

NAME Key

CHEM 1451/ Quiz 5/ March 7, 2019

A 1. What is the conjugate base of  $\text{H}_2\text{PO}_4^-$  ?

- A)  $\text{HPO}_4^{2-}$
- B)  $\text{PO}_4^{3-}$
- C)  $\text{H}_3\text{PO}_4$
- D)  $\text{H}_3\text{O}^+$
- E)  $\text{OH}^-$

(take one  $\text{H}^+$ )

E 2. Which of the following acids is the STRONGEST? The acid is followed by its  $K_a$  value.

- A) HF,  $3.5 \times 10^{-4}$
- B) HCN,  $4.9 \times 10^{-10}$
- C)  $\text{HNO}_2$ ,  $4.6 \times 10^{-4}$
- D)  $\text{HCHO}_2$ ,  $1.8 \times 10^{-4}$
- E)  $\text{HClO}_2$ ,  $1.1 \times 10^{-2}$

largest  $K_a$

(most dissociation)

B 3. Calculate the pH of a solution that contains  $3.9 \times 10^{-4} \text{ M}$   $\text{H}_3\text{O}^+$  at  $25^\circ\text{C}$ .

- A) 4.59
- B) 3.41
- C) 10.59
- D) 9.41
- E) 0.59

$$-\log(3.9 \times 10^{-4}) = 3.41$$

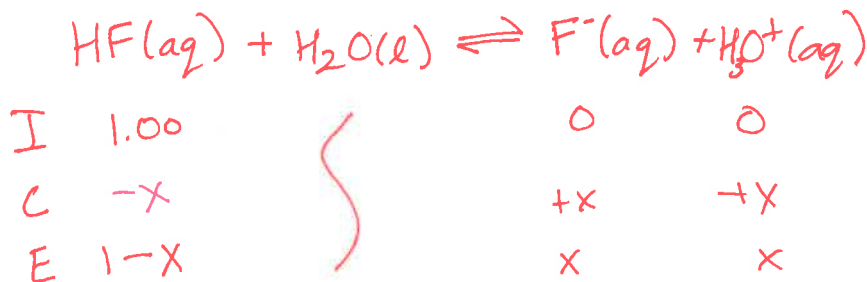
A 4. Calculate the hydroxide ion concentration in an aqueous solution with a pH of 9.85 at  $25^\circ\text{C}$ .

- A)  $7.1 \times 10^{-5} \text{ M}$
- B)  $4.2 \times 10^{-10} \text{ M}$
- C)  $8.7 \times 10^{-10} \text{ M}$
- D)  $6.5 \times 10^{-5} \text{ M}$
- E)  $1.4 \times 10^{-10} \text{ M}$

$$\begin{aligned} \text{pOH} &= 14 - 9.85 \\ &= 4.15 \end{aligned}$$

$$10^{-4.15} = \boxed{7.1 \times 10^{-5} \text{ M}}$$

1. (6 Points) Calculate the pH of a 1.00M HF solution. ( $K_a = 3.5 \times 10^{-4}$ ).



$$\text{pH} = -\log(.019)$$

$$= \boxed{1.73}$$

$$3.5 \times 10^{-4} = \frac{x^2}{1-x}$$

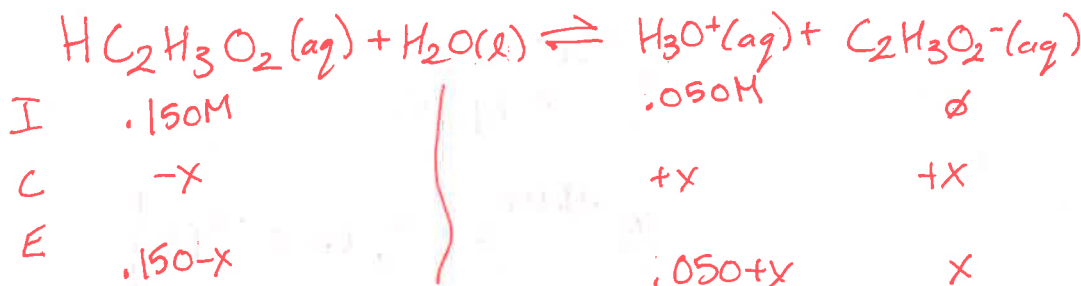
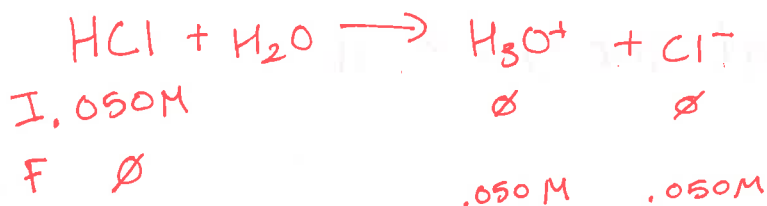
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$$x = \sqrt{3.5 \times 10^{-4}} = .019 \text{ M} \leftarrow \begin{matrix} \text{valid?} \\ \text{yes!} \end{matrix}$$

- a) (4 Points) What is the percent ionization for the HF solution above?

$$\frac{.019}{1.00} \times 100 = \boxed{1.87\%}$$

2. (8 Points) Find the pH of a mixture of 0.150 M  $\text{HC}_2\text{H}_3\text{O}_2$  ( $K_a = 1.8 \times 10^{-5}$ ) and 0.050 M HCl.



$$1.8 \times 10^{-5} = \frac{(.050+x)(x)}{(.150-x)}$$

$$5.4 \times 10^{-5} = x$$

$$[\text{H}_3\text{O}^+] = .05 + 5.4 \times 10^{-5}$$

$$\text{pH} = \boxed{1.30}$$