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Acid-base Eq (1) . Calculating pH of acid (1)

* Calculate the expected pH of 1.00M CH_3COOH ($K_a = 1.8 \times 10^{-5}$)

	CH_3COOH	\rightleftharpoons	CH_3COO^-	+	H_3O^+
I	1.00		0		0
C	-x		+x		+x
E	(1.00-x)		x		x

$$K_a = 1.8 \times 10^{-5} = \frac{(x)(x)}{(1.00-x)} = \frac{[\text{H}_3\text{O}^+][\text{CH}_3\text{COO}^-]}{[\text{CH}_3\text{COOH}]}$$

ignore x b/c its small.
take square root of both sides

$$\sqrt{1.8 \times 10^{-5} = \frac{x^2}{1.00}}$$

$$x = 4.2 \times 10^{-3}$$

$$\text{pH} = -\log 4.2 \times 10^{-3} = \boxed{2.38}$$

_____ x _____ x _____ x _____

(a) Ignoring x .
if dissociation $x < 5\%$ of M of acid .

$$5\% \text{ of } 1.00 = \underline{0.05} . \quad x = 4.2 \times 10^{-3} .$$

if less than 5% then ignore .

(b) $\frac{M_{\text{acid}}}{K_a} > 100$ then ignore x .

$$\left[\frac{1.00}{1.8 \times 10^{-5}} \right] \gg 100 \quad \text{ignore } x .$$