ANSWER KEY

EXTRA PRACTICE: Molarity Practice #2

Name:_____

Molarity Practice Problems

1) How many grams of potassium carbonate are needed to make 200 mL of a 2.5 M solution?

① mol solute = (M)(L soln) → mol = (2.5 M)(0.200 L) = 0.50 mol K_2CO_3

② $\frac{0.50\ mol}{1} \left| \frac{138.21\ g\ K_2CO_3}{1\ mol\ K_2CO_3} \right. = 69.1\ g\ K_2CO_3$

2) How many liters of 4 M solution can be made using 100 grams of lithium bromide?

① $\frac{100\ g\ LiBr}{1} \left| \frac{1\ mol\ LiBr}{86.845\ g\ LiBr} \right. = 1.15\ mol\ LiBr$

② $M = \frac{mol}{L} \rightarrow L = \frac{mol}{M} \rightarrow L = \frac{1.15\ mol\ LiBr}{4\ M\ soln} \rightarrow 0.288\ L\ soln$

3) What is the concentration of a 450 mL solution that contains 200 grams of iron (II) chloride?

① $\frac{200\ g\ FeCl_2}{1} \left| \frac{1\ mol\ FeCl_2}{126.75\ g\ FeCl_2} \right. = 1.58\ mol\ FeCl_2$

② $M = \frac{mol}{L} \rightarrow M = \frac{1.58\ mol}{0.450\ L} \rightarrow 3.51\ M\ FeCl_2$

* 4) How many grams of ammonium sulfate are needed to make a 0.25 M / L solution at a concentration of 6 M?

① mol solute = (6 M)(0.25 L soln) = 1.5 mol soln

② $\frac{1.5\ mol\ (NH_4)_2SO_4}{1} \left| \frac{132.144\ g\ (NH_4)_2SO_4}{1\ mol\ (NH_4)_2SO_4} \right. \rightarrow 198\ g\ (NH_4)_2SO_4$

5) What is the concentration of a solution that has a volume of 2.5 L and contains 660 grams of calcium phosphate?

① $\frac{660\ g\ Ca_3(PO_4)_2}{1} \left| \frac{1\ mol\ Ca_3(PO_4)_2}{310.18\ g\ Ca_3(PO_4)_2} \right. = 2.13\ mol\ Ca_3(PO_4)_2$

② $M = \frac{mol}{L} \rightarrow M = \frac{2.13\ mol}{2.5\ L} \rightarrow 0.852\ M\ Ca_3(PO_4)_2$

6) How many grams of copper (II) fluoride are needed to make 6.7 liters of a 1.2 M solution?

① mol solute = (M)(L soln) → mol = (1.2 M)(6.7 L) = 8.04 mol CuF_2

② $\frac{8.04\ mol\ CuF_2}{1} \left| \frac{101.542\ g\ CuF_2}{1\ mol\ CuF_2} \right. \rightarrow 816\ g\ CuF_2$

7) How many liters of 0.88 M solution can be made with 25.5 grams of lithium fluoride?

① $\frac{25.5\ g\ LiF}{1} \left| \frac{1\ mol\ LiF}{25.939\ g\ LiF_2} \right. = 0.983\ mol\ LiF$

② $L = \frac{mol}{M} \rightarrow L = \frac{0.983\ mol}{0.88\ M} \rightarrow 1.12\ L\ soln$

* 8) What is the concentration of a solution that with a volume of 660 mL that contains 33.4 grams of aluminum acetate?

① $\frac{33.4\ g\ Al(C_2H_3O_2)_3}{1} \left| \frac{1\ mol\ Al(C_2H_3O_2)_3}{204.114\ g\ Al(C_2H_3O_2)_3} \right. = 0.164\ mol\ solute$

② $M = \frac{mol}{L} \rightarrow M = \frac{0.164\ mol}{0.660\ L} \rightarrow 0.248\ M\ Al(C_2H_3O_2)_3$

9) How many liters of 0.75 M solution can be made using 75 grams of lead (II) oxide?

① $\frac{75\ g\ PbO}{1} \left| \frac{1\ mol\ PbO}{223.2\ g\ PbO} \right. = 0.336\ mol\ PbO$

② $L = \frac{mol}{M} \rightarrow L = \frac{0.336\ mol}{0.75\ M} \rightarrow 0.448\ L\ soln$

10) How many grams of manganese (IV) oxide are needed to make a 5.6 liters of a 2.1 M solution?

① mol solute = (M)(L soln) → mole = (2.1 M)(5.6 L soln) = 11.8 mol

② $\frac{11.8\ mol\ MnO_2}{1} \left| \frac{86.938\ g\ MnO_2}{1\ mol\ MnO_2} \right. \rightarrow 1026\ g\ MnO_2$

11) What is the concentration of a solution with a volume of 9 mL that contains 2 grams of iron (III) hydroxide?

① $\frac{2\ g\ Fe(OH)_3}{1} \left| \frac{1\ mol\ Fe(OH)_3}{106.874\ g\ Fe(OH)_3} \right. = 0.0187\ mol\ Fe(OH)_3$

② $M = \frac{mol}{L} \rightarrow M = \frac{0.0187\ mol}{0.009\ L} \rightarrow 2.08\ M\ soln$

12) How many liters of 3.4 M solution can be made using 78 grams of isopropanol (C_3H_8O)?

① $\frac{78\ g\ C_3H_8O}{1} \left| \frac{1\ mol\ C_3H_8O}{60.094\ g\ C_3H_8O} \right. = 1.30\ mol\ C_3H_8O$

② $L = \frac{mol}{M} \rightarrow L = \frac{1.30\ mol}{3.4\ M} \rightarrow 0.382\ L\ soln$

13) What is the concentration of a solution with a volume of 3.3 mL that contains 12 grams of ammonium sulfite?

① $\frac{12\ g\ (NH_4)_2SO_3}{1} \left| \frac{1\ mol\ (NH_4)_2SO_3}{116.144\ g\ (NH_4)_2SO_3} \right. = 0.103\ mol\ solute$

② $M = \frac{mol}{L} \rightarrow M = \frac{0.103\ mol}{0.0033\ L} \rightarrow 31.2\ M\ (NH_4)_2SO_3$

EXTRA . RACTICE: Molarity Practice #2

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Molarity Calculations

Calculate the molarities of the following solutions:

1) 2.3 moles of sodium chloride in 0.45 liters of solution.

$M = \frac{2.3\ mol\ NaCl}{0.45\ L} \rightarrow$ **5.11 M NaCl**

2) 1.2 moles of calcium carbonate in 1.22 liters of solution.

$M = \frac{1.2\ mol\ CaCO_3}{1.22\ L} \rightarrow$ **0.984 M $CaCO_3$**

3) 0.09 moles of sodium sulfate in 12 mL of solution.

$M = \frac{0.09\ mol\ Na_2SO_4}{0.012\ L\ soln} \rightarrow$ **7.50 M Na_2SO_4**

4) 0.75 moles of lithium fluoride in 65 mL of solution.

$M = \frac{0.75\ mol}{0.065\ L} \rightarrow$ **11.5 M LiF**

5) 0.8 moles of magnesium acetate in 5 liters of solution.

$M = \frac{0.8\ mol\ Mg(C_2H_3O_2)_2}{5\ L\ soln} \rightarrow$ **0.160 M $Mg(C_2H_3O_2)_2$**

6) 120 grams of calcium nitrite in 240 mL of solution.

① $\frac{120\ g\ Ca(NO_2)_2}{1} \left| \frac{1\ mol\ Ca(NO_3)_2}{132.108\ g\ Ca(NO_2)_2} \right. = 0.908\ mol\ Ca(NO_2)_2$

② $M = \frac{mol}{L} \rightarrow M = \frac{0.908\ mol}{0.240\ L} \rightarrow$ **3.78 M $Ca(NO_3)_2$**

7) 98 grams of sodium hydroxide in 2.2 liters of solution.

① $\frac{98\ g\ NaOH}{1} \left| \frac{1\ mol\ NaOH}{39.998\ g\ NaOH} \right. = 2.45\ mol\ NaOH$

② $M = \frac{mol}{L} \rightarrow M = \frac{2.45\ mol}{2.2\ L} \rightarrow$ **1.11 M NaOH**

8) 1.2 grams of hydrochloric acid in 25 mL of solution.

① $\frac{1.2\ g\ HCl}{1} \left| \frac{1\ mol\ HCl}{36.458\ g\ HCl} \right. = 0.0329\ mol\ HCl$

② $M = \frac{mol}{L} \rightarrow M = \frac{0.0329\ mol}{0.025\ L} \rightarrow$ **1.32 M HCl**

9) 45 grams of ammonia in 0.75 L of solution.

① $\frac{45\ g\ NH_3}{1} \left| \frac{1\ mol\ NH_3}{17.034\ g\ NH_3} \right. = 2.64\ mol\ NH_3$

② $M = \frac{mol}{L} \rightarrow M = \frac{2.64\ mol\ NH_3}{0.75\ L} \rightarrow$ **3.52 M NH_3**

Explain how you would make the following solutions. You should tell how many grams of the substance you need to make the solution, not how many moles.

10) 2 L of 6 M HCl

① $mol = (6\ M)(2\ L\ soln) \rightarrow 12\ mol\ HCl$

② $\frac{12\ mol\ HCl}{1} \left| \frac{36.458\ g\ HCl}{1\ mol\ HCl} \right. \rightarrow$ **437 g HCl**

11) 1.5 L of 2 M NaOH

① $mol = (2\ M)(1.5\ L\ soln) \rightarrow 3\ mol\ NaOH$

② $\frac{3\ mol\ NaOH}{1} \left| \frac{39.998\ g\ NaOH}{1\ mol\ NaOH} \right. \rightarrow$ **120 g NaOH**

12) 0.75 L of 0.25 M Na_2SO_4

① $mol = (0.25\ M)(0.75\ L\ soln) \rightarrow 0.1875\ mol\ Na_2SO_4$

② $\frac{0.1875\ mol\ Na_2SO_4}{1} \left| \frac{142.04\ g\ Na_2SO_4}{1\ mol\ Na_2SO_4} \right. \rightarrow$ **26.6 g Na_2SO_4**

13) 45 mL of 0.12 M sodium carbonate

① $mol = (0.12\ M)(0.045\ L) = 0.0054\ mol\ Na_2CO_3$

② $\frac{0.0054\ mol\ Na_2CO_3}{1} \left| \frac{105.99\ g\ Na_2CO_3}{1\ mol\ Na_2CO_3} \right. \rightarrow$ **0.572 g Na_2CO_3**

14) 250 mL of 0.75 M lithium nitrite

① $mol = (0.75\ M)(0.250\ L) = 0.1875\ mol\ LiNO_2$

② $\frac{0.1875\ mol\ LiNO_2}{1} \left| \frac{52.951\ g\ LiNO_2}{1\ mol\ LiNO_2} \right. \rightarrow$ **9.93 g $LiNO_2$**

15) 56 mL of 1.1 M iron (II) phosphate

① $mol = (1.1\ M)(0.056\ L\ soln) = 0.0616\ mol\ solute$

② $\frac{0.0616\ mol}{1} \left| \frac{357.49\ g\ Fe_3(PO_4)_2}{1\ mol\ Fe_3(PO_4)_2} \right. \rightarrow$ **22.0 g $Fe_3(PO_4)_2$**

16) 6.7 L of 4.5 M ammonium nitrate

① $mol = (4.5\ M)(6.7\ L) = 30.15\ mol\ NH_4NO_3$

② $\frac{30.15\ mol\ NH_4NO_3}{1} \left| \frac{80.052\ g\ NH_4NO_3}{1\ mol\ NH_4NO_3} \right. \rightarrow$ **2.41E3 g NH_4NO_3**

17) 4.5 mL of 0.05 M magnesium sulfate

① $mol = (0.05\ M)(0.0045\ L) = 0.000225\ mol\ MgSO_4$

② $\frac{0.000225\ mol\ MgSO_4}{1} \left| \frac{120.37\ g\ MgSO_4}{1\ mol\ MgSO_4} \right. \rightarrow$ **0.0271 g $MgSO_4$**

18) 90 mL of 1.2 M BF_3

① $Mol = (1.2\ M)(0.900\ L) = 1.08\ mol\ BF_3$

② $\frac{1.08\ mol\ BF_3}{1} \left| \frac{67.81\ g\ BF_3}{1\ mol\ BF_3} \right. \rightarrow$ **73.2 g BF_3**