CHEMISTRY 11 Name Key.

Molarity of Aqueous Solutions Worksheet Date _____ Block ___

1. Calculate the mass of solute needed to make 250 mL of solution at the indicated molarity.

   a. 0.24 M $Al_2(SO_4)_3$ FW = 2(27.0) + 3(32.1) + 12(16.0) = 342.3 g/mol

   n = M • V

   n = 0.24 M • 0.250 L = 0.060 mol mass = 0.060 mol × 342.3 g/mol = 21 g

   b. 0.60 M $CrCl_3$ FW = 52.0 + 3(35.5) = 158.5 g/mol

   0.60 M • 0.250 L = 0.15 mol

   0.15 mol × 158.5 g/mol = 24 g

   c. 0.20 M NaCl FW = 23.0 + 35.5 = 58.5 g/mol

   0.20 M × 0.250 L = 0.050 mol

   0.050 mol × 58.5 g/mol = 2.9 g

2. Calculate the concentration of each of the following solutions.

   a. 2.5 moles of HCl in a solution of 750 mL volume.

   $$M = \frac{n}{V} = \frac{2.5\ mol}{0.750\ L} = 3.3\ M$$

   b. 6.35 moles of NaOH in a solution of 3.6 L volume.

   $$M = \frac{6.35\ mol}{3.6\ L} = 1.8\ M$$

   c. 65 mg of KOH in a solution of 100 mL volume. FW = 39.1 + 16.0 + 1.0 = 56.1 g/mol

   65 mg = 0.065 g mols KOH = 0.065 g ÷ 56.1 g/mol = 1.16×10^{-3} mol

   $$M = \frac{1.16 \times 10^{-3}\ mol}{0.100\ L} = 0.012\ M$$

3. What volume of the following solutions will yield the following masses when evaporated?

   a. 3.0 M KCl to give 20.0 g FW 39.1 + 35.5 = 74.6 g/mol

   20.0 g ÷ 74.6 g/mol = 0.268 mol

   $$V = \frac{n}{M} = \frac{0.268\ mol}{3.0\ M} = 0.089\ L$$

   b. 1.0 M $AlCl_3$ to give 100 g FW 27.0 + 3(35.5) = 133.5 g/mol

   100 g ÷ 133.5 g/mol = 0.749 mol

   $$V = \frac{0.749\ mol}{1.0\ M} = 0.75\ L$$

4. Calculate the volume of stock solution required to make each of the following diluted solutions.

a. 750 mL of 0.24 M HCl from 2.0 M HCl.

$M_1V_1 = M_2V_2$

$V_2 = \frac{M_1V_1}{M_2} = \frac{(750\,mL)(0.24\,M)}{(2.0\,M)} = \underline{90.\,mL}$

b. 2.5 L of 1.0 M H_2SO_4 from 18 M H_2SO_4.

$V_2 = \frac{2.5\,L \times 1.0\,M}{18\,M} = 0.139\,L = \underline{0.14\,L}$

c. 250 mL of 0.14 M NaOH from 6.0 M NaOH.

$V_2 = \frac{250\,mL \times 0.14\,M}{6.0\,M} = \underline{5.8\,mL}$

d. 650 mL of 0.25 M NaCl from 1.0 M NaCl.

$V_2 = \frac{650\,mL \times 0.25\,M}{1.0\,M} = \underline{160\,mL}$

5. The concentration of NaCl in a sample of human blood is 0.90 M and you wish to prepare a blood substitute using a salt solution with the same NaCl concentration. Describe in a step by step manner how you would do this:

a. using solid NaCl For a 1L volume:

① Weigh out 52.65g of NaCl using a balance
② Transfer the NaCl quantitatively to a volumetric flask
③ Add enough water to make 1L of solution

b. using a 5.0 M NaCl stock solution For a 1L volume:

① Transfer 180mL of 5.0M NaCl to a 1L volumetric flask
② Add enough water to make 1L of solution.