How to perform a Fast Fourier Transform

TO PERFORM AN FFT (using data from the "Earth's Field NMR" practical):

1. Import your Intensity-Time data into Excel, time data should be placed in the A column and Intensities in the B column.
2. Label the C column F_k and the F column $|F_k|$
3. Select the **Data Analysis…** option from the **Tools** menu.
4. From the list of Analysis Tools shown, select **Fourier Analysis** and click on **OK**. The Fourier Analysis window will appear.
5. Assuming your data comprises more than 4096 points, click on the box to the right of **Input Range:** and then highlight the first 4096 intensities (in the B column).
6. Click on the circle to the left of **Output Range:** to select it and then click on the box to right of **Output Range:** and select the cell in the C column that is on the same row as the first intensity used.
7. Click on **OK**.
8. Select the cell in the F Column that is on the same row as the first intensity used and type in the formula =IMABS("*cell"*)
   where "cell" is the address of the first generated FFT value.
9. Copy this cell down the length of the inputted data.

TO GENERATE THE FREQUENCY SCALE

1. Label the D column k and the E column x_k
2. In the D column set up the appropriate k values, i.e. the value in the row next to the first data point is "0", the value in the cell below is "1",…
3. In the E column calculate the x-axis frequencies using the appropriate formula. For the "Earth's Field NMR" data, the formula would be: $x_k = \frac{k}{N\Delta t_s}$, where N would be equal to 4096, if this were the number of points used in the FFT analysis; and Δt_s would be the time interval (in seconds) between measurments.

WHEN PLOTTING THE SPECTRUM

- Use the $|F_k|$ values in the F column as your y-data and the x_k values in the E column as your x-data.
- Never plot more than the first half of the data.