

**Heading:**

Name  
Period  
Role

Date  
Learning Group

**Title:** (5 points) Must be in the proper format:

“The Effect of The (insert the independent variable here) on The (insert the dependent variable here)”

**Key Question:** (5 points) What is the main question that will be answered by conducting this experiment?

**Background:** (15 points) Research your topic: what do you already know, what experience do you have, what does the literature say about this topic? Write a minimum of 2-3 paragraphs, which provide important information, definitions, and explanations **that will help you to create a hypothesis**. Include an illustration, diagram, or concept map that visually represents this information. List the specific sources used (title, copyright, pages, url).

**Independent Variable:** (5 points) Identify the variable you will manipulate or change.

**Dependent Variable:** (5 points) Identify the variable you will be measuring, or is responding to, or affected by, the changes made to the independent variable.

**Hypothesis:** (5 points) Write a prediction, based on your knowledge and research, of how the dependent variable will react to changes in the independent variable. In other words what do you think will be the results of your experiment? Use the following format:

“If the (insert the independent variable here) is (insert how the independent variable will be changed: increased, decreased, changed from \_\_\_\_\_ to \_\_\_\_\_), then the (insert the dependent variable here) will (insert how the dependent variable will react or change).”

**Experimental Design:** (5 points) This is a concise overview of how the experiment is designed. Use the box format shown below:

<b>Independent Variable:</b>	(Insert the independent variable here) (units)			
<b>Levels:</b>				
<b>Number of Trials:</b>				

(Levels are the values of the independent variable, 1 column for each time you change the independent variable. Trials are the number of times you will repeat the experiment for each level.)

**Constants:** Identify the variables (i.e. materials, aspects, actions) that you will keep the same in each level and trial. Be specific including units of measure.

**Control:** Which of the levels would be considered the “normal state” or a standard against which the others will be compared? Not all experiments have controls; if you believe there is none, write “none” do not leave this blank.

**Materials:** (5 points) List the materials to be used, be specific, list quantities, size and description.

**Procedure:** (5 points) Write a detailed and precise procedure that includes the sequence of steps with sufficient detail that another experimenter could duplicate your experiment without asking any questions. A labeled illustration is sometimes helpful.

**Safety Concerns:** List any safety precautions necessary for this lab and sign your name below them. This means you agree to abide by them.

**Qualitative and Quantitative Data Collection:** (10 points) Create a table to record your experimental data. Qualitative data describes the characteristics or traits (how something looks, feels, smells, etc), while quantitative data is expressed as a number (length, temperature, mass, velocity, etc) with a unit of measure.

(Insert independent variable) (units)	(Insert dependent variable) (Units)				
	Trial 1	Trial 2	Trial 3	Mean	Range
Insert Level 1					
Insert Level 2					
Insert Level 3					
Insert Level 4					
Insert Level 5					

For some experiments you may add columns for additional observations or other calculations. Mean is also known as “average”. Add each trail value in a row and divide by the number of trails. Range is calculated by subtracting the lowest value in a row from the highest value in that row. (Higher ranges may sometimes indicate experimental errors.)

Pictures and drawings are good to show how an experiment was set-up or for qualitative observations.

**Results Graph:** (15 points) Design and draw a graph showing your data. Graphs are to be done on graph paper if done by hand. You may use graphing software to create your graphs. Select the proper type of graph, usually a bar or line graph, to best represent your data. A line graph shows continuous change between points or over time. A bar graph is used to display separate and distinct observations. Make your graph large enough to easily and accurately read your plot points. Select an appropriate interval or scale (for

example: 1 square = .5cm) for each axis. This interval must remain constant across the entire axis. Include axis labels, units, graph title, and key. Graph titles are typically worded as: Independent Variable Vs the Dependent Variable.

Remember DRY MIX:

Dependent, Responding variable goes on the Y-axis.

Manipulated, Independent variable goes on the X-axis.

**Conclusions and Analysis:** (20 points) Follow the bullet points below. Write in complete sentences. Use a technical writing format; be clear and precise, not wordy and creative.

- Topic sentence: “The (insert title) are summarized in the data tables and graphs above”
- Write a couple of sentences summarizing your data. You’ll want to compare the mean and range of the different levels. “Our data showed a steady decrease in speed as we increased the weight. The mean value for level one (76.3 cm/sec) exceeded that of level two (61.5 cm/sec). Variations within the levels were similar with ranges of 6.2 and 6.6 cm/sec respectively. This gives us greater confidence that we can compare the results across levels.”
- State whether your hypothesis was **supported by the data or not supported**. “My hypothesis was...”(state your hypothesis and whether the experiment supported your hypothesis or not). “The experiment did/did not support my hypothesis”. (Cite results to illustrate) Never state that your hypothesis was proven true or false.
- What anomalies (unexpected results) did you observe and how you explain them. “One anomaly we noticed was that trail 2 data fell well outside our expected range. This might be explained by an incorrect calibration of the equipment.”
- If someone were to do the lab again what would you suggest they do to improve the reliability of their results? Identify your sources of error. “If this experiment was repeated I would suggest changing... This would result in...”
- How has your thinking about this topic changed during this investigation? What have you learned?
- What recommendations do you have for further study on this topic?