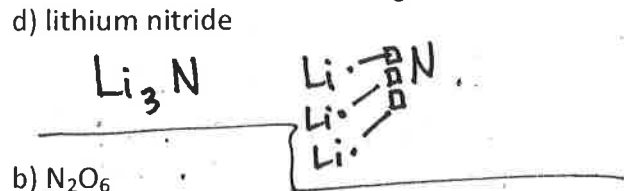
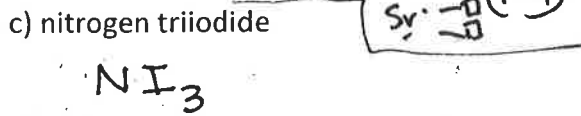
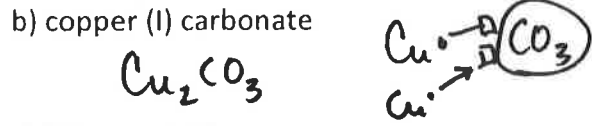
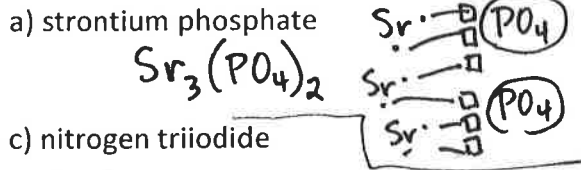


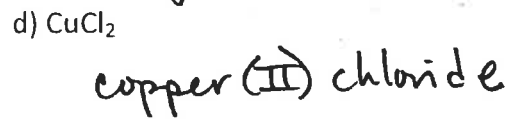
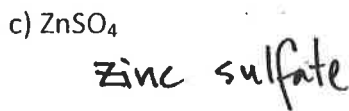
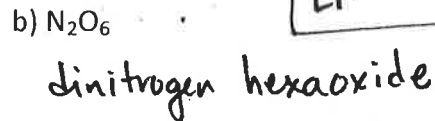
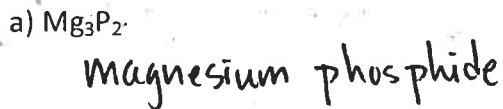
Chemistry: Solutions Unit Test Review

NAMING AND FORMULA WRITING

1. Write the formulas of the following compounds:



2. Write the names of the following compounds:



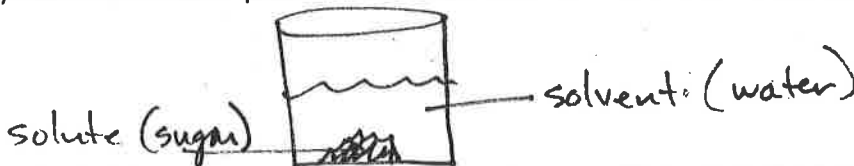
CONCENTRATION

3. a) Define solute: The solid being dissolved.

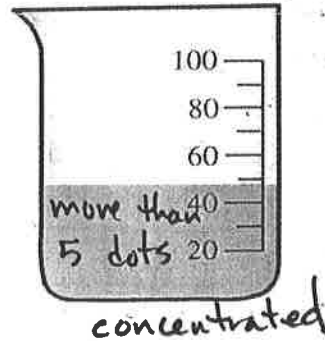
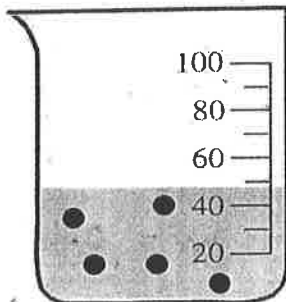
b) Define solvent: The liquid doing the dissolving

c) Define concentration: The amount of solute in the amount of solvent.

d) Draw and label a picture that illustrates the definitions of solute and solvent:



4. On the left beaker, draw a solution that is more dilute than the beaker in the middle. On the right beaker, draw a solution that is more concentrated than the beaker in the middle.



5. What units should be used for each of the following:

a. Molarity M

b. Molality m

c. Molar Mass g/mol

- d. Moles mole or mol or moles
 e. Mass of solvent g
 f. Volume of solution L
 g. Freezing Point °C
 h. Solubility g/100 g H₂O

MOLARITY

6. Determine the number of moles in the following:

a) 4.5 g of MnO

grams	4.5
molar mass	70.937
moles	0.0634

b) 78.3 g of Ni(NO₃)₂

78 grams	78.3
molar mass	182.703
moles	0.429

7. A solution has a volume of 250 mL and contains 0.70 mol NaCl. What is its molarity?

$$M = \frac{\text{moles solute}}{\text{L solution}} = \frac{0.70 \text{ mol}}{0.250 \text{ L}} = \boxed{2.8 \text{ M}}$$

8. a) How many moles of solute are present in 50.0 mL of 0.20 M KNO₃?

$$0.20 \text{ M} = \frac{x \text{ moles}}{0.050 \text{ L}} \quad x = \boxed{0.01 \text{ moles}}$$

b) How many moles of ammonium nitrate are in 335 mL of 0.425 M NH₄NO₃?

$$0.425 \text{ M} = \frac{x \text{ moles}}{0.335 \text{ L}} \quad x = \boxed{0.142 \text{ moles}}$$

9. To what volume should 5.0 moles of KCl be diluted in order to prepare a 0.25 M solution?

$$0.25 \text{ M} = \frac{5.0 \text{ moles}}{x \text{ L}} \quad x = \boxed{20 \text{ L}}$$

10. Calculate the molarity of a solution containing 400 g CuSO₄ in 4.00 L of solution.

grams	400
molar mass	159.609
moles	2.506

$$M = \frac{2.506 \text{ moles}}{4.00 \text{ L}}$$

$$= \boxed{0.6265 \text{ M}}$$

MOLALITY

11. Calculate the molality of a solution prepared by dissolving 10.0 g NaCl in 600 g of water.

grams	10.0
molar mass	58.443
moles	0.1711

$$m = \frac{0.1711 \text{ moles}}{0.600 \text{ kg}}$$

$$= \boxed{0.285 \text{ m}}$$

12. Calculate the molality of a solution prepared by dissolving 2.3 g of AlPO₄ in 2.4 kg of ethanol.

grams	2.3
molar mass	121.953
moles	0.0189

$$\frac{0.0189 \text{ moles}}{2.4 \text{ kg}} = \boxed{0.00785 \text{ m}}$$

PPM AND PPB

13. What is the concentration in ppm if 3.4×10^{-6} g of CaCl_2 is dissolved in 2.5 kg of water?

$$\frac{(3.4 \times 10^{-6}) \text{ g}}{2500 \text{ g H}_2\text{O}} \times 10^6 = 0.00136 \text{ ppm}$$

14. What is the concentration in ppb if 1.5×10^{-9} g of AlBr_3 is dissolved in 550 g of water?

$$\frac{(1.5 \times 10^{-9}) \text{ g}}{550 \text{ g H}_2\text{O}} \times 10^9 = 0.0027 \text{ ppb}$$

COLLIGATIVE PROPERTIES – FREEZING POINT DEPRESSION

15. Determine the freezing points of each solution below assuming a concentration of 0.20 m:

- $\Delta T_f = (m)(k_f)(i.f.)$
- a. K_2SO_4 $\Delta T_f = (0.20 \text{ m})(1.86^\circ\text{C/m})(3) = -1.116^\circ\text{C}$ $\text{K}^+, \text{K}_2\text{SO}_4$
- b. C_2H_4 $\Delta T_f = (0.20 \text{ m})(1.86^\circ\text{C/m})(1) = -0.372^\circ\text{C}$ C_2H_4 is covalent
- c. $\text{Al}(\text{NO}_3)_3$ $\Delta T_f = (0.20 \text{ m})(1.86^\circ\text{C/m})(4) = -1.488^\circ\text{C}$ $\text{Al}^+, \text{NO}_3^-, \text{NO}_3^-, \text{NO}_3^-$

16. What is the freezing point of a solution of 25.6 g of CaBr_2 in 1000 g H_2O ?

grams	25.6
molar mass	199.886
moles	0.128

$$\Delta T_f = \frac{0.128 \text{ moles}}{1 \text{ kg}} \times 1.86^\circ\text{C/m} \times 3 = -0.714^\circ\text{C}$$

$$= 0.128 \text{ m}$$

SOLUBILITY

17. What is the solubility of CaCl_2 at 30°C ?

more than $100 \text{ g CaCl}_2 / 100 \text{ g H}_2\text{O}$.

18. a) If you add 30 grams of KCl to 100 g of water at 50°C , what type of solution do you have?

unsaturated

b) If you add 30 grams of KClO_3 to 100 g of water at 50°C , what type of solution do you have?

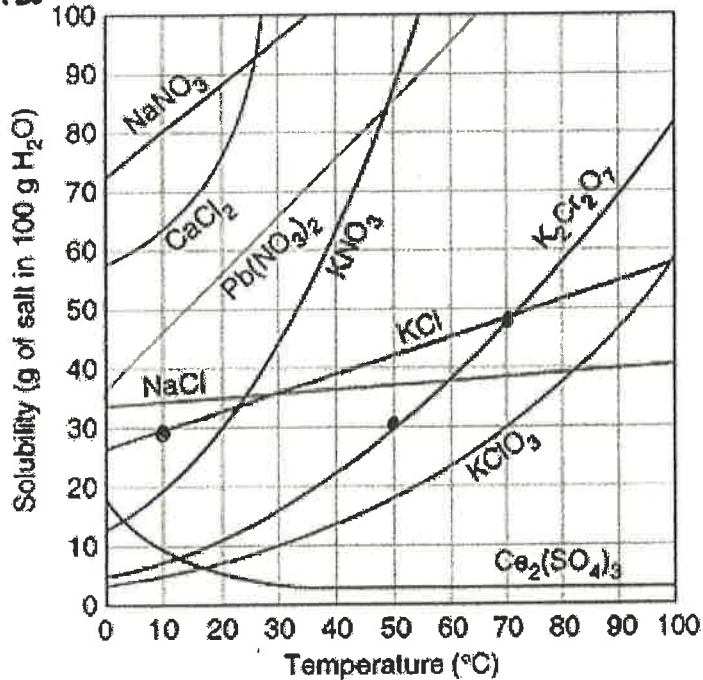
supersaturated

c) If you add 30 grams of $\text{K}_2\text{Cr}_2\text{O}_7$ to 100 g of water at 50°C , what type of solution do you have?

saturated

19. You have a saturated solution of KCl in 100 grams of water. If you cool the saturated solution from 70°C to 10°C , how many grams of precipitate will form?

$$\sim 49 \text{ g} - 30 \text{ g} = \sim 19 \text{ g}$$



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