

## Lab Report Guidelines: IB BIO I

### I. Planning (a)

1. Define the research problem. (Introduction)
  - a. State the problem/question clearly.
2. Formulate a hypothesis (prediction)
  - a. The hypothesis is directly related to the research question and is *explained*.
3. The key variables are selected.

### II. Planning (b)

1. Design a method with appropriate apparatus/materials. (Diagrams are acceptable)
2. Design a realistic method for control of the variables.
3. Design a method for the collection of sufficient relevant data and excludes the collection of irrelevant data.

### III. Data Collection

1. Observing (collecting) raw data.
  - a. Raw data (qualitative/quantitative) is recorded appropriately, including units and uncertainties where necessary.
2. Presenting Raw Data.
  - a. Raw data is presented clearly, allowing for easy interpretation

### IV. Data Analysis (data processing and presentation)

1. Transforming and manipulating (processing) raw data.
  - a. The raw data is processed correctly to produce results that help interpretation, where appropriate error analysis is included.
2. Presenting processed data.
  - a. Data/results are presented appropriately and effectively; where relevant, errors and uncertainties are taken into account.

### V. Evaluation (Conclusion and Evaluation)

1. Evaluating (Interpreting) results (drawing conclusions).
  - a. A valid conclusion (based on the correct interpretation of the results), with an explanation, is given; where appropriate, results are compared with literature values.
2. Evaluating procedures
  - a. The procedure (apparatus, materials and method) including limitation, weaknesses or errors in manipulation, is evaluated. (Discussion of the limitations of data analysis may be included).
3. Modifying the procedure.
  - a. Suggestions to improve the investigation following the identification of weakness(es) are stated.

### VI. Manipulative Skills

1. Carrying out a range of techniques proficiently with due attention to safety.
2. Following a variety of instructions
  - a. A variety of instructions (oral, written diagrams, photos, videos, flowcharts, audio tapes, models, computers, etc.) can be followed accurately and little (or no) assistance is required in adapting to new circumstance.

### VII. Personal Skills (a)

1. Working within a team (2 or more students).
  - a. Team members collaborate with a wide variety of people.
2. Recognizing the contributions of others
  - a. The view of all members of the team are acknowledged and respected.
3. Encouraging the contributions of others.
  - a. The views of all members of the team are expected and actively sought, even from those that are reluctant or less confident.

### VIII. Personal Skills (b)

1. Approaching scientific investigations with self-motivation and perseverance.
  - a. Scientific investigations can be approached independently, with initiative shown, and followed through to conclusion.
2. Approaching scientific investigations in an ethical manner
  - a. Considerable attention is paid to the ethical aspects of scientific investigation including authenticity of data and information, and the approach to materials (living or non-living).
3. Approaching scientific investigations while paying due attention to the environmental impact.
  - a. Considerable attention is paid to the environmental impact of scientific investigations.

*Planning (a)*

	<b>Defining problem/research question</b>	<b>Formulating a hypothesis (prediction)</b>	<b>Selecting variables</b>
<b>C</b>	The problem/research question is stated clearly.	The hypothesis (prediction) is directly related to the research question and it is explained (quantitatively where appropriate).	The key variable(s) are selected.
<b>P</b>	The problem/research question is stated, but it is unclear or incomplete.	The hypothesis (prediction) is stated but it is not explained.	Some variables are selected.
<b>N</b>	No problem/research question is stated	No hypothesis (prediction) is stated.	No variables are selected.

*Planning (b)*

	<b>Designing a method with appropriate apparatus/materials</b>	<b>Designing a method for the control of variables</b>	<b>Designing a method for the collection of (raw) data</b>
<b>C</b>	Appropriate apparatus/materials are selected (diagrams may be acceptable).	A realistic method that allows for the control of the variables is designed.	A method that allows for the collection of sufficient relevant data and excludes the collection of irrelevant data is designed.
<b>P</b>	Some appropriate apparatus/materials are selected or some essential features are missing.	A method that makes some attempt to allow for the control of variables is designed.	A method that allows for the collection of insufficient relevant data or both relevant and irrelevant data, is designed.
<b>N</b>	No apparatus/materials are selected.	A method that makes no attempt to allow for the control of variables is designed	A method that allows for the collection of only irrelevant data is designed or no method is designed

*Data Collection*

	<b>Observing (collecting) and recording of raw data</b>	<b>Presenting raw data</b>
<b>C</b>	Raw data (qualitative/quantitative) is recorded appropriately, including units and uncertainties where necessary.	Raw data is presented clearly, allowing for easy interpretation.
<b>P</b>	Some raw data is recorded.	Raw data is presented in a disorganised manner.
<b>N</b>	No raw data is recorded.	Raw data is presented incomprehensibly or is missing.

*Data Analysis (Data Processing and Presentation)*

	<b>Transforming and manipulating (processing) raw data</b>	<b>Presenting processed data</b>
<b>C</b>	The raw data is processed correctly to produce results that help interpretation; where appropriate error analysis is included.	Data/results are presented appropriately and effectively; where relevant, errors and uncertainties are taken into account.
<b>P</b>	Some processing of the raw data is made (attempted) or errors are made processing the data.	Data/results are presented appropriately but not very effectively; where relevant, errors and uncertainties are not taken into account.
<b>N</b>	No processing of raw data is carried out.	Data/results are presented inappropriately or are presented incomprehensibly or are absent.

*Evaluation (Conclusion and Evaluation)*

	<b>Evaluating (interpreting) results (drawing conclusions)</b>	<b>Evaluating procedures</b>	<b>Modifying the procedure</b>
<b>C</b>	A valid conclusion (based on the correct interpretation of the results), with an explanation, is given; where appropriate, results are compared with literature values.	The procedure (apparatus, materials and method) including limitation, weaknesses or errors in manipulation, is evaluated (discussion of the limitations of data analysis may be included).	Suggestions to improve the investigation following the identification of weakness(es) are stated.
<b>P</b>	A conclusion that has some validity is stated.	The procedure (apparatus, materials and method) is evaluated partially, but some obvious limitations or errors are missed; irrelevant points may be made.	Suggestions to improve the investigation are stated but are simplistic.
<b>N</b>	A conclusion that completely misinterprets the results is drawn or no conclusion is drawn.	The procedure (apparatus, materials and method) is evaluated superficially or the evaluation is completely irrelevant or is absent	Suggestions to improve the investigation are unrealistic or no suggestions are stated.

*Manipulative Skills*

	<b>Carrying out a range of techniques proficiently with due attention to safety</b>	<b>Following a variety of instructions</b>
<b>C</b>	A wide range of techniques can be carried out with proficiency and appropriate attention paid to safety.	A variety of instructions* can be followed accurately and little (or no) assistance is required in adapting to new circumstances.
<b>P</b>	A limited range of techniques can be carried out with proficiency and appropriate attention paid to safety.	A variety of instructions* can be followed, mainly accurately, but some assistance may be required.
<b>N</b>	Only little attention is paid to safety, whatever the range of techniques that can be carried out with proficiency.	Some instructions* can be followed accurately but assistance is required.

\* Instructions may be given in a variety of forms: oral, written worksheets, diagrams, photographs, videos, flowcharts, audiotapes, models, computer programs, etc.

*Personal Skills (a)*

	<b>Working within a team *</b>	<b>Recognizing the contributions of others</b>	<b>Encouraging the contributions of others</b>
<b>C</b>	Teams, whose members collaborate, can be formed with a wide variety of people.	The views of all members of the team are acknowledged and respected.	The views of all members of the team are expected and actively sought, even from those that are reluctant or less confident.
<b>P</b>	Teams can be formed with a variety of people, but the members do not always collaborate.	The views of most members of the team are acknowledged.	The views of the more confident members of the team are expected and actively sought.
<b>N</b>	Teams can be formed with a limited number of people, but the members may not always collaborate.	The views of some members of the team are acknowledged with reluctance.	The views of other members of the team are sought, only after prompting.

\* A team is defined as two or more students.

*Personal Skills (b)*

	<b>Approaching scientific investigations with self-motivation and perseverance</b>	<b>Approaching scientific investigations in an ethical manner</b>	<b>Approaching scientific investigations while paying due attention to the environmental impact</b>
<b>C</b>	Scientific investigations can be approached independently, with initiative shown, and followed through to completion.	Considerable attention is paid to the ethical aspects of scientific investigation including authenticity of data and information, and the approach to materials (living or non-living).	Considerable attention is paid to the environmental impact of scientific investigations.
<b>P</b>	Scientific investigations can be approached independently and followed through to completion.	Some attention is paid to the ethical aspects of scientific investigation including authenticity of data and information, and the approach to materials (living or non-living).	Some attention is paid to the environmental impact of scientific investigations.
<b>N</b>	Scientific investigations can be approached independently or followed through to completion.	Little attention is paid to the ethical aspects of scientific investigation including authenticity of data and information, and the approach to materials (living or non-living).	Little attention is paid to the environmental impact of scientific investigations.



