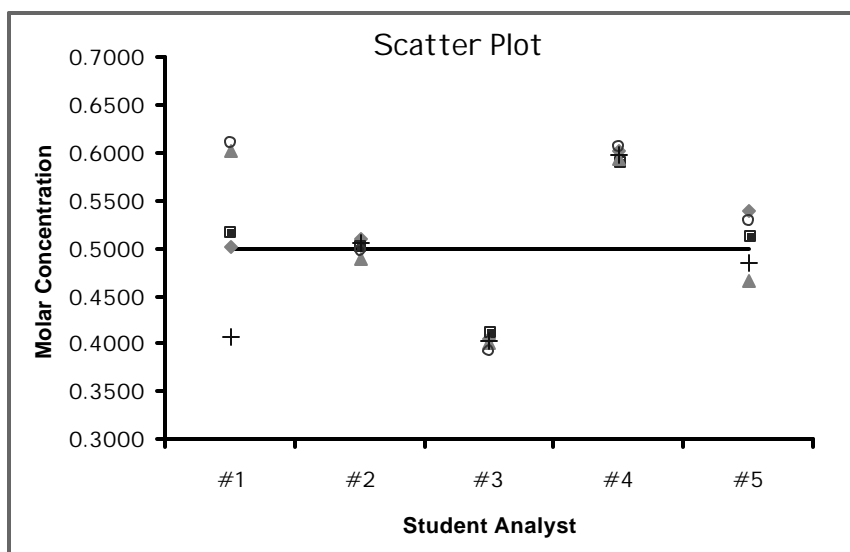


CHM 103 EXAM I

Show all calculations with units and correct significant figures. Write in complete sentences. Turn in your take-home question with this exam. GOOD LUCK!

1. A 10.00-mL sample of HCl, measured with a pipet, is titrated with NaOH. Here are the results for five trials for each of five students. The students used one or more of five 10 mL pipets available in the laboratory. Unbeknownst to them, two of the five pipets were incorrectly calibrated- one was 8 mL and the other 12 mL. The other three pipets were calibrated correctly to 10 mL. The students either got one pipet and used it five times or randomly selected a different pipet for each trial. The sample of HCl was 0.5000 M. From the scatter plot below, explain the cause of the error involved for each student including influence on their



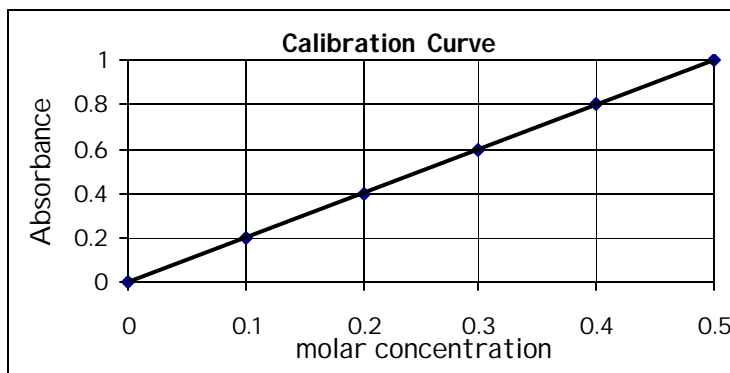
accuracy and precision. Place answers on separate sheet.

(35)

What type of error is occurring - determinate or indeterminate?

If a student decided to blow out the pipet instead of allowing it to drain by gravity, how would this influence the final results?

2. Consider the Beer's Law calibration curve given below. It was determined using a 1.2-cm cell at a $\lambda_{\text{max}} = 560 \text{ nm}$. (20)

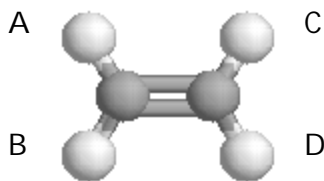


Draw, label with letter, and explain how the curve would respond to the following changes:

- the wavelength was increased to 600 nm
- the cell was changed to a 2.0-cm cell
- all the standards were diluted in half

Calculate the molar absorptivity using the graph above.

3. The structure of ethene, C_2H_4 , is given below. The carbon atoms are very close to ideal trigonal geometry – 120° angles. Now if two of the hydrogens labeled A and C were replaced with the bulky $-\text{C}(\text{CH}_3)_3$ group, how would the bond angles change? Be specific. (15)



Could the molecule rotate along the carbon-carbon bond to lower its energy?