

Name \_\_\_\_\_ KEY \_\_\_\_\_ Section \_\_\_\_\_ chm152 Quiz 6

Formulas you may need:  $\text{pH} = -\log[\text{H}^+]$ ,  $[\text{H}^+] = 10^{-\text{pH}}$ ,  $K_w = K_a K_b = 1.0 \times 10^{-14}$

1) (4 pts) Rank the following weak acids according to **INCREASING acid strength**.  
(i.e., 1 = weakest..... 4 = strongest)

Rank

  2   Hydrogen Sulfide ( $K_a = 1.0 \times 10^{-7}$ )

  1   Hydrocyanic Acid ( $K_a = 4.0 \times 10^{-10}$ )

  4   Nitrous Acid ( $K_a = 4.5 \times 10^{-4}$ )

  3   Formic Acid ( $K_a = 1.8 \times 10^{-4}$ )

2) (4 pts) A 750 mL solution is prepared from 0.295 mol of a weak acid (HA). If the pH of the solution is 2.39, what is the **value of  $K_a$**  for this weak acid?



$$[\text{HA}] = 0.295 \text{ mol} / 0.750 \text{ L} = 0.393 \text{ M}$$

$$[\text{H}^+] = 10^{-(2.39)} = 0.004 \text{ M} \quad , \text{therefore } [\text{A}^-] = 0.004 \text{ M}$$

$$K_a = \frac{(0.004)(0.004)}{(0.393 - 0.004)} = 4.11 \times 10^{-5} \quad \text{OR} \quad 4.0 \times 10^{-5} \quad \text{if you used assumption}$$

3) (4 pts) Hydrofluoric acid (HF) has a  $K_a = 6.8 \times 10^{-4}$ . What are the **equilibrium concentrations** of all species in a 0.810 M HF solution?

$$[\text{H}^+] = \underline{0.0234 \text{ M}}$$

$$[\text{F}^-] = \underline{0.0234 \text{ M}}$$

$$[\text{HF}] = \underline{0.7866 \text{ M}}$$

4) (4 pts) Which of the following statements about weak acids and weak bases is **FALSE**?

- A) The weaker the acid, the stronger its conjugate base.
- B) An acid with a LARGE  $K_a$  will have a SMALL  $K_b$ .
- C) Weak bases do not have  $K_a$  values.**
- D) In a weak acid (HA) solution,  $[H^+] = [A^-]$ .
- E) Weak base solutions have pH values greater than 7.0.

5) (4 pts) Which of the following expressions represents the **SECOND ionization constant ( $K_{a2}$ )** for phosphoric acid ( $H_3PO_4$ )?

A)  $K_a = \frac{[H^+][PO_4^{3-}]}{[HPO_4^{2-}]}$

B)  $K_a = \frac{[H^+][H_2PO_4^-]}{[H_3PO_4]}$

**C)  $K_a = \frac{[H^+][HPO_4^{2-}]}{[H_2PO_4^-]}$**

D)  $K_a = \frac{[H^+]^2[HPO_4^{2-}]}{[H_2PO_4^-]}$

E) None of the above expressions are correct.