Gilleth

CHM151 Quiz 3a 25 Pts Spring 2017 Name: Key

Turn off all cell phones. Show all work to receive credit.

Atomic Masses: H 1.01, O 16.00, K 39.01, C 12.01, Zn 65.39,

1. (5 Pts) 34.62 mL of 0.1510 M NaOH was needed to neutralize 50.0 mL of an H_2SO_4 solution. What is the concentration (molarity) of the original sulfuric acid solution?

$$2NaOH(aq) + H_2SO_4(aq) \rightarrow 2H_2O(l) + Na_2SO_4(aq)$$

34.62 mL, 0.1510 mol/L | 50.0 mL, ? mol/L

$$\frac{34.62\ \text{mL NaOH}}{50.0\times10^{-3}\ \text{L}_{H_2SO_4}} \left|\frac{0.1510\ \text{mol NaOH}}{1000\ \text{mL NaOH}}\right| \frac{1\ \text{mol}\ H_2SO_4}{2\ \text{mol NaOH}} = 0.0523\ \frac{\text{mol}\ H_2SO_4}{\text{L}_{H_2SO_4}}$$

2. (5 Pts) What mass of K_2CO_3 is needed to prepare 200. mL of a solution having a potassium ion concentration of 0.150 M?

$$\frac{200\ \text{mL}}{1000\ \text{mL}} \left|\frac{0.150\ \text{mol}\ K^+}{2\ \text{mol}\ K^+}\right| \frac{1\ \text{mol}\ K_2CO_3}{\text{mol}\ K_2CO_3} \left|\frac{138.03\ \text{g}\ K_2CO_3}{\text{mol}\ K_2CO_3}\right| = 2.07\ \text{g}\ K_2CO_3$$

3. (5 Pts) Zinc dissolves in hydrochloric acid to yield hydrogen gas:

$$Zn(s) + 2HCl(aq) \rightarrow ZnCl_2(aq) + H_2(g)$$

What mass of hydrogen gas is produced when a 7.35 g chunk of zinc dissolves in 500. mL of 1.200M HCl?

$$\frac{7.35\ \text{g Zn}}{65.39\ \text{g Zn}} \left|\frac{1\ \text{mol}\ H_2}{1\ \text{mol Zn}}\right| \frac{2.02\ \text{g}\ H_2}{1\ \text{mol}\ H_2} = 0.227\ \text{g}\ H_2 \quad \Leftarrow \text{Zn is limiting Reactant}$$

$$\frac{500\ \text{mL HCl}}{1000\ \text{mL HCl}} \left|\frac{1.200\ \text{mol HCl}}{2\ \text{mol HCl}}\right| \frac{1\ \text{mol}\ H_2}{1\ \text{mol}\ H_2} \left|\frac{2.02\ \text{g}\ H_2}{1\ \text{mol}\ H_2}\right| = 0.606\ \text{g}\ H_2$$

4. (5 Pts) A 20.00 mL sample of 0.1015 M nitric acid is introduced into a flask, and water is added until the volume of the solution reaches 250. mL. What is the concentration of nitric acid in the final solution?

$$M_1V_1 = M_2V_2$$

$$(0.1015\text{M})(20.00\ \text{mL}) = M_2(250.\ \text{mL})$$

$$M_2 = 0.00812\ \text{M} \text{ or } 8.12\times10^{-3}\ \text{M}$$

5. (5 Pts) What volume (mL) of a 0.3428 M HCl(aq) solution is required to completely neutralize 23.55 mL of a 0.2350 M $Ba(OH)_2$(aq) solution?

$$2HCl(aq) + Ba(OH)_2(aq) \rightarrow 2H_2O(l) + BaCl_2(aq)$$

? mL, 0.3428 mol/L | 23.55 mL, 0.2350 mol/L

$$\frac{23.55\ \text{mL}\ Ba(OH)_2}{1000\ \text{mL}\ Ba(OH)_2} \left|\frac{0.2350\ \text{mol}\ Ba(OH)_2}{1\ \text{mol}\ Ba(OH)_2}\right| \frac{2\ \text{mol HCl}}{0.3428\ \text{mol HCl}} \left|\frac{1000\ \text{mL HCl}}{}\right| = 32.29\ \text{mL HCl}$$