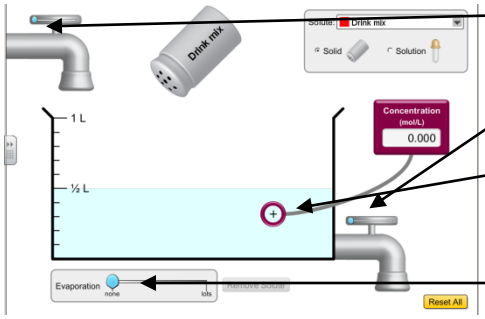
Name _____ Hour_____

Molarity Lab

Simulation instructions

Google "PhET" and click on the first search option—PhET: Free Online Simulations…Click on the orange "Play with Sims…" button. Click on the first simulation you see: "Concentration". Click the green "Run now" button



To add water or remove the solution, move the blue button to the right

Pull the (+) sign into the solution so that you can read the concentration.

Leave the evaporation button alone for this activity

1. Get to know the program. Stay on the "drink mix solute in the solid form" and add drink mix to the water by shaking the container. Play with the variables and see what happens to the mixture. Press reset all and put the reader back into the solution before answering the following questions:
    a. What happens to concentration when you add more solid? Why do you think this is?

    b. What happens to the concentration when you add more water? Why do you think this is?

    c. What happens to the concentration when you remove some of the water? Why do you think this is?

    d. How is color related to concentration in this demonstration?

2. Click the "reset all" button, change your solute to Nickel (II) chloride, and put the reader back in the solution.
    a. Shake the container three times. Does the concentration increase or decrease? Why?

    b. Shake the container again and write down the concentration _____. Using the concentration value and the volume, determine the number of moles of $NiCl_2$ in the container.

c. Shake the container once more and let out enough water so you only have 400 mL (the 4th line up). Write down the concentration _____. Determine the MASS of $NiCl_2$ in the container.

3. Click the "reset all" button. Change the solute to purple potassium permanganate. Shake the container until it turns a very dark purple and says "saturated" in the solution.
   a. What is happening inside the beaker as you add more solid once the solution is "saturated"?

   b. What happens to the concentration as you add more solid once the solution is "saturated"?

   c. What do you think the term "saturated" means?

4. Click the "reset all" button. Change the solute to orange potassium dichromate. Shake the container until it says "saturated" and read the concentration _____. How many moles of potassium dichromate are in ½ L of dichromate solution?

Dilution

5. Click the "reset all" button. Change the solute to red cobalt (II) nitrate. Shake the solid six times and read the concentration _____. How many moles of cobalt (II) nitrate are in this solution?

6. Add more water until the water reads 1L.
   a. What happens to the concentration as you add more water? Does it increase or decrease? Why?

   b. Does the number of moles of solute change as you add more water? Hint: are you changing the amount of solid? Are you adding anymore solid?

c. What is the concentration now? _____Show the math that proves the number of moles is unchanged

DILUTION IMPORTANT IDEA: The number of moles does NOT change, only the molarity and the volume.

- Using the molarity equation circle, we know that mol = M x V
- Which means….
  - Moles from problem #5 = $M_1 \times V_1$ (using "1" just to show this is the initial molarity and volume)
  - Moles from problem #6 = $M_2 \times V_2$ (using "2" just to show this is the final molarity and volume)
- Since Moles from problem #5 = Moles from problem #6…
  - $M_1 \times V_1 = M_2 \times V_2$ ← **This is the dilution equation!!**

If you are just diluting a substance, you do not have to calculate the number of moles they are not changing. ***Diluting a substance means to DECREASE the concentration by adding more water.*

Try a dilution problem:

7. Click the "reset all" button. Change the solute to yellow potassium chromate. Shake the solid six times.
   a. What is the volume of the solution (V_1)? _____
   b. What is the concentration (M_1)?_____
   c. If you add water (don't do it yet!) to the 1L level, what will be the new volume (V_2)? _____
   d. Using the data from a-c and the dilution equation…determine the molarity of the solution at 1L.

   e. Fill the water to 1L and read the concentration _____

8. Click the "reset all" button. Change the solute to blue copper sulfate. Shake the solid six times. Using the dilution equation, what will be the concentration when you fill the water (don't do it yet) up to 700 mL (the 7th dash)? Hint: this is just like problem 7 with different numbers!!

Answer after doing the math: _____ Answer after actually filling the water: _____

Making a solution lab

Make 250 mL of a _____ M solution of _____

1. How many grams do you need to make this solution?

Answer: _____

2. Write DETAILED steps of how to make the solution in a volumetric flask.

_____

_____

_____

_____

_____

_____

_____

_____

Dilute the solution from the first part to make 150 mL of a _____ M solution

1. How many mL of the first solution do you need?

2. Write DETAILED steps of how to dilute the solution in a volumetric flask.

_____

_____

_____

_____

_____

_____