Planning and Conducting a Scientific Investigation

Scientific Investigations Include

1. A Testable Question
2. A Hypothesis
3. A Procedure that will test and measure specific variables
4. A List of Materials
5. Results in the form of Measurable Data
6. A Discussion and Analysis
7. A Summary & Conclusion

Scientific Question Guidelines

A scientific question asks How or What and should be answerable with only one experiment.

For example: How does the growth of organic carrots and potatoes differ from the growth of conventional carrots and potatoes under the same conditions?

Scientific Question

(Type Your Question Here

Hypothesis Guidelines

A Hypothesis should answer the question Why. It should begin with *I hypothesize that*… *because*….. it should offer a simple explanation.

Here is an example: I hypothesize that if organic carrots and potatoes are planted under the same conditions as conventional carrots and potatoes, then the organic carrot and potatoes will grow faster because any residual pesticides in conventional plants will inhibit their growth.

Hypothesis

(Type your hypothesis here)

Identifying Variables Guidelines

Independent Variable	Dependent Variable	Constants	Control
The variable that you change in an experiment on purpose.	The variable that is measured to see how it was influenced by the independent variable, the results of your experiment.	All the variables in an experiment that remain the same so that the only variable that changes is the independent variable.	A trial(s) where all the variables are held constant. A control is used as the standard of comparison for your experiment, your baseline data.

Variables	Relationships (Independent, Dependent, Control or Constants)
Organic Seeds	**Independent**
Amount of Plant Growth	**Dependent**
Conventional Seeds	**Control**
Temperature	**Constant**
Amount of sunlight	**Constant**
Type of Soil	**Constant**
Amount of Soil	**Constant**

Variables

Variable	Relationships (Independent, Dependent, Control, or Constant)

Procedure Guidelines

- Carefully plan out each step of your procedure.
- Write each step as clearly as you can. Be sure to accurately identify variables, clearly describe the experiment set up,and how you will make and record measurements, etc.
- Write the directions in chronological order so that anyone your age or older should be able to follow these directions without your help.
- Keep in mind that things may go wrong as you start running your trials and you will likely have to modify your procedure as you go. This is all a part of the scientific method.

Materials Guidelines

- The purpose of the material list is to make sure you can get or already have everything you need to do your experiment.

Material	Number Needed	Where I will get this	Cost

Example Procedure

1. Cut 1/2 inch off the top of all 10 carrots.
2. Slice 1/4 inch piece of all 10 potatoes, making sure to include an “eye”.
3. Place each vegetable piece in its own jar, along with 1/8 cup of water.
4. Place jars along a counter or window sill.
5. Measure green growth over the next three weeks.
6. Add water when levels get below marked line on jar.

Example Materials

- 5 Organic carrots
- 5 Organic potatoes
- 5 Non-organic carrots
- 5 Non-organic potatoes
- Knife
- Water
- 20 Glass jars
- Marker
- Ruler
- camera

Procedure

1.

Materials

-

Collecting Data

Set up tables to collect data from your experiment. Be as detailed as possible and be sure to include units of measure.

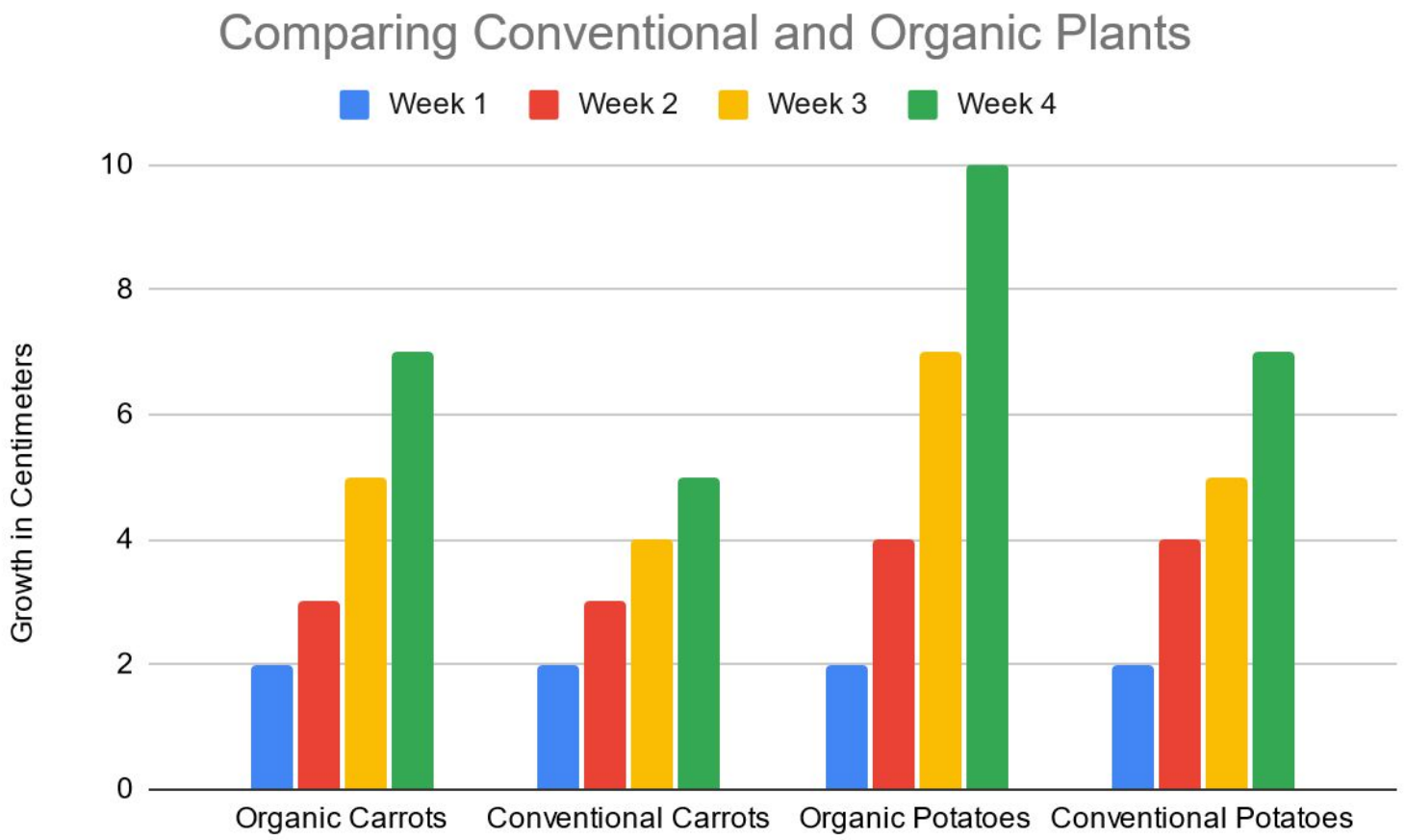
Height (cm)

Plant Type

	wk 1	wk 2	wk 3	wk 4
Conventional Carrots				
Conventional Potatoes				
Organic Carrots				
Organic Potatoes				

Graphs

You may want to represent data as a graph to your final presentation!



Visuals

As you conduct your experiment and collect data, be sure to take pictures to include with your final presentation! Include

- **Examples of experiment set up**
- **Examples of data collection**
- **Special equipment or materials**
- **Unique results**

Background Research

What background research do you need to learn more about your subject? Consider reading newspaper or magazine articles, research journals, videos, personal observations, respected websites etc.

Summarize your research with a short paragraph or infographic.

1. Write a one sentence summary for each of your subtopic paragraphs from the background research.
2. Create an infographic to visually summarize your background research.

Background

Results Guidelines

Write your results by describing what you noticed in your data.

- State and describe exactly what patterns you see in your graphs.
- talk about what happened in simple terms. Do not try to explain why things happened the way they did.
- Mention what trends did you see in your data?
- Consider your average measurements?
- Were there any outliers (odd measurements way different than the others)?

Results

Discussion Directions

Write your discussion to summarize your results and offer possible explanations. Mention what you noticed about the results. Were the results expected and confirm your hypothesis, or were they unexpected and different from your hypothesis? Suggest possible explanations for your results. Confirm if your hypothesis was correct or incorrect. Mention other questions that arise as a result of your experiment. Mention things you would change or do different in the future.

Discussion

Conclusion Guidelines

Your conclusion is pretty short. Explain the question that you were trying to answer.

- What was the question you were trying to answer?
- Was your hypothesis correct
- What data confirms ot refutes your hypothesis or answers your question.

Example: My hypothesis stated that WarHeads candy would remove the most egg shell color. I accept my hypothesis. Through visual observation, there was a significant change in the WarHead solution on the egg shell color. The Sweet Tart solution's effect was less. The Jolly Rancher egg shell color had the least amount of color loss.

Below are starters for your first two sentences.

My hypothesis stated that _____ (fill in the blank).I accept/refute (choose one, erase the other) my hypothesis.

Conclusion

Acknowledgements and Works Cited

ACKNOWLEDGEMENTS: List the names of the people who helped you with your project. (i.e. teachers, peers, parents, etc.).

WORKS CITED: notes the resources from your background research

Acknowledgements

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Works Cited

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Question &
Hypothesis

Procedure Materials

Background

Title

Graphs

Visuals

Visuals

Title

Data Table(s)

Visuals

Visuals

Results

Conclusion

Discussion

Acknowledgments
and Works Cited
(MLA)