

Laboratories (practicals) are an important part of DP Sciences. Remember you are formally marked on the following:

- ✓ Design (D)
- ✓ Data Collection and Processing (DCP)
- ✓ Conclusion and Evaluation (CE)

Depending on the lab, you may be marked on one of these, two of these, or all of these. You will always be told this when given the practical task. All labs should have a title that is concise and descriptive, with a mention of the appropriate variables involved.

DESIGN (D)

Research Question

- ✓ Clearly stated and *answerable*.

Variables

- ✓ *Dependent variable(s)* clearly identified and explained
- ✓ *Independent (experimental) variable(s)* clearly identified and explained
- ✓ *Controlled variable(s)* clearly identified and explained

Hypothesis

- ✓ A scientific prediction or supposition based on prior observations and which you assume to be the explanation to the problem or research question. It should be stated such that the dependent and independent variables are clearly recognizable. 'If/then' hypotheses make this easier to do.

Background Information

- ✓ An explanation and justification of the hypothesis.
- ✓ What you know so far from other people's work - literature and textbooks from at least 3 sources. This shows that you have looked at other peoples' work before doing this and have a better idea of what you are doing. Referencing other peoples' work and ideas increases the validity of what you are saying (shows you are not just making it up).
- ✓ Clear *in-text* or *parenthetical* references and with a complete *works cited* list following MLA formatting. The 'works cited' should be on the last page of your report.

Apparatus/Materials

- ✓ Completely listed materials and special apparatus described.
- ✓ Include clearly labeled diagrams *only if needed* (don't use up unnecessary space).

Method (Methodology)

- ✓ Using paragraphs, write a realistic and complete description of your procedure explaining why you did each step and how the variables were controlled. Explain what you did and why. Any procedures coming from another source must be referenced and included in the works cited.
- ✓ Clearly describe how you controlled the variables to make a 'fair' test. Make it obvious for every part of your method.
- ✓ Allow for the collection of sufficient data.

DATA COLLECTION AND PROCESSING (DCP)

Data Collection

- ✓ Appropriate raw data collected and recorded including units and uncertainties.
- ✓ Raw data presented clearly (with carefully organized tables or drawings).
- ✓ Data must be *your own*, which YOU have observed, counted and measured BY YOURSELF. Any data from another person or group must be referenced to them.

Data Analysis

- ✓ Raw data processed/analyzed carefully and completely, including error analysis.
- ✓ Results presented appropriately and effectively. This must include some sort of charts, graphs, graphical representations tables, or annotated drawings.
- ✓ Errors and uncertainties taken into account at all stages.

CONCLUSION AND EVALUATION (CE)

Conclusion

- ✓ Valid conclusion based on correct interpretation and explained.
- ✓ A discussion of the validity and how far the conclusion can be generalized based on the method used. A discussion of the trends seen and how far they would be expected to continue.
- ✓ Restate the research question
(EX: *"This experiment was trying to determine..."*)
- ✓ Restate your hypothesis
(EX: *"It was expected that if... then..."*)
- ✓ Briefly describe the method
(EX: *"The rate of Oxygen gas given off by pond weed was determined in relation to the intensity of light which was varied... "*)
- ✓ Summarize the data collected
(EX: *"It was found that as the intensity of the light was increased..."*)
- ✓ Decide if your hypothesis was supported or rejected and explain why
(EX: *"The hypothesis was supported because....."*)

Evaluation

- ✓ Method must be evaluated for both validity and reliability. Address the question: Is the method sufficient for producing appropriate data and to what extent does the method produce data showing meaningful trends?
- ✓ Suggestions for modifications of the method based on the evaluation.
- ✓ Describe the limitations of the method in terms of its validity and reliability
(EX: *"The limitations in the method mean that the conclusions only apply to the type of seaweed used"*, *"The data is shown to be reliable due to a clear trend of increasing volume with increasing temperature..."*)
- ✓ Make recommendations for how to improve the experiment for the next person who repeats it
(EX: *"The next time this experiment is run, it will be important to spread out the seaweed so that it is less likely to trap Oxygen bubbles..."*)
- ✓ Questions (2+) for further research and a discussion of them. These should lead on from your own research and you must *explain* why they would be important or interesting to study
(EX: *"The findings of this experiment raise some interesting further questions..."*)

Works Cited

- ✓ MLA format including all sources used in the reports. A variety is required, at least three.