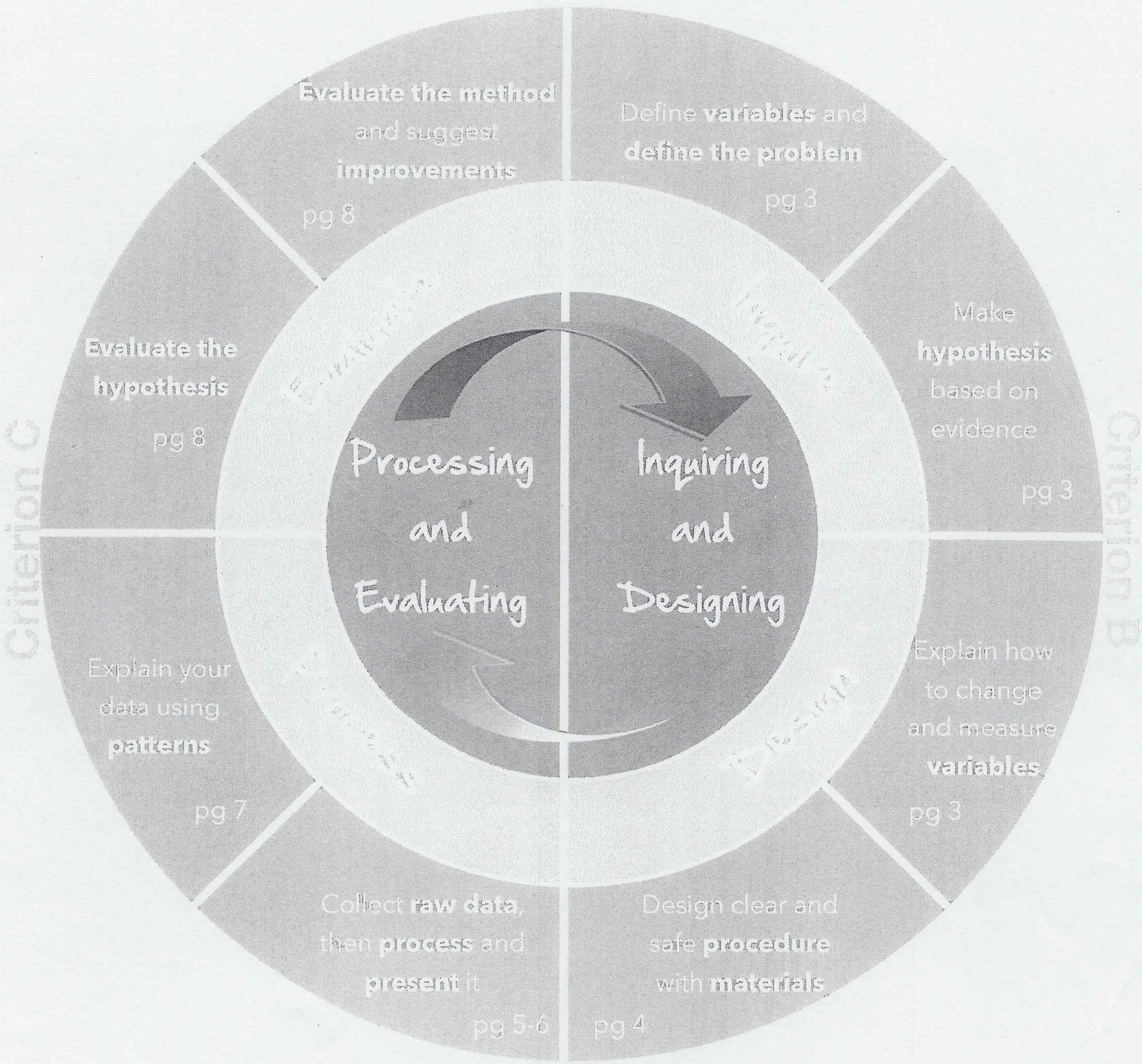
NAME ____________________

MYP SCIENCE LAB REPORT GUIDE

per ________
DATE Due
____



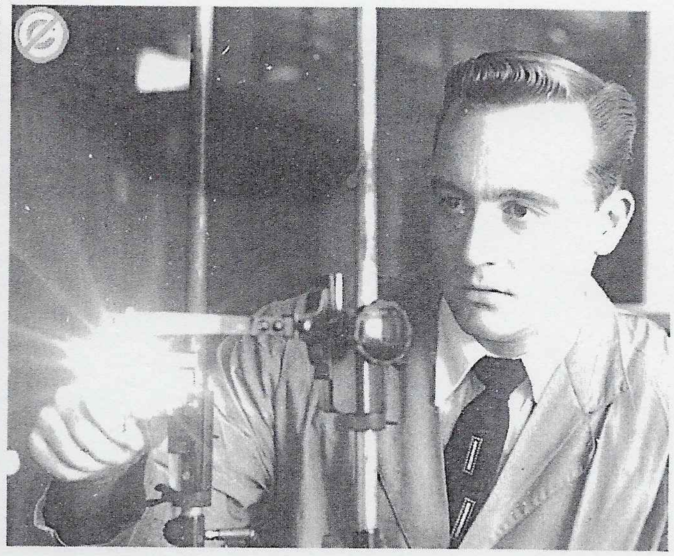
Based on the MYP experimental cycle from the MYP Science Guide page 14

LAB REPORT GUIDE

MYPSCIENCE

MYP Science Aims

- cultivate analytical , inquiring and flexible minds that pose questions, solve problems, construct explanantions and judge arguments
- develop skills to design and perform investigations, evaluate evidence and reach conclusions



How do I scientifically inquire?

The Scientific Method

INQUIRING AND DESIGNING

Criterion B

The first part of any inquiry will be deciding on what question you will try to answer, and then how you will answer the question. In science you must be very detailed BEFORE you do your experiment!

This part of your process will include:

- Variables (B.iii)
- Defining the Problem (B.i)
- Hypothesis (B.ii)

- Procedure (B.iv)
- Materials (B.iv)

PROCESSING AND EVALUATING

Criterion C

After you have properly planned your inquiry and submitted your materials list, you may conduct your investigation!

You will collect your data, then process it to create graphs and tables. This will help you evaluate your hypothesis by finding patterns in the data. You will finish by evaluating your method and suggesting improvements.

This part of your process will include:

- Collecting Raw Data (C.i)
- Data Processing (C.i)
- Processed Data Table (C.i)
- Graphing (C.i)
- Patterns (C.ii)

- Evaluating the Hypothesis (C.iii)
- Evaluating the Method (C.iv)
- Suggesting Improvements (C.v)

Inquiring

Variables are the part of your experiment that you will change and measure. Choosing appropriate variables will also help you make it a fair test. In a scientific inquiry you will change only one type of thing, and only measure one type of thing. The rest of the things you could change, you must actually keep the same!

Independent variable
- the variable you decide to change
- always choose a range based on research
- make sure to include appropriate labels

Dependent variable
- what you will measure
- make sure it is able to be measured using numbers!

Controlled variables
- all the things you will keep the same
- make sure you describe what they should be, and how you will make sure they stay that way!

Defining the Problem (B.i)

When you put your independent and dependent variables together, you can form a question that you will try to answer through your experiment. Your research question is what you are trying to answer when you write your conclusion or form your hypothesis. You must also explain why this is a a problem that needs to be tested.

Research Question Is Testable
- this means it can be measured
- what units will you measure with?

You don't already know the answer
- if you already know the answer, don't waste your time experimenting!
- if you can easily find the answer on google, then maybe it's not the best experiment

Does not try to test too much
- it is not too large of an experiment that will take longer than you have to test, and write up your report

Includes the independent and dependent variables
- you can write your question in form: How does the *(independent variable)* affect the *(dependent variable)*?

Includes an explanation
- explain how this is related to the topic being studied
- explain why it is a relevant question or problem
- includes scientific evidence or data from your research

Hypothesis (B.ii)

Your hypothesis is a statement you make BEFORE you do your experiment, that describes what you think will happen. Our hypotheses are often wrong, and that's ok! After your experiment you will see if your data ***supports*** or ***contradicts*** your hypothesis.

Prediction
- what you think will happen
- refers to the independent and dependent variables

Evidence
- a description of why you made your prediction
- you should use sources such as books, magazines, the internet, or other lab reports and experiments
- make sure to cite your sources!

Format
- written in a format like: "If I (*increase/decrease*) my (*independent variable*), the (*dependent variable*) will (*increase/decrease*), because (*reasons with information and citation of sources*).

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Designing

Your procedure is a very detailed description of what you PLAN to do, not a record of what you changed. If you change anything, you can discuss it in your EVALUATION. Make sure to write a procedure that not just you understand, but that is good enough that someone from another school could do your experiment exactly the way you did!

Clear and easy to follow
- use proper vocabulary
- use the variables in your procedure
- use the quantities in your materials list
- use a numbered list to help others know the steps and the order
- have someone proof read your instructions and see if it makes sense to them

Controlled varibles
- make sure you describe how you will make sure they stay the same as part of your procedure!

Data
- include how you will collect your data
- more data is better! don't just test once, why not 3, 5, 10, or 20 times?

Materials (B.iv)

The materials you need for your lab are very important. Many students forget to ask for proper materials, and then cannot complete their lab. It is important that you think through what you will need, and specifically ask for it before the lab is supposed to start.

Materials Request
- if you do not make a request in enough time, you may not be able to get the materials you need for your lab
- if you're not sure we have something...ask!

Be Specific!
- you get what you ask for!
- someone else should be able to read your list and go get you everything you need, if they can't, then you weren't specific enough!

Quantity
- don't ask for "water" or a "beaker", but "250ml of water" or a "500ml beaker"
- not "salt" but "10g of salt"

Process

Raw data is data that you collect in the experiment. Usually we use a table to collect the data if it is measured. It is also possible to write our observations as sentences, or to take pictures or video for further evidence.

Do it before the experiment
- don't wait until you start the experiment to figure out how to record your data, do it as part of the plan before you start

Can it be messy?
- as long as you can read it!
- you'll be doing a final version in your lab report

Where do the variables go?
- independent on the LEFT
- dependent on the RIGHT

No labels in the tables
- DO NOT include labels in the table, only include them in the title boxes!

Dependent variable!

Time (seconds)	Temp #1 (C)	Temp #2 (C)
0	23	23
30	20	19
60	17	16

Independent variable!

Data Processing (C.i)

After you have completed your experiment you will need to process your raw data. Do you need to find the mean, median, or mode? Maybe a percentage, total, or difference is best? How about a t-test? It will depend on your data!

No averages!
- find the mean, median, or mode not the average!
- you may need to find more than one depending on your data

Show your work
- include the formulas used
- include one example of your processed data for each different type of formula you used

Explain in words
- include a few written sentences to explain why you chose the formula you did
- don't just say, "because I have to process my data"!

Processed Data Table (C.i)

After you have processed your data, you need to present it in a second table. This will be the table that you use to make your graph, and your conclusion.

New table
- create a second table after your data processing section
- DO NOT just add a section on to your raw data table, it should be a separate table

Smaller table
- yes, it is going to be smaller than the raw data table!
- do not include all the raw data in the new table, just the processed data

Variables
- independent variable in the left column
- dependent variable in the right column(s)

Process

Use your processed data to create a graph that shows the results of your experiment. It should be neat, including proper titles, and must be the proper type of graph!

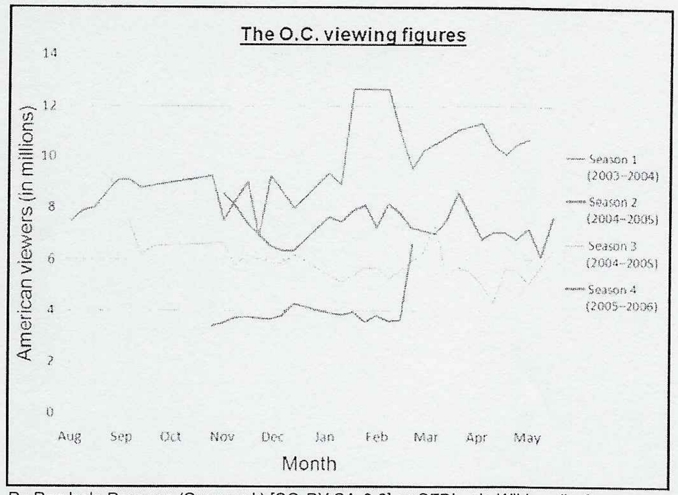
Type of graph
- depends on the type of data your independent variable produces
- continuous data = line graph or scatter plot
- discreet data = bar or pie chart

Don't forget to include...
- title
- x and y axis
- axis titles including units
- proper scale of numbers

Computer or hand drawn?
- both are fine, but the computer doesn't always make good science graphs, sometimes it is quicker and easier to draw them by hand
- hand drawn graphs need to be neat!

Continuous data
- data that could be any number on a continuum
- starts, changes, stops
- changes over time are usually continuous
- imagine the slope of a hill

Discreet data
- data that has only certain options
- imagine a set of steps
- number of people, shoe size, type of exercise are all types of discreet data
- whenever you create groups you create discreet data, i.e. - 0-5minutes, 6-10minutes, 11-15minutes are discreet groups even though time is usually continuous
- if you want to compare different groups, or show which group is the largest, then a vertical line diagram is best
- if you want to compare parts of a whole, then a pie chart is best



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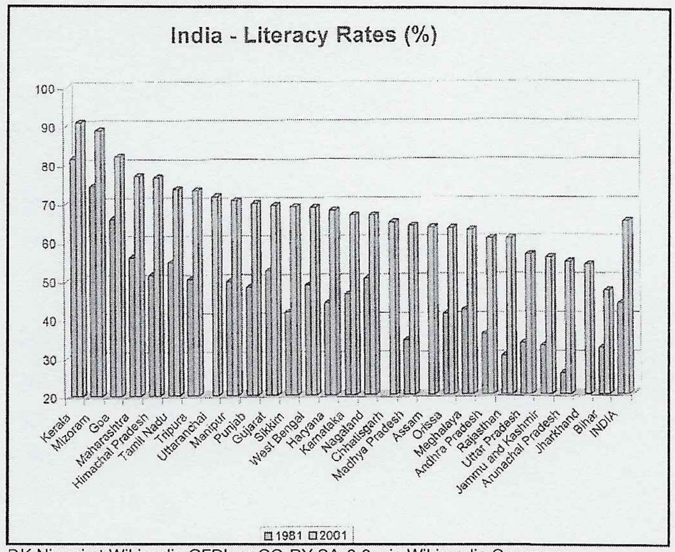

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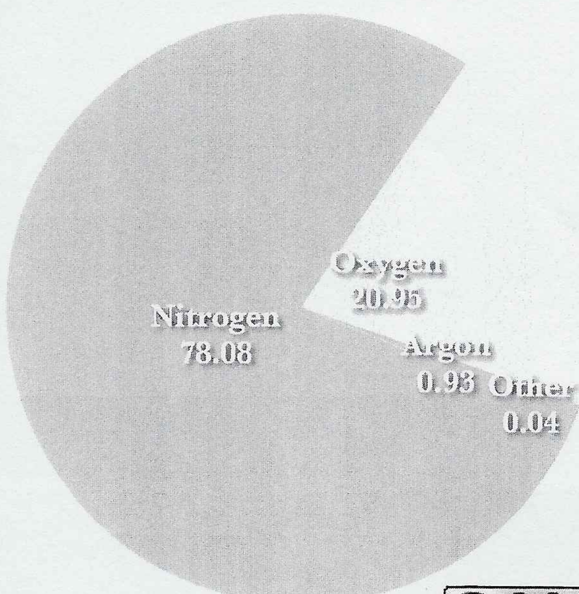
Gases of the Air



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Process

Before evaluating your hypothesis you need to first identify the patterns in the data. Is the dependent variable increasing or decreasing? Is there a linear relationship, or exponential? How exactly are the variables related or not related?

Increase, decrease, or constant

- data does not go "up", it increases
- data does not go "down", it decreases
- data does not stay the same, it is constant
- sometimes data does 1, 2, or all 3 of these at different points

Relationships between variables

- direct = both increase, or both decrease
- indirect = they are opposite

Common graph types

- is this a linear relationship, can you represent it with a line of best fit?
- is this an exponential relationship?
- do you see a normal distribution?

Evaluation

When you evaluate your hypothesis, you will be discussing if it was supported or not. This should reference your data, graph, and the patterns you found. Make sure to have a very clear statement of your final conclusion.

Did you prove it?
- you cannot prove your hypothesis correct, you can only support it
- make sure to discuss the data that supports your thinking

Data, data, data
- make sure to discuss the data, actually use numbers with units to discuss your findings
- refer to the table and graph to help support your thoughts

Research
- have you found information elsewhere to support your ideas? if so, then use a proper citation

Your method probably wasn't perfect, that's ok, as long as you discuss the issues. There are two types of errors in your method, the first type is **reliability**. Reliability according to Worthen is "*The measure of how stable, dependable, trustworthy, and consistent a test is in measuring the same thing each time (*1993*).*

The second type of error in method is **validity**. Worthen describes a method as being valid in "*the degree to which they accomplish the purpose for which they are being used*" (1993). Meaning, does your method actually measure what you are trying to measure.

Consistency
- did your method allow for a consistent set of data to be collected, or did the measurements change because of your method?
- two people measuring the same thing differently is an issue with reliability

Measuring tools
- using poor tools to measure may affect reliability
- counting out loud is not a very reliable way to measure time, a stopwatch is much more reliable

Proper variables
- make sure your variables are actually the correct ones to assess what you're trying to investigate
- if you're interested in health, is measuring someone's weight the most valid measurement, or would BMI be better?

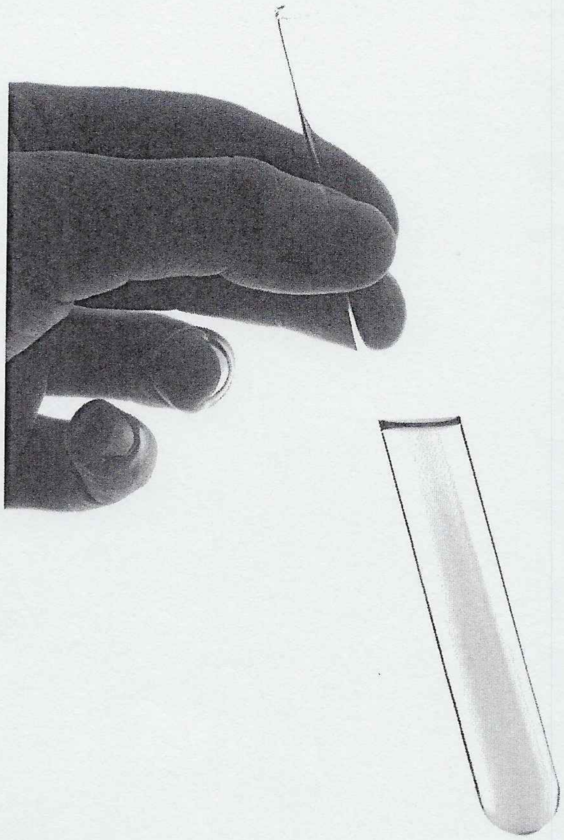
Proper tools
- make sure your measurement tool is the proper way to measure your variable
- if you want to measure the change in acidity, then blue-red litmus paper will not give you a valid set of data, you may need a pH probe

Now that you have identified areas of reliability and validity that need improvement, make sure to suggest specific ways to improve on these.

Specific
- your suggestions should be very specific, not "try harder" or "do more"

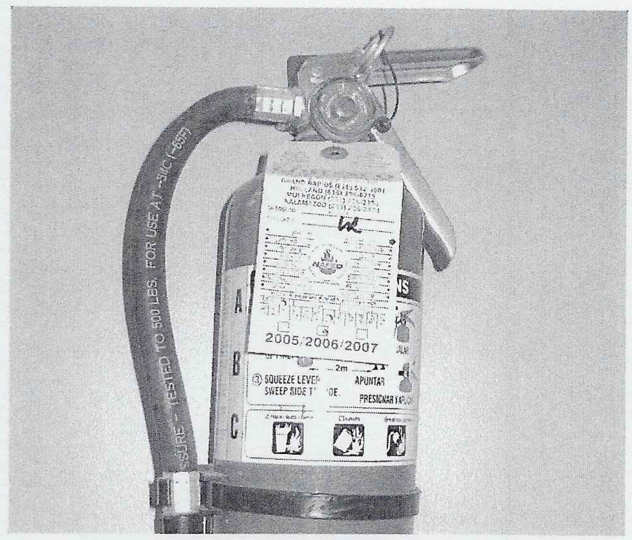
Realistic
- make sure that your suggestions are realistic
- this does not mean that you cannot suggest using equipment that we do not have though! Just don't suggest using lightsabers!

Research
- you may need to do a bit of research to find suggestions. "I don't know" is not acceptable. Find out!



Rules:

1. Read all procedures and **ask questions if necessary**. Follow directions and class rules.
2. No Food! Never taste or drink anything in the lab.
3. Absolutely no horseplay. The consequences will be immediate removal from the room, no excuses.
4. Treat living things humanely



Lab Safety Procedures!

Attitudes in Science

Safety and Emergency Procedures:

1. Always do your best to assure the safety of your classmates and yourself. Be aware of your surroundings and be careful when you move around.

2. Wash hands with soap and water after experiments or handling animals.

3. If you catch on fire: stop, drop, and roll. Know the location of the fire blanket.

4. Let your teacher know right away if glass or anything else breaks.

Lab Instructions and Clean-up:

1. Make sure that no solids go down the sink drains (sand, dirt, plant parts, etc.).

2. Shoes are recommended.

3. Tie back your hair and wear goggles when using an open flame or harmful chemicals.

3. Use common sense!

4. Wash and put away materials as instructed. Clean up your work area, washing the table if necessary. No team member leaves until table clean up is finished.

MYP SCIENCE LAB REPORT

Name:
Group:

Independent variable (x axis)		Data Range:
Dependent variable (y axis)		How will I measure this:
Controlled variables		How will I make sure these stay the same:

B.i **Define the Problem**

How is the ______________ impacted by ______________?

B.ii **Hypothesis :** What I predict with support from sources

IF I ______________ the ______________

THEN the ______________ will ______________

BECAUSE

B.iv **Procedure** : step-by-step list of what I will do

B.iv **Materials** : Specific list of what I need, including quantities

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Raw Data

C.i **Data Processing** : Write the formulas you used, and show a few examples

C.i **Processed Data Table** : [illegible] new table with only your processed data

C.i **Graph** : Attach your graph to the back of the lab write-up sheet

C.ii **Patterns** : Explain [illegible] data using words like increase or decrease

MYP SCIENCE LAB REPORT

Evaluating the Hypothesis

Evaluating the Method & Suggesting Improvements

Method	Significance (low, moderate, high)	Improvement

Criterion B: Inquiring & Designing

i. describe a problem or question to be tested by a scientific investigation
ii. outline a testable hypothesis and explain it using scientific reasoning
iii. describe how to manipulate the variables, and describe how data will be collected
iv. design scientific investigations

Level	*The student is able to:*
1-2	i. **state** a problem or question to be tested by a scientific investigation, with **limited success** ii. **state** a testable hypothesis iii. **state** the variables iv. design a **method, with limited success**
3-4	i. **state** a problem or question to be tested by a scientific investigation ii. **outline** a testable hypothesis **using scientific reasoning** iii. **outline** how to manipulate the variables, and **state** how **relevant data** will be collected iv. design a **safe method** in which he or she **selects materials and equipment**
5-6	i. **outline** a problem or question to be tested by a scientific investigation ii. **outline and explain** a testable hypothesis **using scientific reasoning** iii. **outline** how to manipulate the variables, and **outline** how **sufficient, relevant data** will be collected iv. design a **complete and safe** method in which he or she **selects appropriate materials and equipment**
7-8	i. **describe** a problem or question to be tested by a scientific investigation ii. **outline and explain** a testable hypothesis **using correct scientific reasoning** iii. **describe** how to manipulate the variables, and **describe** how **sufficient, relevant** data will be collected iv. design a **logical, complete** and safe method in which he or she **selects appropriate materials and equipment.**

Criterion C: Processing & Evaluating

i. present collected and transformed data
ii. interpret data and describe results using scientific reasoning
iii.discuss the validity of a hypothesis based on the outcome of the scientific investigation
iv. discuss the validity of the method
v.describe improvements or extensions to the method

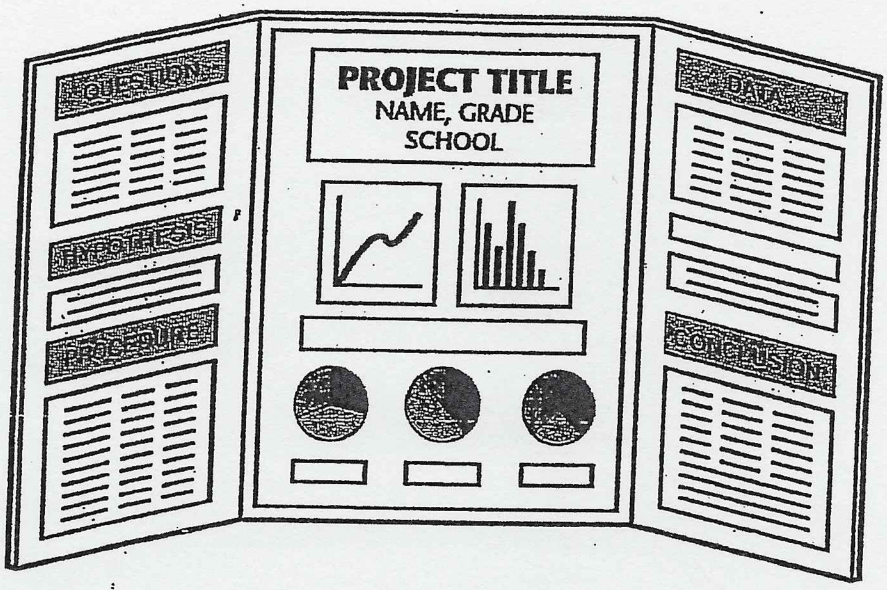
Level	*The student is able to:*
1-2	i. **collect and present** data in numerical and/or visual forms ii. **accurately interpret** data iii. **state** the validity of a hypothesis **with limited reference** to a scientific investigation iv. **state** the validity of the method **with limited reference** to a scientific investigation v. **state limited** improvements or extensions to the method
3-4	i. **correctly collect and present** data in numerical and/or visual forms ii. **accurately interpret** data and **describe** results iii. **state** the validity of a hypothesis based on the outcome of a scientific investigation iv. **state** the validity of the method based on the outcome of a scientific investigation v. **state** improvements or extensions to the method that would benefit the scientific investigation
5-6	i. **correctly collect, organize and presen**t data in numerical and/or visual forms ii. **accurately interpret** data and **describe** results **using scientific reasoning** iii. **outline** the validity of a hypothesis based on the outcome of a scientific investigation iv. **outline** the validity of the method based on the outcome of a scientific investigation v. **outline** improvements or extensions to the method that would benefit the scientific investigation
7-8	i. **correctly collect, organize, transform and present** data in numerical and/or visual forms **ii.** **accurately interpret** data and **describe** results **using correct scientific reasoning** iii. **discuss** the validity of a hypothesis based on the outcome of a scientific investigation iv. **discuss** the validity of the method based on the outcome of a scientific investigation v. **describe** improvements or extensions to the method that would benefit the scientific investigation.

Task Specific Clarifications
MYP Lab Report

B	***i.*** *describe a problem or question to be tested by a scientific investigation*	***ii.*** *outline a testable hypothesis and explain it using scientific reasoning*	***iii.*** *describe how to manipulate the variables, and describe how data will be collected*	***iv.*** *design scientific investigations*
1-2	I have stated a **problem** as a research question.	My **hypothesis** is testable.	I have stated the **variables**.	I have a **procedure** written down for my lab.
3-4	I have stated a **problem** as a research question that connects with our topic.	My **hypothesis** is testable, and includes my **variables**.	I have given brief details on how to manipulate the independent **variable**, and stated how to measure the dependent **variable** to collect relevant data.	My **procedures** are safe. I have selected the **materials** I will need.
5-6	I have given brief details on how my **problem** is connected to the topic we are studying. I have stated the problem as a research question.	My **hypothesis** is testable and I provided details about my **variables** using words like 'increase, decrease, no change', and I have supported it clearly using scientific reasoning in my 'because' statement.	I have given brief details on how to manipulate the independent **variable**, how to measure the dependent **variable** to collect relevant data, and how to manipulate the controlled **variables**.	My **procedures** are safe and complete. Someone else could probably do my lab because I describe how to collect data. I have selected the **materials** I will need, including quantities.
7-8	I have provided details on a **problem** I want to investigate, and how it is connected to the topic we are studying. I have stated the problem as a research question that includes my **variables**.	My **hypothesis** is testable and I provide details about my **variables** using words like 'increase, decrease, no change', and I have supported it clearly using correct scientific reasoning in my 'because' statement.	I have provided details on how to manipulate the independent **variable**, how to measure the dependent **variable** to collect sufficient relevant data, and how to manipulate all the controlled **variables**.	My **procedures** are safe, complete, and logical. Someone else would have no problem with my lab because I describe how to work with the variables and collect data. I have selected every **material** I will need, including quantities, and I won't need to ask for anything on the day of the lab.

C	***i.*** *present collected and transformed data*	***ii.*** *interpret data and describe results using scientific reasoning*	***iii.*** *discuss the validity of a hypothesis based on the outcome of the scientific investigation*	***iv.*** *discuss the validity of the method*	***v.*** *describe improvements or extensions to the method*
1-2	I have presented the data I collected in my experiment using **tables** or **graphs**.	I have used knowledge and understanding of science to recognize **patterns** and draw conclusions from the data.	I have **evaluated my hypothesis** by stating if it has been supported or not.	I have **evaluated my method** by listing errors.	I have stated how I **suggest improvement** to my procedures.
3-4	I have presented the data I collected in my experiment by using the correct type of **graph**, including titles, axis labels.	I have used knowledge and understanding of science to recognize **patterns** and draw conclusions from the data. I have given an account of the variables.	I have **evaluated my hypothesis** by stating if it has been supported or not, based on my data.	I have **evaluated my method** by listing errors in my procedures and lab work.	I have stated how I **suggest improvement** to limitations in my procedures.
5-6	I have organized the data I collected in my experiment using **tables** that include units in the proper place. My **graph** is the correct type, including titles, axis labels, and I have used lines of best fit.	I have correctly used knowledge and understanding of science to recognize **patterns** and draw conclusions from the data. I have given an account of how and why the variables are related.	I have **evaluated my hypothesis** by briefly mentioning the data to state if I my hypothesis has been supported or not, based on my data.	I have **evaluated my method** by briefly considering my procedures and lab work.	I have given brief details of how I **suggest improvement** to limitations in my procedures.
7-8	I have correctly organized the data I collected in my experiment using **tables** that include units in the proper place. I have **processed** my **data** using proper methods and showed examples. My **graph** is correct, including titles, axis labels, and I have used lines of best fit.	I have correctly used knowledge and understanding of science to recognize **patterns** and draw conclusions from the data. I have correctly given an account of how and why the variables are related.	I have **evaluated my hypothesis** by considering many possibilities. I have used the data to clearly state if I my hypothesis has been supported or not. I use scientific reasons and sources to help explain my reasons.	I have **evaluated my method** by considering the strengths and limitations of my procedures and lab work. I have discussed the validity and reliability of my methods, and addressed its significance.	I have provided details of how I **suggest improvement** to limitations in my procedures. These suggestions are realistic and based on scientific reasoning and research.

An Example The illustration below is one example of how information can be laid out on the display. You can do it differently, but remember to place the information from left to right in the general order that you performed each item. It is also common to place models, samples, demonstration props, or small pieces of equipment in front of the display board.



Here's how the information is organized on the display shown above:

- **Top Left** This section provides basic background information and introduces the purpose and hypothesis of the project.
- **Bottom Left** This section briefly explains the procedure that was followed (review your Procedural Plan for Action).
- **Right-hand Panel** Brief written summaries of the data and the conclusions are located on this panel. The research is displayed so that it is obvious that the data support the conclusions.
- **Center** The middle panel contains the title of the project and the name, grade, and school of the researcher. Charts, graphs, photographs, and other illustrations are displayed here.
- **Keep It Simple** The display touches on all aspects of the project, but keeps the information general. The details of the project belong in the written report.

Designing Your Display

Back to the Drawing Board Before you construct a display, sketch some ideas of how you want your display to look. Sketching it out on paper lets you easily choose colors, borders, sizes, lettering, and even arrangement of items in your display.

Display Due March 6.

riteria C / : this Is how the Points will be given for project.

Science Experiment Display Student: ____________

Element **Assessment Points**

Question /10

A concise statement of the problem/ what are you trying to find out.

Hypothesis /10

The hypothesis as a clear specific prediction is stated clearly.

B

Procedure /10

A description of the steps are clear and include a description of all variables and how they are measured

Title
Name, per date /10

A title is present with student name, period and title.

Table /10

Table done correctly with a title and headings

Graph /10

graph correctly done with axis labels and a title.

Data Statement /10

A summary of what was measured is written into sentences without a conclusion

C

Conclusion /10

The major findings are stated clearly and the original hypothesis is referenced.

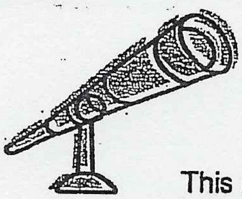
Presentation

The Layout is in a three folded free standing form /5
There are labels for each part of experiment /5
The writing, graphs and tables are clear and in proper order /5
It is neat and attractively presented. /5

Comments:

/100 **Total points**

/5 rubric



The SCIENTIFIC METHOD

IDENTIFY THE PROBLEM

This is an important step in the scientific process. Topics can be very large and often need to be narrowed down to something that is easier to study

REFER TO AUTHORATITIVE SOURCES

Reading books, magazine articles, pamphlets and brochures will help the student learn about their topic of interest. All good scientists will first learn basic facts about their subject before conducting their research. A visit to the local library, a trip to the Zoo or Aviary or visiting a local gardening shop may help the student learn new information about the topic.

ASK AN APPROPRIATE QUESTION

If a student is interested in plants, asking various questions related to plants may help the student to choose a topic. How do plants grow? What nutrients are needed? How much water do they need? Can they grow using different liquids?

DEVELOP A HYPOTHESIS

A hypothesis is an educated guess; a statement of how the scientist thinks the experiment will turn out. It is a prediction, based on the best available information of what the scientist believes will happen at the end of the experiment. An example is: Plants will not grow without sunlight or clothes will be cleaner using the hot water cycle of the washing machine rather than the cold water cycle.

CONDUCT AN EXPERIMENT

This involves testing your hypothesis. A student will learn what happens when a condition is created or changed. For example, determining whether plants will grow without sunlight can be tested by planting a group of plants and then allowing some to have sunlight and others to have no contact with the sun or light of any kind. What happens to the plants? Can your questions be answered?

KEEP DETAILED RECORDS OF METHODS AND RESULTS

In order to come to a conclusion, students should keep a log or record of their work. Observations and summaries of the "events" of the experiment will help the student find the answer to their questions. They will then be able to analyze the results of their experiment.

ANALYZE THE RESULTS

What facts or numbers were produced as a result of your experiment? Analyzing the results allows the student to look at the information from the experiment and develop a conclusion or answer to the questions that were originally asked. It is often helpful to summarize findings in a graph or table of information.

DEVELOP A CONCLUSION

The conclusion should provide some answer to the original question. For example, if your hypothesis was that clothes get cleaner using the hot water cycle and if in fact, through your experiments, you discover that this is true, then your conclusion would be that clothes do become the most clean using hot water. It is often most interesting when the hypothesis is found to be incorrect. The experiment proved something else to be true.

Science Project Proposal Form

Name: ____________________

The question I plan to investigate in my experiment (*please phrase as a question*):

Science Fair Project Question Checklist	
1. Your teacher may put some restrictions on projects. Have you met your teacher's requirements?	Yes / No
2. Is the topic interesting enough to read about, then work on for the next couple months?	Yes / No
3. Can you find at least 3 sources of written information on the subject?	Yes / No
4. Can you measure changes to the important factors (variables) using a number that represents a quantity such as a count, percentage, length, width, weight, voltage, velocity, energy, time, etc.? Or, just as good, are you measuring a factor (variable) that is simply present or not present? For example, • Lights **ON** in one trial, then lights **OFF** in another trial • **USE** fertilizer in one trial, then **DON'T USE** fertilizer in another trial	Yes / No
5. Can you design a "fair test" to answer your question? In other words, can you change only one factor (variable) at a time, and control other factors that might influence your experiment, so that they do not interfere?	Yes / No
6. Is your experiment safe to perform?	Yes / No
7. Do you have all the materials and equipment you need for your science fair project, or will you be able to obtain them quickly and at a very low cost?	Yes / No
8. Do you have enough time to do your experiment more than once before the science fair?	Yes / No
9. If you are planning to enter a science fair outside of your school: • Does your project meet all the rules and requirements for the science fair?	Yes / No
• Have you checked to see if your science fair project will require approval from the fair before you begin experimentation?	Yes / No

I have discussed the project idea and the checklist with my parent(s) and I am willing to commit to following through on this project.

Student Signature **Date**

I have discussed the project idea and the checklist with my student and I believe he or she can follow through with this project.

Parent Signature **Date**