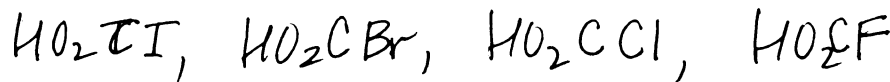


Unless otherwise specified, each question is worth 4 points.

3. Order the following sets of acids from weakest to strongest:

a. HO<sub>2</sub>CBr, HO<sub>2</sub>CCl, HO<sub>2</sub>CF, HO<sub>2</sub>CI

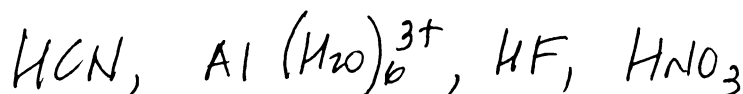


b. HF,  $K_a = 7.2 \times 10^{-4}$

HNO<sub>3</sub> ( $K_a$  cannot be calculated)

HCN,  $K_a = 6.2 \times 10^{-10}$

Al(H<sub>2</sub>O)<sub>6</sub><sup>3+</sup>,  $pK_a = 4.86$   $K_a = 10^{-4.86} = 1.38 \times 10^{-5}$



4. Would you expect solutions of the following to be acidic, basic or neutral?

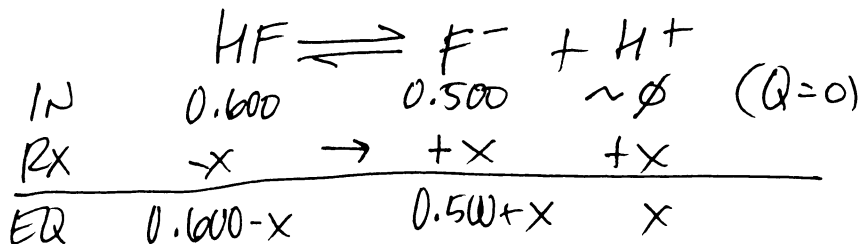
a. MnCl<sub>6</sub> ..... Mn<sup>6+</sup> ..... acidic basic neutral

b. NaCl ..... acidic basic neutral

c. NaNO<sub>2</sub> ..... NO<sub>2</sub><sup>-</sup> ..... acidic basic neutral

d. NH<sub>4</sub>NO<sub>3</sub> ..... NH<sub>4</sub><sup>+</sup> ..... acidic basic neutral

5. Calculate the pH of a solution containing 0.500 M NaF and 0.600 M HF.



$$K_a = 7.2 \times 10^{-4} = \frac{(0.500+x)(x)}{(0.600-x)} \approx \frac{(0.500)(x)}{(0.600)}$$

ALTERNATIVELY,  
USE  
THE  
HOFF



$$x = 8.64 \times 10^{-4} = H^+$$

pH = 3.06





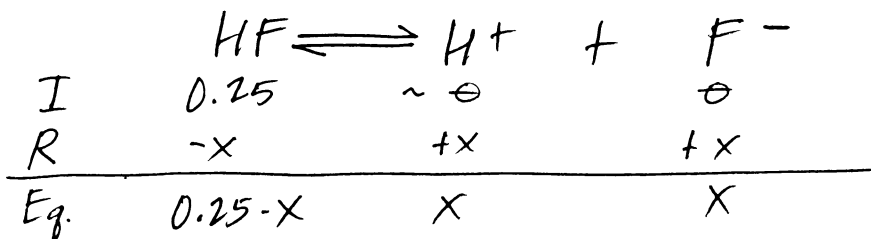
**Basic Competency Quiz #4**  
Chemistry, 7<sup>th</sup> ed., Zumdahl & Zumdahl, sections 14.4-15.1

Unless otherwise specified, each question is worth 4 points.

1. Calculate the pH of each of the following acidic solutions:

a. 0.25 M HCl  $pH = -\log(0.25) = \boxed{0.60}$

b. 0.25 M HF ( $K_a = 7.2 \times 10^{-4}$ )



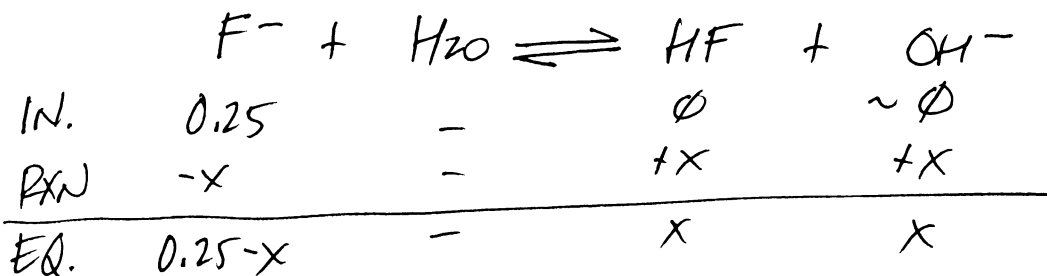
$$K_a = \frac{x^2}{0.25-x} \approx \frac{x^2}{0.25}$$

$$7.2 \times 10^{-4} = \frac{x^2}{.25} \quad x = 0.0134 \quad \boxed{pH = 1.87}$$

2. Calculate the pH of each of the following basic solutions:

a. 0.25 M NaOH  $pOH = -\log(0.25) = 0.60$   
 $pH = 14.00 - 0.60 = \boxed{13.40}$

b. 0.25 M NaF



$$K_b = \frac{K_w}{K_a} = \frac{1.00 \times 10^{-14}}{7.2 \times 10^{-4}} = \frac{(x)(x)}{0.25-x} \approx \frac{x^2}{0.25}$$

$$x = 1.86 = [OH^-] \quad pOH = 5.73 \quad \boxed{pH = 8.27}$$

