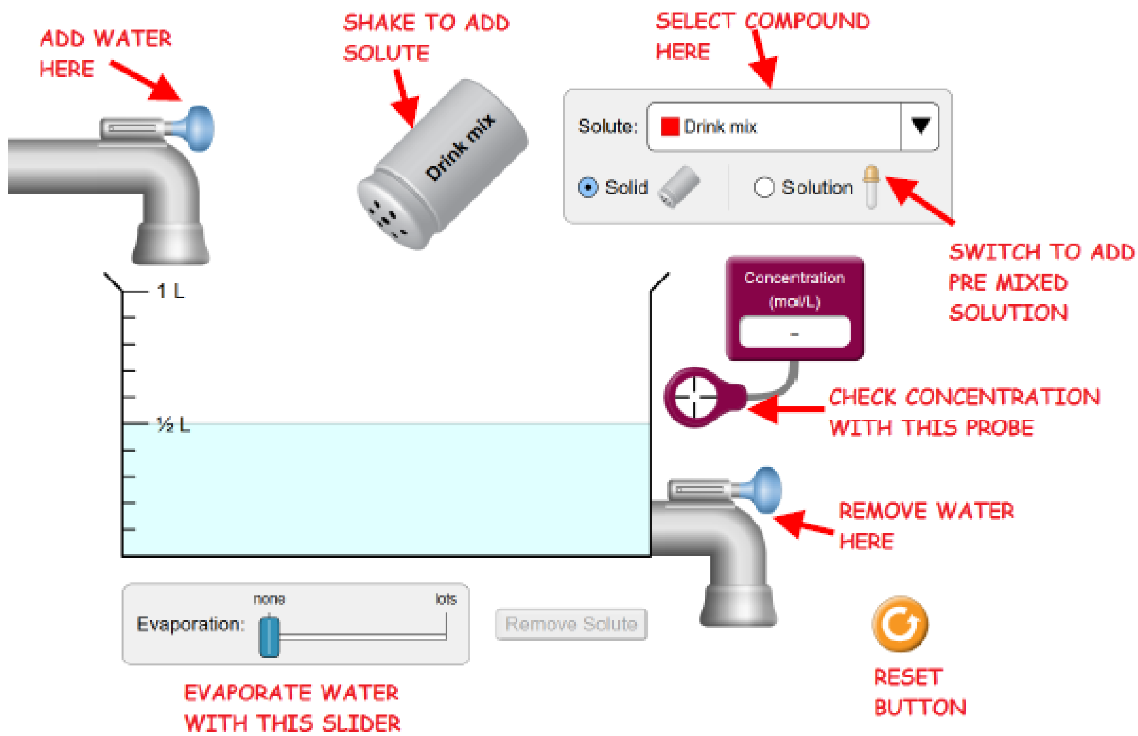
PhET Concentration Lab

Name: ___________________________ Pd: _____

Adapted from the University of Colorado.

Website: https://phet.colorado.edu/sims/html/concentration/latest/concentration_en.html



Familiarize yourself with the various functions of the simulation by clicking and moving the various parts.

PART 1 - EFFECT OF CHANGING THE AMOUNT OF SOLUTE AND SOLVENT

1. Click RESET
2. Move the Concentration Probe into the liquid.
3. **Shake some Drink mix** into the water. Continue to add solute until the concentration reading is between 4 & 5.
   a. What happened to the concentration as more solute is added? ____
   b. What units of concentration are used for the concentration reading on the concentration probe? ________________
   c. What happens to the color of the solution as more solute is added? ____
   d. What is the relationship between concentration and color? ____
4. Now **add more water** with the valve on the upper left.
   a. What happens to the concentration as the quantity of water increases? ______________________________
   b. Explain why. (Mention what is happening to the quantity of solvent and solute)
5. Now **Remove some solution** with the valve on the lower right.
   a. What happens to the concentration as the quantity of water decreases? ______________________________
   b. Explain why. (Mention what is happening to the quantity of solvent and solute)
6. Now **Remove water with the Evaporation Slider Bar** on the bottom.
   a. What happens to the concentration as the quantity of water decreases? ______________________________
   b. Explain why. (Mention what is happening to the quantity of solvent and solute)

PART 2 - SATURATION

1. Click RESET.
2. Switch to a different Compound by selecting the Drop Down Menu called SOLUTE. Select $CuSO_4$ (If you don't know what this is, look it up).
3. **Shake to add $CuSO_4$** until a saturated solution is created.
   a. How do you know when a saturated solution is created?

   b. Move the Concentration Probe into the liquid. What is the concentration? (Include Units) _______________
   c. Add more solute. What happens to the concentration? (Explain why)

PART 3 - CONTROLLING THE CONCENTRATION

1. Click RESET.
2. **Select $CuSO_4$** from the Drop Down Menu called SOLUTE.
3. **Shake to add** enough to create a 0.5 Molar Solution in the ½ liter of water originally in the beaker.
4. **Calculate the number of moles of $CuSO_4$** in the beaker using the equation for molarity. Show your work below.

5. **Calculate the mass in grams of $CuSO_4$** that was added to the beaker to achieve a 0.5 Molar solution.

6. **Predict** the concentration if the solution is diluted to a volume of 1 liter. Show the calculation of this concentration, include units in all your work.

   a. **After you make the calculation:** Add water until there is 1 L of water in the beaker.
   b. What is the concentration? ____________ Does this match your calculation? *Yes* or *No*
7. **Predict** the concenteration if the solution is now concentrated (by using evaporation) to a volume of .75 liters (1/2 way between .5 liters and 1 liter). Show the calculation of this concentration, include units in all your work.

   a. **After you make the calculation**: Evaporate water with Evaporation Slider Bar until there is 0.75 L of solution in the beaker.
   b. What is the concentration? ____________ Does this match your calculation? *Yes* or *No*
8. Using the **current concentration & volume, calculate** the number of moles of solute in the solution. Show your calculation with units.

   a. Calculate the mass in grams of solute for the current concentration and volume.

   b. How does the # moles of solute and mass of solute compare to the # of moles and mass of solute calculated in question 4 and 5. **Explain why these numbers compare as they do.**

9. **Predict the concentration & # of moles of solute** if water is added until the volume is 1 liter.

   a. **Fill the beaker** to a volume of 1 liter and check the concentration. What is the concentration? ___________

10. **Open the Remove Water Valve** (on the lower right) until there is 0.5 L of solution in the beaker.

    a. What happened to the concentration when ½ of the solution was allowed to run out? (Explain why in terms of the amount of solute and solvent)

    b. Using the **current concentration & volume, calculate** the number of moles of solute in the solution. Show your calculation with units.

    c. How does the # moles of solute compare to the # of moles of solute calculated in question 4. **Explain why these numbers compare as they do.**

11. **Predict** the concentration if the solution is diluted to a volume of 1 liter. Show the calculation of this concentration, include units in all your work.

    a. **After you make the calculation:** Add water with the valve until there is 1 L of water in the beaker .
    b. **What is the concentration?** ____________ Does this match your calculation? *Yes* or *No*

<u>SUMMARY OF LEARNING OBJECTIVES</u> – CIRCLE THE WORD OR PHRASE THAT BEST FITS THE STATEMENT.

1. Adding solute (solid) to an unsaturated solution causes the concentration of the solution to:

   INCREASE /DECREASE/ REMAIN UNCHANGED

2. Adding pure water to a saturated solution will cause the concentration of the solution to:

   INCREASE /DECREASE/ REMAIN UNCHANGED

3. Adding a solid salt to a saturated solution causes the concentration of the solution to:

   INCREASE /DECREASE/ REMAIN UNCHANGED

4. Evaporation acting on an unsaturated solution causes the concentration of the solution to:

   INCREASE /DECREASE/ REMAIN UNCHANGED

5. Evaporation acting on a saturated solution causes the concentration of the solution to:

   INCREASE /DECREASE/ REMAIN UNCHANGED.