**Error propagation in Chemistry IB Labs**

*A short guideline*

Error propagation is a way of combining two or more **random** errors together to get a third while performing calculations for a laboratory report (Data analysis).

All chemical equipment has random error incorporated in their measurements.

Ex. 10.00mL pipettes +/- 0.01mL

50.00mL burettes +/- 0.02 mL

When calculations are performed on this data, the random error must be combined or propagated. Using the following rules

**RULE 1:** If you add or subtract x and y, the absolute uncertainty on x+y or x-y is obtained by adding the absolute uncertainties x and y

Ex. 22.34mL +/ 0.02 mL

-1.06mL +/ 0.02 mL

= 21.28mL +/ 0.04 mL

**RULE 2:** If you multiply or divide x and y, the fractional uncertainty of x times y or x/y is obtained by adding the percent or fractional uncertainties x/x and y/y

Percent error can also be calculated for other operations such as squaring etc.

Ex. 1.22g +/ 0.01 g

[(0.01/1.22) + (0.04/21.28)] X 0.0573333 = 0.00058

(leave 2 significant digits in error only)

Divided by 21.28mL +/ 0.04 mL

= 0.0573333

= 0.05733 +/- 0.00058 g/mL

**Error propagation in Chemistry IB Graphs**

Draw a properly formatted graph:

* Graphs should have a good title and a caption in which you describe the contents of the graph. The axes of the graphs have to be labelled (ALL graphs are titled / each axis is labeled with what is measured and unit used for example: Time, sec.). The independent variable is placed on the X axis, the dependant on the Y.
* Include error bars on each data point.
* Draw a line of best fit. This line will represent your experimental results/
* Draw a line of minimal fit (the lowest slope that could be drawn that fits your data)
* Draw a line of maximal fit (the highest slope acceptable for your data)
* From the slopes and intercepts of the maximal and minimal lines of fit, determine the range of variation of your line of best fit. Divide the range by 2, and this is the error on your line of best fit. Keep your error to 2 significant figures.

(ex. the uncertainty in the slope is one-half of the difference between max and min slopes.)

