Beer's Law Feedback Rubric

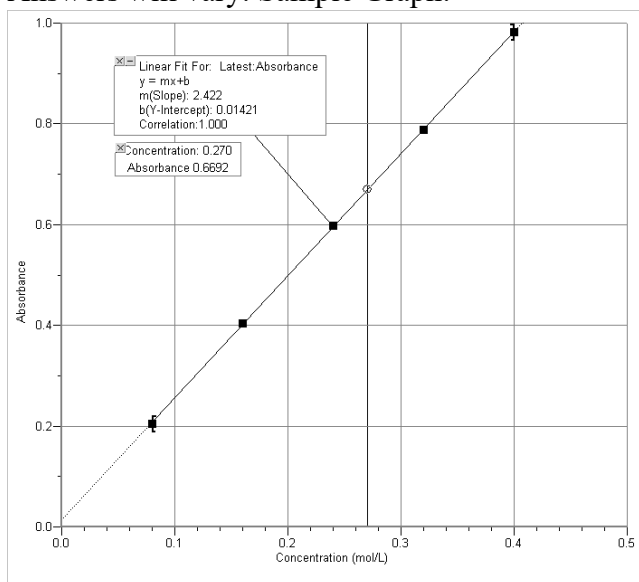| Category	General	Pts	Specific	Self Assessment
Lab Title, Topic	Topic is not the same as the title of the chapter!	1	Spectroscopy	
Purpose/Question/ Problem/Goal /Hypothesis	Relevant, thoughtful	1	You will determine the concentration of an unknown $CuSO_4$ solution by measuring its absorbance	
Key vocab terms and equations		2	Spectroscopy, Concentration, A=abc, Beer's Law, absorbance	
Key concept explained	All relevant concepts explained in a detailed and scientific way that demonstrates the connection to the material taught in the chapter.	3	• Beer's law uses spectroscopy because of the direct relationship between absorbance and concentration. • By locating the absorbance of the unknown on the vertical axis of the graph, the corresponding concentration can be found on the horizontal axis. The concentration of the unknown can also be found using the slope of the Beer's law curve	
Lab equipment, setup, named lab techniques	All important items included, labeled, explained	2	Spectrometer/colorimeter, cuvette, pipette, spectroscopy, beakers/flasks, test tubes, stir rod, test tube rack,	
Sig figs related to the equipment		1	Spectrometer gave 2-4 sig figs depending on the absorbance reading	
Experimental results	Reported in a succinct and direct way.	2	Needed to include the absorbance of your unknown, the concentration of your unknown	
Accepted values/results	Relevant accepted values/results reported	2	Accepted values were told to you in class and need to be stated here. You needed to say what your unknown concentration was.	
% Error Calculation	Done correctly, work shown, answer reported	2	Needed to see the calculation for %error, work shown and answers provided	
Sample calculations	Sample calculation shown for each type of calculation, work shown, numbers and units included, done correctly, answers reported.	4	Calculation of $[CuSO_4]$ – only one example	

Possible Lab errors	Relevant lab errors reported. No mention of "human error" or "calculation mistakes" etc	3	• Finger prints left on cuvettes (incorrect absorbance = incorrect [ ]) • Cuvette not completely cleaned between trials (contaminated) • Incorrect solution(s) made for creation of Beer's Law Curve • Cuvette not completely dried between trials (dilute next trial)	
Mathematical impact of lab errors	Identifies if errors result in higher or lower final results, explaining mathematical reasoning	3	NA – Points automatically given unless you wrote something that did not apply. You should know this box was not applicable to the lab being done. Don't make up nonsense just to fill a box!	
Example test question on topic	Thoughtful, relevant possible test question on this topic	2	Question needed to be complex enough to show thought/processing of the scientific concepts being taught during the chapter – not just a simple "what color flame does calcium make" type question.	
Solved Example test question	Work shown, done correctly, explanation given if not a mathematical problem.	2	Answer needed to be detailed and correct.	
Data Tables	Professional, large, rows/columns labeled, data legible	2	Data tables were already made: must include descriptive title along with reaction (no rxn for this experiment). This was to see if you recorded your data in a detailed way. Needs a descriptive title.	
Discussion questions	One or more questions will be evaluated for completion and/or accuracy.	4	This time it was for completion and displaying a reasonable amount of detail/effort consistent with an AP level class. Points were deducted for copying the questions instead of paraphrasing, or for not paraphrasing at all.	
Professionalism	Neat, legible, demonstrates deep level of thought/detail/effort.	3	Points deducted if the legibility detracted from my ability to grade the assignment. Points also deducted for a blatant disregard for the level of thought and detail required of an Honors level course. This category is also used for strange/unique issues that do not fit nicely into another category.	

Discussion Questions – The highlighted ones were graded.

All were graded for completion, detail, thought AND accuracy

All were graded for completion, detail, and thought

1) Answers will vary. Sample Graph:

Linear Fit For: Latest:Absorbance
y = mx+b
m(Slope): 2.422
b(Y-Intercept): 0.01421
Correlation:1.000

Concentration: 0.270
Absorbance 0.6692

Absorbance (y-axis: 0.0 to 1.0)
Concentration (mol/L) (x-axis: 0.0 to 0.5)

2) The student may discuss the theory of Beer's Law as well as the components of the equation. In spectroscopy, Beer's Law is the relationship between the amount of light being absorbed and the concentration of the substance absorbing the light. As a function, Beer's Law is defined as: $A = \alpha\,l\,c$. The term A is absorbance, α is the molar absorptivity of a substance (in this case it is the $CuSO_4$ solution), l is the distance that light passes through the substance (commonly 1 cm in a standard cuvette), and c is the molar concentration of the substance.

3) The answer could be qualified. The student may suggest that, if the fingerprints were made before the cuvette was used at all, and not cleaned off, then the fingerprints' effect on the amount of light passing through the cuvette would be accounted for in calibration and the results of the experiment may not be affected. However, stated, the student should comment that if a smudge from any source lies in the path of the light traveling through the substance, the smudge can absorb or deflect some of the light. This can affect the accuracy of the absorbance readings.

4) The answer should reflect the student's understanding of the basics of visible light spectroscopy, which depends on the substance being tested having a color that can be seen by the naked eye. A $CuSO_4$ solution has a blue color, thus it is a suitable candidate for this type of analysis. A solution of Na_2SO_4 is colorless to the naked eye, thus visible light spectroscopy will not work.