Determination of Signal-to-Noise Ratio Signal Averaging

You may work in pairs on the lab. Put both of your names on the lab report.

EFT 60 directions –

Place a neat ethylbenzene sample into the instrument, and tune if necessary. Set up to do a C-13 spectrum. Obtain spectra with NS =1, 4, 16, 64, 256. (NS = number of scans) Use <CTRL a3> to process the data. Pick the methylene C-13 peak and measure its height from the middle of its baseline this will be your signal (S) level. Now measure the height of the noise (N) level (but not too close to the peak). Measure the distance between top of the noise to the bottom and divide this by 2.5. This statistically gives the average noise level. Calculate the S/N ratio.

Graph the resulting plot of S/N (signal to noise) *vs.* $\sqrt{\mathrm{NS}}$. On a cover page to these spectra briefly summarize your results and answer the following questions.

1. When a decoupled C-13 spectrum is run on a 400 MHz instrument; the sample is irradiated continuously with _____ radiation and pulsed with _____ radiation.

   a) 400 MHz, 400 MHz b) 100 MHz, 100 MHz
   c) 400 MHz, 100 MHz d) 100 MHz, 400 MHz

2. The signal to noise ratio is 100:1 after 16 scans. What would the signal to noise ratio be after just one pulse?

   a) 4:1 b) 6.4:1 c) 10:1 d) 12½:1 e) 25:1

3. All other things being equal, by what factor would you multiply NS (the number of scans) in order to get the same signal to noise ratio on a sample that is 1/100 as concentrated as the original.

   a) 0.01 b) 0.10 c) 10 d) 100 e) 10,000