

From the course web-site, download the Excel spreadsheet labeled "Signals and Noise." Open the spreadsheet and, if necessary, click on the tab labeled "Sheet 1" to display the data. The first column is simply a marker for the x-axis. The next three columns show single scans for the raw analytical signal, the raw noise, and the total measured signal (that is, signal + noise). Select the tab labeled "Chart 1" and examine the three graphical outputs.

Return to the worksheet and note the value in cell I2, which has a default value of 10. This value gives the maximum deflection of the noise (from zero) relative to that for the magnitude of the first peak for the pure signal. A value of 10, for example, means that the maximum deflection of the noise from zero is 10% of that for the first peak. For example, if the peak has a height of 100, then the maximum deflection of the noise is +10 or -10. Try changing this value and examining its effect on the three graphical outputs.

Once you have a feeling for how noise affects the total signal, answer the following questions.

1. Set the noise to 10% of the first peak. Using the separate graphical outputs for the signal and the noise, calculate and report the S/N ratio for all three peaks. You can use a ruler to measure the appropriate magnitudes.
2. Focusing on the first peak, how much noise can be present before you no longer have any confidence in the qualitative presence of the analytical signal? What criteria did you use in making your decision? To what signal-to-noise ratio does this correspond?
3. Quantitative work generally requires a better signal-to-noise ratio than that for qualitative work. Focusing on the first peak, how much noise can be present before you no longer have any confidence in the quantitative presence of the analytical signal? What criteria did you use in making your decision? To what signal-to-noise ratio does this correspond?

For each question, prepare a brief written response annotated with copies of the chart showing your measurements and calculations. Please note that questions 2 and 3 ask you to make an individual judgment; there is no one correct answer to these questions.

This assignment is due by 4:00 PM, Friday, February 1<sup>st</sup>.