Name _____ Per ____

Concentrations Worksheet: Molarity and Molality

Concentration is a measurement of how much solute (substance) is in a given amount of solvent (liquid).
Diluted solutions contain a relatively *small* amount of solute. **Concentrated solutions** contain a relatively *large* amount of solute

Scientists measure Concentration in MOLARITY or MOLALITY

MOLARITY (M) = <u>moles of solute</u>
Liters of solvent

MOLALITY (m or μ) = <u>moles of solute</u>
kg of solvent

Molarity Example: 4.0 moles of LiCl is dissolved in 5.0 liters of water. What is the molarity of the solution?

$\frac{4.0 \text{ moles}}{5.0 \text{ Liters}} = 0.8$ M   **This solution is 0.8 Molar or 0.8 M**

1) 6.0 moles of $MgCl_2$ is dissolved in 20.0 L of water. What is the molarity of the solution?   0.3M

2) 3.6 moles of KOH are dissolved in 18.3 Liters of acetone. What is the molarity of the solution?   0.196M

3) 10.0g of NaCl is dissolved in 5.0L of water. What is the molarity of the solution? (first convert grams to moles!)   0.035M

4) How many grams of NaCl must be added to 2.00mL of water to make a 85.5M solution? (1000 mL = 1 L)   9.99g

Molality Example: If you add 0.5 moles of sugar ($C_6H_{12}O_6$) to 2.0 kg of water, what is the molality?

$\frac{0.5 \text{ moles}}{2.0 \text{ kg}} = 0.25$ m   **This solution is 0.25 molal or 0.25 m**

5) Determine the molality of a solution of 5 moles of NaCl in 620 g of water. (Remember 1kg=1000g)   0.065m

6) How many moles of 2-butanol must be dissolved in 0.125 kg of ethanol in order to produce a 12.0 molal solution?   1.5 moles

MORE MOLARITY (M) PRACTICE

7) How many moles of solute are in 125 mL of a 2.0 M hydrochloric acid (HCl) solution?   0.25 mol HCl

8) How many grams of magnesium chloride ($MgCl_2$) are contained in 0.50 L of a 1.5 M solution?   71 g $MgCl_2$

9) How many liters of a 0.500 M sodium chloride solution would contain 13.5 grams of solute?   0.462 L NaCl

10) How many grams of magnesium nitrate, $Mg(NO_3)_2$ are contained in 415 mL of a 2.5 M solution?   154 g $Mg(NO_3)_2$

11) How many moles of sulfuric acid (H_2SO_4) are in 63.5 mL of a 3.0 M solution?   0.190 mol H_2SO_4

12) What volume of 0.1 M sodium hydroxide (NaOH) could be made with 20.0 g of solute?   5L NaOH

13) How many grams of potassium chlorate ($KClO_3$) must be used to prepare 500 mL of a 0.2 M solution?   12.3 g $KClO_3$

MORE MOLALITY (m or μ) PRACTICE

14) What is the molality of a solution in which 3.0 moles of NaCl is dissolved in 1.5 kg of water?   2.0 m

15) What is the molality of a solution in which 25 g of NaCl is dissolved in 2.0 kg of water?   0.22 m

16) What is the molality of a solution in which 15 g of I_2 is dissolved in 500 g of alcohol?   0.12 m

17) How many grams of I_2 (solute) should be added to 750 g of CCl_4 (solvent) to prepare a 0.020 m solution?   3.8 g

18) How much water (solvent) should be added to 5.00 g of KCl to prepare a 0.500 m solution?   0.135 kg