

11. Measurement and Data Processing and Analysis

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Keywords	Definition
Significant Figures	The number of digits in a value, often a measurement, that contribute to the degree of accuracy of the value.
Random Error	Errors made by the person carrying out the measuring, usually thought of as human errors. The effect can be reduced by repeating the experiment and calculating a mean.
Systematic Error	Errors made, not by chance, but by issues with the experiment itself. The effect cannot be reduced by calculating the average of a set of results.
Reproducible	If several experimenters can duplicate the results of an experiment.
Repeatable	If the same person can duplicate the experiment with the same result.
Accuracy	How closely to the literature value of a quantity a measured value is. An accurate value indicates a low amount of systematic error.
Precision	How close a series of measurements are to one another. A precise value indicates a low amount of random error.
Percentage Error	A measure of how close the experimental value is to the literature or accepted value.
Experimental Value	The value obtained by experimental methods.
Independent Variable	The cause, or factor that you have changed in an experiment. Plotted on the horizontal axis of a graph.
Dependent Variable	The effect, or factor you measure in an experiment. Plotted on the vertical axis of a graph.
Extrapolation	When a line on a graph has been extended beyond the range of measurements of the graph.
Interpolation	The assumption that the trend line of a graph applies between two points.
Inversely Proportional	As one value increases, the other decreases. Easily visible on a graph.
Qualitative Analysis	The detection of the presence, but not quantity, of a substance in a mixture.
Quantitative Analysis	The measurement of the quantity of a particular substance in a mixture.
Structural Analysis	A description of how the atoms are arranged in molecular structures
Infrared Spectroscopy	Used to identify the bonds in a molecule
Mass Spectroscopy	Used to determine the relative atomic and molecular masses. The fragmentation patterns can also be used to fingerprint unknown substances.
Nuclear Magnetic Resonance Spectroscopy	Used to show the chemical environments of certain isotopes (hydrogen, carbon, phosphorus and fluorine) in a molecule and also gives vital structural information.
Fragmentation Pattern	When a compound breaks up into smaller ions in a mass spectrometer, can provide information on the structure of the molecule.
Degree of Unsaturation	A measure of how many molecules of H ₂ would be needed to convert the molecule to the corresponding saturated, non-cyclic molecule.
Index of Hydrogen Deficiency (IHD)	A measure of how many molecules of H ₂ would be needed to convert the molecule to the corresponding saturated, non-cyclic molecule.

Wavelength	The distance between successive crests or troughs
Frequency	The number of waves which pass a point every second.
Wavenumber	The number of waves per centimetre.
Radio Waves	Absorbed by certain nuclei causing reversal of spin. Used in NMR.
Microwaves	Cause molecules to increase rotational energy, gives information about bond length (not in IB)
Infrared Radiation	Absorbed by certain bonds causing bending and stretching.
Visible Light	Can produce electronic transitions
Ultraviolet Light	Can produce electronic transitions
X Rays	Produced when electrons make transitions between inner energy levels, produce diffraction patterns.
Resonance	The frequency used to make nuclei flip over and spin in the opposite direction.
Chemical Environments	The placement of hydrogen in a molecule. Symmetrical hydrogens will share a chemical environment.
Chemical Shift	The signal produced by hydrogens in NMR relative to the TMS standard.
Integrated Trace	The area under the peak in an NMR which gives information about the number of hydrogens in a certain environment.

Higher

Keyword	Definition
Spin-Spin Coupling	The splitting of NMR peaks due to neighbouring protons.
Diffraction	The pattern caused by the orderly scattering of X-Rays when they pass through a crystalline solid.
Interfere Constructively	Waves reinforce each other, producing a resultant wave with a larger amplitude than the original waves.
Destructive Interference	Waves that are out of phase by 180° with the peak of one wave aligned with the trough of another, these waves will cancel each other out if they are the same amplitude.