Student's Name

Professor's Name

Course

Date

Answer the questions:

1. How many moles of H_3PO_4 are contained in 150.0 mL of 18.1 M H_3PO_4?

Formula to use:

$$Molarity = \frac{no\ of\ moles}{Volume}$$

$$no\ of\ moles = Molarity \times Volume$$

$$moles\ H_3PO_4 = 18.1 \frac{mol}{L}\ H_3PO_4 \times 150.0\ mL \times \frac{1\ L}{1000\ mL}$$

$$moles\ H_3PO_4 = 2.7\ moles$$

2. Describe in words and using calculations how you would prepare 475 mL of a 0.40 M hypochlorous acid solution:

Calculations:

$$Moles\ of\ Hypochlorous\ Acid = 0.40 \frac{mol}{L} \times 475\ mL \times \frac{1\ L}{1000\ mL}$$

$$Moles\ of\ Hypochlorous\ Acid = 0.19\ moles$$

$$Mass\ of\ Hypochlorous\ Acid = 0.19\ moles \times 52.46 \frac{g}{mole}$$

$$Mass\ of\ Hypochlorous\ Acid = 9.97\ g$$

Alternatively, since the usual available volumetric flask is 500 mL, you may opt to produce 500 mL of 0.40 M hypochlorous acid. From there, you may dispense 475 mL. An excess of 25 mL is present.

If 500 mL is prepared,

$$Moles\ of\ Hypochlorous\ Acid\ =\ 0.40\frac{mol}{L}\times 500\ mL\times\ \frac{1\ L}{1000\ mL}$$

$$Moles\ of\ Hypochlorous\ Acid\ =\ 0.20\ moles$$

$$Mass\ of\ Hypochlorous\ Acid\ =\ 0.19\ moles\times 52.46\frac{g}{mole}$$

$$Mass\ of\ Hypochlorous\ Acid\ =\ 10.49\ g$$

In order to prepare, weigh 9.97 grams of pure hypochlorous acid in a 475 mL volumetric flask. Dissolve this mass in a small volume of water in the flask. After complete dissolution, dilute to mark (475 mL volume)

Or, if a 500 mL flask is used:

In order to prepare, weigh 10.49 grams of pure hypochlorous acid in a 500 mL volumetric flask. Dissolve this mass in a small volume of water in the flask. After complete dissolution, dilute to mark. Dispense with 475 mL from the container.

3. A 500.0 mL lead(II) nitrate solution contains 15.5 g of lead(II) nitrate.

a. What is the concentration of lead ions?

$$\left[Pb^{2+}\right]=\ 15.5\ g\times\frac{1\ mol}{207.20\ g}\times\ \frac{1}{500\ mL}\times\ \frac{1000mL}{1\ L}$$

$$\left[Pb^{2+}\right]=\ 0.15\ \frac{mol}{L}$$

b. Describe how you would dilute this solution to make a 0.01M lead(II) nitrate solution:

Use the dilution formula:

$$0.15\ \frac{mol}{L}\times 500\ mL\ =\ 0.01\frac{mol}{L}\times\ V_{new}$$

$$V_{new}\ =\ 7500\ mL$$

Using the 500 mL volume of 0.15 M of lead(II) nitrate, add water to it and dilute up to 7500 mL or 7.50 L. The resulting solution is 7.50 L of 0.01M of lead(II) nitrate.

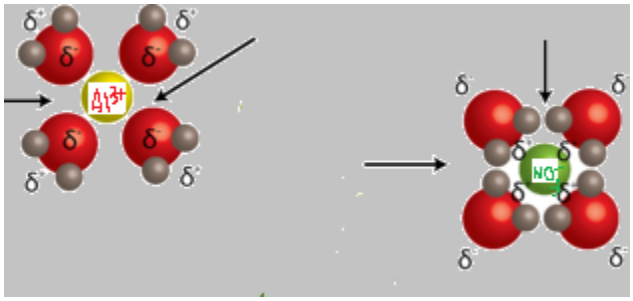
4. How can you tell whether or not a given chemical is an electrolyte by looking at its formula?

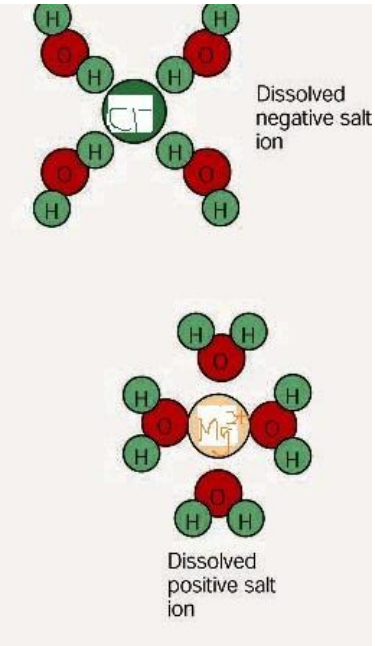
Electrolytes belong to a class of ionic compounds. Therefore, to judge as to whether it is an electrolyte or not is to evaluate its ionic properties. It is an electrolyte when the compound is primarily formed from the bonding between a METAL and a NON-METAL. This bonding causes a transfer of charges, making the compound susceptible to hydration, thereby forming ions known as electrolytes. Non-metal-Non-metal interaction only yields covalent compounds, which are in molecular form in the solution.

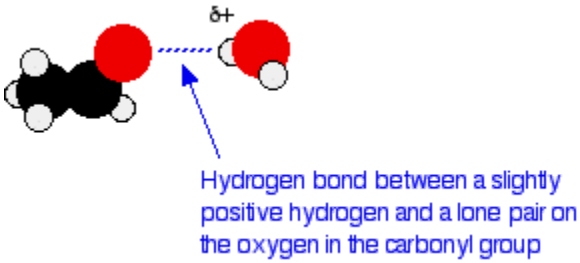
5. Draw a molecular-level picture that shows the particles present in water when each of the following is dissolved in it at room temperature.

c. $Al(NO_3)_3$ b) $MgCl_2$ c) CH_3CHO

A. $Al(NO_3)_3$







Identify the acid (A), base(B), conjugate acid(CA) and conjugate (B) in the reaction between carbonic acid and sodium hydroxide.

$$2\,NaOH + H_2CO_3 \rightarrow Na_2CO_3 + H_2O$$

BASE — ACID — CONJUGATE BASE — CONJUGATE ACID

This reaction is also possible:

$$NaOH + H_2CO_3 \rightarrow NaHCO_3 + H_2O$$

BASE — ACID — CONJUGATE BASE — CONJUGATE ACID