**IBDP Sciences Internal Investigation Headings and Guidance**

**Research Question**

□ The introduction includes an observation that leads to the research question

□ A descriptive yet concise title is given

□ A grammatically correct question about a precise relationship is asked

□ A sufficiently detailed question to stand alone and be self-explanatory is asked

□ A specific measurable dependent variable is included

□ A specific independent variable to be manipulated is included

□ Precise locations, measurements and *Genus species* names are given

**Background Information**

□ Thinking, initiative or insight for investigating chosen topic is given □ Justification indicates personal interest, significance or curiosity for chosen design & presentation is given □ All information is clearly supported with references □ At least 3 appropriate sources with authors have been used □ Both Internet and print sources are included □ There is no plagiarism (this will give a zero)  **Hypothesis**

□ A grammatically correct answer to the research question is given

□ The hypothesis can be supported through scientific research and reasoning

□ A precise relationship between the independent and dependent variables is predicted

□ The independent and dependent variables are written exactly the same as in the question

□ The hypothesis is given as a scientifically reasonable answer to the research question

□ The hypothesis is clearly justified and supported through a review of scientific literature

**Variables**

□ All key variables relevant to the experiment are investigated

□ Subheadings of Independent Variable, Dependent Variable and Controlled Variables are given

□ Independent and dependent variables are written exactly the same as in the question

□ A very brief description of how the independent variable is modified is given

□ A very brief description of how the dependent variable is measured is given

□ Controlled variables include all significant variables that could affect the dependent variable

□ A very brief description of why each controlled variable must be kept constant is given

**Apparatus**

□ [List all equipment used] [Include all items, quantities, concentrations, volumes, masses etc., for measuring equipment uncertainties]

**Method- manipulation and control of variables**

□ An introduction establishes the methodology as a fair test of the hypothesis

□ The modification of procedures from other sources are clearly referenced in APA format

□ All materials are clearly listed with details (type, amount, size, volume, concentration…)

□ Diagrams and/or photographs clearly showing the setup of apparatus is included

□ Diagrams and photographs are referenced using APA or (Drawing/Photograph by Author)

□ What was done and an explanation of why is given for each step

□ How the independent variable was manipulated is clearly described

□ How the listed controlled variables were kept controlled in the experiment is described

□ The use and method of random sampling is described where relevant□ Comment on possible hazards, environmental, ethical and social impacts of the work, and say how they will dealt with to minimise the impact]

**Method- choice of data processing and presentation**

□ The introduction establishes the data collected is valid for answering the research question

□ The reliability of the methodology is established through sufficient repetition

□ How the dependent variable measurements were taken is precisely explained

□ The number of dependent variable measurements and why this amount is described

□ The size of the increments between each data point and why this was acceptable is described

□ The use of at least 5 repeats to calculate standard deviation for error analysis is explained

□ The inclusion of a sample size of at least 10 is described when the T-test was used

□ The collection of data from any other students or sources is clearly explained and referenced

**Data Collection and Analysis: Processing Data (raw including qualitative data and processed data tables)**

□ A short introduction is given to establish what data was collected and why it is appropriate

□ Appropriate raw quantitative data is recorded in a clearly designed and drawn table

□ A descriptive title with the variables is given for the data table

□ Column headings include the quantity, units and uncertainties

□ Data is recorded to an appropriate degree of precision and consistent with uncertainties

□ How the uncertainties were determined for measurements is stated below the data table

□ Each data table has a short paragraph establishing its relevance

□ Qualitative data is recorded in the data table or separately as appropriate

□ A short introduction of how the data was processed is given

□ The relevance of this data processing to answer the research question is given

□ Calculations are carried out correctly and allow construction of an appropriate graph

□ Calculations are included in a table of calculations when appropriate

□ Data table from collection is copied and pasted and modified to include calculations

□ Sample calculations are demonstrated for the reader

□ Uncertainties are calculated and explained if necessary

**Data Analysis: presenting and describing data (graphs and description of trends)**

□ The dependent variable is appropriately graphed against the independent variable

□ Graphs include descriptive titles of the variables and axis are labeled including units

□ Error bars showing the uncertainties are included on the graph for individual data points

□ How uncertainties were determined is stated below the graph and explained if not included

□ Maximum and minimum lines of best fit are drawn if appropriate

□ Each graph has a paragraph discussing the relationship(s) and trends shown – no conclusion

**Conclusion**

□ An introduction is given (see the 8 step conclusion)

□ A conclusion is clearly stated “In conclusion…”

□ The conclusion given is correct and clearly supported by the interpretation of the data

□ Key data from the analysis is given and trends in the data are discussed

□ The extent to which the hypothesis is supported by the data is explained

□ The variation in results is reported, showing the strength of the conclusion

□ Scientific reasoning is used to show the validity of the relationship

□ How far the conclusion can be generalized is discussed

**Evaluation**

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□ The appropriateness of the apparatus in obtaining relevant data is commented on

□ Weaknesses in the methodology are discussed

□ The reliability of the data is commented on

□ The quantity of the data is commented on

□ The precision and accuracy of the data is commented on

□ Outlier data or irregularities in the data are addressed

□ The significance of uncertainties in the trend line is determined

**Suggested Improvements**

□ Where limitations are determined to be significant, specific improvements are proposed

□ Improvements effectively address the limitations (not just to be more careful)

□ Improvements are given which are possible within the context of a school laboratory

**Further Research Questions**

□ At least 2 further research questions are stated with clear independent and dependent variables

□ The research questions are an extension from the conclusion and evaluation

□ A short explanation for each question is given to establish its importance and relevance

**References**

□ Parenthetical in-text references/citations are given in APA format

□ A Works Cited List with APA formatting is given at the end of the report

□ Sources are written in alphabetical order by author’s last name

□ Each source is listed with a hanging indent

Overall Guidance for the Internal Assessment

**Overall Presentation**

□ No spelling or grammar errors are present

□ There are clear headings for each section, with consistent formatting

□ All tables and diagrams have a title and brief description with APA referencing if required.

□ Arial or Times New Roman font size 12 font is used

**Methodology**

□ A well-organized methodology written in past tense with good paragraph/numbered structure