Unit 9 Worksheet 3: Describing Concentration of *Aqueous* Solution Mixtures

Find solutions (get it?) to the following problems on a SEPARATE sheet of paper.
SKIP A LINE between each problem.
Answers must have correct SIGNIFICANT FIGURES, UNITS, CHEMICAL FORMULA
Make sure to show all your work WITH UNITS and BOX your answers.

1. You pour a glass of Kool-Aid and find it to be rather bland. You pour a new glass, this time adding two tablespoons of sugar. Describe the difference between each glass. Be sure to include the terms "solute", "solvent", "solution" and "concentration" in your description.

2. A dilute solution of propanol (C_3H_7OH) is prepared by dissolving 5.8 mL of pure propanol in 75 mL of water. What is the percent by volume of propanol in the solution? (assume volumes are additive)

3. An alcohol-iodine solution ("tincture" of iodine) is prepared by dissolving 5 g of iodine crystals in 215 grams of water and 5 g of isopropyl alcohol. Calculate the mass percent of iodine in the solution.

4. Describe how to properly prepare 100.0 g of a 9.00% by mass lithium nitrate aqueous solution.

5. Sodium chloride salt was dissolved in water to produce a 1.5M solution.

    a) Describe/explain what this concentration tells us about the NaCl solution.

    b) How might a chemist use this ratio?

6. A 45.3 g sample of potassium nitrate is dissolved in enough water to make 225 mL of solution. Determine the molar concentration of the potassium nitrate.

7. Concentrated hydrochloric acid is made by pumping hydrogen chloride gas into distilled water. If concentrated HCl contains 439 g of HCl per liter, what is the molarity?

8. How many grams of silver nitrate are needed to prepare 250 mL of a standard (known concentration) 0.100 M silver nitrate solution? Describe how you would prepare this solution starting with solid silver nitrate, distilled water, and appropriate lab equipment.

9. Describe how to prepare a 0.25 M sodium chloride solution if you go to the stock room and find that only 5.2 g of NaCl (s) is left in the bottle of solid sodium chloride. Assume you have as much distilled water as you need. What volume of solution would you be able to make?

10. Draw a particle diagrams of each of these ionic substances in solution. Then calculate the molarity of each *ion* present in each of the following solutions.
    a. 0.25 M $AlCl_3$
    b. 0.375 M Na_2CrO_4
    c. 0.103 M Na_3PO_4

# Unit 9 Worksheet 4: Molar Concentration & Stoichiometry

Find solutions to the following problems on a SEPARATE sheet of paper.
SKIP A LINE between each problem.
Answers must have correct SIGNIFICANT FIGURES, UNITS, CHEMICAL FORMULA
Make sure to show all your work WITH UNITS and BOX your answers.

1. How many moles of lead(II) hydroxide (solid) can be formed when 22.5 mL of
    0.135 M $Pb(NO_3)_2$ solution reacts with excess sodium hydroxide? (Hint: Use a BCA table!).

2. Calcium chloride (aq) reacts with sodium carbonate (aq) to from solid calcium carbonate and aqueous
    sodium chloride. Determine the volume of a 2.00 M calcium chloride solution that would be needed to
    exactly react with 65.0 mL of 1.50 M Na_2CO_3.

3. Sodium phosphate reacts with aqueous magnesium sulfate to produce solid magnesium phosphate and
    aqueous sodium sulfate. Abigail places 25.00 mL of 0.300 M magnesium sulfate in a flask. She has a
    0.225M sodium phosphate solution available. What volume of this sodium phosphate solution must she
    add to her flask of magnesium sulfate in order to precipitate all of the magnesium ions?

4. One way to determine the amount of chloride ion in a water sample is to titrate[1] the sample with standard
    silver nitrate solution to produce solid silver chloride. The net ionic equation is:

$$Ag^+(aq) + Cl^-(aq) \rightarrow AgCl(s)$$
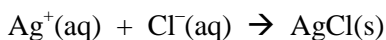
    If a 25.0 mL sample of drinking water requires 27.2 mL of 0.104 M $AgNO_3$ to completely precipitate all
    of the chloride ion in such a titration, what mass of silver chloride is produced? What was the
    concentration of chloride anion, Cl^- (aq), in the original water sample?

5. When aqueous solutions of lead(II) nitrate and potassium iodide are mixed, a bright yellow precipitate is
    formed, similar to the color of school bus yellow. Answer the following questions related to this
    precipitation reaction:

    a) Give the chemical formula and name of the precipitate that forms.

    b) Write the balanced chemical equation for the reaction that occurs.

    c) If a 25.0 mL sample of 0.500 M lead(II) nitrate is mixed with a 25.0 mL sample of 0.500 M
        potassium iodide, determine the mass of solid precipitate that should form.

    d) Calculate the concentration of all ions remaining in solution. (Hint: the volumes of the solutions are
        additive)

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[1] A common laboratory technique in which a solution of known concentration (a "standard solution") is used to analyze a
    solution of unknown concentration.