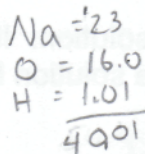


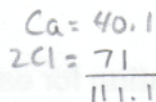
Worksheet: Problems Involving Solutions**1. What mass of solute is required to make up the following solutions?**

(a) 200. mL of a 0.25 M NaOH solution?

$$\frac{0.25 \text{ mol}}{\text{L}} \times 0.2 \text{ L} \times \frac{40.01 \text{ g}}{\text{mol}} = 2.0$$

**2.0 g NaOH**(b) 50. mL of a 2.0×10^{-2} M CaCl_2 solution?

$$\frac{2.0 \times 10^{-2} \text{ mol}}{\text{L}} \times 0.05 \text{ L} \times \frac{111.1 \text{ g}}{\text{mol}} = 0.111 \text{ g}$$

**0.11 g CaCl_2** **2. What is the molarity of the following solutions?**(a) 212 g of HNO_3 in 250. mL solution?

$$212 \text{ g} \times \frac{1 \text{ mol}}{63.01 \text{ g}} = 3.3645 \text{ mol} / 0.25 \text{ L} = 13.458 \text{ mol/L}$$

13.5 M HNO_3 (b) A 5.0 L solution containing 10. moles of MgCl_2 ?

$$\frac{10 \text{ mol}}{5.0 \text{ L}} = 2 \text{ mol/L}$$

2.0 M**3. How many moles of each salt are present in:**

(a) 10. mL of 3.0 M of KCl?

$$\frac{3.0 \text{ mol}}{\text{L}} \times 0.01 \text{ L} = 0.03 \text{ mol}$$

0.03 mol or 3.0×10^{-2} mol

(b) 5.0 L of 12 M NaCl?

$$\frac{12 \text{ mol}}{\text{L}} \times 5.0 \text{ L} = 60 \text{ moles}$$

60. moles**4. What volume of solution is required to make up each of the following solutions?**(a) 1.2 moles of MgSO_4 are used to make a 1.0 M solution?

$$1.2 \text{ mol} \times \frac{1 \text{ L}}{1.0 \text{ mol}} = 1.2 \text{ L}$$

(b) 0.050 mole of AgI are used to make a 1.0×10^{-4} M solution?

$$0.050 \text{ mol} \times \frac{1 \text{ L}}{1.0 \times 10^{-4} \text{ mol}} = 500 \text{ L}$$

5. calculate the volume required to prepare the following diluted solution:

Given 1.0 M NaOH; need 250. mL of 0.25 M NaOH

$$\begin{array}{l} M_1 = 1.0 \text{ NaOH} \\ V_1 = ? \\ M_2 = 0.25 \text{ M NaOH} \\ V_2 = 0.250 \text{ L} \end{array}$$

$$\frac{1.0 \times V_1}{1.0} = \frac{0.25 \times 0.25 \text{ L}}{1.0}$$

$$M_1 V_1 = M_2 V_2$$

Sig figs

63 mL

$$V = 0.0625 \text{ L or } 62.5 \text{ mL}$$

6. If water is added to 100 mL of a 0.15 M NaOH solution until the final volume is 150 mL, what will the molarity of the diluted solution be?

$$\begin{array}{l} M_1 = 0.15 \text{ M} \\ V_1 = 100 \text{ L} \end{array}$$

$$\begin{array}{l} M_2 = ? \\ V_2 = 150 \text{ L} \end{array}$$

$$\frac{0.15 \text{ mol} \times 0.1 \text{ L}}{0.15 \text{ L}} = \frac{M_2 \times 0.15 \text{ L}}{0.15 \text{ L}}$$

$$0.1 \text{ mol/L} = M_2$$

0.1 M NaOH

7. If 25 mL of water is added to 125 mL of a 0.15 M NaOH solution, what will the molarity of the diluted solution be?

$$M_1 = 0.15 M \quad M_2 = ?$$

$$V_1 = 0.125 L \quad V_2 = 0.150 L$$

$$\frac{0.15 \text{ mol}}{L} \times 0.125 L = M_2 \times 0.15 L$$

$$0.01875 \text{ mol} = M_2 \times 0.15 L$$

$$0.125 M = M_2$$

0.13 M
NaOH

8. I have 345 mL of a 1.5 M NaCl solution. If I boil the water until the volume of the solution is 250 mL, what will the molarity of the solution be?

$$M_1 = 1.5 M \quad M_2 = ?$$

$$V_1 = 0.345 L \quad V_2 = 0.25 L$$

$$\frac{1.5 \text{ mol}}{L} \times 0.345 L = M_2 \times 0.25 L$$

$$2.07 M = M_2$$

2.1 M
NaCl

9. Write the **dissociation equation** for each of the following solutions and then calculate the **concentration of each ion** in each solution.:

- (a) 1.05 M K_3PO_4

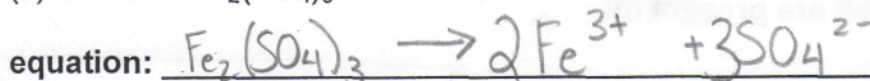


concentration of ions:

$$[K^+] = 1.05 M$$

$$[PO_4^{3-}] = 3.15 M$$

- (b) 0.102 M $Fe_2(SO_4)_3$



$$0.102 \times 2 = 0.204$$

$$0.102 \times 3 = 0.306$$

concentration of ions:

$$[Fe^{3+}] = 0.204 M$$

$$[SO_4^{2-}] = 0.306$$

Define the following words:

Soluble - able to dissolve - more than 0.1 mol of solute will dissolve in 1 L of solution @ 25°C

Solution

-homogenous mixture - uniform - retains some properties of its components

Dissociation

- cations + anions ~~sep~~ being separated by the solvent $AB \rightarrow A^+ + B^-$

Solubility

The maximum amount of solute that will dissolve in a given amount of solvent at a particular temperature