

# IB Biology Internal Assessment Clarification

## DESIGN Aspect 1: Defining the problem and selecting variables

*Formulates a focused research question and identifies the relevant variables.*

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### 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

### Variables

- ☐ 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

### 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

### Background

- ☐ A well organized essay with paragraphs is given with an introduction, body and conclusion
- ☐ The introduction includes an observation that leads to the research 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
- ☐ All key variables relevant to the experiment are investigated
- ☐ 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)

### References (formatting)

- ☐ Parenthetical in-text references/citations are given in MLA format
- ☐ A Works Cited List with MLA formatting is given at the end of the report
- ☐ Sources are written in alphabetical order by author's last name
- ☐ Each sources is listed with a hanging indent

## DESIGN Aspect 2: Controlling the variables

*Designs a method for the effective control of the variables.*

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### Methodology: Manipulation and Control of the Variables

- ☐ A well organized methodology written in past tense with good paragraph structure
- ☐ An introduction establishes the methodology as a fair test of the hypothesis
- ☐ The modification of procedures from other sources are clearly referenced in MLA 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 MLA 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

## DESIGN Aspect 3: Developing a method for collection of data

*Develops a method that allows for the collection of sufficient relevant data.*

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### Methodology: Collection of the Data

- ☐ 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

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*While there are many clarifications, this does not mean the report must be very long to include all aspects. The report must be written to be as concise and to the point as possible.*

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## DATA COLLECTION AND PROCESSING Aspect 1: Recording raw data

*Records appropriate quantitative and associated qualitative raw data, including units and uncertainties where relevant.*

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### Data Collection

- ☐ 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 the uncertainties
- ☐ How the uncertainties were determined for measurements is stated just 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
- ☐ Data from other sources or students are clearly referenced

Volume of Gas  
/mL  $\pm 0.05$  mL

## DATA COLLECTION AND PROCESSING Aspect 2: Processing raw data

*Processes the quantitative raw data correctly.*

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### Data Analysis: Processing Data

- ☐ 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 possible
- ☐ 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 (usually 1 standard deviation in IB Biology)

## DATA COLLECTION AND PROCESSING Aspect 3: Presenting processed data

*Presents processed data appropriately and, where relevant, includes errors and uncertainties.*

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### Data Analysis: Presenting Data

- ☐ 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
- ☐ Uncertainties are normally calculated as one standard deviation from the mean in IB Biology
- ☐ 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 AND EVALUATION Aspect 1: Concluding

*States a conclusion, with justification, based on a reasonable interpretation of the data.*

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### 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

## CONCLUSION AND EVALUATION Aspect 2: Evaluating procedures

*Evaluates weaknesses and limitations.*

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### Evaluation

- ☐ 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

## CONCLUSION AND EVALUATION Aspect 3: Improving the investigation

*Suggests realistic improvements in respect of identified weaknesses and limitations.*

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### 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 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

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