Concentration Worksheet

1) 6.80 g of sodium chloride are added to 2750 mL of water. Find the mole fraction of the sodium chloride and of the water in the solution.

2) How many grams of magnesium cyanide are needed to make 275 mL of a 0.075 M solution?

3) How many grams of magnesium cyanide would you need to add to 275 mL of water to make a 0.075 molal solution?

4) Explain how to make one liter of a 1.25 molal sodium hydroxide solution.

5) What is the molarity of a solution made when 52 grams of potassium sulfate are diluted to a volume of 4100 mL?

6) The density of ethylene glycol (antifreeze, $HOCH_2CH_2OH$) is 1.09 g/mL. How many grams of ethylene glycol should be mixed with 375 mL of water to make a 7.50% (v/v) mixture?

7) Find the volume of a 0.75 M solution if it contains 39 grams of potassium hydroxide.

8) How many grams of hydrochloric acid are present in 3.0 L of a 0.750 M solution?

9) The concentration of oxygen in water at the bottom of a lake is 0.48 g/L and the pressure is 2.5 atm. If water from the bottom is moved by a current upwards to a depth where the pressure is 1.3 atm, what is the concentration of the oxygen in the water at this depth?

10) What is the molarity of a solution in which 0.850 grams of ammonium nitrate are dissolved in 345 mL of solution?

11) Explain how you would make 675 mL of a 0.400 M barium iodide solution.

1. 6.80 g NaCl x $\frac{1 \text{ mole NaCl}}{58.45 \text{ g NaCl}}$ = 0.116 mole NaCl

2750 mL H_2O x $\frac{1 \text{ g } H_2O}{1 \text{ mL } H_2O}$ x $\frac{1 \text{ mole } H_2O}{18 \text{ g } H_2O}$ = 152.8 mol H_2O

mole fraction NaCl = $\frac{0.116 \text{ mole NaCl}}{152.9 \text{ mole soln}} = 7.59 \times 10^{-4}$

mole fraction H_2O = $\frac{152.8 \text{ mole } H_2O}{152.9 \text{ mole soln}} = 0.999$

2. 275 mL H_2O x $\frac{1 \text{ g } H_2O}{1000 \text{ mL } H_2O}$ = 0.275 L H_2O

275 L $Mg(CN)_2$ x $\frac{0.075 \text{ mole } Mg(CN)_2}{1 \text{ L } Mg(CN)_2}$ x $\frac{76.3 \text{ g } Mg(CN)_2}{1 \text{ mole } Mg(CN)_2}$ = 1.6 g $Mg(CN)_2$

3. 275 mL H_2O x $\frac{1 \text{ g } H_2O}{1 \text{ mL } H_2O}$ x $\frac{1 \text{ kg } H_2O}{1 \text{ g } H_2O}$ = 0.275 kg H_2O

0.275 kg H_2O x $\frac{0.075 \text{ mol } Mg(CN)_2}{1 \text{ kg } H_2O}$ x $\frac{76.3 \text{ g } Mg(CN)_2}{1 \text{ mole } Mg(CN)_2}$ = 1.6 g $Mg(CN)_2$

4. 1.25 molal NaOH = $\frac{1.25 \text{ mole NaOH}}{1 \text{ kg } H_2O}$

1.25 mole NaOH x $\frac{40 \text{ g NaOH}}{1 \text{ mole NaOH}}$ = 50.0 g NaOH

Measure 50.0 g NaOH and add water to 1 L volume.

5. 52 g K_2SO_4 x $\frac{1 \text{ mole } K_2SO_4}{174 \text{ g } K_2SO_4}$ = 0.299 mole K_2SO_4

$\frac{0.299 \text{ mole } K_2SO_4}{4.100 \text{ L } K_2SO_4}$ = 0.073 M

6. 375 mL x 0.0750 = 28.125 mL ethylene glycol

28.125 mL ethylene glycol x 1.09 g ethylene glycol/1ml = 30.7 g ethylene glycol

7. 39 g KOH x $\frac{1 \text{ mole KOH}}{56 \text{ g KOH}}$ x $\frac{1 \text{ L KOH}}{0.75 \text{ mol KOH}}$ = 0.93 L = 930 mL

8. 3.0 L soln x $\frac{0.750 \text{ moles HCl}}{1 \text{ L soln}}$ x $\frac{36.45 \text{ g HCl}}{1 \text{ mole HCl}}$ = 82 g HCl

9. $\frac{1.3 \text{ atm}}{2.5 \text{ atm}} = \frac{C}{0.48 \text{ g/L}}$ → $C = \frac{(1.3 \text{ atm})(0.48 \text{ g/L})}{(2.5 \text{ atm})} = 0.25 \text{ g/L}$

10. 0.850 g NH_4NO_3 x $\frac{1 \text{ mole } NH_4NO_3}{80 \text{ g } NH_4NO_3}$ = 0.0106 mole NH_4NO_3

$\frac{0.0106 \text{ mole } NH_4NO_3}{0.345 \text{ L } NH_4NO_3}$ = 0.0307 M

11. 0.675 L BaI_2 x $\frac{0.400 \text{ moles } BaI_2}{1 \text{ L } BaI_2}$ = 0.270 moles BaI_2

0.270 moles BaI_2 x $\frac{391.1 \text{ g } BaI_2}{1 \text{ mole } BaI_2}$ = 106 g BaI_2

Measure 106 g BaI_2 into a beaker and add water to 675 mL volume.