Name:

Date:

School:

Facilitator:

7.02 Spectrophotometer (40 Points)

# Beer’s Law Simulation

**Explore the “Concentration” portion of the simulation and answer the questions below.** (2 points each)

1. How does the concentration of a solution affect its appearance?
2. How is concentration affected by the following changes?
   1. Adding more of the solid chemical:
   2. Adding more water:
   3. Removing some solution by opening the drain on the bottom right:
3. How does the type of solute (solid being sprinkled in) affect the appearance of the solution?

**Explore the “Beer’s Law” portion of the simulation and answer the questions below.** (2 points each)

1. Select the drink mix and direct green light (wavelength 508 nm) though the solution.
   1. Where is the green light most intense?
   2. Where is the green light least intense?
   3. Where is the intensity of the light changing?
2. Investigate the intensity of the green light passing through the drink mix as you change the concentration.
   1. Describe the relationship between concentration and absorbance.
   2. Describe the relationship between concentration and transmittance.
3. Create a calibration curve using the absorbance and concentration values gathered below. (10 points)

|  |  |
| --- | --- |
| Concentration (M) | Absorbances |
| 0.20 | 0.27 |
| 0.30 | 0.41 |
| 0.40 | 0.55 |
| 0.50 | 0.69 |

|  |
| --- |
| *Insert your graph below:* |
|  |

1. If a solution with an unknown concentration were found to have an absorbance of 0.35, what is the approximate molarity of the solution?      M (2 points)

The output from a spectrometer for many wavelengths is called a spectrum (plural is spectra). A UV-Vis spectrum is shown for a KMnO4 solution (concentration 800 M), with data generated in the simulation. Collect a few data points; check that you get the same absorbance values.

Note: You can change the wavelength of light by selecting “variable” under the light source.

B

A

1. The regions labeled A, B, and C correspond to certain colors. Give the letter of the area which corresponds to each of the colors below. (1 point each)

* Red:
* Green:
* Blue:

1. What color is the KMnO4 solution? (1 point each)
2. Which colors are absorbed best the KMnO4 solution? (1 point each)
3. Explore another solution to determine the color and wavelength of best absorbed. (1 point each)
   1. What is the identity and color of the solution you chose?
   2. What wavelength of light is best absorbed by this solution?
   3. What color of light is best absorbed by this solution?