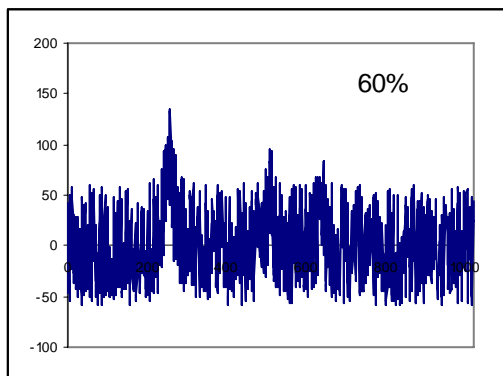


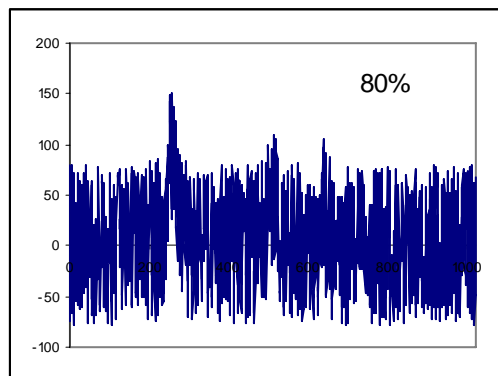
Signal-to-Noise Ratios

Question 1. The signal heights for the three peaks (left-to-right) are 23.5 mm, 11.7 mm and 10.3 mm. The noise envelope has a peak-to-peak height of 6.5 mm, which makes the standard deviation of the noise 1.3 mm. The S/N ratios are (left-to-right) 23.5, 11.7 and 7.92. Any value close to these is reasonable giving the uncertainty in measuring the heights.

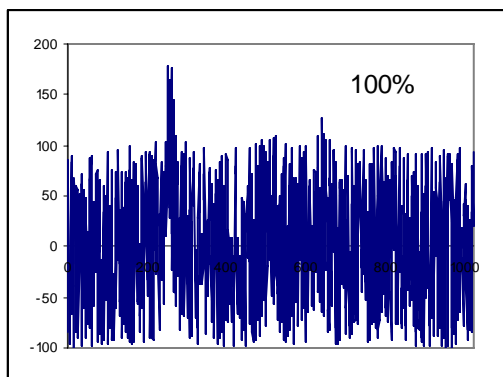
Question 2. In making a judgment about the ability to detect the qualitative presence of the analyte, you simply need to ask “Can I see clear evidence of a peak?”. Shown below are some examples of data for different levels of noise, ranging from 60% to 160% of the first peak. Even when the noise is at 100% of the peak, you can still see clear evidence of the peak. Typically S/N ratios of 2-3 are sufficient to detect the presence of a peak.



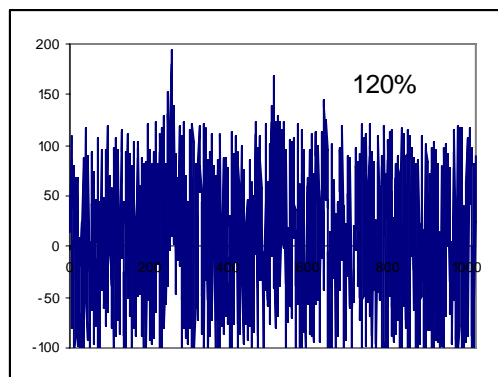
S/N = 4.3



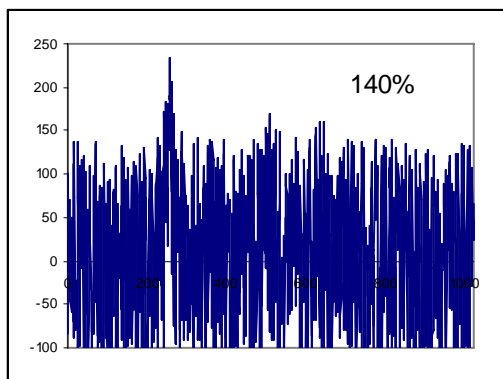
S/N = 3.2



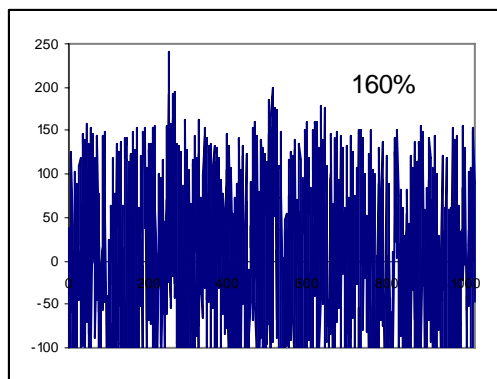
S/N = 2.6



S/N = 2.2

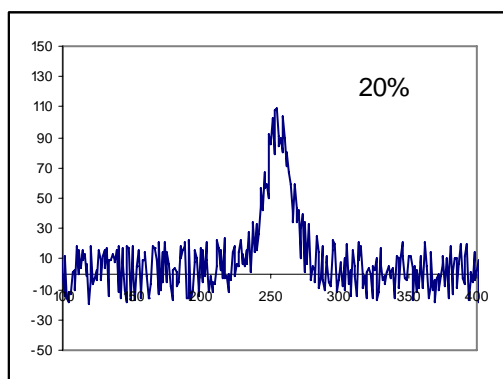


S/N = 1.9

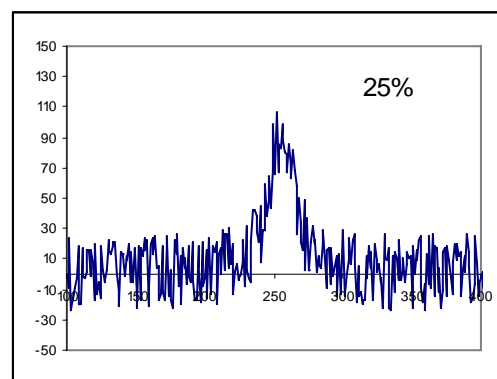


S/N = 1.6

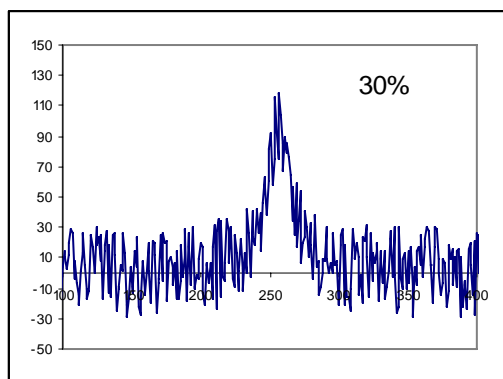
Question 3. In making a judgment about the ability to detect the quantitative presence of a peak, you need to ask “Can I clearly establish a baseline and can I clearly determine the peak’s height?”. Shown below are some examples of data for different levels of noise, ranging from 25% to 45% of the first peak. A smaller portion of the data is shown because it is important to see the peak’s shape. When the noise is above 25% it becomes more difficult to draw a smooth curve through the noise at the peak’s center. Note that the example where the noise is at 40% seems distorted, although the peak at 45% is less obviously so. This suggests that staying below 35% noise is a must as peak distortion makes measurements very uncertain. It isn’t unusual for analysts to want a S/N ratios of about 10 to ensure confidence in quantitative measurements.



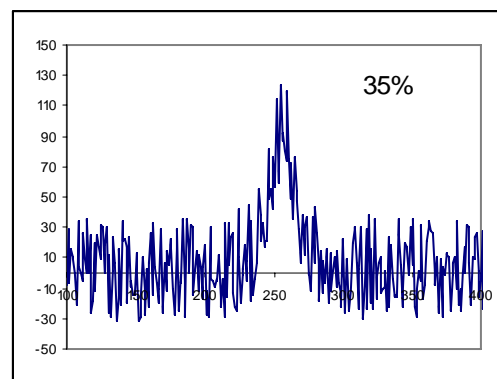
S/N = 12.9



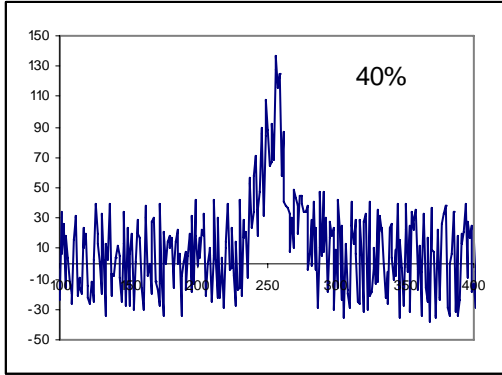
S/N = 10.3



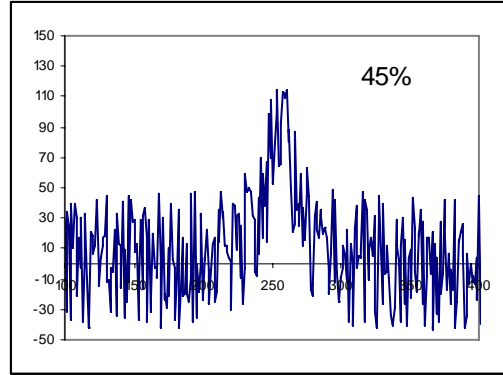
S/N = 8.6



S/N = 7.6



$S/N = 6.6$



$S/N = 5.6$