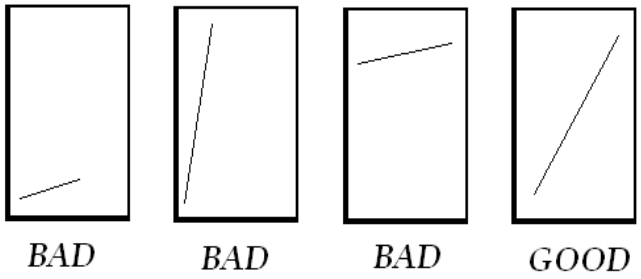
Graphical analysis

A graph is a diagram consisting of a line which shows the variation of two quantities relative to each other, in lab terminology we say *plot y versus x*. In order to plot a good graph you should note the following:

- Use a sharp pencil or pen.
- Draw your graph on full page of graph paper. A compressed graph will reduce the accuracy of your graph.



- Give the graph a title.
- The dependent variable should be plotted along the vertical or y axis and the independent variable should be plotted along the horizontal or x axis.
- Choose a suitable scale for both variables. It is not essential to have the same scale units for both quantities, but avoid scale factors like 3 or 7. The scale should neither be too wide nor too narrow. In any graph you should give for both axes the proper scale, the physical quantity plotted and its unit.
- If the relation between the two variables begins from zero, then zero must be taken as the origin on both scales. Otherwise the origin on both axes should represent a quantity little less than the smallest value of the corresponding variable.
- Label axes and include units.

- Use **Error bars** to indicate errors in measurements.
- Draw a smooth free-hand curve to pass through as many plotted points as possible. If a smooth curve does not pass through all the points, those left out should lie evenly about it.

Linear graph

A straight line graph has a constant slope. The slope is the change in the value of the variable plotted on vertical axis (y axis) divided by the corresponding change in the value of the variable plotted on the horizontal axis (x axis). The slope is determined by selecting two well separated points **A** and **B** on the line. Record the values of $x_{_A}$, $y_{_A}$ and $x_{_B}$, $y_{_B}$. Then the slope m is given by:

$$m = \frac{y_{_B} - y_{_A}}{x_{_B} - x_{_A}} \tag{1}$$

The general equation of a straight line not passing through the originis

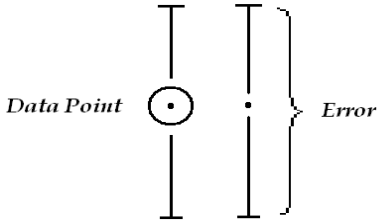
$$y = mx + C \tag{2}$$

Where m is the slope and C is the intercept on the y axis ($x = 0$). The intercept on the x axis ($y = 0$) can be obtained from

$$x = -\frac{C}{m} \tag{3}$$

Graphical representation of uncertainties

Your graphs should clearly show the size of the experimental uncertainties in each plotted point of your data. When plotting a graph, the standard or traditional way of including the error in each point is done in the form **Error bars**.



The plotted data point is represented as a dot, and the range of uncertainty is shown by the extent of the bars on either side. In this figure, the error is entirely in the dependent variable y.