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

**Scientific Method Notes**

**I. Question**

**-**  Define a problem

Good science questions are:

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

4. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**II. Background Information /Research**

* Write out any information you need to share with the reader so that they can \_\_\_\_\_\_\_\_\_\_\_ what your experiment is about!
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to see if others have done your experiment, what were their \_\_\_\_\_\_\_\_\_\_\_\_? Gives you a better idea what to \_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**III. Hypothesis**

* What is going to be \_\_\_\_\_\_\_\_\_\_\_\_\_\_ by the experiment
* \_\_\_\_\_\_\_\_\_\_\_\_\_ on your \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ what you \_\_\_\_\_\_\_\_\_\_\_\_\_ will happen
* Should include what you’re going to \_\_\_\_\_\_\_\_\_ and what will \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ if you do (If… then….)

**Hypothesis Practice**

If the question is…

* What causes people’s toenails to grow faster?

A good hypothesis would be…

* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

If the question is…

* Does music affect a person’s heart rate?

A good hypothesis would be…

* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Your turn…

If the question is…

* Do pill bugs prefer moist or dry environments?

A good hypothesis would be….
 - \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**IV. Experimental Procedure**

* This is the step by step \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of exactly how to carry out the experiment
	+ 1…. 2… 3… and so on
* Should be detailed enough to be
	+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Multiple Trials (\_\_\_\_\_\_\_\_\_\_\_ the experiment)
	+ The more \_\_\_\_\_\_\_\_\_\_\_ you have the more \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ your conclusion will be
	+ Want to have the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ sample size/data collection possible

**V. Data**

- Organized \_\_\_\_\_\_\_\_\_\_\_\_\_ and/or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of the information you gathered
- Display appropriate \_\_\_\_\_\_\_\_\_\_\_

**VI. Conclusion**

* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ your hypothesis
* \_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_ (nullify), or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ BASED ON \_\_\_\_\_\_\_\_\_\_\_\_
* Include a discussion of \_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Discusses the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of the experiment

**What does it mean to nullify a hypothesis?**

* Your results \_\_\_\_\_\_\_\_\_\_ support your \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* DO NOT
	+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_ your \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to match your data
	+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_ your \_\_\_\_\_\_\_\_\_\_\_\_ to match your hypothesis
	+ Toss out your experiment as a \_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Variables:**

Independent (Experimental) Variable: part of the experiment that the scientist \_\_\_\_\_\_\_\_\_\_\_\_\_, ONLY \_\_\_\_\_\_\_\_\_ PER EXPERIMENT

* The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ group is the part of the experiment where you are testing something new out
* Why only one independent variable?

Dependent Variable: the part of the experiment that changes because of the independent variable, part that is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Control Group: done \_\_\_\_\_\_\_\_\_\_\_\_ the independent \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, something to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to

**Laws and Theories**

Scientific Law: a descriptive \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ or equation that reliably \_\_\_\_\_\_\_\_\_\_\_\_\_ events under \_\_\_\_\_\_\_\_\_\_\_\_\_ conditions helps us make predictions (ex. Universal law of gravity)

Scientific Theories: explains why things work, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ by a large amount of evidence (\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_) and investigations (\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_)
 \*\*Always being questioned and examined (ex. Theory of evolution)

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

**Scientific Method Notes**

**I. Question**

**-**  Define a problem

Good science questions are:

1. Testable

2. Measureable

3. Observable

4. Repeatable

**II. Background Information /Research**

* Write out any information you need to share with the reader so that they can understand what your experiment is about!
* Research to see if others have done your experiment, what were their results? Gives you a better idea what to expect.

**III. Hypothesis**

* What is going to be tested by the experiment
* Based on your research what to predict will happen
* Should include what you’re going to change and what will happen if you do (If… then….)

**Hypothesis Practice**

If the question is…

* What causes people’s toenails to grow faster?

A good hypothesis would be…

* An increase of vitamin A causes toenails to grow longer

If the question is…

* Does music affect a person’s heart rate?

A good hypothesis would be…

* When exposed to music with a rapid tempo, their heart rate will increase

Your turn…

If the question is…

* Do pill bugs prefer moist or dry environments?

A good hypothesis would be….

**IV. Experimental Procedure**

* This is the step by step description of exactly how to carry out the experiment
	+ 1…. 2… 3… and so on
* Should be detailed enough to be
	+ Repeatable
	+ Done safely
	+ Easy to adjust if something goes wrong
* Multiple Trials (repeat the experiment)
	+ The more data you have the more reliable your conclusion will be
	+ Want to have the largest sample size/data collection possible

**V. Data**

- Organized chart and/or graph of the information you gathered

- Display appropriate units

**VI. Conclusion**

* Restate your hypothesis
* Accept, reject (nullify), or inconclusive BASED ON DATA
* Include a discussion of data
* Discusses the validity of the experiment

**What does it mean to nullify a hypothesis?**

* Your results don’t support your hypothesis
* DO NOT
	+ Change your hypothesis to match your data
	+ Change your data to match your hypothesis
	+ Toss out your experiment as a failure

**Variables:**

Independent (Experimental) Variable: part of the experiment that the scientist changes, ONLY ONE PER EXPERIMEN T

* The experimental group is the part of the experiment where you are testing something new out
* Why only one independent variable?

Dependent Variable: the part of the experiment that changes because of the independent variable, part that is measured

Control Group: done without the independent variable, something to compare to

**Laws and Theories**

Scientific Law: a descriptive statement or equation that reliably predicts events under certain conditions helps us make predictions (ex. Universal law of gravity)

Scientific Theories: explains why things work, supported by a large amount of evidence (observations) and investigations (experiments)
 \*\*Always being questioned and examined (ex. Theory of evolution)