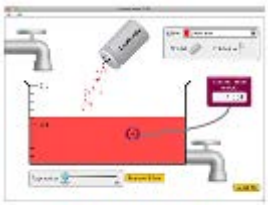
Concentration and Molarity PhET Labs

Name: _____

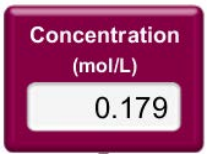
Procedure: **https://phet.colorado.edu/sims/html/concentration/latest/concentration_en.html**



Concentration

Part 1: Dissolution and Saturation

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. 



1. How does the concentration change as solid solute is added? concentration increases

2. How does the concentration change as additional water is added? concentration decreases

3. How does the concentration change as evaporation occurs? concentration increased

4. How do you know when a solution is ***saturated***? concentration does not change (it also shows on screen)

6. When a solution *is* saturated, and additional solid solute is added, what happens? solid does not dissolve and settles at bottom

7. Why do you think this is? solvent cannot hold any more solute

8. How does adding this additional solute change the concentration of this saturated solution? decreases concentration

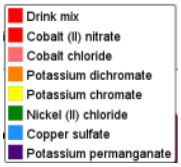
9. How does evaporation change the concentration of a saturated solution? no change- solution is already saturated

Part 2: Concentrated Solutions (same website as part 1 just click on the Solution option) 

10. Adding a concentrated solution… describe a way to determine the concentration of the solution in the spigot. Write your plan here: empty the container and add only one solution from the dropper and then use the sensor to measure concentration

11. Using your plan…how might you get that concentrated solution to become saturated? you can evaporate

12. Does your plan work for all the other solutions too? yes Why? / Why Not? evaporation reduces the amount of water (or solute) so concentration increases



Part 3: Molarity *https://phet.colorado.edu/sims/html/molarity/latest/molarity_en.html*

$$Molarity\ (M) = \frac{amount\ of\ solute\ (mol)}{volume\ of\ solution\ (L)}$$

Molarity is **moles per Liter**, that is, how many moles of solute (entire salt) is dissolved per Liter of solution.

Molarity

First, determine the **saturation concentration** of each of the solutions, that is, how concentrated can you get each solution before the solution is saturated. If you can't determine the concentration using the simulation "Molarity", try using the simulation "Concentration" (You will use this information again in ***Part 5***, if your instructor requires it)

Cobalt (II) nitrate	Saturation concentration 5.640 M	Potassium chromate	Saturation concentration 3.350 M
Cobalt chloride	4.330 M	Nickel (II) chloride	5.210 M
Potassium dichromate	0.510 M	Copper sulfate	1.380 M
Gold (III) chloride	2.30 M	Potassium permanganate	0.480 M

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Part 4: Calculating Molarity Using the simulation and the formula for Molarity on the front, complete the table below.

Moles of Compound (mol)	Liters of Solution (L)	Molarity of Solution (M)	Moles of Compound (mol)	Liters of Solution (L)	Molarity of Solution (M)
.53	.79	0.67	0.46	.78	.59
.86	.34	2.5	.88	0.5	1.8
1.0	.20	5.0	3.5	8.4	0.40
.67	.67	1.0	54.4	6.4	8.5

Conclusion Questions and Calculations, Concentration and Molarity Post-Lab Exercises

1. Adding pure water to a saturated solution (with no solids) would cause the concentration of that solution to *increase / decrease / remain the same*. (circle)

2. Adding pure water to a saturated solution (with some solids) would cause the concentration of that solution to initially *increase / decrease / remain the same.* (circle)

3. Adding a solid salt to a saturated solution causes the concentration of that solution to *increase / decrease / remain the same.*

4. Evaporation acting on an unsaturated solution causes the solution's concentration to *increase / decrease / remain the same.*

5. Evaporation acting on a saturated solution causes the solution's concentration to *increase / decrease / remain the same.*

6. Using your notes, your text, or the internet discover what happens to the saturation concentration when a solution's temperature is increased. What happens as a solution is heated? concentration decreases

7. Why does this happen? (hint…think about the molecules) molecules are moving faster

8. Can you dissolve .35 moles of Potassium Permanganate ($KMnO_4$) into 500 mL of water? No Why? / Why not? (please show work)

   .35mol/.5L = 0.7 M 0.480 is saturated

9. Can 1750 mL of water dissolve 4.6 moles of Copper Sulfate $CuSO_4$? No Why? / Why not? (please show work)

   4.6mol/1.75L = 2.63 M 1.380 is saturated

10. What is the solution concentration formed from 3.6 moles NaCl dissolved into 1.3 L of water? (please show work)

    3.6mol/1.3L = 2.77 M

11. What is the solution concentration formed from 2.1 moles $BaCl_2$ dissolved into 1.9 L of water? (please show work)

    2.1mol/1.9L = 1.11 M

12. How many moles of solute are present in 1.4 L of a 1.9 M (molar) solution? (please show work)

    1.4L x 1.9mol/L = 2.66 mol

13. What volume of water would be required to dissolve .46 moles of solute to produce a .22 M solution? (please show work)

    0.46 mol/ 0.22mol/L = 2.09 L