Name: _____ Period: _____Date: _____

INTRODUCTION

In this lab, we will be exploring the concept of **molarity** in solutions with more depth. So far, you've determined the murder weapon and its molarity. What we need now is a clearer understanding of molarity and how it impacts the identity of solutions.

Enter the following URL in your web browser: http://phet.colorado.edu/en/simulation/molarity Click on the button that says **Run Now**. You can also click **Run in HTML 5** .

Directions

Using the controls above, we are going to make 3 solutions and answer questions regarding their properties.

Solution #1: ***Concentration – Adding solute***

1. Click on Show Values
2. What is the starting **solute** amount in moles?_____.
3. What is the starting solution **volume** in Liters? _____.
4. What is the solution **concentration**? _____.

Now, **increase** the **solute** amount to the highest level and keep the **volume** the same.

5. What is the resulting **solute** amount in moles? _____.
6. What is the solution **volume** in Liters? _____.
7. What is the solution **concentration**? _____.
8. How do you calculate **concentration**? Show work below.

9. What does **increasing** the **solute** do to the **concentration**?

Solution #2: ***Concentration – Decreasing Volume***

1. Click on control Reset All
2. Click on control Show Values
3. What is the starting **solute** amount in moles?_____.
4. What is the starting solution **volume** in Liters? _____.
5. What is the solution **concentration**? _____.

Now, **decrease** the **volume** amount to the lowest level and keep the **solute** amount the same.

6. What is the resulting **volume** in Liters? _____.
7. What is the solution **concentration**? _____.
8. What does **decreasing** the **volume** do to the **concentration**?

Solution #3: ***Concentration – Calculating Molarity***

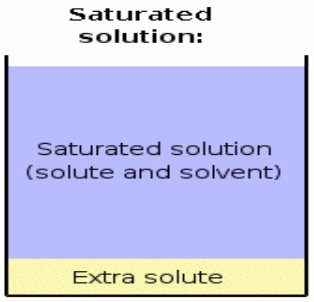
1. Click on control Reset All
2. Click on control Show Values
3. Change the solute to $CuSO_4$ (Copper (II) Sulfate) using control (Solute)
4. If the starting molarity is 1 *M*, what is another **solute** amount or **solution volume** that will give you the same molarity (1 *M*)? Show the calculation below.

Using the formula for Molarity, complete the table below.

Moles of Compound (mol)	Liters of Solution (L)	Molarity of Solution (M)
.53	.79	
.86	.34	
1.0	.20	
.67	.67	

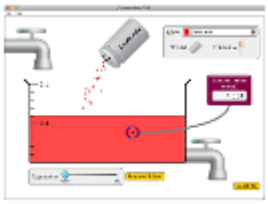
Moles of Compound (mol)	Liters of Solution (L)	Molarity of Solution (M)
	.78	.59
.88		1.8
3.5	8.4	
	6.4	8.5

A saturated solution is one where the solution cannot dissolve any more solute. You will get is some type of layering where the **extra solute** settles at the bottom.



5. Find the molarity at which Copper (II) Sulfate is **saturated**. Give at least 2 different **solute**/**volume** combinations that will give you the **saturated** solution. Show calculation below.

Introduction: Everyone likes candy. Have you ever wondered how that candy is produced? How do they get all that delicious sugar into those tiny packages? Could you make hard candy like those you can buy? It's easier than you think. Web searching for "rock candy" will yield a number of delicious recipes you can try at home.



Concentration

Enter the following URL in your web browser: http://phet.colorado.edu/en/simulation/concentration or PhET→Play with the Sims → Chemistry → Concentration
Click on the button that says **Run Now**. You can also click **Run in HTML 5** .

Take some time to play and familiarize yourself with the simulation. Click on everything. Move all the sliders.

Notice what happens to the concentration as solid solute  is added and when evaporation occurs.

How does the concentration change as additional water is added? _____

Why? _____

How does the concentration change as evaporation occurs? _____

Why is this? _____

How do you know when a solution is saturated? _____

Does evaporation change the concentration of a saturated solution?

_____

Why is this?

_____

Using **the concentrated solution** spigot, add a ½ Liter of Drink Mix to an empty beaker.

What is the concentration?_____ Is this solution saturated? _____ How do you know? _____

Fill the beaker with another ½ Liter of water. What is the new concentration? _____

Complete the table below, using Cobalt chloride in an empty beaker, writing the concentration in the boxes provided.

Only .25L of spigot solution	.25L spigot+.25L water	.25L spigot + .50 L water	.25L spigot + .75 L water

Repeat the exercise, using Potassium dichromate in an empty beaker.

Only .25L of spigot solution	.25L spigot+.25L water	.25L spigot + .50 L water	.25L spigot + .75 L water

What do you notice about the concentration change as each addition of .25L of water is added to the concentrated spigot solution? _____

The formula $M_1V_1 = M_2V_2$ is a great way to calculate the concentration of a solution that undergoes dilution or concentration. M_1V_1 Refer to the concentration and volume of the original solution, and M_2V_2 refer to that solution after it has been diluted or concentrated.

Empty the Water.

0.20 L of Nickel (II) chloride has a concentration of 5.0 M. (M_1 = 5.0 M and V_1 = 0.20 L) If the solution's volume, V_2 is increased with water to .50 L, calculate the new concentration, M_2.

Check your work in the sim AFTER your calculation.

Your Calculated M_2: _____New concentration shown in the simulation: _____

Complete the table below using Potassium permanganate. Remember to calculate first, and then check in the sim.

M_1	V_1	M_2	V_2
.40 M	.20 L		.80 L
.40 M	.50 L		.90 L
.40 M	.30 L	.15 M	

Conclusion Questions and Calculations *SHOW WORK*

1. Dilution causes the concentration of an unsaturated solution to *increases / decreases / remains the same.*
2. Evaporation causes the concentration of an unsaturated solution to *increases / decreases / remains the same.*
3. What is the solution concentration formed from 3.6 moles NaCl dissolved into 1.3 L of water?
4. How many moles of solute are present in 1400mL of a 1.9 M (molar) solution?
5. What volume of water would be required to dissolve .46 moles of solute to produce a .22 M solution?
6. What is the solution concentration formed from 291.52 g $BaCl_2$ dissolved into 1.9 L of water?
7. 1.8 L of a 2.4 M solution of $NiCl_2$ is diluted to 4.5 L. What is the resulting concentration of the diluted solution?
8. 350 mL of a 1.0 M $CuSO_4$ solution is left on the counter and allowed to evaporate. $CuSO_4$'s saturation solubility point is 1.4 M. At what volume will the solution begin to show solid crystals?