IB Biology Internal Assessment Lab Format

The following titles and subtitles should be used for your lab report and given in this order within your lab report.

Design

Question – must be focused and not ambiguous in any way. If a living organism was used, identify it by common name and scientific name.

Hypothesis – state your hypothesis first & then give a logical rationale – your conclusion should address the hypothesis you are giving here.

Variables – create a chart or list identifying the Independent, Dependent, & Controlled Variables (be specific; room conditions is not acceptable)
Example:

Independent Variable	Dependent variable	Control variables (5 minumim)

Protocol Diagram – draw & label a diagram which best shows the major protocol(s) you will use. Often this will focus on the technique that is used to measure the dependent variable and/or the technique that is used to 'setup' different increments of the independent variable. Make sure to show how control group(s) differ from experimental group(s). This is also where I want you to emphasize the inclusion of a period of time for 'equilibration' of equipment, fluids, organisms, etc. The inclusion of time periods for equilibration should also be included in your written procedure.

Photograph of Lab Setup (only if you actually carry the lab out) – annotate this to show how **variables** were instituted, especially the controlled variables. Do not just label equipment. This is the section that I use to decide if your procedure properly institutes the variables that you have identified in a chart or list above.

Procedure – write in numbered, list form, passive voice, and read like directions for the procedure. Detail should allow repeatability. You should ensure that your procedure includes at least 5 independent variable "intervals" {5 temps, 5 pH's, 5 concentrations, etc} and also includes a minimum of 5 repeats {trials}. You must also collect some data that is qualitative (in a numbered, titled data table), for example, you could report that a person's ventilation (breathing) rate appears elevated in addition to the collection of a quantitative heart rate measurement.

To receive full marks for the design you MUST include the data tables that will be needed for DCP. You should have 3 (raw data, control variable data, and qualitative data)

Data Collection and Processing

Raw Data Table – make sure this is raw data only. Data table design & clarity is important. A title should be given (**Raw Data Table is not a data table title, it is a lab report section title**) Make sure that all columns, etc. are properly headed & units are given. Forgetting one unit or misidentifying one unit is enough to drop your score in this section. Do not "split" a data table (putting part of a table on one page and finishing it on another). If you absolutely have to split a table (due to quantity of data), make sure that you re-do the title and all column headings. Create one table that includes each of your 5 independent "intervals" DO NOT make 5 separate tables.
Uncertainties are mandatory and can be given within column headings for equipment precision and as footnotes beneath data tables for other types of uncertainties.

Control variables data table – follow the same guidelines as above

Qualitative data table – table must be numbered, titled, and have appropriate labels. Remember this is information you observe, but cannot collect "number" data on.

Data Processing & Presentation

Overview – this is a short paragraph section that gives an overview of how and why you decided to process and present the data in the form that shows up later in this section.

Sample Calculation – neatly lay out and explain **one example** only of any type of manipulation that was done to the raw data to help make it more useful for interpretation.

Processed Data & Graph(s) – this is typically one or more data tables (of your now processed data) and one or more graphs of this processed data. Once again, the design & clarity of data table(s) is important and the quality of graphs is also very important. Give careful consideration to the choice of graph style(s) that you choose to do. Remember that demonstrating errors and uncertainties in your data is also mandatory for the processed data. Plotting best fit lines with error bars is a good way to show uncertainties in processed data. Make sure that you follow good standard rules for doing graphs (valid title, axis' labeled including units, etc.) **Never graph raw data!**

Note: Weak experimental design can sometimes limit you to pie graphs and/or bar graphs; avoid this by good experimental design in which you have a quantitative independent variable (with well chosen incremental values) as well as a quantitative dependent variable.

Conclusion & Evaluation

Conclusion - this is a paragraph section in which you get a chance to discuss the results of your experiment. Start by addressing whether the data supports or refutes your hypothesis. This should be discussed and not just stated. Specifically refer to your graphs and include actual data to give support to this discussion. Avoid the use of the word "proof"or "proves" within your conclusion, as your data will not prove anything.

Limitations of Experimental Design – this paragraph section discusses how well the experimental design helped answer the original question. What worked well (and why) and what did not work well (and why) (include a minimum of three limitations). This is also a section in which outlier points could be discussed (if there were any outlier points) as well as possible reasons for those outlier points. If you did a statistical test, what did the results of that test show? If you have error bars on your graph(s) what do those show? Remember to relate all of this to the **design**.

Suggestions for Improvement - In **reference to the limitations** given in the previous subsection, what realistic and useful improvements could be made if you were to do this investigation again? Both the limitations and the suggestions for improvement must show good reflective thinking…..if you simply list a few obvious 'flaws' without good consideration of their relative importance or if you ignore obvious 'flaws', then do not expect to score well.