EXPERIMENTAL RESEARCH WORKBOOK

Version 3.0

RQ/IQ:

_____

(IQ= Investigative Question you are answering in your experiment – See *"Investigative Question"* in your guide for details. IB also refers to this as the "Research Question" (RQ))

_____

Researcher's Name

- Remember that this is an outline. This means you don't need to write in full sentences; you can use shorthand, abbreviations and bullet points.
- This assignment does NOT count as your lab report grade. It is here to help you plan for the final submission of your report.
- Use the guide, *"More than Meets the Eye: Lab Write up Guide for IB"* to help you along this template.
- Remember to ***sign*** the Academic Honesty Policy and Agreement before you start your investigation!

Academic Honesty Policy and Agreement

According to IB, "The **candidate** (you) is ultimately responsible for ensuring that all work submitted for assessment is authentic, with the work or ideas of others fully and correctly acknowledged. Candidates are expected to comply with all internal school deadlines; this is for their own benefit and may allow time for revising work that is of doubtful authorship before the submission of the final version."

Cheating is never profitable. We are here to learn and cheating makes learning impossible. Cheating will not be tolerated and is clearly a violation of course and school policy. The following acts of cheating are examples of behavior that will result in disciplinary actions as set by Ms.Chien, Ms. McCarthy and Schenectady High School.

- Passing calculators during a test, quiz, or other assessment
- Copying someone else's test, quiz, homework, assignment, or report
- Letting someone copy from a test, quiz, homework, assignment, or report - *Work that demonstrates more than 10% similarity or identical in character with another (from a peer or professional resource) is considered plagiarism.*
- Looking at notes during a test, quiz, or other assessment
- Sharing questions from a test with students who have yet to take the test
- Listing someone else's data without giving credit, or worse, making up data to fit the expected answer. It is acceptable to present your own data, to state the reasons that you feel the results should be disregarded, and then to present another student's data (making sure the source is acknowledged). Specifically, IB states that, "In group 4 subjects (the sciences), including design technology, no collaboration is allowed in assessment tasks except in the area of data collection. Although there are different requirements depending on the subject, candidates ideally should work on their own when collecting data. When data collection is carried out in groups, the actual recording and processing of data must be undertaken independently if this criterion is to be assessed. For more subject-specific details, refer to the appropriate subject guide. (This does not apply to the group 4 project, which by its very nature is a collaborative project and is assessed for personal skills only.)"
- More than 10% of your graph and data presentation alike with other student(s). While it is understandable that you might have the same raw data points as people in your group, you are responsible in creating YOUR OWN RAW DATA charts and YOUR OWN graphs.
- Any form of plagiarism: Remember that *work that demonstrates more than 10% similarity or identical in character with another (from a peer or professional resource) is considered plagiarism.*
- Using opinions, facts, ideas, charts, data and direct quotes from research papers, newspapers, magazines, textbooks, websites, or another person without citing the source. Quotes need not to be more than 3 sentences long and requires much analysis from your part, using your own words. Any quotes longer than that is considered an act of cheating. *Work that demonstrates more than 10% similarity or identical in character with another (from a peer or professional resource) is considered plagiarism.*
- The above criteria applies, whether you are the copier(s) or the copee(s)

Penalties for plagiarism in a lab report or internal assessment

- All students involved will receive a "0" as their lab report score.
- Parents and administrators will be notified of the incident. A disciplinary write-up will be made that will have a copy of the work involved.
- If the student(s) is an IB Diploma or certificate candidate, he/she will receive a "0" in their Practical Scheme of Work (PSOW) for IB submission.
- Acts of plagiarism set a tone of dishonesty and distrust between you and your teacher. Ms.Chien and Ms.McCarthy will not be able to serve as a reference or write a letter of recommendation for anyone who lacks integrity.

By signing this agreement, you are acknowledging that you understand the following Academic Honesty Policy. This policy is set forth by IB as well as by Ms.Chien and Ms.McCarthy for IB Biology at Schenectady High School.

Your Name: _____Your Signature: _____

I. INTRODUCTION:

a. Hook (*One* or *two* sentences to draw the reader in):

b. Your next few statements will be on the background research that brings out the SIGNIFICANCE (the value) of your investigation. *Ask yourself: Why is my topic important?* In bullet points, state 3 significant issues behind your experimental research.

c. Give three specific case studies as EVIDENCE of the importance of your research. Be sure to use key terms, as well as identify names, time, date and "what happened" if talking about a specific incident. *See "Background" of the guide to help you*.

Case Study #1:

Bibliography:
Summary brief methods:
Results of study:
Connection with my research experiment:

Case Study #2:

Bibliography:
Summary brief methods:
Results of study:
Connection with my research experiment:

Case Study #3:

Bibliography:
Summary brief methods:
Results of study:
Connection with my research experiment:

<u>CONNECTION</u>: Tie the purpose of your experiment with the background research you have done. Address these questions (a) How is your experiment different from current research - How might it look at a different POINT OF VIEW, an ALTERNATIVE, at SOMETHING DEEPER? (b) How does your experiment apply to the real world? (and don't be fluffy about it!)

II. <u>HYPOTHESIS STATEMENT</u>: This should contain – (1) both independent and dependent variables (2) Should contain the rationale behind your hypothesis (3) Must be a total of at least 3 statements. *See "Hypothesis" of the guide to help you.*

III. <u>METHODS</u>: *Identify the following components of your design. These must be listed explicitly in your report:*
Methods:

Identify the following components of your design. These must be listed explicitly in your report:

Independent Variable: (what you are changing) Dependent Variable: (what you are measuring)	Define and describe your constants: (factors that need to be the same in each trial to assure a fair test)
Describe your control:	

Systematic Errors: (See guide)

Write your experimental method:

Describe each step of your experimental design. (Avoid obvious steps, such as "Take down data"	How does this step assure that the CONSTANTS of the experiment are maintained?

IV. RESULTS: *RAW DATA*

- □ Complete title (The effect of _____ on _____)
- □ Figure #
- □ Systematic error(s)
- □ Units *(remember METRIC!)*

IV. RESULTS: *Processing Data – **Displaying** the BIG STORY*

On graph paper, construct 2 graphical representations of your data (Each telling a different "story"). Be sure that each graph has:

- □ A title that includes both the independent and dependent variables
- □ All labels and units on its axis
- □ A key if necessary
- □ Don't forget error bars!
- □ Systematic errors!

Statistical Analysis Calculations

- □ Provide standard deviation of your results. You don't need to show the calculations, just the figure.
- □ Provide t-test and/or chi-square analysis of your results. You would need to show your calculations here. Your final figures need to be mentioned somewhere on your graphs.
- □ Indicate any literature values that apply
- □ Don't forget systematic errors!

Use the space belong to sketch or paste whatever might belong in your results. Add on additional paper if needed.

V. CONCLUSION: EXPLAIN WHAT THE DATA TELLS YOU

(1) State the Problem

(2) Restate the hypothesis

(3) Was your hypothesis supported?

(4) Summarize the results (use values!)

(5) Use specific EVIDENCE from your data to support your conclusion. Select at least 3 specific examples directly from your data analysis! REMEMBER TO USE VALUES where apply.

(6) ***WHAT IS THE STORY THAT YOUR DATA IS TELLING YOU?*** Why do you think these results were observed? EXPLAIN the *science* behind what happened in your experiment. REMEMBER TO PULL VALUES FROM YOUR EXPERIMENT TO HELP YOU CONNECT YOUR STORY.

(7) ***WHERE DOES YOUR STORY GO FROM HERE?*** What does your data tell you now about your original question? How would you answer the research question now?

EVALUATION: EVALUATE YOUR EXPERIMENT

(8) How reliable are your results? Were there errors that leave your conclusion questionable? Again, use specific evidence (i.e. sample relevant data) to support your conclusion.

(9) What specific ***patterns*** in your experiment are worth following up? What is the value and significance of these patterns?

IMPROVEMENTS: WHERE DO WE GO FROM HERE?

(10). What anomalies were there and where were the errors? How did those affect the data? Use the following table to help you describe those errors and how to fix them:

The error or problem encountered	How that error affected the data (VALUES NEEDED)	A suggestion for improvement

(11). What are some real world applications or examples that we can connect these results to? Provide at least 2 examples (you must do outside research for this);

(12). Are there further experiments that can be performed or did the data suggest other avenues to explore? (Repeat and elaborate on your idea in #9, and add on 1 more idea)

Note: do not say “Measurements could have been more accurate…” or “there was error in measurement.” Or “we could have worked harder/paid more attention.” Those are not valid evaluation statements and you are just wasting paper.

VI. BIBLIOGRAPHY: List your resources accordingly in the blank space below. Use the format provided. Remember, you must come up with at least 2 more resources OTHER than the ones that Ms. Chien provided on her website. USE APA format!

Use Citation Machine or Noodle tools to make your life a tad bit better ☺

Don't forget to make a cover page for your lab report: It should include:

(1) Investigative Question
(2) Your name
(3) Course title
(4) Date of submission
(5) Instructor's Name

Don't forget to attach at the back of your lab:

(1) Your raw data
(2) All your drafts (to show how hard you worked!)