
Analytical Chemistry Cume – Instrumental Analysis

January 2012, Prof. Luke Hanley

All questions are worth 7 points each.

1. What information is provided by the slope of the calibration curve for a measurement?
2. Describe the analytical use of an inductively coupled plasma.
3. Why is spectrophotometric precision poorer when the absorbance is near zero? When the absorbance is greater than three?
4. The following molar absorptivities are known for the cobalt and nickel complexes of 8-quinolinol in an acetone solution that is 1 M in HCl:
 $\epsilon_{\text{Co}, 365 \text{ nm}} = 3529$; $\epsilon_{\text{Ni}, 365 \text{ nm}} = 3228$; $\epsilon_{\text{Co}, 700 \text{ nm}} = 428.9$; $\epsilon_{\text{Ni}, 700 \text{ nm}} = 0$
[all values are with units of $\text{M}^{-1} \text{ cm}^{-1}$] data from Mukhedkar, A. J.; Deshpande, N. V., *Anal. Chem.*, **1963**, 35, 47-48. Calculate the concentration of cobalt and nickel in a solution for which the absorbance at 365 nm is 0.721 and the transmittance at 700 nm is 85.7%. Assume that the sample cell is 1.00 cm.
5. What is retention time in chromatography?
6. Describe one way that you can improve separation of analytes with a fixed column in high performance liquid chromatography.
7. What fraction of the data points lie above the mean in a Gaussian distribution of data points?
8. What fraction of the data points lie within plus or minus one standard deviation of the mean in a Gaussian distribution of data points?
9. Describe the difference in the nature or type of parent ion formed by chemical ionization vs. electron ionization in mass spectrometry.
10. Which method produces more fragmentation of the molecules, chemical ionization or electron ionization? Why?
11. Name the dominant desorption/ionization method current used to couple mass spectrometry to high performance liquid chromatography.
12. What is the difference between potentiometry and voltammetry in electrochemistry?
13. In a *galvanic* electrochemical cell, oxidation occurs at which electrode?
14. Describe the main components of any mass spectrometer.