1. (10%) Explain the following terms:
   a. Rayleigh scattering　　　　b. chromophor
   c. monochromator　　　　　　d. resolution

2. (10%) Explain the influences of structure, temperature, solvent. dissolved oxygen and PH on fluorescence.

3. (10%) What are the two major interferences for atomic absorption spectroscopy? How to correct them?

4. (10%) Explain the NOE effect and the spin coupling

5. (10%) Why do double focusing mass spectrometers give narrower peaks and higher resolutions?

6. (10%) Draw the potential-time plot and current-potential plot for differential pulse polaragraphy.

7. (10%) Describe in detail how to calibrate a 50 ml burette.

8. (10%) Substances A and B have a retention time of 15.4 and 16.6 min, respectively, on a 30 cm column. An unretained species passes through the column in 1.3 min. The peak widths ( at base) for A and B are 1.1 and 1.2 min, respectively.
   Calculate (1) column resolution for A and B.
   　　　　　(2) average number of theoretical plates.
   　　　　　(3) length of the column required to achieve a resolution of 1.5.

9. (10%) Calculate the standard deviation for the data obtained from weighing of a 10 g standard weight. At what confidence level can one say there is an error? Can this error be corrected?

10. (10%) Calculate the pH of a solution that is 0.2 M in $NH_3$ and 0.35M in $NH_4Cl$

$$NH_3 + H_2O = NH_4^+ + OH^-　　　(K_b = 1.76 \times 10^{-5})$$