Chem 506 Name:_____
Final Exam

Due: 3:00 p.m, Thursday, December 7, 2016

Work 10 of the following 12 problems (5 pts each). If you work all twelve, your best 10 will be totaled. Any "non-living" resource can be used.

1. Draw a block diagram of a modern flame atomic absorption spectrophotometer (AAS). Label the major components, including the components of the light source.

2. Our inductively coupled plasma spectrophotometer is radially oriented and uses a charge injection device (CID) detector. Photomultiplier tube detectors are more sensitive to low levels of light and are an available option. What is an advantage of the CID detector over photomultiplier tube detectors? Plasmas are typically either oriented "radially" or "axially". What's an advantage of each orientation?

3. Describe the process of fluorescence using a Jablonski diagram. Why is the emitted photon at a longer wavelength than the absorbed photon?

4. Give two methods for developing “latent” fingerprints.

5. Absorbance is necessary for quantitative infrared analysis, while % transmittance is good enough for qualitative analysis. Explain.

6. Describe the preparation of an aqueous 200 μg/mL ephedrine standard solution in a 250.00 mL volumetric flask. Show calculation and write a procedure.

7. A GC/MS instrument often produces two kinds of plots, a "total ion chromatogram" and many "mass spectra". Briefly describe each (what is plotted?) and the information obtained from each.

8. Describe the preparation of a 0.10% w/v standard aqueous ethanol solution containing 0.08% w/v 1-propanol as an internal standard in a 500 mL volumetric flask. Show calculation and write a procedure.

9. The fate of alcohol in the body is relatively simple….absorption into the bloodstream, distribution throughout the body's water, and finally elimination through excretion and oxidation. Roughly 95-98% of the alcohol is oxidized in the liver. The remainder is lost through the breath, sweat, and urine. The breath elimination is the basis for field "breathalyzers". Write the reaction (balanced, of course) for the <u>oxidation</u> of ethanol, C_2H_6O. Don't worry about adding the enzyme catalyst found in the liver.

10. Why is AAS primarily used as a quantitative analysis rather than qualitative analysis tool?

11. Compare *attenuated total reflectance* (ATR) to *transmission* sampling in infrared spectrometry by giving one advantages & disadvantage of each method.

12. You are given an unknown solid, white powdery substance and two days to determine if it is a single substance or mixture and if the substance contains any illicit drug materials. Also, since you have a budget, you can only choose two techniques to answer these questions. What techniques will you choose? What information will be gained from each analysis? You'll be taking your evidence to court to testify.