

## IB Biology Summer Work

Your assignment for IB Biology summer work is as follows:

Over the summer break, you are to construct a mesocosm. What's a mesocosm, you say? This you will have to RESEARCH on your own. :) Included at the end of this document are links to get you started. The GOAL of this summer work is to prepare you for the internal assessment component of SL/HL Biology.

The FOCUS of the summer work should be the RESEARCH, DESIGN, QUALITATIVE DATA COLLECTION, and CONCLUSION/EVALUATION sections of the internal assessment criteria. This is NOT your IA, rather a prescribed lab experiment from IB.

This mesocosm experiment should have a PERSONAL INTEREST COMPONENT. This could include why you are interested in the biotic and abiotic factors that you selected, why you chose the container, what interests you about this project, etc. This does not have to be a mesocosm design that you make up on your own, but can be something that has already been done by another scientist, as long as you correctly reference that experimental design.

You should note that this is a project that can be very beneficial to your understanding of the scientific inquiry process and great practice for your internal assessment.

You **should not** wait until the last minute to try to complete this summer work. It should be something that is done in steps, over a period of time. The time period, of course, needed is dependent on the experiment conducted so I cannot tell you how long each experiment will take. Take in account your setup and data collection time. **YOU NEED AT LEAST TWO WEEKS OF RECORDED QUALITATIVE DATA.**

**Please note that you CANNOT use vertebrate animals in ANY form for experiments without supervision. THIS IS AN IB REQUIREMENT!** If you have questions, please ask BEFORE proceeding with your design!

Your overall lab report should be 3-6 pages in length. This should include all qualitative data in tables. Citations should be the last page of your work.

If you have questions, please contact me at any time at [llalexander@auburnschools.org](mailto:llalexander@auburnschools.org) or Mrs. Starr at [rastarr@auburnschools.org](mailto:rastarr@auburnschools.org). We will check our email weekly over the summer break and will be happy to assist you. However, please do not ask us to proof your experiment when completed before grading, as we will not do this.



# Internal Assessment (IA) Lab Report Guide



IB Biology – Mrs. Alexander & Mrs. Starr

The lab report is graded by merits of *the five aspects* and will be worth a total of **48 points**.

<b>Personal Engagement</b> Show evidence of your commitment and dedication to solving your research question.	+2 Points (8%)
<b>Exploration</b> Provide a well-designed lab complete with background research and focus on controls.	+6 Points (25%)
<b>Analysis</b> Processing data in a table(s) and graph(s) as well as use of appropriate statistics to support a conclusion.	+6 Points (25%)
<b>Evaluation</b> Concluding and discussing your data based on your research question and its implications to the world.	+6 Points (25%)
<b>Communication</b> The focus of your lab to the research question and your ability to clearly convey data, ideas and thoughts to readers.	+4 Points (17%)
<b>Total</b>	+24 Points (100%)

## Requirements of the Mesocosm Lab Report:

- i. Write your lab report in third person format. No “I” or “me”—only exception is in the Personal Interest Section.
- ii. Must be typed in 12 point font in a legible, professional font (no *comic-sans!*).
- iii. All factual information must be cited and properly sourced on a separate works cited page.
- iv. Lab report needs to be organized in the proper format as stated later in the instructions.
- v. The final lab report must be printed and submitted to the teacher on the **FIRST DAY BACK TO SCHOOL**. **Mesocosms must be submitted with the lab report!**

## Responsibilities:

Make sure you develop a mesocosm design that is within your abilities and time to complete. Every year some hot shot tries to go above and beyond in what they see as the “ultimate lab”, only to find that the deadline approaches and they ran out of biological resources, don’t have enough trials, ran out of money, etc. Just keep it simple and you can succeed. **Your summer work is the INITIAL attempt at designing a project and it is NOT meant to be PERFECT.** Do your best and DO NOT WAIT UNTIL THE LAST MINUTE. You have ALL SUMMER to do this project.

It is **your responsibility** to appreciate the meaning of **academic honesty**, especially authenticity and intellectual property. You are also responsible for initiating your research about mesocosms and building them on your own. Seeking help when in doubt, demonstrating independence of thought, initiative in the design and implantation of your investigation are important for you to demonstrate as a scientist and as a student.

The mesocosm lab is your responsibility and it is your work. Plagiarism and copying other’s work is **not permissible**. You must clearly distinguish between your own words and thoughts and those of others by the use of quotation marks (or another method, like indentation) followed by an appropriate citation that denotes an entry in the bibliography. It is preferred that you use MLA format (although biologists tend to use CSE or CMS format).

## Assessment – The Five Aspects of Your Lab Report Grading:

### **Personal engagement (+2 points max)**

This criterion assesses the extent to which you engage with the investigation and make it your own. Personal engagement may be recognized in different attributes and skills. These include thinking independently and/or creatively, addressing personal interests, and presenting scientific ideas in your own way.

### **Exploration (+6 points max)**

This criterion assesses the extent to which you establish the scientific context for your work, state a clear purpose and use concepts and techniques appropriate to the course you are studying. Where appropriate, this criterion also assesses awareness of safety, environmental and ethical consideration.

### **Analysis (+6 points max)**

This criterion assesses the extent to which your report provides evidence that you have recorded, analyzed, and interpreted the QUALITATIVE data in ways that are relevant to the purpose of the mesocosm and can support a conclusion. **You are NOT responsible for ANY VARIABLES OR QUANTITATIVE MEASUREMENTS for the mesocosm project.**

### **Evaluation (+6 points max)**

This criterion assesses the extent to which your report provides evidence of evaluation of the investigation and results with regard to the purpose and the “wider world”.

### **Communication (+4 points max)**

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

*-A more specific and general rubric for the assessment is included at the back of this lab guide-*

**Please follow this format to avoid point deduction!**

## **STRUCTURE OF THE MESOCOSM LAB REPORT**

### **Title Page**

Title referring to your lab, your name, date with some graphic to generate interest.

### **Part I: Design**

#### **1. Purpose**

- a. What are you trying to discover or observe in your mesocosm? Your personal interest should be included in this section.

#### **2. Background Information**

- a. Paragraph or two discuss the background of your experiment and relevant ecological details.

#### **3. Controls**

- a. Identify practical things that must be held constant between groups and how you will do it.
  - i. Describe the surroundings/temperature of the area where your mesocosm was kept during the time of the experiment.

#### **4. Materials**

- a. Numbered list of specific materials with quantities used.

#### **5. Procedure/ Methods**

- a. Numbered list of how to construct – must be very precise and replicable! A visual aid must be included in this section.

### **Part II: Data Collection & Processing**

#### **6. Data Table for Recording Qualitative Data**

- a. Anything to help us visualize the mesocosm, note trends, etc. for conclusion. You MAY include photos but need to be captioned neatly. Remember to include dates on all data recorded.

### **Part III: Conclusions**

#### **7. Results**

- a. Cite what observations you noticed in your mesocosm. Be thorough and descriptive.

#### **8. Discussion**

- a. Discuss and interpret the meaning and implications of your results. This should CONNECT back to some ecological aspect of designing the mesocosm. Use what you learned in the Background to complete this section. (This is almost always longer than your conclusion and it is where you get to speak your mind.)

#### **9. Evaluations & Improvements**

- a. Must evaluate any sources of errors present and identify how to they could be improved.

#### **Works Cited/ Reference Page**

- a. Work cited page listed alphabetically by author and properly formatted.

### **See markscheme below for assessment criteria: Please NOTE—this is the IA assessment criteria and many of the descriptors will NOT apply to this work!**

#### **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.

Mark	Descriptor
0	The student's report does not reach a standard described by the descriptors below.
1	<p><b>The evidence of personal engagement with the exploration is limited with little independent thinking, initiative or creativity.</b></p> <p>The justification given for choosing the research question and/or the topic under investigation does not demonstrate <b>personal significance, interest or curiosity</b>.</p> <p>There is little evidence of <b>personal input and initiative</b> in the designing, implementation or presentation of the investigation.</p>
2	<p><b>The evidence of personal engagement with the exploration is clear with significant independent thinking, initiative or creativity.</b></p> <p>The justification given for choosing the research question and/or the topic under investigation demonstrates <b>personal significance, interest or curiosity</b>.</p> <p>There is evidence of <b>personal input and initiative</b> in the designing, implementation or presentation of the investigation.</p>

### 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.

Mark	Descriptor
0	The student's report does not reach a standard described by the descriptors below.
1–2	<p>The topic of the investigation is identified and a research question of some relevance is <b>stated but it is not focused</b>.</p> <p>The background information provided for the investigation is <b>superficial</b> or of limited relevance and does not aid the understanding of the context of the investigation.</p> <p>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.</p> <p>The report shows evidence of limited awareness of the significant <b>safety</b>, ethical or environmental issues that are <b>relevant to the methodology of the investigation*</b>.</p>
3–4	<p>The topic of the investigation is identified and a relevant but not fully focused research question is described.</p> <p>The background information provided for the investigation is mainly appropriate and relevant and aids the understanding of the context of the investigation.</p> <p>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.</p> <p>The report shows evidence of some awareness of the significant <b>safety</b>, ethical or environmental issues that are <b>relevant to the methodology of the investigation*</b>.</p>
5–6	<p>The topic of the investigation is identified and a relevant and fully focused research question is clearly described.</p> <p>The background information provided for the investigation is entirely appropriate and relevant and enhances the understanding of the context of the investigation.</p> <p>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.</p> <p>The report shows evidence of full awareness of the significant <b>safety</b>, ethical or environmental issues that are <b>relevant to the methodology of the investigation*</b>.</p>

\* This indicator should only be applied when appropriate to the investigation. See exemplars in TSM.

### 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.

Mark	Descriptor
0	The student's report does not reach a standard described by the descriptors below.
1–2	<p>The report includes <b>insufficient relevant</b> raw data to support a valid conclusion to the research question.</p> <p>Some <b>basic</b> data processing is carried out but is either too <b>inaccurate</b> or too <b>insufficient to lead to a valid</b> conclusion.</p> <p>The report shows evidence of little consideration of the impact of measurement uncertainty on the analysis.</p> <p>The processed data is <b>incorrectly</b> or <b>insufficiently</b> interpreted so that the conclusion is invalid or very incomplete.</p>
3–4	<p>The report includes relevant but incomplete quantitative and qualitative raw data that could support a simple or partially valid conclusion to the research question.</p> <p>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.</p> <p>The report shows evidence of some consideration of the impact of measurement uncertainty on the analysis.</p> <p>The processed data is interpreted so that a broadly valid but incomplete or limited conclusion to the research question can be deduced.</p>
5–6	<p>The report includes sufficient relevant quantitative and qualitative raw data that could support a detailed and valid conclusion to the research question.</p> <p>Appropriate and sufficient data processing is carried out with <b>the accuracy</b> required to enable a conclusion to the research question to be drawn that is <b>fully consistent</b> with the experimental data.</p> <p>The report shows evidence of full and appropriate consideration of the impact of measurement uncertainty on the analysis.</p> <p>The processed data is correctly interpreted so that a completely valid and detailed conclusion to the research question can be deduced.</p>

## 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.

Mark	Descriptor
0	The student's report does not reach a standard described by the descriptors below.
1–2	<p>A conclusion is <b>outlined</b> which is not relevant to the research question or is not supported by the data presented.</p> <p>The conclusion makes superficial comparison to the accepted scientific context.</p> <p>Strengths and weaknesses of the investigation, such as limitations of the data and sources of error, are <b>outlined</b> but are restricted to an <b>account of the practical or procedural issues</b> faced.</p> <p>The student has <b>outlined</b> very few realistic and relevant suggestions for the improvement and extension of the investigation.</p>
3–4	<p>A conclusion is <b>described</b> which is relevant to the research question and supported by the data presented.</p> <p>A conclusion is described which makes some relevant comparison to the accepted scientific context.</p> <p>Strengths and weaknesses of the investigation, such as limitations of the data and sources of error, are <b>described</b> and provide evidence of some awareness of the <b>methodological issues*</b> involved in establishing the conclusion.</p> <p>The student has <b>described</b> some realistic and relevant suggestions for the improvement and extension of the investigation.</p>
5–6	<p>A detailed conclusion is <b>described and justified</b> which is entirely relevant to the research question and fully supported by the data presented.</p> <p>A conclusion is correctly <b>described and justified</b> through relevant comparison to the accepted scientific context.</p> <p>Strengths and weaknesses of the investigation, such as limitations of the data and sources of error, are <b>discussed</b> and provide evidence of a clear understanding of the <b>methodological issues*</b> involved in establishing the conclusion.</p> <p>The student has <b>discussed</b> realistic and relevant suggestions for the improvement and extension of the investigation.</p>

\*See exemplars in TSM for clarification.

## Communication

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

Mark	Descriptor
0	The student's report does not reach a standard described by the descriptors below.
1–2	<p><b>The presentation of the investigation is unclear, making it difficult to understand the focus, process and outcomes.</b></p> <p>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.</p> <p>The understanding of the focus, process and outcomes of the investigation is obscured by the presence of inappropriate or irrelevant information.</p> <p>There are many errors in the use of subject-specific terminology and conventions*.</p>
3–4	<p><b>The presentation of the investigation is clear. Any errors do not hamper understanding of the focus, process and outcomes.</b></p> <p>The report is well structured and clear: the necessary information on focus, process and outcomes is present and presented in a coherent way.</p> <p>The report is relevant and concise thereby facilitating a ready understanding of the focus, process and outcomes of the investigation.</p> <p>The use of subject-specific terminology and conventions is appropriate and correct. Any errors do not hamper understanding.</p>

\*For example, incorrect/missing labelling of graphs, tables, images; use of units, decimal places. For issues of referencing and citations refer to the "Academic honesty" section.

<https://www.youtube.com/watch?v=ITdm5FP0rMI>

<https://lhicks2015.weebly.com/design-process.html>

<https://biologymesocosm.wordpress.com/2014/09/24/day-1-research/>

<https://www.youtube.com/watch?v=-W9mYiqX9jk>

<http://www.int-res.com/articles/meps/28/m028p069.pdf>

[https://www.youtube.com/watch?v=2hmKf5v\\_LLM&NR=1](https://www.youtube.com/watch?v=2hmKf5v_LLM&NR=1)