9.46: Describe how you would prepare 250 mL of a 0.10 M NaCl solution?

- take 0.10 g of NaCl and dissolve it into 250 mL of water

9.50: How many moles of each substance are needed to prepare the following solutions?

a) 50.0 mL of 8.0% (m/v) KCl (MW = 74.55 g/mol) KCl = 74.5513 g

$$\frac{(50.0\text{mL})(8.0\%)}{100} = 4.0\text{g KCl} \times \frac{1\text{ mol KCl}}{74.5513\text{ g KCl}} = 0.054\text{ mol KCl}$$

b) 200.0 mL of 7.5% (m/v) acetic acid (MW = 60.06 g/mol)

$CH_3COOH = 60.0228$ g

$$\frac{(200.0\text{mL})(7.5\%)}{100} = 15\text{ g acetic acid} \times \frac{1\text{ mol acetic acid}}{60.0228\text{ g acetic acid}} = 0.25\text{ mol acetic acid}$$

9.56: How many grams of solute are in the following solutions?

a) 200 mL of 0.30 M acetic acid, $CH_3COOH \Rightarrow 60.0228$ g

$$200\text{mL} \times \frac{1\text{L}}{1000\text{mL}} = .2\text{L} \quad \Big| \quad \frac{0.30\text{ mol}}{1\text{L}} \times .2\text{L} = .06\text{ mol} \times \frac{60.0228\text{ g}}{1\text{ mol}}$$

$$\Downarrow$$

$3.6\text{ g } CH_3COOH$

b) 1.50 L of 0.25 M NaOH $\longrightarrow$ 39.99016 g

$$1.50\text{L} \times \frac{0.25\text{mol}}{1\text{L}} = .375\text{ mol} \times \frac{39.99\text{ g}}{1\text{ mol}} = 15\text{ g NaOH}$$

9.58: Nalorphine, a relative of morphine, is used to combat withdrawl symptoms in heroine users. How many milliliters of a 0.40% (m/v) solution of nalorphine must be injected to obtain a dose of 1.5 mg?

$$1.5\,mg \times \frac{1\,g}{1000\,mg} = .0015\,g$$

$$\frac{(?\,mL)(.40\%)}{100} = .0015\,g \Rightarrow .0015\,g \times 100 = \frac{.15}{.40} = \frac{(?\,mL)(.40\%)}{.40} = \boxed{.38\ mL}$$

9.65: Concentrated (12.0M) hydrochloric acid is sold for household and industrial purposes under the name "muriatic acid". How many milliliters of 0.500M HCl solution can be made from 25.0mL of 12.0 M HCl solution.

$$(12.0)(25.0) = (0.500)(V_d) \Rightarrow \frac{300}{0.500} = \frac{(0.500)(V_d)}{0.500} = \boxed{600.\ mL}$$

9.89: a typical dosage of statin drugs for the treatment of high cholesterol is 10mg. Assuming a total blood volume of 5.0L, calculate the (m/v)% concentration of drug in the blood units of g/100mL.

$$10mg \times \frac{1g}{1000mg} = .01g \Rightarrow \frac{.01g}{5.0L} \times 100 = \boxed{.20\%\ (m/v)}$$

10.47: label the Bronsted-Lowry acids + bases in the following equations, + tell which substances are conjugate acid-base pairs.

a) $CO_3^{2-}(aq) + HCl(aq) \longrightarrow HCO_3^-(aq) + Cl^-(aq)$

CO_3^{2-}: base; HCl: acid; HCO_3^-: conjugate acid; Cl^-: conjugate base

b) $H_3PO_4(aq) + NH_3(aq) \longrightarrow H_2PO_4^-(aq) + NH_4^+(aq)$

H_3PO_4: acid; NH_3: base; $H_2PO_4^-$: conjugate base; NH_4^+: conjugate acid

10.67: write equations for HCO_3^- and $H_2PO_4^-$ acting as bases with the strong acid HCl and as acids with the strong base NaOH.

$$HCl + HCO_3^- \longrightarrow H_2O + Cl^- + CO_2$$
$$HCO_3^- + NaOH \longrightarrow H_2O + NaCO_3$$

10.69: $NaHCO_3$ = common home remedy for acid indigestion + is also use to neutralize acid spills in the lab. write a balanced equation for the reaction with:

a) $HCl + NaHCO_3 \longrightarrow NaCl + H_2O + CO_2$

b) $H_2SO_4 + 2NaHCO_3 \longrightarrow Na_2SO_4 + 2H_2O + 2CO_2$

10.80: what is the pH of a buffer system that contains 0.15 M NH_4^+ and 0.10 M NH_3? The pKa of NH_4^+ = 9.25

$$pH = pKa + \log\frac{[base]}{[acid]} \qquad pKa + pK_b = 14$$

$[NH_3] = 0.10M$; $[NH_4^+] = 0.15M$

$$pH = 9.25 + \log\frac{[0.10]}{[0.15]}$$

$$\boxed{pH = 9.07}$$