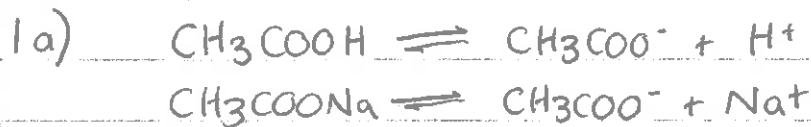


Buffer Questions Extra Answers



$$\frac{0.4}{1} = 0.4 \text{ mol dm}^{-3}$$

$$\frac{0.5}{1} = 0.5 \text{ mol dm}^{-3}$$

$$K_a = \frac{[\text{CH}_3\text{COO}^-][\text{H}^+]}{[\text{CH}_3\text{COOH}]}$$

$$1.74 \times 10^{-5} = \frac{0.5 \times [\text{H}^+]}{0.4}$$

$$[\text{H}^+] = 1.392 \times 10^{-5}$$

$$\text{pH} = \underline{4.86}$$

1b) $\frac{50}{1000} = 0.05 \text{ dm}^3$

$$\frac{150}{1000} = 0.15 \text{ dm}^3$$

$$0.3 \times 0.05 = 0.015 \text{ moles}$$

HCOOH

$$0.3 \times 0.15 = 0.045 \text{ moles}$$

HCOONa

$$\frac{0.015}{0.2} = 0.075 \text{ mol dm}^{-3}$$

HCOOH

$$\frac{0.045}{0.2} = 0.225 \text{ mol dm}^{-3}$$

HCOONa

$$K_a = \frac{[\text{HCOO}^-][\text{H}^+]}{[\text{HCOOH}]}$$

$$10^{-3.75} = 1.778 \times 10^{-4}$$

$$1.778 \times 10^{-4} = \frac{0.225 \times [\text{H}^+]}{0.075}$$

$$[\text{H}^+] = 5.926 \times 10^{-5}$$

$$\text{pH} = \underline{4.23}$$

$$1c) \frac{0.1}{0.25} = 0.4$$

NH₃

$$\frac{0.2}{0.25} = 0.8$$

NH₄⁺



$$pK_a = 9.25 \quad 10^{-9.25} = 5.62 \times 10^{-10} \text{ (Ka)}$$

$$K_a = \frac{[\text{NH}_3][\text{H}^+]}{[\text{NH}_4^+]}$$

$$5.62 \times 10^{-10} = \frac{0.4 \times [\text{H}^+]}{0.8}$$

$$\text{H}^+ = 1.124 \times 10^{-9} \quad \text{pH} = \underline{\underline{8.95}}$$

$$1d) \frac{0.250 \times 100}{1000} = 0.025 \text{ moles}$$

CH₃NH₂

$$\frac{0.250 \times 100}{1000} = 0.025 \text{ mol}$$

CH₃NH₃Cl

$$\frac{0.025}{0.2} = 0.125$$

CH₃NH₂

$$\frac{0.025}{0.2} = 0.125$$

CH₃NH₃Cl

$$K_a = \frac{[\text{CH}_3\text{NH}_2][\text{H}^+]}{[\text{CH}_3\text{NH}_3^+]}$$

$$2.29 \times 10^{-11} = \frac{0.125 \times [\text{H}^+]}{0.125}$$

$$\text{H}^+ = K_a \quad \text{pH} = \underline{\underline{10.64}}$$

2a) $\frac{60}{60} = 1 \text{ mole } \text{CH}_3\text{COOH}$ $\frac{82}{82} = 1 \text{ mole } \text{CH}_3\text{COONa}$ in $1 \text{ dm}^3 \therefore \underline{1 \text{ mol dm}^{-3}}$

$$K_a = \frac{[\text{CH}_3\text{COO}^-][\text{H}^+]}{[\text{CH}_3\text{COOH}]} \quad 1.74 \times 10^{-5} = \frac{\cancel{1} \times [\text{H}^+]}{\cancel{1}}$$

$$K_a = [\text{H}^+] \quad \text{pH} = \underline{\underline{4.76}}$$

b) $5 \times 0.01 = 0.005 \text{ moles}$
HCl

$$K_a = \frac{[\text{CH}_3\text{COO}^-][\text{H}^+]}{[\text{CH}_3\text{COOH}]} \quad \begin{array}{l} \text{CH}_3\text{COO}^- = 0.5 \text{ moles} \\ \text{CH}_3\text{COOH} = 0.5 \text{ moles} \end{array}$$

$$\text{CH}_3\text{COO}^- = 0.5 - 0.005 = 0.495 \text{ moles} \div 0.5 = 0.99 \text{ mol dm}^{-3}$$

$$\text{CH}_3\text{COOH} = 0.5 + 0.005 = 0.505 \text{ moles} \div 0.5 = 1.01 \text{ mol dm}^{-3}$$

$$1.74 \times 10^{-5} = \frac{0.99 \times [\text{H}^+]}{1.01} \quad \text{H}^+ = 1.775 \times 10^{-5} \quad \text{pH} = \underline{\underline{4.75}}$$

c) $5 \times 0.01 = 0.005 \text{ moles}$
NaOH

$$K_a = \frac{[\text{CH}_3\text{COO}^-][\text{H}^+]}{[\text{CH}_3\text{COOH}]} \quad \begin{array}{l} \text{CH}_3\text{COO}^- = 0.5 \text{ moles} \\ \text{CH}_3\text{COOH} = 0.5 \text{ moles} \end{array}$$

$$\text{CH}_3\text{COO}^- = 0.5 + 0.005 = 0.505 \text{ moles} \div 0.5 = 1.01 \text{ mol dm}^{-3}$$

$$\text{CH}_3\text{COOH} = 0.5 - 0.005 = 0.495 \text{ moles} \div 0.5 = 0.99 \text{ mol dm}^{-3}$$

$$1.74 \times 10^{-5} = \frac{1.01 \times [\text{H}^+]}{0.99} \quad \text{H}^+ = 1.7055 \times 10^{-5} \quad \text{pH} = \underline{\underline{4.77}}$$