

Answer on Question #63494 - Chemistry – General Chemistry

16.80

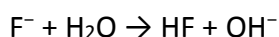
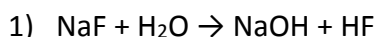
Using data from Appendix D in the textbook, calculate $[\text{OH}^-]$ and pH for each of the following solutions.

1) 0.12 M NaF.

2) 4.5×10^{-2} M Na_2S .

3) A mixture that is 4.8×10^{-2} M in $\text{NaC}_2\text{H}_3\text{O}_2$ and 4.5×10^{-2} M in $\text{Ba}(\text{C}_2\text{H}_3\text{O}_2)_2$.

Solution.



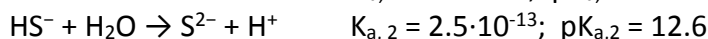
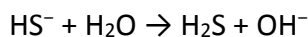
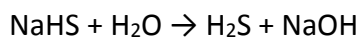
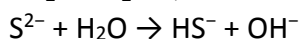
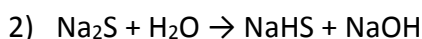
$$K_{\text{HF}} = 6.2 \cdot 10^{-4}; \text{p}K_{\text{HF}} = 3.21$$

$$\text{pH} = 7 + \frac{1}{2} \text{p}K_{\text{HF}} + \frac{1}{2} \lg C_{\text{NaF}}$$

$$\text{pH} = 7 + 1/2 \times 3.21 + 1/2 \times \lg(0.12) = 8.15$$

$$\text{pOH} = 14 - \text{pH} = 14 - 8.15 = 5.85;$$

$$[\text{OH}^-] = 10^{-5.85} = 1.4 \times 10^{-6} \text{ M}$$



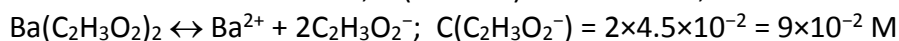
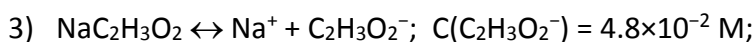
$$K_{a,2} < K_{a,1}$$

$$\text{pH} = 7 + \frac{1}{2} \text{p}K_{a,2} + \frac{1}{2} \lg C_{\text{Na}_2\text{S}}$$

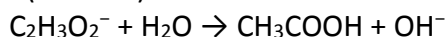
$$\text{pH} = 7 + 1/2 \times 12.6 + 1/2 \times \lg(4.5 \times 10^{-2}) = 12.63$$

$$\text{pOH} = 14 - \text{pH} = 14 - 12.63 = 1.37;$$

$$[\text{OH}^-] = 10^{-1.37} = 4.27 \times 10^{-2} \text{ M}$$



$$C(\text{C}_2\text{H}_3\text{O}_2^-) = 4.8 \times 10^{-2} + 9 \times 10^{-2} = 13.8 \times 10^{-2} \text{ M}$$



$$K_{\text{CH}_3\text{COOH}} = 1.74 \cdot 10^{-5}; \text{p}K_{\text{CH}_3\text{COOH}} = 4.76$$

$$\text{pH} = 7 + \frac{1}{2} \text{p}K_{\text{CH}_3\text{COOH}} + \frac{1}{2} \lg C_{\text{C}_2\text{H}_3\text{O}_2^-}$$

$$\text{pH} = 7 + 1/2 \times 4.76 + 1/2 \times \lg(13.8 \times 10^{-2}) = 8.95$$

$$\text{pOH} = 14 - \text{pH} = 14 - 8.95 = 5.05;$$

$$[\text{OH}^-] = 10^{-5.05} = 8.9 \times 10^{-6} \text{ M}$$

- Answer:** 1) pH = 8.15
[OH⁻] = 1.4×10⁻⁶ M
2) pH = 12.63
[OH⁻] = 4.27×10⁻² M
3) pH = 8.95
[OH⁻] = 8.9×10⁻⁶ M