OCR B Physics – H557

Module 2: Fundamental Data Analysis

You should be able to demonstrate and show your understanding of:	Progress and understanding:			
	1	2	3	4
2.1 Data Analysis				
Factors affecting accuracy and uncertainty of measurements				
Recognising the largest source of uncertainty in a measurement				
Systematic error is where a measured value has an offset from the accurate value, for example 'human error', zero error				
Random error is where a measured value fluctuates due to unpredictable apparatus. It is always present and out of your control.				
Zero error is where an output reads a non-zero value, for an input of zero value				
SI units and their prefixes, standard form, angles in degrees and radians				
Accuracy: The degree to which the measured value differs from the true value (If they are close, there is a high accuracy)				
Precision: The degree to which repeated measured values differ from each other (If they are all close, there is a high precision)				
Resolution: The smallest detectable change in a value. For example, 1mm on a standard ruler, the volts/division or time base values on an oscilloscope				
Sensitivity: (change in output) / (change in input)				
Response Time: The time interval between a change in input and the corresponding change in output, for example how long it takes a temperature sensor to respond when put in hot water				
Plots such as dot plots of the distribution of measured values to estimate the mean or median value, the spread and to identifying outliers.				
Outliers: A value that is more than twice the spread away from the mean				

You should be able to demonstrate and show your understanding of:	Progress and understanding:			
	1	2	3	4
Spread: ±half of the range				
A variety of graphical plots such as scatter graphs, pie charts, log graphs				
Use of uncertainty bars to help establish whether a valid conclusion can be drawn from the measured data (If the lobf passes through all the error bars then the data set is valid)				
Calculations involving uncertainty of experimental data, mean of results, range, spread and percentage uncertainties				
Estimate of best fit gradients and intercepts with uncertainty				
Estimations of uncertainties when data are combined by addition, subtraction, multiplication, division and raising to powers				
Addition and Subtraction: Add the absolute uncertainties				
Multiplication and Division: Add the percentage uncertainties to get the percentage error in the final value; or add the fractional uncertainties (absolute/measured value) to get the absolute uncertainty in the final value				
Raising to powers: If a value is raised to the power n, the percentage uncertainty, and hence fractional uncertainty, of the final value is n multiplied by the percentage/fractional uncertainty of the measured value. For example, area=(length)^2, percentage/fractional uncertainty in area = 2 x percentage/fractional uncertainty in length				
Percentage Uncertainty: $\% = \frac{absolute}{measured\ value} \times 100$:				
Fractional Uncertainty: $Fractional = \frac{absolute}{measured\ value}$				
Estimated magnitudes of everyday quantities, for example the weight of an apple is roughly ≈ 0.1kg x g = 1N (where g is taken to be 10Nkg^{-1})				