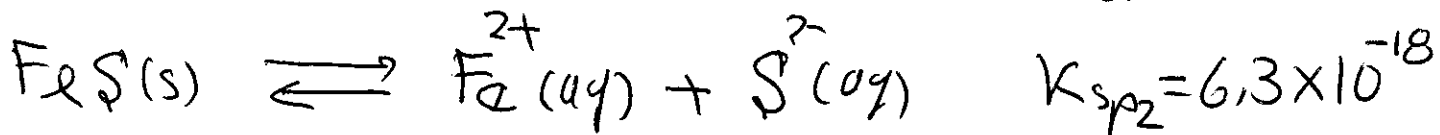
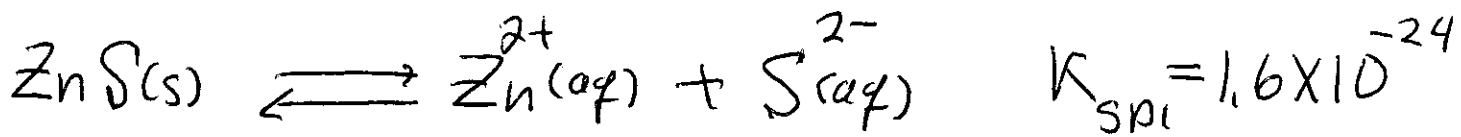
I	1	0	0
C	-x	x	x
E	1	x	x

$$x^2 = 1.6 \times 10^{-10}$$

$$x = 1.3 \times 10^{-5}$$

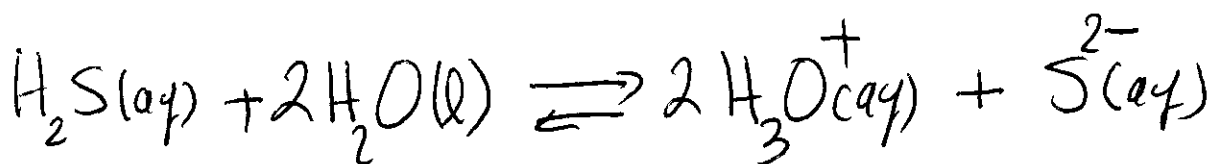
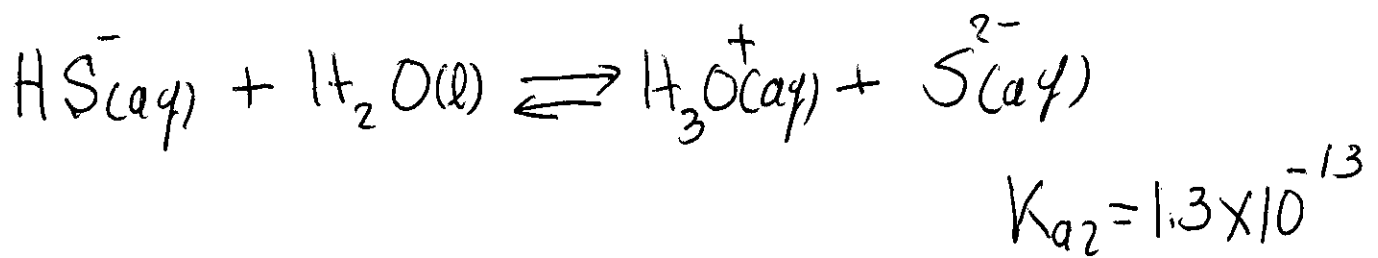
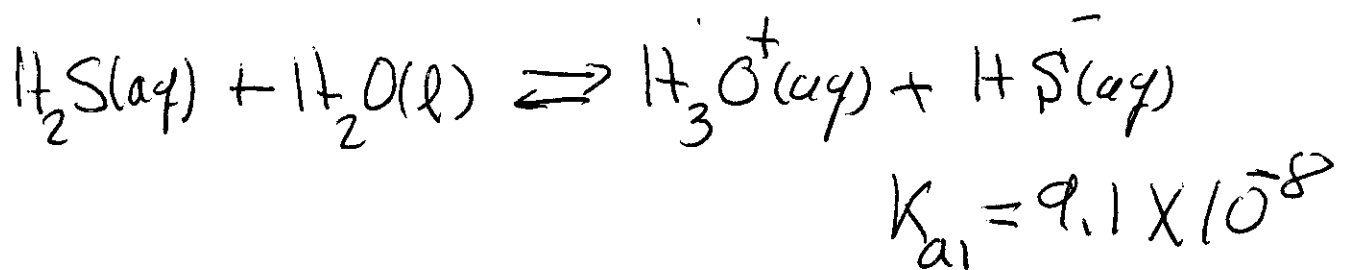
$$[\text{Ag}^+] = 1.3 \times 10^{-5} \text{ M}$$

CONSIDER THE FOLLOWING SULFIDES:



$\text{S}^{2-}(aq)$ IS A CONJUGATE BASE OF HYDROGEN SULFIDE $\text{HS}^{-}(aq)$

$\text{HS}^{-}(aq)$ IS A CONJUGATE BASE OF HYDROSULFURIC ACID $\text{H}_2\text{S}(aq)$



$$K_{a3} = K_{a1} K_{a2} = 1.1 \times 10^{-20}$$

$$K_{a3} = \frac{[\text{H}_3\text{O}^+]^2 [\text{S}^{2-}]}{[\text{H}_2\text{S}]}$$

$$[\text{S}^{2-}] = K_{a3} \frac{[\text{H}_2\text{S}]}{[\text{H}_3\text{O}^+]^2}$$

We can saturate the solution with $\text{H}_2\text{S}(\text{aq})$ hydrosulfuric acid.

For a saturated solution $[\text{H}_2\text{S}] = 0.10 \text{ M}$
At 25°C

We can also control the pH, and
for $\text{pH} = 2.00 \Rightarrow [\text{H}_3\text{O}^+] = 1.0 \times 10^{-2} \text{ M}$

$$\Rightarrow [\text{S}^{2-}] = 1.1 \times 10^{-17} \text{ M}$$

$$K_{sp1} = [Zn^{2+}][S^{2-}] = 1.6 \times 10^{-24}$$

$$K_{sp2} = [Fe^{2+}][S^{2-}] = 6.3 \times 10^{-18}$$

BUT FOR A SATURATED SOLUTION WITH

$H_2S(aq)$ AT $pH = 2.00$, WE HAVE

$$[S^{2-}] = 1.1 \times 10^{-17} M,$$

THEREFORE

$$[Zn^{2+}] = 1.5 \times 10^{-7} M \quad \text{INSOLUBLE}$$

$$[Fe^{2+}] = 0.57 M \quad \text{SOLUBLE}$$