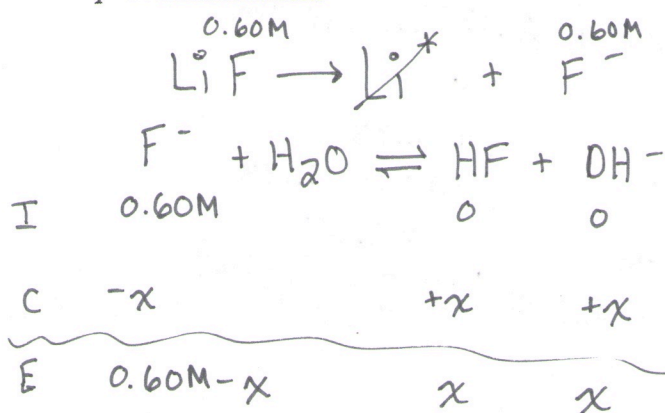


Acid-Base # 2
(K calculations - bases & salts)

Write your response in the space provided. Express answer in correct sig figs & units where appropriate.

(5 marks)

1. Calculate the pH of a 0.60 M LiF salt solution. Begin by writing the equation for the predominant equilibrium reaction.



$$K_b = \frac{[\text{HF}][\text{OH}^-]}{[\text{F}^-]} = \frac{1.00 \times 10^{-14}}{3.5 \times 10^{-4}}$$

Ka for HF

$$= 2.857 \dots \times 10^{-11}$$

$$\frac{(x)(x)}{(0.60 - x)} = 2.857 \dots \times 10^{-11}$$

$$x^2 + 2.857 \dots \times 10^{-11}x - 2.85 \dots \times 10^{-11}(0.60) = 0$$

$$x = [\text{OH}^-] = 4.14 \dots \times 10^{-6} \text{ M}$$

$$\text{pOH} = -\log(4.14 \dots \times 10^{-6} \text{ M})$$

$$\text{pOH} = 5.382 \dots$$

$$\text{pH} = 14 - 5.382 \dots$$

$$\text{pH} = 8.62$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

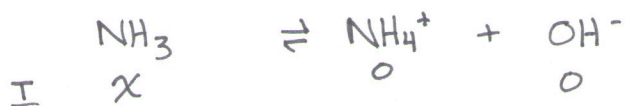
2.

Calculate the initial concentration of a solution of NH_3 which has a $\text{pH} = 11.33$ and $K_b = 1.8 \times 10^{-5}$. Begin by writing the equation for the predominant reaction. base

(5 marks)



$$K_b = \frac{[\text{NH}_4^+][\text{OH}^-]}{[\text{NH}_3]} = 1.8 \times 10^{-5}$$



$$\text{C} \quad -2.13 \times 10^{-3} \quad +2.13 \times 10^{-3} \quad +2.13 \times 10^{-3}$$

$$\text{E} \quad x - 2.13 \times 10^{-3} \quad 2.13 \times 10^{-3} \quad 2.137 \times 10^{-3}$$

↑

$$\text{pH} = 11.33$$

$$\text{pOH} = 14 - 11.33$$

$$= 2.67$$

$$\frac{(2.13 \times 10^{-3})(2.13 \times 10^{-3})}{x - 2.13 \times 10^{-3}} = 1.8 \times 10^{-5} \quad [\text{OH}^-] = 10^{-2.67}$$

$$(2.13 \times 10^{-3})^2 + (2.13 \times 10^{-3})(1.8 \times 10^{-5}) = 1.8 \times 10^{-5} x$$

$$x = 0.2560 \dots$$

$$[\text{NH}_3]_i = x = 0.26 \text{ M}$$