PRACTICAL PHYSICS DIRECTIVES

PROCESS

- **Planning stage**;
- understand and appreciate the aim of the experiment. This will enable one to know what kind of data to anticipate, and what possible manipulations may be involved
- check the apparatus listed
- read and understand the procedure and the necessary precautions provided . It is necessary to decipher the information before engaging in the task of setting the apparatus. This helps in apportioning time correctly for various stages in the procedure.
- from the instructions given and/or apparatus provided, it is possible for the experimenter to have an overview of the theory behind the experiment.

- **Performing stage**;
- the experimenter should clearly follow the illustration showing the set-up and arrange or connect as indicated. Instructions from the set-up should be followed to the letter so that the results obtained fall within acceptable range. Details such as alignment, displacement, length, inclination and so on, should be observed with strict accuracy.
- many cases of faulty results arise from not following the experimental procedure as outlined. record observations as soon as they are made.
- the mode of presentation of experimental findings is often dictated by the format of the table of results ,which is usually provided. The table is tailored to include derivative expressions of experimental variables, which are in turn useful in plotting the appropriate graphs.

- **Analysis and conclusion;**
- the experimenter should note the fact that the viability of analysis of results and hence the conclusion leans heavily on the accuracy observed during performing stage.
- Inevitable inhibitions such as friction, uncontrolled heat loss, internal resistance and non-uniformity of a metre rule may need to be cited as sources of error in a given experiment.

GRAPHS

PLOTTING OF GRAPHS

To provide the required information, graphs should be drawn as accurately and clearly as possible. The key areas are;

- Table of results

- When making the table of results, it is important to maintain the same degree of accuracy for each variable. The units of the variables being investigated should be included with the quantity i.e

Current[amps]	0.0008	0.0040	0.0066	0.0078	0.0120
Potential difference[volts]	0.4	1.7	2.7	3.2	4.9

The data may be made clearer by having large or very small numbers expressed in suitable powers of 10 as a common factor. The table can thus be rewritten with values of current expressed as 10^-3.

Current x 10^-3[amps]	0.8	4.0	6.6	7.8	12.0
Potential difference[volts]	0.4	1.7	2.7	3.2	4.9

- In some cases, extension of a given table may be necessary. for example , in an experiment to determine focal length using where this is not given , one is expected to expand the table, extension from the equation relating the two variables, i.e., s and d. Thus having obtained the values of s and d in the table, a graph of [ ] is plotted against s. The table is therefore extended as

s									
d									

- **Choice of axes**
- dependent quantities should be plotted on the vertical axes while independent quantities on horizontal axes .dependent

quantities are those that depend on others for their observation to be made e.g in heating effect of electric current, heat produced depend on time of production this means time is an independent variable whereas heat produced is a dependent variable.

- in some cases, deliberate instructions are given, such as; plot A[y-axis] against B.
- In situations where one is asked to plot a suitable graph given an equation, the choice of axes is made with consideration of the constant to be determined from the graph. e.g given the value of m and v and the equation ,it is simpler to obtain the value of f when m is plotted on the vertical axis and v on horizontal axis.
- **Labeling the axes**;
- axes must be labeled and units, where possible, indicated. Write in full the independent and independent variables, with symbols of the units in bracket. Only in exceptional

cases should symbols be used to represent quantities, e.g, , , . Note that in these cases , the units change accordingly.

- **Choice of scale;**
- the scale chosen must allow the graph to occupy more than half the page on either axis.
- the scale chosen should easily be interpreted
- the scale must be uniform from the origin on both axes
- there are situations where it is not advisable to have the scale begin from zero on both axes. in such cases, a broken line is used to indicate the position of the hidden values e.g

- **Plotting;**
- this involves locating positions of the values on the table grid. Points are marked on the grid using small ‘x’ or a dot. preferable is x to be seen after drawing.
- the plotted points may be joined by a straight line or a curve. the decision could be arrived at by taking hints from;
- the general spread of the points being plotted
- the equation provided.
- the relationship between quantities being plotted [background knowledge].
- the question(s) pertaining to the graph. for example, when plotting F against e, given that F=ke, a straight line graph is expected. A graph of pressure (P) against volume (V) is a curve. the questions whose answers are to be obtained from the graph may also provide a hint. Being asked to obtain gradient suggests a**straight line** whereas gradient at a point suggests a

- When drawing a straight line graph, care should be taken to ensure that the line has uniform intensity and thickness. The line may not , however, pass through all the plotted points, and is referred to as the **line of best fit.**
- **Graph interpretation/Manipulation**

Straight line graph

- the general equation for a straight line is , where y and x are the variables, m the gradient and c a constant.
- Gradient
- the following points should be noted;
- Given y=mx+c, m=gradient
- In an equation, e.g., ; if V is plotted against I, then -r is the gradient.
- The gradient of a straight line is obtained by;