Worksheet: Molarity Name Key

Molarity:

- a molarity description of solution concentration.
- Abbreviated M

Molarity = $\frac{\text{moles solute}}{\text{liters solution}}$

*watch sig figs!!

Problems: Show all work and circle your final answer.

1. To make a 4.00 M solution, how many moles of solute will be needed if 12.0 liters of solution are required?

$M = \frac{mol}{L}$

$L \times M = mol = (4)(12) =$ 48.0 mol of solute

2. How many moles of sucrose are dissolved in 250 mL of solution if the solution concentration is 0.150 M?

$\frac{250}{1000} = 0.250 L$

$mol = M \times L = (0.150)(0.250)$

$=$ 0.0375 mol sucrose $= 0.038$ mol (2 sig figs.)

3. What is the molarity of a solution of HNO_3 that contains 12.6 grams HNO_3 in 1.0 L of solution?

$M = \frac{mol}{L}$

$12.6\ g\ HNO_3 \left| \frac{1\ mol}{63\ g\ HNO_3} \right. = 0.2\ mol\ HNO_3$

$\frac{0.2\ mol\ HNO_3}{1.0\ L}$

0.20 M HNO_3

4. How many grams of potassium (K^+) nitrate (NO_3^-) are required to prepare 0.250 L of a 0.700 M solution?

$mol = M \times L = (0.700)(.250)$

$= 0.175\ mol\ KNO_3 \left| \frac{101.1\ g\ KNO_3}{1\ mol\ KNO_3} \right. =$ 17.7 g KNO_3

$1 cm^3 = 1 mL$

5. 125 cm^3 of solution contains 3.5 moles of solute. What is the molarity of the solution?

$$M = \frac{mol}{L} = \frac{3.5}{0.125} = 28\ M$$

6. Which solution is more concentrated? Solution "A" contains 50.0 g of $CaCO_3$ in 500.0 mL of solution. Solution "B" contains 6.0 moles of H_2SO_4 in 4.0 L of solution. *SHOW WORK!*

Solution A

$$50.0\ g\ CaCO_3 \left| \frac{1\ mol}{100.1\ g} \right. = \frac{0.4995\ mol}{0.5000\ L}$$

$0.999\ M\ CaCO_3$

$\approx 1.00\ M$

Soln B

$$\frac{6.0\ mol}{4.0\ L} = 1.5\ M$$

Soln B is more concentrated

7. How many liters of solution can be produced from 2.5 moles of solute if a 2.0 M solution is needed?

$$L = \frac{mol}{M} = \frac{2.5\ mol}{2.0\ M} = 1.25\ L\ of\ soln$$

$\approx 1.3\ L$ w/ sig figs

8. What would be the concentration of a solution formed when 1.00 g of NaCl are dissolved in water to make 100.0 mL of solution?

$$1.00\ g\ NaCl \left| \frac{1\ mol}{58.5\ g} \right. = \frac{0.0171\ mol}{0.100} = 0.171\ M\ NaCl$$

$M_i V_i = M_f V_f$

Dilutions Worksheet

1) If I add 25 mL of water to 125 mL of a 0.15 M NaOH solution, what will the molarity of the diluted solution be?

$(125\ mL)(0.15) = (25)\ M_f$

$0.75M = M_f$

NaOH

2) If I add water to 100 mL of a 0.15 M NaOH solution until the final volume is 150 mL, what will the molarity of the diluted solution be?

$(100)(0.15) = (150) M_f$

$M_f = 0.1\ M\ NaOH$

3) How much 0.05 M HCl solution can be made by diluting 250 mL of 10 M HCl?

$(250)(10M) = (0.05)\ V_f$

$50{,}000\ mL = V_f$

or 50 L

4) I have 345 mL of a 1.5 M NaCl solution. If I boil the water until the volume of the solution is 250 mL, what will the molarity of the solution be?

$(345)(1.5) = (250)\ M_f$

$2.1\ M = M_f$

5) How much water would I need to add to 500 mL of a 2.4 M KCl solution to make a 1.0 M solution?

$(500mL)(2.4) = (1.0)\ V_f$

$1200\ mL = V_f$

so this means 700mL of H_2O was added