Checklist for design

Aspect 1: defining the problem and selecting variables

- ☐ I have identified a focused problem or a specific research question. I have done this by, for example, stating a clear aim, a clear hypothesis, and clearly defining the variables.
- ☐ I have identified and stated the independent variable and the dependent variable, and I have listed the controlled variables

Aspect 2: controlling variables

- ☐ I describe a method for the effective control of the variables. In particular, I describe how the independent variable is manipulated and how the controlled variables are maintained at constant values
- ☐ I list all the apparatus and materials used, including the volumes of tubes and cylinders, the concentrations of solutions, the model and manufacturer of any complex apparatus, etc.
- ☐ I state the level of precision of the values for the independent variable
- ☐ Any standard methods that I use are fully referenced in a footnote

Aspect 3: developing a method for the collection of data

- ☐ I describe a method that allows for the collection of sufficient relevant data
- ☐ The data gathered enables the aim, the research question or the hypotheses to be adequately addressed
- ☐ The data gathered enables an evaluation of the reliability of the data
- ☐ The sample size should be adequate to allow a reasonable statistical analysis of the data (for calculating the standard deviation, at least five items per treatment)
- ☐ An adequately broad data range is considered
- ☐ An adequate number of data values within this range are considered

Checklist for data collection and processing

Aspect 1: recording raw data

- ☐ I have recorded my data independently
- ☐ I have data which is quantitative (numerical)
- ☐ I have chosen a suitable format in which to record the raw data
- ☐ The variable that is measured or recorded is clearly stated (e.g. in the column heading in a table)
- ☐ The units are given for every variable (e.g. in any column headings)
- ☐ An indication is given of the uncertainty of measurements (e.g. in any column headings)
- ☐ A complete and descriptive title is given to any table that is used
- ☐ The same level of precision (number of decimal places) is used for all the items of a variable

Aspect 2: processing raw data

- ☐ I have decided on a suitable manner in which to process the raw data, so that I may fully test the hypotheses or fulfil the aim (this may involve a mathematical processing, statistical analysis, or transforming the data into a suitable graphical representation)
- ☐ All of the raw data has been processed to a suitable extent
- ☐ The raw data has been processed correctly
- ☐ Any raw data plotted onto a graph includes a line of best-fit

Aspect 3: presenting processed data

- ☐ I have decided upon a suitable format in which to present the processed data.
- ☐ There are clear, unambiguous headings for calculations, tables or graphs
- ☐ Any graphs have appropriate scales, labelled axes with units and accurately plotted data points with a suitable best-fit line or curve
- ☐ The data has been presented so that all the stages to the final result can be followed
- ☐ Metric/SI units are included for the final results
- ☐ The final results are shown expressed to the correct number of significant figures
- ☐ The uncertainties and errors associated with the raw data have been taken into account and this is shown in some manner (e.g. error bars may be used, as appropriate)

Checklist for conclusion and evaluation

Aspect 1: concluding

- ☐ I state a conclusion which is based on a reasonable interpretation of the data
- ☐ If any hypotheses are being tested, I have stated whether the data supports these hypotheses
- ☐ I give a justification for my conclusion
- ☐ As appropriate, I compare different graphs, or describe the trends shown in my graphs
- ☐ If I am measuring an already known and accepted value, I have compared my value with that in a textbook, in order to assess the validity of the result.
- ☐ I fully reference any literature that is quoted.

Aspect 2: evaluating procedures

- ☐ I have commented on the design and method of the investigation
- ☐ I have commented on the quality of the data
- ☐ I have listed the weaknesses of the study
- ☐ I have assessed the importance of each of these weaknesses
- ☐ I have commented on the precision and accuracy of the measurements
- ☐ In evaluating the procedure, I have specifically looked at the processes, the use of equipment and the management of time

Aspect 3: improving the investigation

- ☐ My suggestions for improvements are based on the weaknesses and limitations identified in aspect 2
- ☐ As appropriate, I address modifications to the experimental technique and the data range
- ☐ The modifications that I propose are realistic and clearly specified

Checklist for manipulative skills

Aspect 1: following instructions

- □ I follow instructions accurately, adapting to new circumstances. I mostly work independently, reading the instructions carefully, but seek assistance when required

Aspect 2: carrying out techniques

- □ I am competent and methodical in the use of a range of techniques and equipment

Aspect 3: working safely

- □ I pay attention to safety issues