Name: Key

Date: 2/13/18

Molarity Practice Problems

1. Calculate the mass of potassium hydroxide necessary to create a 160 mL solution of 0.60 M KOH.

$$0.60\,M = \frac{n}{0.160\,L} \longrightarrow n = \left(0.60\,\frac{mol}{\cancel{L}}\right)(0.160\,\cancel{L})$$

$$n = 0.096\,mol$$

$$mass = 0.096\,\cancel{mol} \times \frac{56.11\,g}{\cancel{mol}} = 5.387 \rightarrow \boxed{5.4\,g\,KOH}$$

2. Gilligan needs to make a solution of 2.00 M $CuSO_4$. If he uses 15.3 g of $CuSO_4$, what is total volume of water needed after he adds the $CuSO_4$?

$$2.00\,M\,CuSO_4 = \frac{(15.3g)(1/159.62)}{V}$$

$$V = \frac{(15.3)(1/159.62)}{2.00} = 0.04793$$

$$\boxed{V = 0.0480L = 48.0\,mL}$$

3. Describe the procedure for making a 200 mL solution of 0.046 M NaOH from solid NaOH tablets.

Weigh out 368 mg of solid NaOH. Dissolve them in 100-150 mL of water. Finally, Fill the ~~beaker~~ flask to the 200mL mark (total volume of 200 mL)

$$n = \frac{[NaOH] \times 0.200}{\cancel{\text{[illegible]}}} = 0.046 \times 0.200 = 0.0092\,mol$$

$$m = 0.0092\,\cancel{mol} \times \frac{40.0\,g}{\cancel{mol}}$$

$$m = 0.368\,g = 368\,mg$$

4. Mr. Darcy is making a lithium chloride solution. He fills a beaker with 500 mL of water and 25.4 g LiCl. However, he believes that he made the solution too concentrated so he adds another 250 mL of water. What was the final concentration of his LiCl solution?

$$25.4\cancel{g}\left(\frac{mol}{42.39\cancel{g}}\right) = 0.\overset{5991}{\cancel{7989}}\,\cancel{g}\,mol \sim 0.600\,mol$$

$$\frac{\overset{0.600}{\cancel{0.7989}}\,mol}{0.750} = \boxed{0.800\,M\,LiCl}$$

5. Refer back to #4 – Mr. Darcy didn't pay attention in chemistry class so he doesn't know how to calculate molarity. If Mr. Darcy initially wanted a concentration of 1.0 M LiCl, was his initial solution accurate?

$$\frac{0.600\ mol}{0.500\ L} = \boxed{1.2\ M\ LiCl}$$

Poor Mr. Darcy!

6. The salt content of seawater is mostly sodium chloride (NaCl). Approximately 3.5% of seawater is salt which means that for every 1000 mL of seawater, there are 35 g of salt. Assuming that all of the salt is NaCl, what is the molarity of the salt in seawater?

$$35g\left(\frac{58.44g}{mol}\right) = 0.5989 \rightarrow 0.600\ mol$$

$$\frac{0.600\ mol}{1000\ mL} = \frac{0.600\ mol}{1\ L} = \boxed{0.600\ M\ NaCl}$$

STUMPER – Mr. Frank decides he wants to prank the Northern Swim Team. He is going to fill the pool with red, water-soluble food coloring (because he can totally afford that much food coloring). In order to accomplish this, he needs to fill the pool to a concentration of 2.0 M. If the molecular weight of red dye is 496.42 $^g/_{mol}$, and the NHS pool has approximately 180,000 gallons of water, what mass of red dye does Mr. Frank need to buy to successfully turn the NHS pool red? Assume the pool is pure water (Hint: 1 gallon =3.785 liters)

$$180{,}000\ \cancel{gal}\left(\frac{3.785\ L}{1\ \cancel{gal}}\right) = 681{,}300\ L$$

$$2.0\ M = \frac{n}{681{,}300\ L} \longrightarrow (2.0)(681{,}300\ L) = n = 1362600\ moles$$

$$1{,}362{,}600\ \cancel{mol}\left(496.42\ g/\cancel{mol}\right) = 676421892$$

$$\boxed{= 6.8 \times 10^8\ g = 6.8 \times 10^5\ Kg} = \boxed{680\ \text{metric tonnes of red dye}}$$

$$\boxed{748\ \text{tons}}$$