CHEMISTRY 133
Spring, 2015 Homework Set 1
Homework Set 1.3
Complete by Mar. 3 (but no quiz planned)

1. Which type of noise is best reduced by shielding the critical electronics?

2. An instrument measures the concentration of a compound in a river that varies on the order of minutes. Most of the noise associated with the measurement occurs at frequencies greater than 1 Hz. Suggest a method (analog or digital) to increase the signal to noise ratio.

3. What type of noise can be reduced by using internal amplification in a transducer?

4. What type of noise can be reduced by cooling electrical components?

5. A sample is measured 12 times by a spectroscopic method. The average concentration and standard deviation in the average are found to be 5.2±0.7 µM. With the assumptions made below answer the following questions:
Assume: 1) noise is purely random, 2) the noise is defined as the standard deviation, and 3) that the standard deviation is well-represented. (The third assumption allows you to avoid using t-factors in signal averaging)
a) What signal to noise ratio would be expected in a single measurement?
b) What is the signal to noise in the average value for the twelve measurements?
c) A researcher needs to have the noise be less than 2% of the value in a particular experiment. How many measurements should she make?

Harris Text: Ch. 13:   1, 5, 10, 16, 19, 28, 36