### We use the **experimental cycle** to help us plan, carry out and write about scientific investigations.

In your notebook, use these sentence starters to begin to plan a lab on . You will later write up your final lab plan for your summative assessment.


### Use these sentence starters to plan your lab. Make sure your lab report has all four major sections.

**Research Question: Explain** the problem or question to be tested

❏ I want to investigate....

❏ This is because I have observed that…

#### OR

❏ I will test the effect of ... on ....

❏ This is because I have observed that…

❏ I have included some scientific background information. This should be about two paragraph.

❏ I have referenced my background information with in-text citation and transferred this to my references section at the end

**Variables: Explain** how to *manipulate variables* and how to *collect data*

❏ The **independent variable** is the variable **I am changing**.

❏ My independent variable is...

❏ I will change the independent variable by increasing / decreasing from … to …

❏ I will change the independent variable in increments of …

❏ The **dependent variable** is the variable **I will measure**.

❏ My dependent variable is...

❏ I will measure the dependent variable by...

❏ I will repeat my measurements ... times to be more reliable.

❏ The **controlled variables** are variables that I will **keep the same** to make my test more reliable. Identify at least 3-5.

❏ I will control … by … because …

I have given a detailed account of a **problem** I want to investigate using scientific facts and sources, and how it is connected to the topic we are studying. I have stated the problem as a research question that includes my **variables**.

I have given a detailed account of 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**.

**Hypothesis: Formulate** a *testable hypothesis* using *scientific reasoning*

❏ I predict that if I increase / decrease ... then … will …

❏ This is because...

❏ Other information that supports my hypothesis is....

❏ Reference my scientific explanation and transferred this to my references section at the end

❏ My prediction is / is not testable. I know this because ….

**Method & Materials: Design** a safe, *logical* and *complete* method

❏ There are some / no risks in this investigation because...

❏ I will **stay safe** by ...

❏ I will **keep others safe** by ...

❏ I need to use these **materials** and **equipment** in my investigation...

❏ I need to **carry out these steps** in my investigation...

❏ I will repeat my method ... times

❏ This is a photo / diagram of my investigation

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.

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.

Commonly-confused words. Make sure ***you*** use them correctly.

## Facts

are *simple truths* that we use when we describe the universe. Often we can measure them.

A **scientific problem** is a **question** that we are trying to solve by making a **hypothesis** and **testing** it with an **experiment**.

## Hypothesis

is a *testable prediction* that we make, with a logical *reason*.

# Criterion B: Inquiring & Designing

1. explain a problem or question to be tested by a scientific investigation
2. formulate a testable hypothesis and explain it using scientific reasoning
3. explain how to manipulate the variables, and explain how data will be collected
4. design scientific investigations

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| --- | --- | --- |
| **Achievement Level** | **Level Descriptor** | **Clarifications** |
| **0** | The student does not reach a standard described by any of the descriptors below. | The student does not reach a standard described by any of the descriptors below. |
| **1–2** | The student is able to;1. **state** a problem or question to be tested by a scientific investigation
2. **outline** a testable hypothesis
3. **outline** the variables
4. **design** a method, **with limited success.**

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 | * I attempted to **state** a research question with some variables
* I attempted to **state** a hhypothesis.
* I attempted to write a method

  |
| **3–4** | 1. **outline** a problem or question to be tested by a scientific investigation
2. **formulate** a testable hypothesis **using scientific reasoning**
3. **outline** how to manipulate the variables, and **outline** how **relevant data** will be collected
4. design a **safe method** in which he or she **selects materials and equipment**.
 | * I **outlined** a problem or question to be tested that contained the IDV and DV
* I **formulated** a hypothesis that contains the IDV and DV with a simple explanation
* I **outlined** how to manipulate the IDV; collect the DV; how to control the CV’s
* I have **outlined** a method which collects multiple sets of data points for the identified variables
* I have **designed** a method that is safe and contains the equipment used
 |
| **5–6** | 1. **describe** a problem or question to be tested by a scientific investigation
2. **formulate and explain** a testable hypothesis **using scientific reasoning**
3. **describe** how to manipulate the variables, and **describe** how **sufficient, relevant data** will be collected
4. design a **complete and safe method** in which he or she selects **appropriate materials and equipment**

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 | * I clearly **describe** a focused problem or research question that contains the IDV and DV
* I have **formulated**  a hypothesis that contains the IDV and DV and **explained** it scientifically with some errors
* I have **described** how to manipulate the IDV (4 data points); collect the DV (including units and measuring equipment); how to control the CV’s
* I have **described** how to collect the multiple sets of the data
* I have **designed** a detailed method which collects data for at least 4 data points, that is safe, and contains the equipment (amounts and sizes) used.
 |
| **7-8** | 1. **explain** a problem or question to be tested b y a scientific investigation
2. **formulate and explain** a testable hypothesis **using correct scientific reasoning**
3. **explain** how to manipulate the variables, and **explain** how **sufficient, relevant data** will be collected
4. **design** a **logical, complete and safe method** in which he or she **selects appropriate materials and equipment**
 | * I clearly **explained** a focused problem or research question that contains the IDV and DV and **explained** why it’s important
* I have **formulated** a hypothesis that contains a IDV and DV and clearly **explained** it scientifically
* I have **explained** how to manipulate the IDV (5 data points); collect the DV (including units and measuring equipment); why and how to control the CV’s
* I have **explained** how to collect the multiple sets of the data
* I have **designed** a detailed method which collects data from at least make the best use of available equipment and repeated measurement of at least 5 data points
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# Self Reflection Rubric

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| --- | --- | --- | --- | --- |
| ***B*** | ***i.*** *explain a problem or question to be tested by a scientific**investigation* | ***ii****. formulate a testable hypothesis and explain it using**scientific reasoning* | ***iii****. explain how to manipulate the variables, and explain how data**will be collected* | ***iv****. design scientific investigations* |
| **1-2** | I have stated a **problem** as a research question that connects with our topic. | My **hypothesis** is testable. | I have given brief details on the**variables**. | I have a **procedure** written down for my lab. |
| **3-4** | 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 includes my **variables**. | 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.I have selected the **materials** I will need. |
| **5-6** | 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 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 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 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 given a detailed account of a **problem** I want to investigate using scientific facts and sources, 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 given a detailed account of 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. |