Practice problems

1. Find the molarity when 734 grams of Li_2SO_4 are dissolved to make 2500 mL of solution.

$2 \times Li = 2 \times 6.94\ g/mol = 13.88$
$1 \times S = 1 \times 32.06\ g/mol = 32.06$
$4 \times O = 4 \times 16.00\ g/mol = 64.00$
$109.94\ g/mol$

$734\ g\ Li_2SO_4 \times \frac{1\ mol}{109.94\ g} = 6.68\ mol\ Li_2SO_4$

$M = \frac{n}{V}$
$= \frac{6.68\ mol}{2.5\ L}$
$= 2.67\ mol/L$

$2500\ mL \div 1000 = 2.5\ L$

2. What mass of $Ca(OH)_2$ is needed to make 5.0 liters of a 0.1 M solution?

$M = \frac{n}{V}$, $n = M \cdot V$
$n = (0.1\ M)(5.0\ L)$
$n = 0.5\ mol$

$0.5\ mol\ Ca(OH)_2 \times \frac{74.10\ g}{1\ mol}$
$= 37.05\ g\ Ca(OH)_2$

$1 \times Ca = 1 \times 40.08\ g/mol = 40.08$
$2 \times O = 2 \times 16.00\ g/mol = 32.00$
$2 \times H = 2 \times 1.01\ g/mol = 2.02$
$74.10\ g/mol$

3. Calculate the molarity of 198 g of $BaBr_2$ in 2.0 L of solution.

$1 \times Ba = 1 \times 137.33\ g/mol = 137.33$
$2 \times Br = 2 \times 79.90\ g/mol = 159.80$
$297.13\ g/mol$

$198\ g\ BaBr_2 \times \frac{1\ mol}{297.13\ g} = 0.67\ mol\ BaBr_2$

$M = \frac{n}{V}$
$= \frac{0.67\ mol}{2.0\ L}$
$= 0.34\ mol/L$

4. 25.0 grams of sodium chloride (NaCl) is dissolved in 100 mL of solution. What is the concentration of the solution in parts per million (ppm)?

$ppm = \frac{mass}{volume}$
$= \frac{25000\ mg}{0.10\ L}$
$= 250000\ ppm$

$100\ mL \div 1000 = 0.10\ L$
$25\ g \times 1000 = 25000\ mg$

5. The concentration of a solution is 284,000 ppm. How many grams of solute is contained in 100 mL of solution?

$ppm = \frac{mass}{volume}$

$100mL \div 1000 = 0.10L$

$mass = ppm \cdot volume$

$= (284000\ ppm)(0.10L)$

$= 28400\ mg$

$28400mg \div 1000 = 28.4g$

6. 2.0 L of an aqueous solution of potassium chloride contains 45.0 g of KCl. What is the weight/volume percentage concentration of this solution?

$\%\ \frac{w}{v} = \frac{mass}{volume} \times 100\%$

$2.0L \times 1000 = 2000mL$

$= \frac{45.0g}{2000mL} \times 100\%$

$= 2.25\%$

7. 15 mL of an aqueous solution of sucrose contains 750 mg sucrose. What is the weight/volume percentage concentration of this solution?

$750mg \div 1000 = 0.75g$

$\%\ \frac{w}{v} = \frac{mass}{volume} \times 100\%$

$= \frac{0.75g}{15mL} \times 100\%$

$= 5\%\ \frac{w}{v}$