HPS Scientific Processes Packet 2022 Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Per \_\_\_\_\_

OBJECTIVE: Explain the nature of science including key components of the scientific method. (7)

BACKGROUND INFO: Evidence is used to develop theories, generalize data to form laws, and propose hypotheses. Evidence is often gathered through some sort of controlled experiment.

Define the terms and answer the questions.

**Theory** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* Can theories change? \_\_\_\_\_\_\_\_\_\_\_\_
* List examples from science \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Law** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* Can laws change? \_\_\_\_\_\_\_\_\_
* List examples from science \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Identifying Variables

A science experiment has three kinds of variables.

* **Independent variable (IV):** Factor the scientist changes in an experiment on purpose.
* **Dependent variable (DV**): What is being measured in an experiment. (changes because of Independent variable)
* **Controlled variable (CV):** Factor that remains constant in an experiment (what you keep the same, often there are many of these in each experiment)

DIRECTIONS: Identify the three variables in the following scenarios.

1. How does the amount of fertilizer used affect the height of a bean plant?
2. The independent variable is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. The dependent variable is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. The controlled variable(s) is/are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
5. Think about it….How could they change this experiment for next time?
6. How does the pullback distance of a rubber band affect the travel distance of a paper ball?
7. The independent variable is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
8. The dependent variable is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
9. The controlled variable(s) is/are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
10. Think about it….How could they change this experiment for next time?

What is something YOU could test? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. The independent variable is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. The dependent variable is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. The controlled variable(s) is/are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Data Tables Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Background Information: A group of scientists wanted to see how the amount of fertilizer affects the height of the plant. These scientists understand the importance of multiple trials to get the best results. Fill in the missing information and the data on the table. Then average the trials.

* 2.0 grams of fertilizer → plant height: 8.00 cm, 7.00 cm, 9.00 cm
* 4.0 grams of fertilizer → plant height: 12.00 cm, 10.00 cm, 11.00 cm
* 6.0 grams of fertilizer → plant height: 17.00 cm, 16.00 cm, 15.00 cm

|  |  |
| --- | --- |
|   |  |
|  | Trial 1 | Trial 2 | Trial 3 | Average |
| 2.00 |  |  |  |  |
| 4.00 |  |  |  |  |
| 6.00 |  |  |  |  |

Answer the following questions:

1. The independent variable is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. The dependent variable is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. What happened to the average plant height as scientists increased the amount of fertilizer? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. **Raw Data** = the measurements you record. **Processed data** = “messed with by math” Label the raw data (there are several!) and the processed data.
5. Once we have processed our data, we make a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to show other people.
6. Can you make your own data table below? You may use Google Sheets to create and screenshot below. Be sure to format correctly. *See my Unit 1 Power Point for details.*

Graphs Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Background Information: A group of scientists wanted to see how the amount of fertilizer affects the height of the plant. These scientists understand the importance of multiple trials to get the best results. The table of their data is below.

|  |  |
| --- | --- |
|   | Plant Height (± .05 cm) |
| Amount of fertilizer (± .05g) | Trial 1 | Trial 2 | Trial 3 | Average |
| 2.00 | 8.00 | 9.00 | 7.00 | 8.00 |
| 4.00 | 12.00 | 10.00 | 11.00 | 11.00 |
| 6.00 | 17.00 | 16.00 | 15.00 | 16.00 |

GRAPHING NOTES

**Axis Labels**: The label on the x-axis (horizontal or side-to-side) is the name of the independent variable. The label on the y-axis (vertical or up and down) is the name of the dependent variable. The dependent variable is graphed on the y-axis, because it “stands on” or “depends on” the independent variable.

**Title:** The format for the title of a graph is: “Dependent variable name vs. Independent variable name.”

**Data:** Only graph the “processed” data or averages. Do NOT graph all 3 trials.

**Best fit line:** This is a line that best represents the relationship between the variables. The line may pass through some of the points, none of the points, or all of the points.

**Directions:** Make a graph using the table above. (PREFERRED: Go to the Google Store and download “Graphical Analysis” onto your Chromebook to create your graph.) Be sure to format correctly. *See my Unit 1 Power Point for details.*

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Practice Lab Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. QUESTION: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
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2. Independent Variable \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. Dependent Variable \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. Controlled Variables \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
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5. RESEARCH:

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1. HYPOTHESIS:

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1. TEST YOUR HYPOTHESIS:
2. MATERIALS:

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1. METHODS:

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1. DATA TABLE: (CREATE AND ATTACH)

1. ANALYZE DATA:
2. PROCESS RAW DATA (SHOW WORK BELOW)
3. CREATE GRAPH (CREATE AND ATTACH)
4. BASED ON YOUR GRAPH, WHAT IS THE RELATIONSHIP BETWEEN THE VARIABLES?
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5. REPORT YOUR RESULTS:
6. DESCRIBE WHAT YOUR DATA SHOWED AS YOU ANSWER YOUR QUESTION.
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1. WHAT CHALLENGES DID YOU FACE IN THE LAB?
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1. HOW CAN YOU IMPROVE YOUR LAB?
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1. HOW COULD YOU FURTHER YOUR INVESTIGATION?

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