



Spectroscopy

STEM Sims

Lesson 1: Ballparking a Solution's Unknown Concentration

When dealing with unknown solutions, scientists use what has already been researched as a comparison to the unknown solution. It is your job to determine the unknown concentration of a solution, so grab a pipette to test it out!

Doing the Science

1. Start the Spectroscopy Simulation by clicking on the "Sim" tab.
2. Decide which unknown solution you wish to test, *A* or *B* and record it in the top of Table 1. *The following directions are written as if you chose the Unknown "A" solution.*
3. Click the pipette on the shelf and drag it to "Stock Solution A" and place the tip of the pipette in the solution.
4. After the pipette has been filled, drag the pipette above the cuvette.
5. Click and hold the red top on the pipette to drop the solution into the cuvette.
6. Be sure to count as each drop goes into the cuvette, because there must be the correct number of drops. The number of drops of both "Stock Solution A" and of " H_2O " must each be a multiple of 25 and the sum of both must total 100.
7. If you lose track of counting, you can place the pipette back on the shelf to see how many drops are inside the cuvette. If you need to add more solution, drag the pipette back over the cuvette.
8. Repeat steps 3 - 6 for " H_2O " to fill the cuvette.
9. Once the cuvette is full, click on the light switch to turn the lights off.
10. Click on the "On" button on the voltmeter to turn it on.
11. Click on the "On" button of the Laser 2000 and record the voltage from the voltmeter into Table 1 below.
12. Click the "New" button and then repeat steps 3-11 for the number of drops of Solution A and the number of drops of water given by Table 1.
13. Click the "New" button to reset the cuvette, then click the pipette on the shelf and drag it to "*Unknown A*" and place the tip of the pipette in the solution.
14. After the pipette has been filled, drag the pipette above the cuvette.
15. Click and hold the red top on the pipette and count the number of drops to 100.
16. Repeat steps 9 - 11 to find the voltage of *Unknown A* and record it in Table 1.
17. Estimate and record in Table 1 the concentration of *Unknown A* by comparing the voltage of the unknown solution to the voltages of the known concentration solutions that you tested.

Table 1. Unknown Solution: **A** **B** **(Circle your choice)**

Drops Solution A	Drops Water	Solution A Concentration	Voltage (millivolts)
100	0	100%	
75	25	75%	
50	50	50%	
25	75	25%	
0	100	0%	
Unknown A's Voltage:		Unknown A's Concentration:	

Do You Understand?

1. As the number of drops of water added increased, did the voltage increase or decrease?