

CHEM 8152
Problem Set #3:

1. Read the distributed protocol for “Determination of lead in blood by GF AAS-Deuterium and Zeeman Background Correction.” Use the information and data presented below as well as the information in the protocol to fill in the following:

- (a) standard concentrations ($\mu\text{g/L}$) on page 2
- (b) calibration curves in figures 3,4,5, and 6
- (c) calculated concentration ($\mu\text{g/dL}$) in tables 6,7,8, and 9
- (d) summary table and conclusions on page 10

Please show at least a sample of your work.

After calibration, the measured absorbance from each of the four samples under four different conditions was:

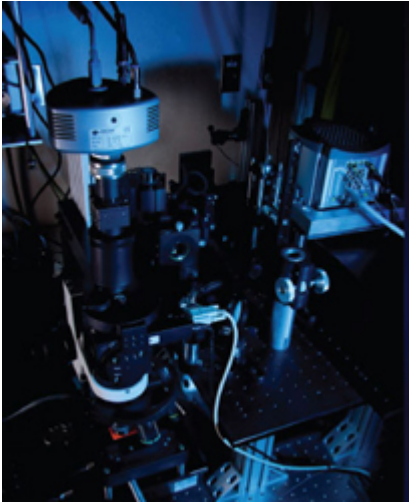
BLOOD SAMPLE	MEASURED ZEEMAN PLATFORM ABSORBANCE	MEASURED DEUTERIUM PLATFORM ABSORBANCE	MEASURED ZEEMAN PARTITION ABSORBANCE	MEASURED DEUTERIUM PARTITION ABSORBANCE
Goat 1	0.125	0.132	0.362	0.444
Goat 2	0.056	0.055	0.144	0.169
Human 1	0.077	0.089	0.194	0.232
Human 2	0.027	0.027	0.057	0.072

2. Draw three molecules that, based on the Woodward-Fieser or Fieser-Kuhn rules, you would expect to absorb light at (a) 244 nm (b) 331 nm, and (c) 356 nm, respectively. In each case, identify each component of the molecule that is contributing to the absorption behavior.

3. “For 47 years, the prestigious R&D 100 Awards have identified revolutionary technologies newly introduced to the market. Many of these have become household names, helping shape everyday life. In addition an R&D 100 Award can provide the important initial push a new product needs to compete successfully in the marketplace.”

On July 27, 2009 a technology created at Sandia National Labs was chosen as a recipient of the R&D 100 Award with the following press release

<http://www.rdmag.com/Awards/RD-100-Awards/R-D-100-Awards/>.



Hyperspectral goes Hyperspeed

Hyperspectral microscopes image hundreds of spectral wavelengths when obtaining spectral images, allowing users to observe multiple individually-fluorescing species. Microscope developers at [Sandia National Laboratories](#), Albuquerque, N.M., have combined this capability with 3-D confocal imaging and multivariate curve analysis software to help observers discover and quantify these species. The **Hyperspectral Confocal Fluorescence Microscope System** can extract quantitative image information from the hyperspectral images at diffraction-limited spatial resolutions (250 nm

in X and Y and 600 nm in Z). What sets this system apart is its ability to achieve an unprecedented spectral acquisition speed: 512 spectral emission wavelengths at each voxel (3-D pixel) in the image over the spectral range from 500 nm to 800 nm at a spectral resolution of 1 nm to 3 nm and at an imaging rate of 8300 spectra/sec. This is possible with the use of an electron multiplying charge coupled device (EMCCD).

The microscope is especially useful for multiplexed 3-D imaging of live cells at diffraction-limited spatial resolutions.

Using literature sources, describe this method (emphasizing novel aspects) and the instrumentation required, and propose an experiment that would make use of this technology.