**Molarity Worksheet #1**  identifiera \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. What does molarity mean?
2. What is the molarity of a solution that contains 4.53 moles of lithium nitrate in 2.85 liters of solution?
3. What is the molarity of a solution that contains 0.00372 moles hydrochloric acid in 2.39 x 10-2 liters of solution?
4. A flask contains 85.5 g C12H22O11 (sucrose) in 1.00 liters of solution. What is the molarity?
5. A beaker contains 214.2 grams osmium (III) fluoride in 0.0673 liters of solution. What is the molarity?
6. Calculate the molarity if a flask contains 1.54 moles potassium sulfate in 125 ml of solution.
7. A chalice contains 36.45 grams ammonium chlorite in 2.36 liters of solution - calculate the molarity.
8. What is the molarity of a solution that contains 14.92 grams magnesium oxalate in 3.65 ml of solution?
9. What mass of lithium phosphate would you mass to make 2.5 liter of 1.06 M lithium phosphate solution?
10. If you evaporated 250. mL of a 3.5 M solution of iron (II) nitrite, what mass of iron (II) nitrite would you recover?
11. A chemist has 4.0 g of silver nitrate and needs to prepare 2.0 L of a 0.010 M solution. Will there be enough silver nitrate? If so, how much silver nitrate will be left over?

12. A rabbit pours 500.00 mL of a 3.0000 molar solution of sodium hydroxide into a 2.000 liter volumetric flask and fills the flask up with water. What is the new molarity of the solution?

**Solutions**:

**Molarity Worksheet #1**  identifiera \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. What does molarity mean?

# **Number of moles of solute**

 **1 liter solution**

1. What is the molarity of a solution that contains 4.53 moles of lithium nitrate in 2.85 liters of solution?

**4.53 mol LiNO3 = 1.59 M LiN03**

 **2.85 L soln**

1. What is the molarity of a solution that contains 0.00372 moles hydrochloric acid in 2.39 x 10-2 liters of solution?

**0.00372 mol HCL = 0.156 M HCL**

 **2.39x10-2 L soln**

1. A flask contains 85.5 g C12H22O11 (sucrose) in 1.00 liters of solution. What is the molarity?

**85.5g sucrose x 1 mol sucrose = 0.250 M sucrose**

 **1.00 L soln 342.34g sucrose**

1. A beaker contains 214.2 grams osmium (III) fluoride in 0.0673 liters of solution. What is the molarity?

**214.2g OsF3 x 1 mol OsF3 = 12.9 M OsF3**

 **0.0673 L soln 247.23g OsF3**

1. Calculate the molarity if a flask contains 1.54 moles potassium sulfate in 125 ml of solution.

**1.54 mol K2SO4 = 12.3 M K2SO4**

 **0.125 L soln**

1. A chalice contains 36.45 grams ammonium chlorite in 2.36 liters of solution - calculate the molarity.

**36.45g NH4ClO2 x 1 mol NH4ClO2 = 0.181 M NH4ClO2**

 **2.36 L soln 85.50g NH4ClO2**

1. What is the molarity of a solution that contains 14.92 grams magnesium oxalate in 3.65 ml of solution?

**14.92g MgC2C4 x 1 mol MgC2C4 = 36.4 mol MgC2C4**

 **0.00365 L soln 112.32g MgC2C4**

1. What mass of lithium phosphate would you mass to make 2.5 liter of 1.06 M lithium phosphate solution?

**2.5 L soln x 1.06 mol Li3PO4 x 115.79g Li3PO4 = 310g Li3PO4**

  **1 L soln 1 mol Li3PO4**

1. If you evaporated 250. mL of a 3.5 M solution of iron (II) nitrite, what mass of iron (II) nitrite would you recover?

**0.250 L soln x 3.5 mol Fe(NO2)2 x 147.86g Fe(NO2)2 = 130g Fe(NO2)2**

 **1 L soln 1 mol Fe(NO2)2**

1. A chemist has 4.0 g of silver nitrate and needs to prepare 2.0 L of a 0.010 M solution. Will there be enough silver nitrate? If so, how much silver nitrate will be left over?

**2.0 L soln x 0.010 mol AgNO3 x 169.88g AgNO3 = 3.4g AgNO3 Used/Needed**

##  1 L soln 1 mol AgNO3

 **There is enough silver nitrate available. 4.0g AgNO3 – 3.4g AgNO3 = 0.6 g AgNO3**

12. A rabbit pours 500.00 mL of a 3.0000 molar solution of sodium hydroxide into a 2.000 liter volumetric flask and fills the flask up with water. What is the new molarity of the solution?

 **0.50000 L soln x 3.0000 mol NaOH = 1.5000 mol NaOH**

 **1 L soln**

**1.500 mol NaOH = 0.75000 M NaOH**

 **2 L soln**

Dilutions:

**Dilutions Worksheet**

1)    If I have 340 mL of a 0.5 M NaBr solution, what will the concentration be if I add 560 mL more water to it?

2)    If I dilute 250 mL of 0.10 M lithium acetate solution to a volume of 750 mL, what will the concentration of this solution be?

3)    If I leave 750 mL of 0.50 M sodium chloride solution uncovered on a windowsill and 150 mL of the solvent evaporates, what will the new concentration of the sodium chloride solution be?

4)    To what volume would I need to add water to the evaporated solution in problem 3 to get a solution with a concentration of 0.25 M?

**Dilutions Worksheet – Solutions**

1)    If I have 340 mL of a 0.5 M NaBr solution, what will the concentration be if I add 560 mL more water to it?

    **0.19 M (the final volume is 900 mL, set up the equation from that)**

2)    If I dilute 250 mL of 0.10 M lithium acetate solution to a volume of 750 mL, what will the concentration of this solution be?

    **0.033 M (the final volume is 750 mL, set up the equation from that.  Note that the phrasing difference between problems 1 and 2 makes a big difference in the final answer).**

3)    If I leave 750 mL of 0.50 M sodium chloride solution uncovered on a windowsill and 150 mL of the solvent evaporates, what will the new concentration of the sodium chloride solution be?

    **0.63 M (this is the opposite of a dilutions problem – the V2 value is smaller than V1, but otherwise the equation is no different.)**

4)    To what volume would I need to add water to the evaporated solution in problem 3 to get a solution with a concentration of 0.25 M?

    **1500 mL**

    Solution Stoich:

Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Solution Stoichiometry Worksheet**

Solve the following solutions Stoichiometry problems:

1. How many grams of silver chromate will precipitate when 150**.** mL of 0**.**500 M silver nitrate are added

 to 100**.** mL of 0**.**400 M potassium chromate?

2. How many mL of 0**.**280 M barium nitrate are required to precipitate as barium sulfate all the sulfate

 ions from 25**.**0 mL of 0**.**350 M aluminum sulfate? **(93.8 mL barium nitrate)**

3. 25**.**0 mL of 0**.**350 M NaOH are added to 45**.**0 mL of 0**.**125 M copper (II) sulfate.  How many grams of

 copper (II) hydroxide will precipitate?

4. What volume of 0**.**415 M silver nitrate will be required to precipitate as silver bromide all the bromide

 ion in 35**.**0 mL of 0**.**128 M calcium bromide?

5. What volume of 0**.**496 M HCl is required to neutralize 20**.**0 mL of 0**.**809 M sodium hydroxide?

6. How many mL of 0.715 M HCl is required to neutralize 1.25 grams of sodium carbonate? (producing

 carbonic acid)

7. What minimum number of grams of oxalic acid monohydrate, H2C2O4• H2O, would you specify for a

 titration of no fewer than 15**.**0 mL of 0**.**100 M NaOH? Both of the hydrogen’s from oxalic acid are

 replaceable in this reaction.

8. How many grams of magnesium hydroxide will precipitate if 25**.**0 mL of 0**.**235 M magnesium nitrate

 are combined with 30**.**0 mL of 0**.**260 M potassium hydroxide?

9. 60**.**0 mL of 0**.**322 M potassium iodide are combined with 20**.**0 mL of 0**.**530 M lead (II) nitrate.

 How many grams of lead (II) iodide will precipitate?

**Solutions (Get it?)**

Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Solution Stoichiometry Worksheet**

Solve the following solutions Stoichiometry problems:

1. How many grams of silver chromate will precipitate when 150**.** mL of 0**.**500 M silver nitrate are added

 to 100**.** mL of 0**.**400 M potassium chromate?

 **2 AgNO3(aq) + K2CrO4(aq) 🡺 Ag2CrO4(s) + 2 KNO3(aq)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **0.150 L AgNO3** | **0.500 moles AgNO3** | **1 moles Ag2CrO4** | **331.74 g Ag2CrO4** | **= 12.4 g Ag2CrO4** |
|  | **1 L** | **2 moles AgNO3** | **1 moles Ag2CrO4** |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **0.100 L K2CrO4** | **0.400 moles K2CrO4** | **1 moles Ag2CrO4** | **331.74 g Ag2CrO4** | **= 13.3 g Ag2CrO4** |
|  | **1 L** | **1 moles K2CrO4** | **1 moles Ag2CrO4** |  |

2. How many mL of 0**.**280 M barium nitrate are required to precipitate as barium sulfate all the sulfate

 ions from 25**.**0 mL of 0**.**350 M aluminum sulfate? **(93.8 mL barium nitrate)**

 **3** **Ba(NO3)2(aq) + Al2(SO4)3(aq) 🡺 3 BaSO4(s) + 2 Al(NO3)3(aq)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **0.0250 L Al2(SO4)3** | **0.350 moles Al2(SO4)3** | **3 moles Ba(NO3)2** | **1 L** | **= 0.0938 L Ba(NO3)2** |
|  | **1 L** | **1 moles Al2(SO4)3** | **0.280 moles Ba(NO3)2** |  |

3. 25**.**0 mL of 0**.**350 M NaOH are added to 45**.**0 mL of 0**.**125 M copper (II) sulfate.  How many grams of

 copper (II) hydroxide will precipitate?

 **2 NaOH(aq) + CuSO4(aq) 🡺 Cu(OH)2(s) + Na2SO4(aq)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **0.0250 L NaOH** | **0.350 moles NaOH** | **1 moles Cu(OH)2** | **97.57 g Cu(OH)2** | **= 0.427 g Cu(OH)2** |
|  | **1 L NaOH** | **2 moles NaOH** | **1 mole Cu(OH)2** |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **0.0450 L CuSO4** | **0.125 moles CuSO4** | **1 moles Cu(OH)2** | **97.57 g Cu(OH)2** | **= 0.549 g Cu(OH)2** |
|  | **1 L NaOH** | **1 moles CuSO4** | **1 mole Cu(OH)2** |  |

4. What volume of 0**.**415 M silver nitrate will be required to precipitate as silver bromide all the bromide

 ion in 35**.**0 mL of 0**.**128 M calcium bromide?

 **2 AgNO3(aq) + CaBr2(aq) 🡺 Ca(NO3)2(aq) + 2 AgBr(s)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **0.0350 L CaBr2** | **0.128 moles CaBr2** | **2 moles AgNO3** | **1 L AgNO3** | **= 0.0216 L AgNO3** |
|  | **1 L CaBr2** | **1 moles CaBr2** | **0.415 mole AgNO3** |  |

5. What volume of 0**.**496 M HCl is required to neutralize 20**.**0 mL of 0**.**809 M sodium hydroxide?

 **HCl(aq) + NaOH(aq) 🡺 NaCl(aq) + H(OH)(l)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **0.0200 L NaOH** | **0.809 mole NaOH** | **1 mole HCl** | **1 L HCl** | **= 0.0326 L HCl** |
|  | **1 L NaOH** | **1 mole NaOH** | **0.496 mole HCl** |  |

6. How many mL of 0.715 M HCl is required to neutralize 1.25 grams of sodium carbonate? (producing

 carbonic acid)

 **2 HCl(aq) + Na2CO3(s) 🡺 2 NaCl(aq) + H2CO3(aq)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **1.25 g Na2CO3** | **1 mole Na2CO3** | **2 mole HCl** | **1 L HCl** | **= 0.0330 L HCl** |
|  | **105.99 g Na2CO3** | **1 mole Na2CO3** | **0.715 mole HCl** |  |

7. What minimum number of grams of oxalic acid monohydrate, H2C2O4• H2O, would you specify for a

 titration of no fewer than 15**.**0 mL of 0**.**100 M NaOH? Both of the hydrogen’s from oxalic acid are

 replaceable in this reaction.

 **H2C2O4• H2O(aq) + 2 NaOH(aq) 🡺 Na2C2O4• H2O(aq) + 2 H(OH)(l)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **0.0150 L NaOH** | **0.100 mole NaOH** | **1 mole H2C2O4• H2O** | **108.06 g H2C2O4• H2O** | **= 0.0810 g H2C2O4• H2O** |
|  | **1 L NaOH** | **2 mole NaOH** | **1 mole H2C2O4• H2O** |  |

8. How many grams of magnesium hydroxide will precipitate if 25**.**0 mL of 0**.**235 M magnesium nitrate

 are combined with 30**.**0 mL of 0**.**260 M potassium hydroxide?

**Mg(NO3)2(aq) + 2 KOH 🡺 2 KNO3(aq) + Mg(OH)2(s)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **0.0250 L Mg(NO3)2** | **0.235 mole Mg(NO3)2** | **1 mole Mg(OH)2** | **58.33 g Mg(OH)2** | **= 0.343 Mg(OH)2** |
|  | **1 L Mg(NO3)2** | **1 mole Mg(NO3)2** | **1 mole Mg(OH)2** |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **0.0300 L KOH** | **0.260 mole KOH** | **1 mole Mg(OH)2** | **58.33 g Mg(OH)2** | **= 0.227 g Mg(OH)2** |
|  | **1 L KOH** | **2 mole KOH** | **1 mole Mg(OH)2** |  |

9. 60**.**0 mL of 0**.**322 M potassium iodide are combined with 20**.**0 mL of 0**.**530 M lead (II) nitrate.

 How many grams of lead (II) iodide will precipitate?

 **2 KI(aq) + Pb(NO3)2(aq) 🡺 2 KNO3(aq) + PbI2(s)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **0.0600 L KI** | **0.322 mole KI** | **1 mole PbI2** | **461.00 g PbI2** | **= 4.45 g PbI2** |
|  | **1 L KI** | **2 mole KI** | **1 mole PbI2** |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **0.0200 L Pb(NO3)2** | **0.530 mole Pb(NO3)2** | **1 mole PbI2** | **461.00 g PbI2** | **= 4.89 g PbI2** |
|  | **1 L Pb(NO3)2** | **1 mole Pb(NO3)2** | **1 mole PbI2** |  |