

Name: \_\_\_\_\_

## Scientific Investigation - \_\_\_\_\_

[Click here to use these resources to complete all parts of the summative](#)

### Experimental Question:

- Was a question clearly written? (i.e. Does the type of surface affect the amount of energy lost in a pendulum system)
- Did the question include a dependent and independent variable? (underlined)
- ALL COMPONENTS WERE INCLUDED**

### Purpose:

State, outline, or describe the purpose of the experiment. Why do this experiment? How does this experiment connect with what you have learned about the topic (atoms, energy, waves, etc)? How could knowing the answer to the question be helpful or important to people?

- the purpose needs to be clearly stated
- the purpose needs to be referenced the dependent variable in the experimental question (i.e. to understand how "energy is lost in a pendulum system.")
- the science behind the experiment needs to be explained?
- The relevant science vocabulary words, definitions and/or laws need to be included and explained (ie. We learned in science that energy is not really lost, it is transformed into un-useful energy. According to the law of conservation of energy, energy cannot be created or destroyed, only transformed.)
- a specific real world EXAMPLE needs to be included and explained?
- ALL COMPONENTS WERE INCLUDED**

### Variables:

**Independent (Manipulated) Variable:**

**Dependent (Responding) Variable:**

- the independent variable needs to be revised and correctly identified
- the dependent variable (what is measured) needs to be revised and correctly identified
- ALL COMPONENTS WERE INCLUDED** (independent variable and dependent variable)

**Method of Measurement (MoM):** Identify the **1. Equipment used to measure**, the **2. Process** (steps to ensure accuracy of measurement), and **3. units** used to measure the dependent variable. Explain the method of measuring & collecting data.

- ONLY** the Scientific tool to measure **DEPENDENT VARIABLE** needs to be identified
- the Steps to accurately use the scientific tool need to be revised  
Revise by: \_\_\_\_\_
- add how to calibrate the scientific tool
- add the units of measurement (or the units need to be more clearly stated)
- ALL COMPONENTS WERE INCLUDED** (scientific tool, steps to use scientific tool accurately, units)

### Controls:

**Positive Control and its expected outcome**

**Negative Control and its expected outcome**

- the positive control needs to be revised and correctly identified
- The expected outcome for the positive control needs to be added
- the Negative control needs to be revised and correctly identified
- The expected outcome for the positive control needs to be added
- ALL COMPONENTS INCLUDED** (positive and negative control and expected outcome for both)

**Hypothesis:** Write your experimental hypothesis and explain your thinking for your hypotheses using scientific reasoning. Use additional paper if needed.

- Hypothesis is not written or not written in complete sentences
- The science behind the hypothesis needs to be explained?
- The relevant science vocabulary words, definitions and/or laws need to be included and explained (ie. because I learned in science that when a pendulum swings and experiences friction, \_\_\_\_ is transformed into \_\_\_\_ energy and is therefore “lost” to the system. So when we add friction by changing the surface of the pendulum.....)
- a personal EXAMPLE needs to be included
- ALL COMPONENTS WERE INCLUDED (clear hypothesis, science behind the experiment was explained, science vocabulary, definitions, laws included, a personal example was included)

## Method

### List Materials and Amounts

- Materials in the investigation were not all included and some need to be added
- Amounts of all materials are not listed and should be added (even if you only need one of the item)
- ALL COMPONENTS WERE INCLUDED (materials and amounts of each)

### Method of Experiment (MoE)

#### Procedures

- The steps for the conducting the experiment were not complete or not included
  - Did not include “Gather materials”
  - Did not explain \_\_\_\_\_
  - Did not explain how or where to line the meter stick up
  - Did not explain how to calibrate the meter stick (where the zero end goes)
  - Did not include how to Measure the dependent variable (This can be as simple as saying “follow the M.o.M”.)
  - 7. Repeat for \_\_\_\_ trials
- The steps for the conducting the positive control were not complete or not included  
Example: Follow steps 1-7 except use \_\_\_\_ surface material.
- The steps for the conducting the negative control were not complete or not included  
Example: Follow steps 1-7 except use \_\_\_\_ surface material.
- ALL COMPONENTS WERE INCLUDED (experimental set up, positive control set up and negative control set up.)

#### How will you ensure the *reliability* of the data?

- Did not discuss comparing data to controls
- Did not discuss having multiple trials
- Did not discuss calibration of equipment
- ALL COMPONENTS WERE INCLUDED

#### Safety Actions

##### How could we get hurt (Hazards)?

- Did not discuss or need to revise how people can get hurt in the lab
- More than one safety hazard was identified clearly.

##### How can we keep from getting hurt?

- Did not include how (ACTIONS) to take in lab to avoid people can get hurt in the lab
- More than one safety Action was identified clearly.

## Experiment Feedback and Assessment

<b>Name of Experiment:</b>	
<b>Name:</b>	
<b>Partner Names:</b>	
<b>Peer Reviewer Name</b>	

### Instructions

- Place one (1) check mark for each strand (i. ii. iii. iv. v.) in the box describing the level of work for that strand.
- Place the number representing the 'best fit' grade for the overall work.

Criterion B - Inquiring and Designing			
Level	Peer	Self	Level Description
<b>0</b>			The student does not reach a standard identified by any of the descriptions below.
<b>1-2</b>			The student is able to:
			i. <b>state</b> a problem or question to be tested by a scientific investigation, with limited success
	peer:		ii. <b>state</b> a testable hypothesis
	self:		iii. <b>state</b> the variables
			iv. design a <b>method, with limited success.</b>
<b>3-4</b>			The student is able to:
			i. <b>state</b> a problem or question to be tested by a scientific investigation
	peer:		ii. <b>outline</b> a testable hypothesis <b>using scientific reasoning</b>
	self:		iii. <b>outline</b> how to manipulate the variables, and <b>outline</b> how <b>relevant data</b> will be collected
			iv. design a <b>safe method</b> in which he or she <b>selects materials and equipment.</b>
<b>5-6</b>			The student is able to:
			i. <b>outline</b> a problem or question to be tested by a scientific investigation
	peer:		ii. <b>outline and explain</b> a testable hypothesis <b>using scientific reasoning</b>
	self:		iii. <b>outline</b> how to manipulate the variables, and <b>outline</b> how <b>sufficient, relevant data</b> will be collected
			iv. design a <b>complete and safe method</b> in which he or she selects <b>appropriate material and equipment.</b>
<b>7-8</b>			The student is able to:
			i. <b>describe</b> a problem or question to be tested by a scientific investigation
	peer:		ii. <b>outline and explain</b> a testable hypothesis <b>using correct scientific reasoning</b>
	self:		iii. <b>describe</b> how to manipulate the variables, and <b>describe</b> how <b>sufficient, relevant data</b> will be collected
			iv. design a <b>logical, complete and safe method</b> in which he or she <b>selects appropriate material and equipment.</b>

**Glossary:**

**State** - Name it

**Outline** - Give a brief account or bullet point

**Describe** - Give a detailed account or picture of a situation, event, pattern or process. Paint a mental picture

**Explain** - Give a detailed account. Paint a mental picture and give specific examples or nonexamples

**Extensions** – What questions does this experiment raise? What other research or experiments could be done to answer those questions.

**Formulate** – Create or develop from your prior knowledge or from research.

**Improvements** – What could have made the method more valid? Were there errors in the way the experiment was designed, or done? Were there things missing? What does this experiment still not show because it was not tested? These are all considered limitations of the experiment.

**Interpret** – Explain how the data supports or does not support the hypothesis, claim, or question. What do the results tell us?

**Manipulate** – Set-up, organize, change, handle, control

**Sufficient** – Enough data to be sure or be confident in your results.

**Relevant** – Directly related to the question being tested. Does the data collected give information about the question being asked?

**Testable** – Is it possible to design an experiment to test the experimental question and your hypotheses?

**Transform** – Show your data in different ways. Tables, graphs, charts, etc.

**Validity** – How well does hypothesis or method match the results of the experiment? Do the results support the hypothesis or not? Did the experiment do a good job of measuring the dependent variable, why or why not?