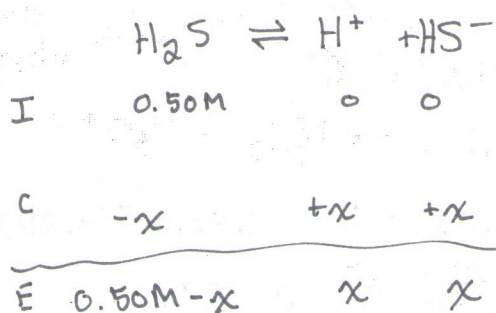


Acid-Base #2

(Ka Calculations Type 2)

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

1. Calculate the pH of 0.50 M H_2S . (4 marks)
acid



$$K_a = \frac{[\text{H}^+][\text{HS}^-]}{[\text{H}_2\text{S}]} = 9.1 \times 10^{-8}$$

$$\frac{(x)(x)}{0.50 - x} = 9.1 \times 10^{-5}$$

Assume: $0.50M - x \approx 0.50M$

$$\frac{x^2}{0.50} = 9.1 \times 10^{-5}$$

$$x = [\text{H}^+] = \sqrt{9.1 \times 10^{-5} (0.50)}$$

$$= 6.745 \dots \times 10^{-3} \text{M}$$

$$\text{pH} = -\log [\text{H}^+]$$

$$= -\log (6.745 \dots \times 10^{-3} \text{M})$$

$$\text{pH} = 2.17$$

justification:

$$\% \text{diss} = \frac{[\text{H}^+]}{[\text{H}_2\text{S}]} \times 100$$

$$= \frac{(6.74 \dots \times 10^{-3} \text{M})}{(0.50 \text{M})} \times 100$$

$$= 1.3\%$$

\therefore approximation is valid.

2.

What pH results when 0.75 mol of acetic acid is dissolved in enough water to make 3.0 litres of solution? (4 marks)



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

I	CH_3COOH $\frac{0.75 \text{ mol}}{3.0 \text{ L}}$	\rightleftharpoons	CH_3COO^- 0	+	H_3O^+ 0
C	$-\chi$		$+\chi$		$+\chi$
E	$0.25 - \chi$		χ		χ

$$\frac{\chi^2}{(0.25 - \chi)} = 1.8 \times 10^{-5}$$

$$\chi^2 + 1.8 \times 10^{-5} \chi - 1.8 \times 10^{-5}(0.25) = 0$$

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

$$\chi = [\text{H}_3\text{O}^+] = 0.00211 \dots \text{M}$$

$$\text{pH} = -\log[\text{H}_3\text{O}^+]$$

$$= -\log(0.00211 \dots \text{M})$$

$$\text{pH} = 2.68$$