Lab Report and Internal Assessment Criteria (IB Sciences) (Ver. 7)

Personal Engagement

. This criterion assesses the extent to which the student engages with the exploration and makes it their own. Personal engagement may be recognized in different attributes and skills. These could include addressing personal interests or showing evidence of independent thinking, creativity or initiative in the designing, implementation or presentation of the investigation.

2 marks (maximum)	2	**The evidence of personal engagement with the exploration is clear with significant independent thinking, initiative or insight.**	The justification given for choosing the research question and/or the topic under investigation demonstrates **personal significance, interest or curiosity.**	There is evidence of **personal input and initiative** in the designing, implementation or presentation of the investigation.
	1	**The evidence of personal engagement with the exploration is limited with little independent thinking, initiative or insight.**	The justification given for choosing the research question and/or the topic under investigation does not demonstrate **personal significance, interest or curiosity.**	There is little evidence of **personal input and initiative** in the designing, implementation or presentation of the investigation.
	0	The student's report does not reach a standard described by the descriptors above.	The student's report does not reach a standard described by the descriptors above.	The student's report does not reach a standard described by the descriptors above.
Additional feedback:				

Communication

This criterion assesses whether the investigation is presented and reported in a way that supports effective communication of the focus, process and outcomes.

4 marks (maximum)	3 to 4	**The presentation of the investigation is clear. Any errors do not hamper understanding of the focus, process and outcomes**.	The report is well structured and clear: the necessary information on focus, process and outcomes is present and presented in a coherent way.	The report is relevant and concise thereby facilitating a ready understanding of the focus, process and outcomes of the investigation.	The use of subject-specific terminology and conventions is appropriate and correct. Any errors do not hamper understanding.
	1 to 2	**The presentation of the investigation is unclear, making it difficult to understand the focus, process and outcomes.**	The report is not well structured and is unclear: the necessary information on focus, process and outcomes is missing or is presented in an incoherent or disorganized way.	The understanding of the focus, process and outcomes of the investigation is obscured by the presence of inappropriate or irrelevant information.	There are many errors in the use of subject-specific terminology and conventions*.
	0	The student's report does not reach a standard described by the descriptors above.	The student's report does not reach a standard described by the descriptors above.	The student's report does not reach a standard described by the descriptors above.	The student's report does not reach a standard described by the descriptors above.
Additional feedback:		Overall referencing and citations throughout need to be considered and carried out consistently General use of labels, titles, and images needs to be consistent General use of units, decimal places, and significant figures needs to be consistent Formatting of report: title page, references as footnotes, description of materials, experiment set-up, logical layout, no vagueness			

Exploration

This criterion assesses the extent to which the student establishes the scientific context for the work, states a clear and focused research question and uses concepts and techniques appropriate to the Diploma Programme level. Where appropriate, this criterion also assesses awareness of safety, environmental, and ethical considerations.

Introduction should include the research question, background information with footnote references, evidence of personal engagement. Subheadings will help with communication.

6 marks (maximum)	5 to 6	The topic of the investigation is identified and a relevant and fully focused research question is clearly described.	The background information provided for the investigation is entirely appropriate and relevant and enhances the understanding of the context of the investigation.	The methodology of the investigation is highly appropriate to address the research question because it takes into consideration all, or nearly all, of the significant factors that may influence the relevance, reliability and sufficiency of the collected data.	The report shows evidence of full awareness of the significant **safety,** ethical or environmental issues that are **relevant to the methodology of the investigation***.
	3 to 4	The topic of the investigation is identified and a relevant but not fully focused research question is described.	The background information provided for the investigation is mainly appropriate and relevant and aids the understanding of the context of the investigation.	The methodology of the investigation is mainly appropriate to address the research question but has limitations since it takes into consideration only some of the significant factors that may influence the relevance, reliability and sufficiency of the collected data.	The report shows evidence of some awareness of the significant **safety,** ethical or environmental issues that are **relevant to the methodology of the investigation***.
	1 to 2	The topic of the investigation is identified and a research question of some relevance is **stated but it is not focused**.	The background information provided for the investigation is **superficial** or of limited relevance and does not aid the understanding of the context of the investigation.	The methodology of the investigation is only appropriate to address the research question to a very limited extent since it takes into consideration few of the significant factors that may influence the relevance, reliability and sufficiency of the collected data.	The report shows evidence of limited awareness of the significant **safety,** ethical or environmental issues that are **relevant to the methodology of the investigation***.

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	0	The student's report does not reach a standard described by the descriptors above.	The student's report does not reach a standard described by the descriptors above.	The student's report does not reach a standard described by the descriptors above.	The student's report does not reach a standard described by the descriptors above.
Additional feedback:		Include a variables table with HOW and WHY Avoid the word 'amount' Express *concentrations* in the correct units At least 5 controlled variables should be discussed Aim is unclear/unspecific Aim must clearly include independent and dependent variable More controlled variables are needed Variables are not quantitatively described Variables are incorrect/missing	Clear citations are needed More relevant scientific references needed Relevant units are missing Hypothesis needs to be developed Footnotes with citations needed	Lower limit is five measurements of IV with three runs for each → recommended five runs Need enough data to conduct statistical tests Appropriate range of data should be considered; e.g. pH, temp Appropriate instruments should be chosen for measuring such things as length, volume, pH, temp, light intensity etc. Explanation of <u>how</u> variables will be controlled is lacking detail/missing *in variables table* Explanation of <u>why</u> it is necessary to control the variables is lacking detail/missing *in variables table* More controlled variables need to be discussed Need to emphasize control of variables Methodology lacks detail A clearly labeled diagram should be used to explain how you will control the variables 'HOW' - means experimentally 'WHY' - justify what effect NOT controlling the variable would have	Consider safety issues for the experimenter Needs discussion of preventing negative effects on the environment – i.e. chemicals Working with live organisms? Have you considered everything? Pain, stress, suffering, death, return to environment *See IB Animal Experimentation document*
Analysis This criterion assesses the extent to which the student's report provides evidence that the student has selected, recorded, processed and **interpreted** the data in ways that are relevant to the research question and can support a conclusion.					
6 marks (maximum)	5 to 6	The report includes sufficient relevant quantitative and qualitative raw data that could support a detailed and valid conclusion to the research question.	Appropriate and sufficient data processing is carried out with **the accuracy** required to enable a conclusion to the research question to be drawn that is fully **consistent** with the experimental data.	The report shows evidence of full and appropriate consideration of the impact of measurement uncertainty on the analysis.	The processed data is correctly interpreted so that a completely valid and detailed conclusion to the research question can be deduced.
	3 to 4	The report includes relevant but incomplete quantitative and qualitative raw data that could support a simple or partially valid conclusion to the research question.	Appropriate and sufficient data processing is carried out that could lead to a broadly valid conclusion but there are significant inaccuracies and inconsistencies in the processing.	The report shows evidence of some consideration of the impact of measurement uncertainty on the analysis.	The processed data is interpreted so that a broadly valid but incomplete or limited conclusion to the research question can be deduced.
	1 to 2	The report includes **insufficient relevant** raw data to support a valid conclusion to the research question.	Some **basic** data processing is carried out but is either too **inaccurate or too insufficient to lead to a valid** conclusion.	The report shows evidence of little consideration of the impact of measurement uncertainty on the analysis.	The processed data is incorrectly or insufficiently interpreted so that the conclusion is invalid or very incomplete.
	0	The student's report does not reach a standard described by the descriptors above.	The student's report does not reach a standard described by the descriptors above.	The student's report does not reach a standard described by the descriptors above.	The student's report does not reach a standard described by the descriptors above.
Additional feedback:		Title is unclear or missing or needs to be more explanatory Units should only appear in cell headings Error for the instrument used or accuracy of reading should be in cell heading Decimal places should be consistent throughout a column Mean values should not have more decimal places that the raw data Insufficient number of trials conducted More appropriate data should be collected More appropriate data range should be considered More specific detail required Table organization unclear SI units should be used Avoid non-metric units Independent variable should be in first column Qualitative data and observations should be included	Title is unclear or missing or needs to be more explanatory Data processing unclear More trials needed for sufficient processing Additional statistical testing is necessary (chi/t) Calculations are missing/incorrect Appropriate statistical tables missing Significant figures are inconsistent Calculating an average is not sufficient for data processing Title is unclear/missing/lacking detail Graphs should be clear and easy to read IT software produced graphs should have identifiable data points Consider if adjacent data points should be joined by straight line Line of best fit should be used ONLY if there is good reason to believe so → large amount of data; reference made to literature values Avoid extrapolation beyond first and last data point Graph type should be appropriate to type of data collected Explain choice of statistical test Explain result of statistical test within context of investigation Include null and alternative hypotheses for stat. test	Sources of error should be taken into consideration Random errors discussed; e.g. kept to minimum through careful selection of material and plan Human error or 'making mistakes' is not an acceptable source of error The 'act of measuring' may influence your results – think about this Systematic errors can be reduced if equipment is calibrated regularly Units are incorrect or missing Uncertainties are missing/incorrect Significant figures are inconsistent Need to address "least count" or "limit of error of instrument" (see guide)	Statistical tests need to be presented clearly More trials needed for sufficient processing Additional statistical testing is necessary Graph missing/inappropriate Scales/labels are missing/incorrect Line/curve of best fit is missing or unclear Outliers are not identified Error bars are not shown or explained Title is unclear/missing/lacking detail

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			Include clear degrees of freedom, critical values and probability levels for stat. test		
Evaluation This criterion assesses the extent to which the student's report provides evidence of evaluation of the investigation and the results with regard to the research question and the accepted scientific context.					
6 marks (maximum)	5 to 6	A detailed conclusion is **described and justified** which is entirely relevant to the research question and fully supported by the data presented.	A conclusion is correctly **described and justified** through relevant comparison to the accepted scientific context.	Strengths and weaknesses of the investigation, such as limitations of the data and sources of error, are **discussed** and provide evidence of a clear understanding of the **methodological issues** involved in establishing the conclusion.	The student has **discussed** realistic and relevant suggestions for the improvement and extension of the investigation.
	3 to 4	A conclusion is **described** which is relevant to the research question and supported by the data presented.	A conclusion is described which makes some relevant comparison to the accepted scientific context.	Strengths and weaknesses of the investigation, such as limitations of the data and sources of error, are **described** and provide evidence of some awareness of the **methodological issues** involved in establishing the conclusion.	The student has **described** some realistic and relevant suggestions for the improvement and extension of the investigation.
	1 to 2	A conclusion is **outlined** which is not relevant to the research question or is not supported by the data presented.	The conclusion makes superficial comparison to the accepted scientific context.	Strengths and weaknesses of the investigation, such as limitations of the data and sources of error, are **outlined** but are restricted to an **account** of **the practical** or **procedural issues** faced.	The student has **outlined** very few realistic and relevant suggestions for the improvement and extension of the investigation.
	0	The student's report does not reach a standard described by the descriptors above.	The student's report does not reach a standard described by the descriptors above.	The student's report does not reach a standard described by the descriptors above.	The student's report does not reach a standard described by the descriptors above.
Additional feedback:		Biological explanations are incorrect/lacking detail Research needs to be included/cited Values from results need to be discussed Statistical tests need be discussed correctly Hypothesis is not referenced Use appropriate citation methods	Biological explanations are incorrect/lacking detail Research needs to be included/cited Values from results need to be discussed Statistical tests need be discussed correctly Hypothesis is not referenced Use appropriate citation methods Additional comparison to scientific literature is needed Included sources are not relevant or lack credibility	More focus on the limitations of the *experimental design* is necessary Sources of error including random and systematic errors are discussed Avoid using mistakes or human error as things that need to be fixed – following the plan carefully can avoid this More focus on variables that need to be controlled More weaknesses need to be identified Greater discussion of statistics necessary Additional trials should be suggested Use suggested table-formatting Greater detail needed	Suggestions are too simplistic Suggestions are needed for *each* of the weaknesses identified Additional methods/apparatuses not discussed Additional data ranges should be suggested Further *related* experiments should be suggested Further trials lead to more reliable statistics