

# Science Toolkit of Graphic Organizers



**With Lin Kuzmich**

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*is about...*

[Empty rounded rectangular box]

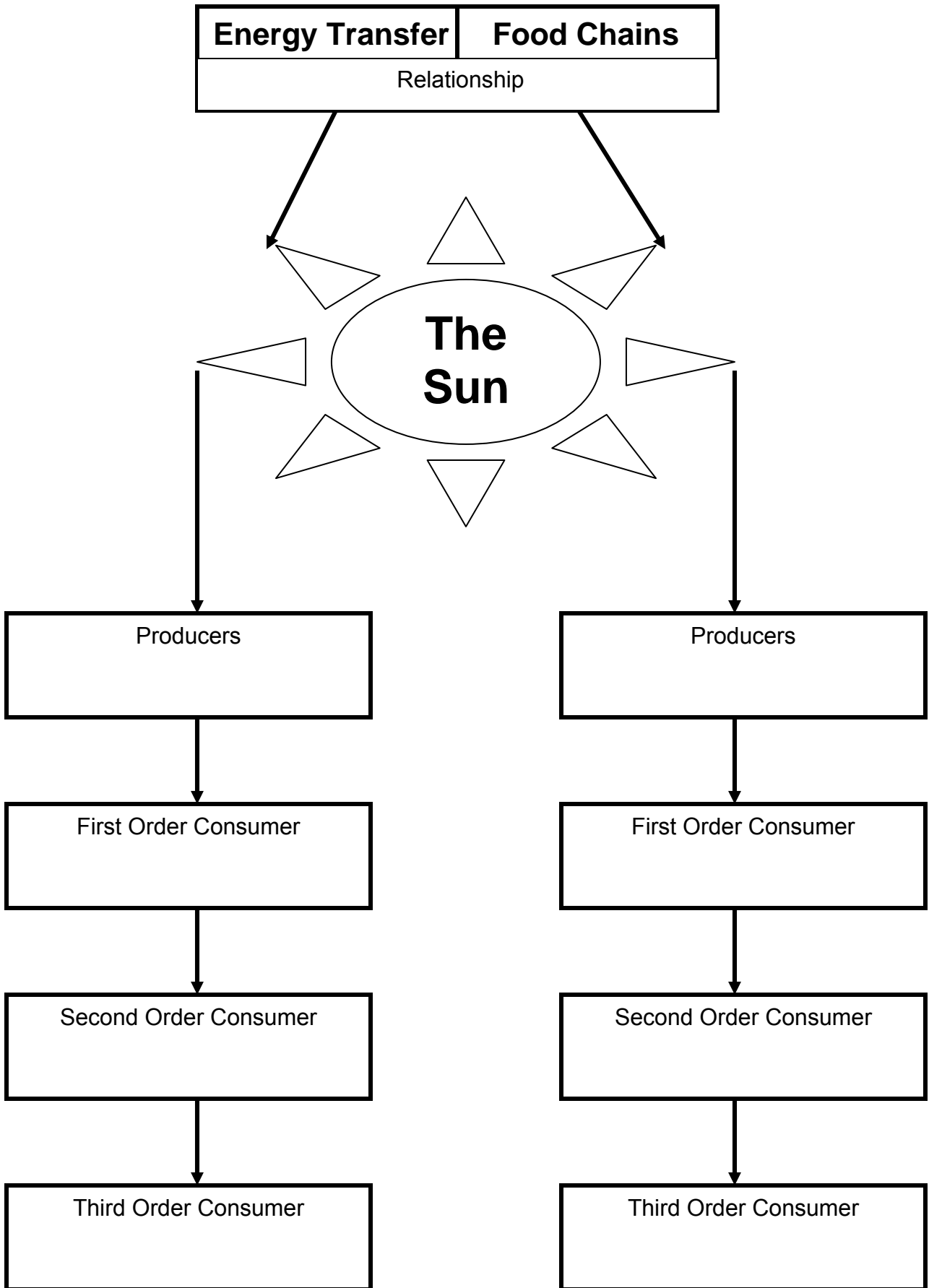
[Large empty rounded rectangular box]

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[Empty rounded rectangular box with a smaller rounded rectangular box on top]

[Empty rounded rectangular box with a smaller rounded rectangular box on top]

Important things to remember...



# Transfer of Energy

*is about ...*

Order

Main Idea

Details

1	Sun
---	-----

2	Producer
---	----------

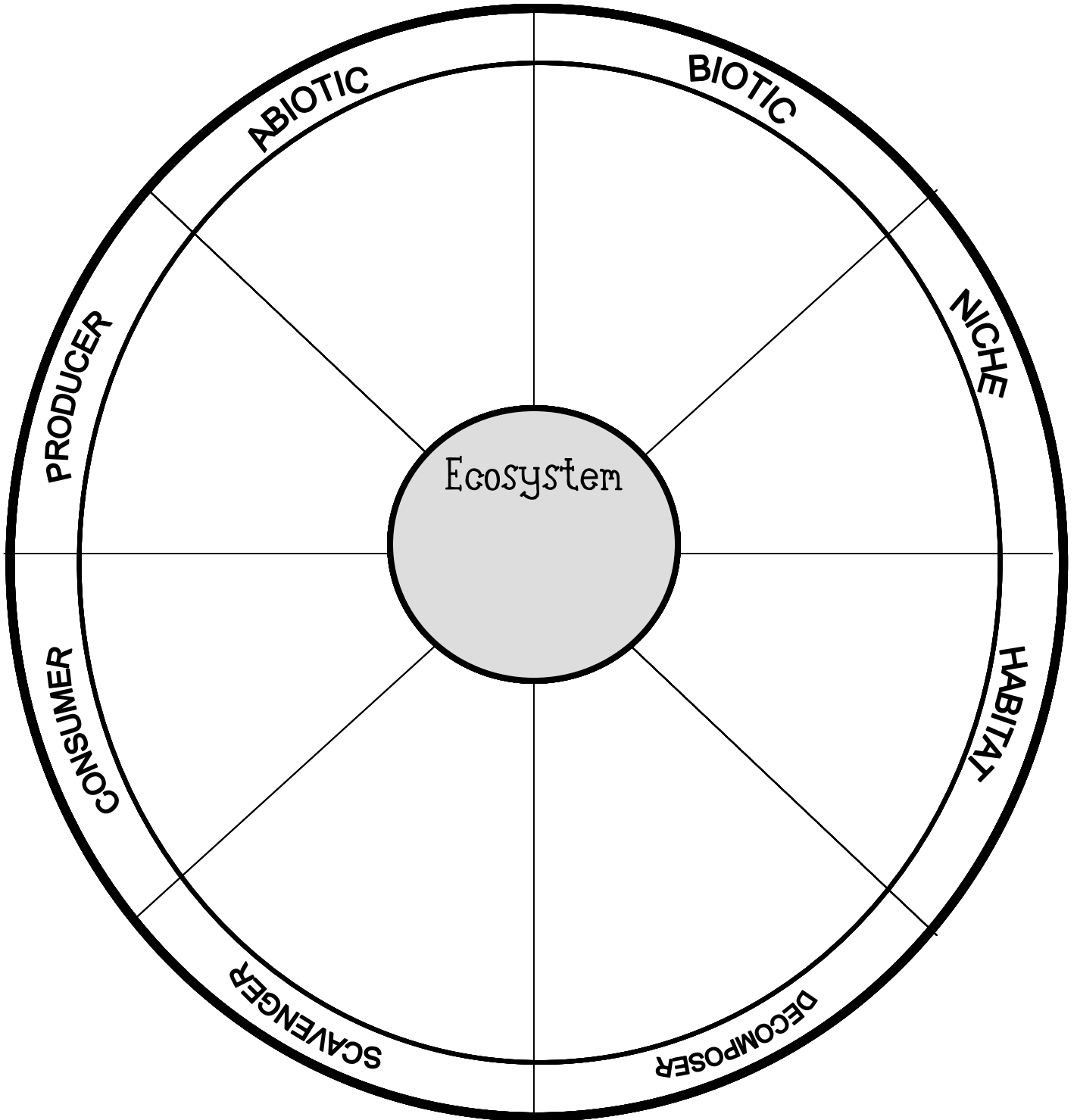
3	First Order Consumer
---	----------------------

4	Second Order Consumer
---	-----------------------

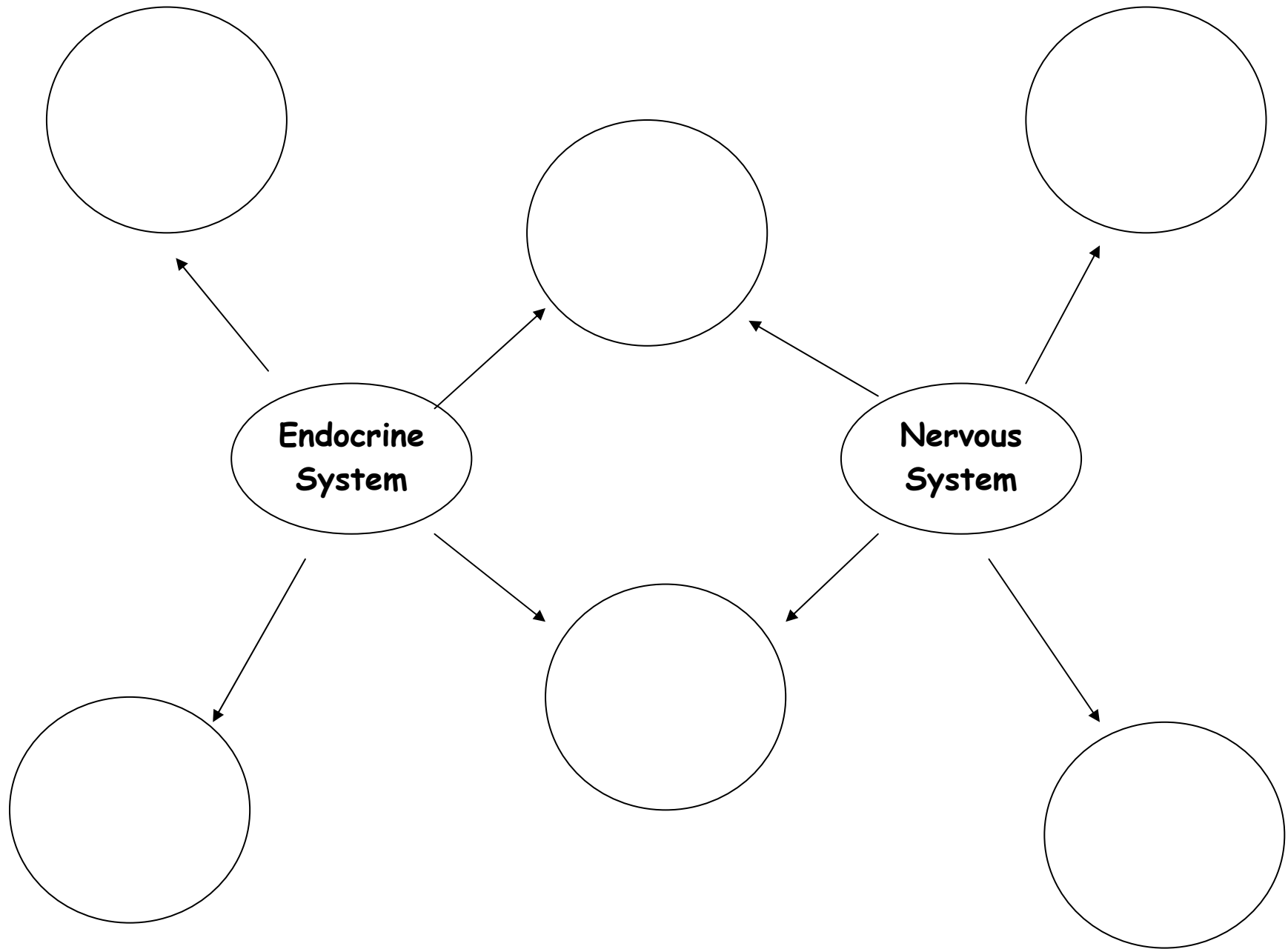
It is important to understand the transfer of energy because...

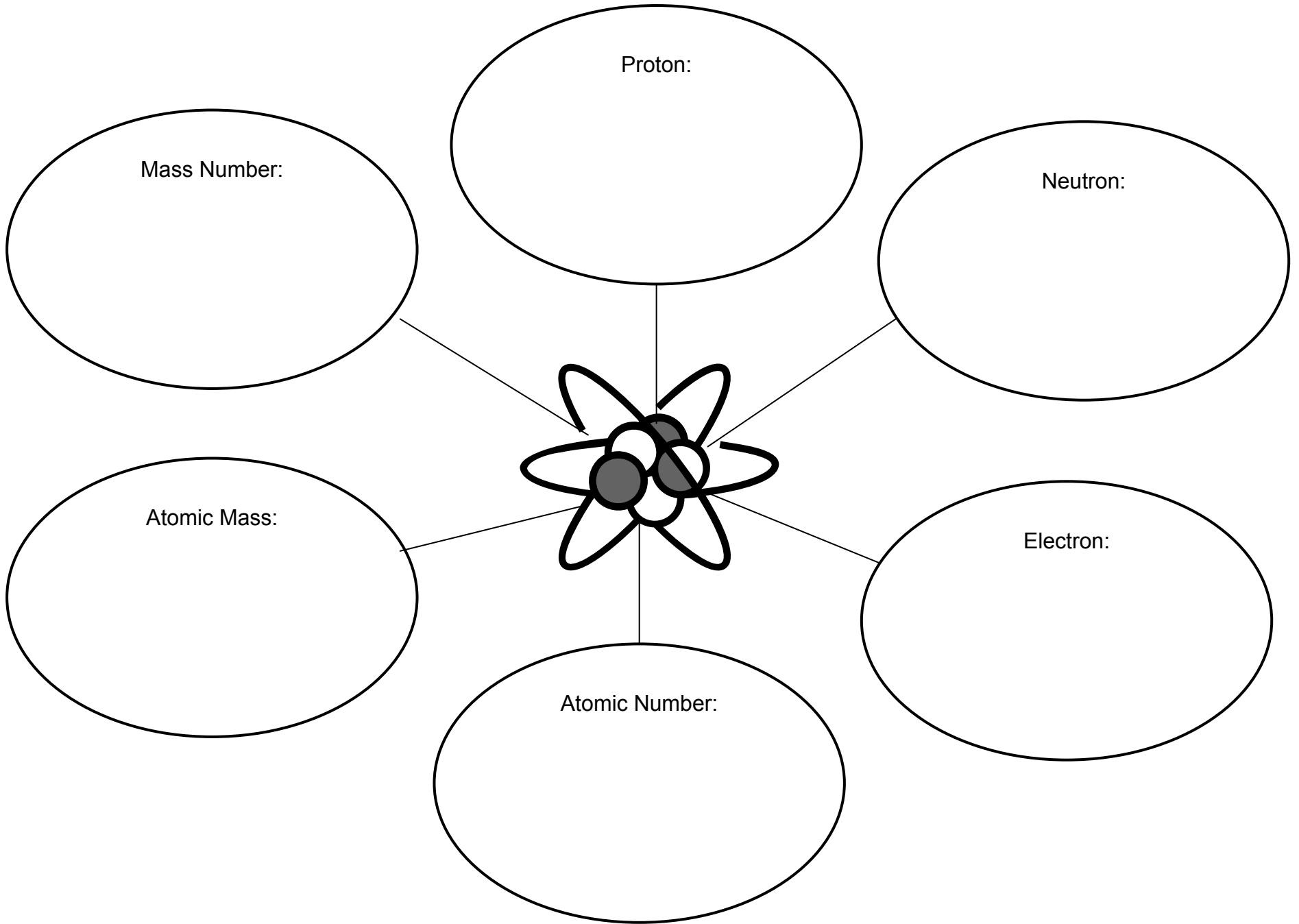


Name \_\_\_\_\_



Name \_\_\_\_\_





# VOCABULARY

New Word	Definition
Speed	
Picture	Reminds Me Of ...

New Word	Definition
Average Speed	
Picture	Reminds Me Of ...

New Word	Definition
Instantaneous Speed	
Picture	Reminds Me Of ...

New Word	Definition
velocity	
Picture	Reminds Me Of ...



# VOCABULARY

New Word <i>Orbit</i>	Definition
Picture	Reminds Me Of ...

New Word <i>Revolution</i>	Definition
Picture	Reminds Me Of ...

New Word <i>Rotation</i>	Definition
Picture	Reminds Me Of ...

New Word <i>Tilt</i>	Definition
Picture	Reminds Me Of ...

# VOCABULARY

New Word	Definition
<i>Experimental</i>	
Picture	Reminds Me Of ...

New Word	Definition
<i>Descriptive</i>	
Picture	Reminds Me Of ...

New Word	Definition
<i>Qualitative</i>	
Picture	Reminds Me Of ...

New Word	Definition
<i>Quantitative</i>	
Picture	Reminds Me Of ...

# VOCABULARY

New Word	Definition
Picture	Reminds Me Of ...

New Word	Definition
Picture	Reminds Me Of ...

New Word	Definition
Picture	Reminds Me Of ...

New Word	Definition
Picture	Reminds Me Of ...

# VOCABULARY

New Word	Definition
Population	
Picture	Reminds Me Of ...

New Word	Definition
Community	
Picture	Reminds Me Of ...

New Word	Definition
Limiting Factor	
Picture	Reminds Me Of ...

New Word	Definition
carrying capacity	
Picture	Reminds Me Of ...

# Experimental Research

*is about...*

Independent /  
Manipulated  
Variables

Dependent /  
Responding  
Variables

Controlled  
Variables

Important things to remember...

# Energy Transfer in the Atmosphere

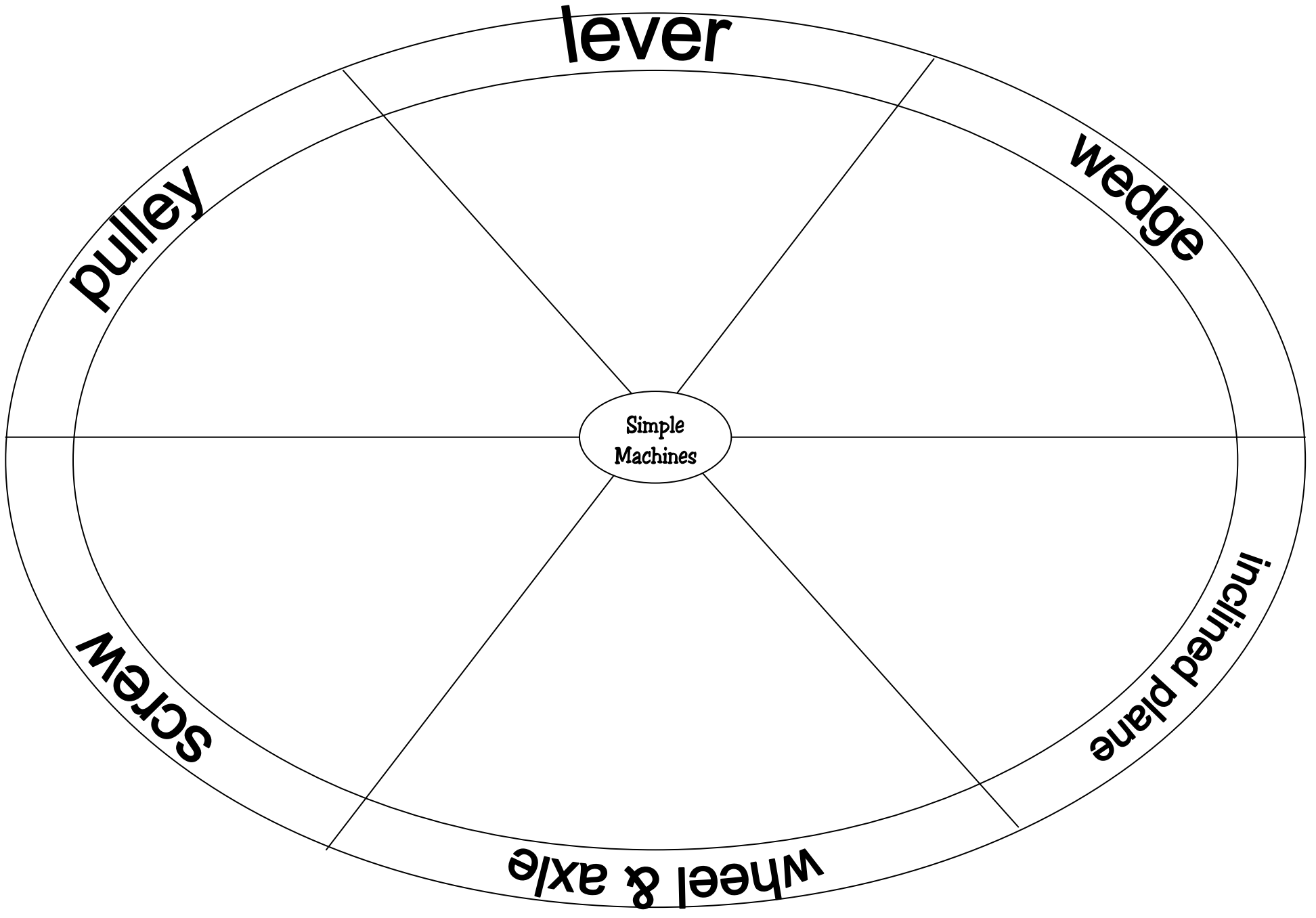
*is about...*

## Radiation

## Convection

## Conduction

Important things to remember...



Describing Motion: Newton's Laws

1<sup>st</sup> Law of Motion  
Law of Inertia

Blank writing area with horizontal dashed lines for notes.

2<sup>nd</sup> Law of Motion  
Law of Acceleration

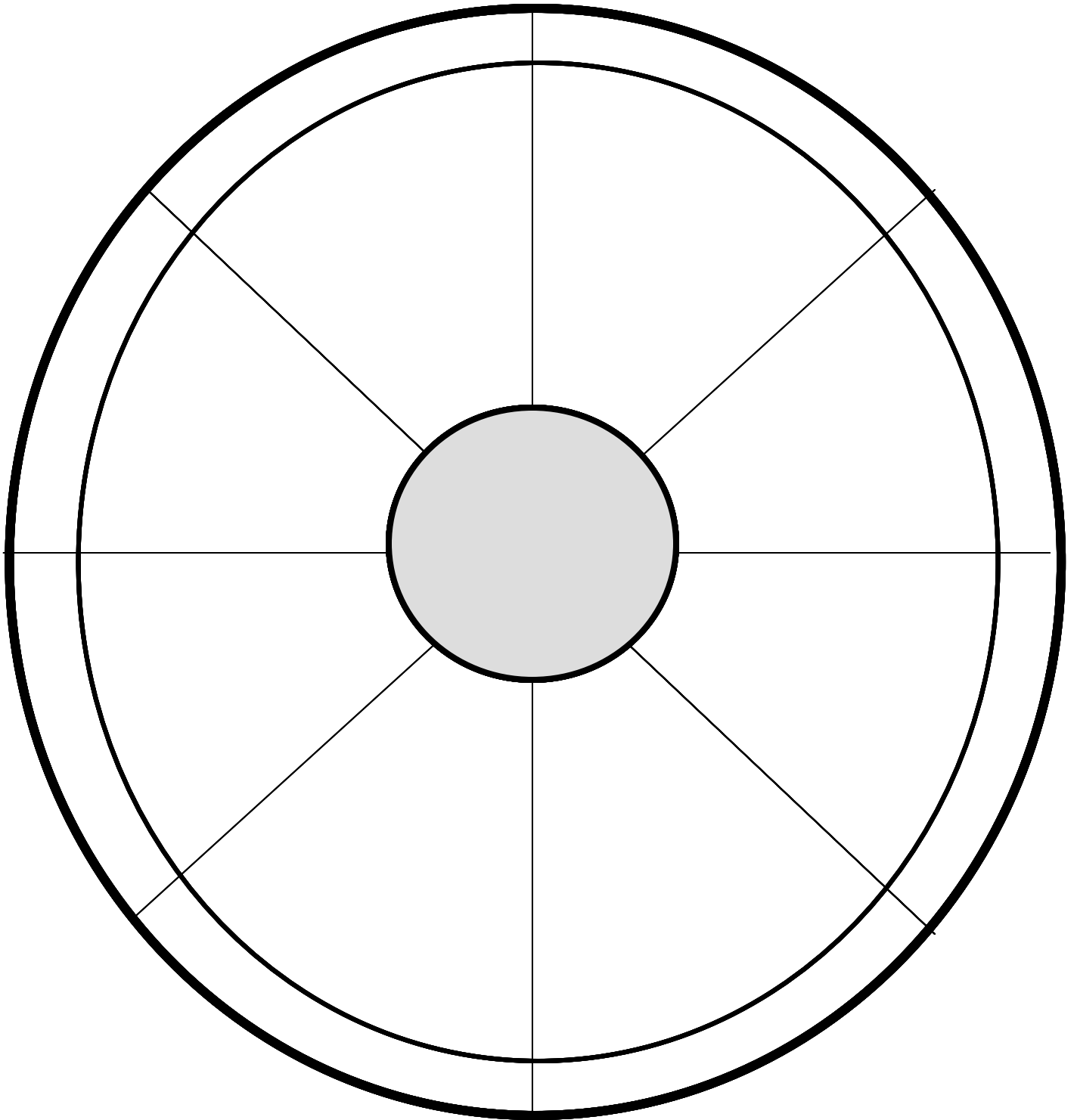
Blank writing area with horizontal dashed lines for notes.

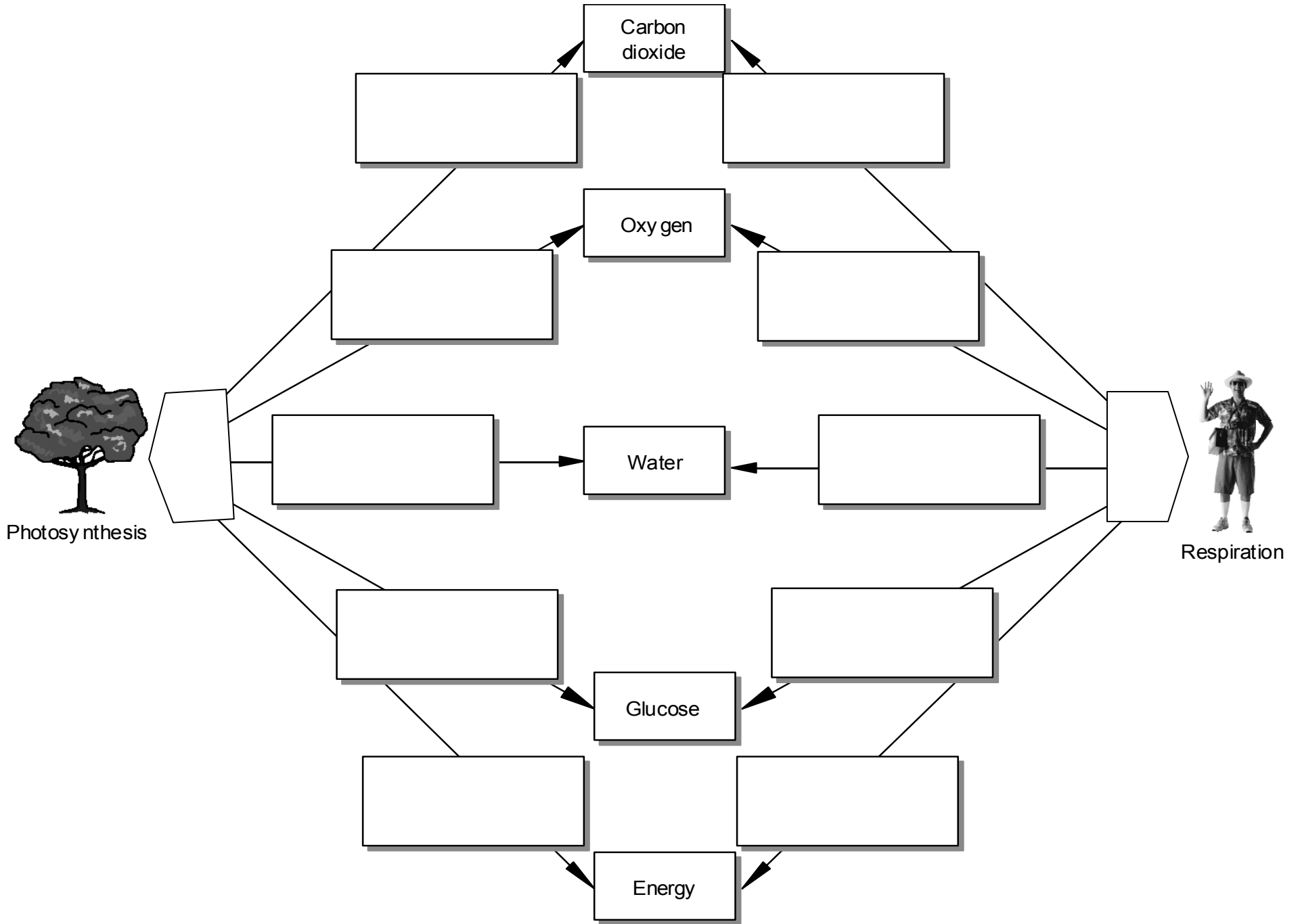
3<sup>rd</sup> Law of Motion  
Law of Action - Reaction

Blank writing area with horizontal dashed lines for notes.



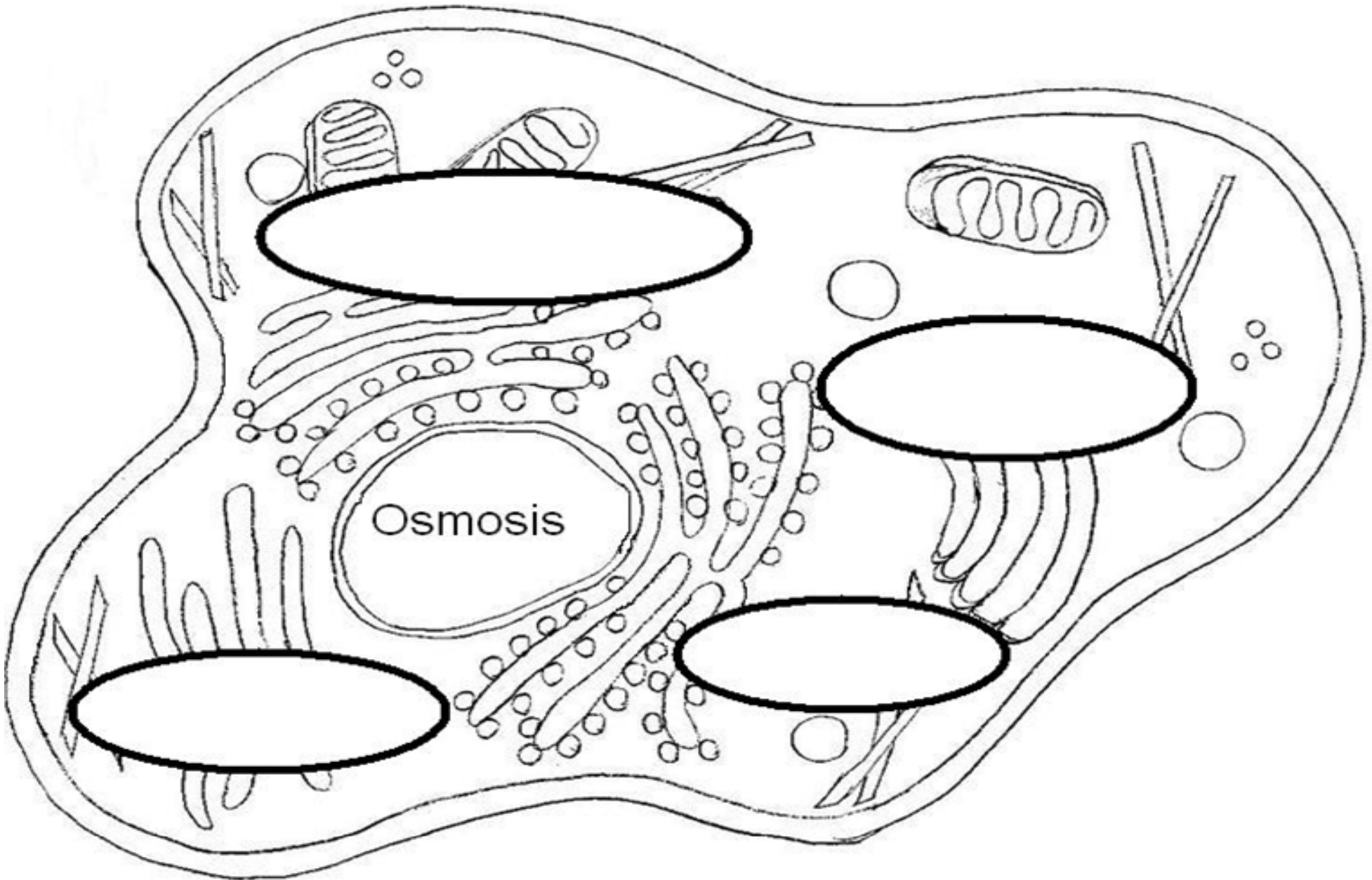
Name .....





Name \_\_\_\_\_

Write 4 phrases describing osmosis in the blank circles.



[Empty rounded rectangular box]

*is about ...*

[Large empty rounded rectangular box for notes]

Order

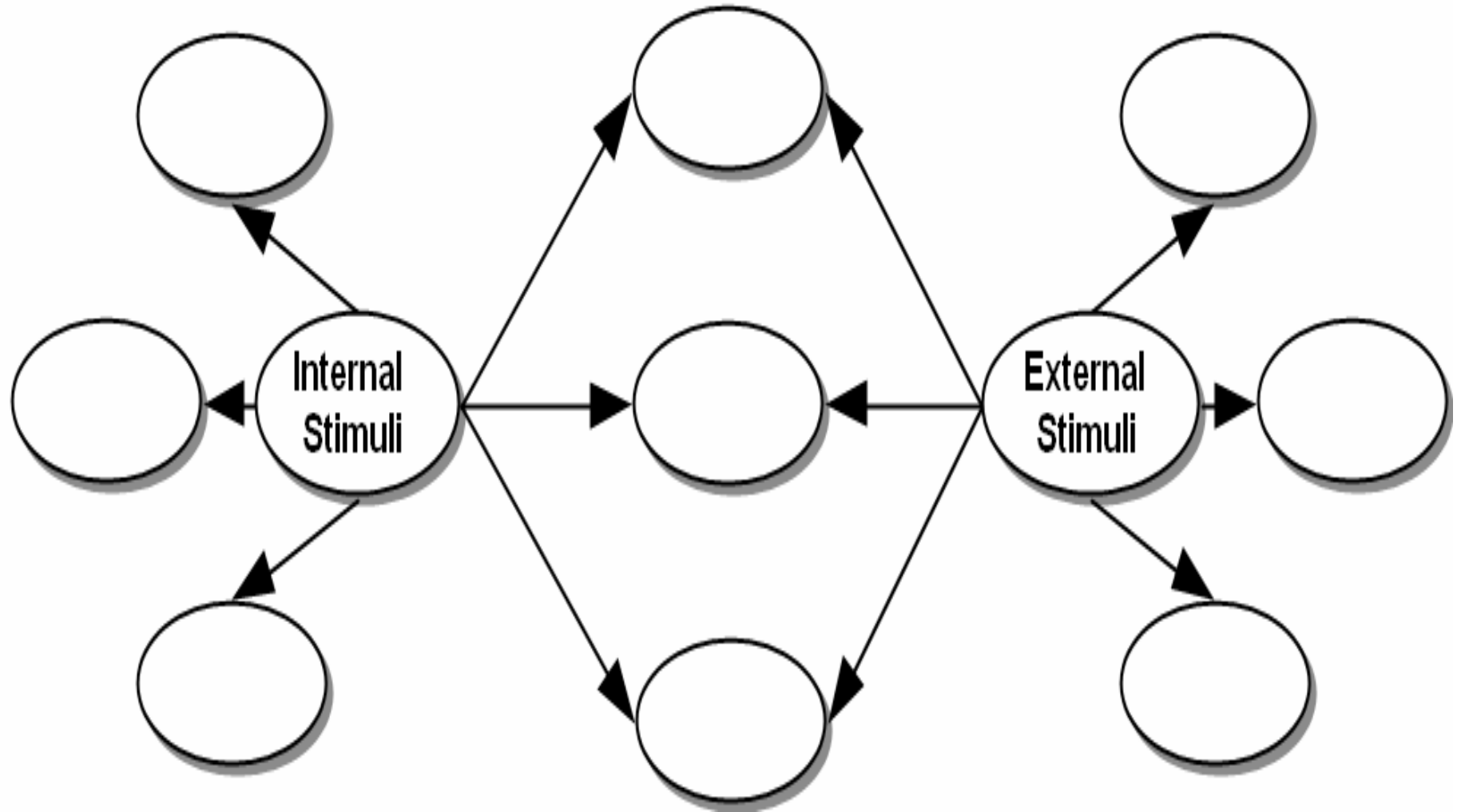
Main Idea

Details

Order	Main Idea	Details
1	[Empty box]	[Empty box]
2	[Empty box]	[Empty box]
3	[Empty box]	[Empty box]
4	[Empty box]	[Empty box]

**It is important to understand this concept because...**

Name \_\_\_\_\_



Name

Date

Directions: Pick a scientific phenomenon. Describe it and write words that are best associated with it. Describe characterizes and give real life examples.

Scientific Topic or Area: \_\_\_\_\_

Describe a scientific phenomenon:

What is it like and what are the characteristics or rules associated with the phenomenon:

Science words associated with this process and meanings.

Picture or Diagram of phenomenon:

Real World Examples of this Phenomena or the Importance of the Phenomena:

Your study tips for remembering this information:

## Understanding Scientific Phenomena

Define a Scientific Phenomenon and <u>Key Vocabulary</u>	Attributes, Characteristics or Rules	Real World Example
<p>Example:  <b>Avogadro's law</b>            (sometimes referred to as <b>Avogadro's hypothesis</b> or <b>Avogadro's principle</b>) is a gas law named after Amedeo Avogadro who, in 1811,<sup>[1]</sup> hypothesized that two given samples of an <u>ideal gas</u>, at the same <u>temperature, pressure and volume</u>, contain the same number of <u>molecules</u>. Thus, the number of molecules or atoms in a <u>specific volume of gas</u> is independent of their size or the <u>molar mass</u> of the gas.            Vocabulary underlined.</p>	<p>Avogadro's law is stated mathematically as:</p> $\frac{V}{n} = k$ <p>Where:</p> <p><math>V</math> is the volume of the gas.  <math>n</math> is the amount of substance of the gas.  <math>k</math> is a proportionality constant.</p> <p>The most significant consequence of Avogadro's law is that the ideal gas constant has the same value for all gases. This means that:</p> $\frac{p_1 \cdot V_1}{T_1 \cdot n_1} = \frac{p_2 \cdot V_2}{T_2 \cdot n_2} = \text{constant}$ <p>Where:</p> <p><math>p</math> is the pressure of the gas  <math>T</math> is the temperature in Kelvin of the gas</p> <p>Or another mathematical way: <math>pV = nRT</math></p>	<p>As an example, equal volumes of molecular hydrogen and nitrogen contain the same number of molecules when they are at the same temperature and pressure, and observe ideal gas behavior. In practice, real gases show small deviations from the ideal behavior and the law holds only approximately, but the law is still a useful approximation for scientists.</p> <p><b>Real World:</b> Pumping the tires in your car or bike is an example of the law as the air molecules increase the volume increases.</p>

Select a phenomenon from the list that you think will have the most significance in your lifetime. Why will it have this impact? On what basis did you infer this and what are your multiple sources to justify your point of view?

Name \_\_\_\_\_

Date \_\_\_\_\_

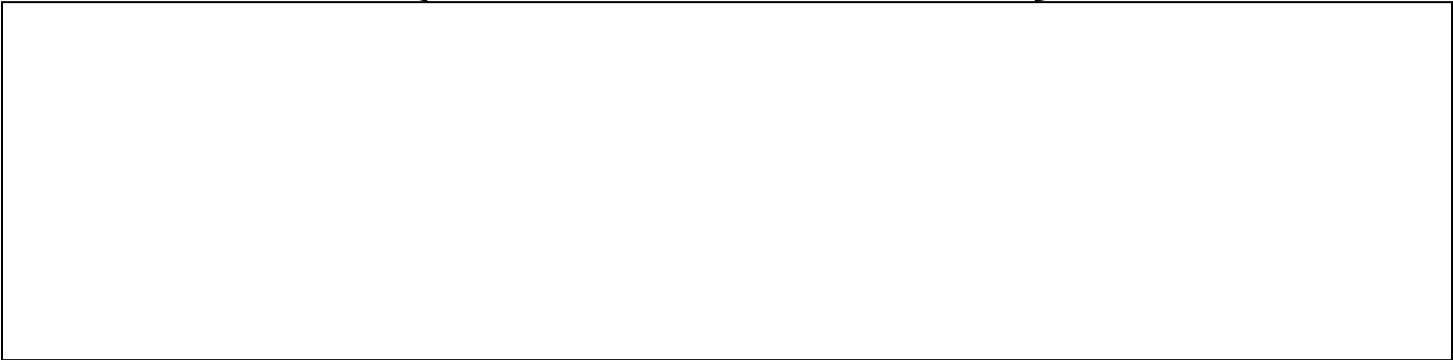
Directions: Use this compare and contrast organizer to explore characteristics of two concept related to a given Topic.

Science Topic: \_\_\_\_\_

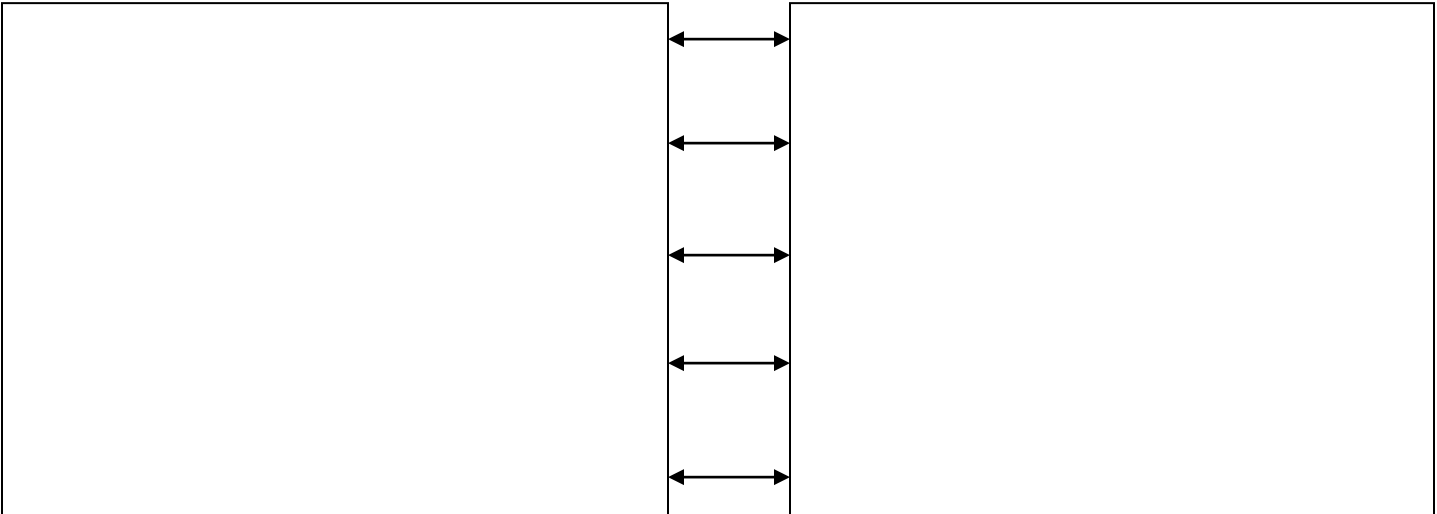
Concept 1:

Concept 2:

How are they alike?



How are they different?



How do these similarities and differences impact our upcoming experiment? Or - Create a hypothesis to test during lab based on this compare and contrast organizer.



Title: \_\_\_\_\_ Name: \_\_\_\_\_  
Date: \_\_\_\_\_ Lab Partners: \_\_\_\_\_

Purpose: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Materials: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Procedure: \_\_\_\_\_  
\_\_\_\_\_  
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Data: \_\_\_\_\_  
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Results: \_\_\_\_\_  
\_\_\_\_\_  
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\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Conclusions: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

References: \_\_\_\_\_  
\_\_\_\_\_

## Science Lab Write Up

Downloaded: <http://donnayoung.org/apologia/labhow-cr.htm> Nov. 2011

Scientists know that lab reports are a very important part of every experiment. The purpose of an experiment is to answer a question by testing a hypothesis. During an experiment you may collect a lot of information, or data. But that data is not very useful unless it is organized. The purpose of a lab report is *to organize and communicate* what you did in your experiment. A good lab report explains exactly what you have done. It can be used to repeat the experiment or to test other hypotheses in new experiments.

### Lab Report Form

(Name) \_\_\_\_\_ (Date) \_\_\_\_\_

Title: \_\_\_\_\_ (the name of the lab or experiment)

#### 1. Purpose/Problem:

The purpose or problem states the reason(s) why you are doing the experiment. Write down exactly the problem that will be investigated or experimented. Purposes can be stated as a question.

#### 2. Introduction/Research:

In a few words tell what you already know or have found about the problem that will let you make an educated guess. This is your background information from the text, teacher, or other sources. It gives the reader an understanding of underlying principles and content information of the laboratory.

#### 3. Introduction/Research:

What do you expect to find? The hypothesis can be stated as an "If..., then..." statement. The 'If' part of the statement is based on related facts that you know to be true. The 'then' part of the statement is an **educated guess** on the outcome of the experiment. The hypothesis does not have to guess the correct outcome, but the experiment must be set up to test the hypothesis.

#### 4. Materials/Supplies:

This is a list of all equipment and chemicals used to do the experiment. Please include quantities (amounts).

#### 5. Procedure:

The procedure tells exactly what you did. Make statements in the **past tense**. Be specific. The procedure you use affects the results. So, it is important to be accurate in explaining what you did. The procedure is written in paragraph form.

#### 6. Observations and Data:

The observations tell exactly what happened when you did the lab. *An observation is measurable information that comes to you through your senses.* Results include experimental (raw) data in the form of well-labeled tables, graphs, drawings and other observations. Place your observations and data in this section without discussion or comment. This is where you include any calculations made during the experiment. Answer any questions here.

#### 7. Conclusion/Summary:

Conclusions explain your observations and describe how your data relates to the problem. It is written in paragraph/essay form and should include why you did this experiment (restate the purpose/problem). You should explain in your own words what you found out or discovered. Your conclusion should state whether or not the data confirms or rejects your hypothesis. Discuss any errors as well as any patterns you see. Part of the conclusion may be a new hypothesis based on your findings and suggestions for testing the new hypothesis in a different experiment. You may also make any predictions you would expect based on what you discovered.

## Sample Report

Tyler Fleegenshneeze August 11, 2001

Title: Making a Seismograph

Purpose: How does the magnitude of vibrations affect the amplitude of a seismograph?

Hypothesis: An increase in the magnitude of vibrations will result in an increase in amplitude of the seismograph.

Materials: clamp, metal bar, piece of string, rubber bands (2), table, pencil, two people

Procedure: I laced a piece of paper directly beneath the pen and the clamp stand. One person slowly moved the paper past the pen, as the other hit the end of the table. The first trial represented a medium magnitude movement. The second trial was the soft movement, and the third was the hardest, or the most forceful magnitude. While looking at each individual seismograph, the greatest magnitude was observed and identified. Measuring the distance from the top and bottom of the spike represented the amplitude. The data from each seismograph was recorded in the table on the following page.

Magnitude	Amplitude	Observations
Medium #1	>1.3 cm.	a little jagged, the dots are the darkest of all the trials, the pen a little wild
Softest (#2)	>.5 cm.	the smoothest line, more dots and dots are closer together, the pen was not out of control
Hardest (#3)	2 cm.	the most jagged, doesn't really have a certain path, the least amount of dots, pen way out of control

Conclusion: **This lab investigated** how the magnitude of vibrations affects the amplitude of a seismograph. **In order to study the problem we** created three magnitudes of movement and measured the amplitude of each with a seismograph. **My results showed** the trial with the greatest amplitude was trial three because the table was being hit with the most force, making the table and the pen move more than the other three trials. The trial with the least amplitude was trial two because the table was hit with the least amount of pressure. While observing the experiment, I noticed that the more vibrations or higher magnitude resulted in a higher amplitude on the seismograph. The harder the table was being hit, the higher the amplitude rose. **This proves my hypothesis was** correct.

I believe the results are accurate **because** while the experiment was in progress, the frame moved at the same rate as the table. It was proven in trials one through three that the increased magnitude of table movement caused the greatest amplitude differences on the seismograph. It is clear, therefore, that the movement of the frame also corresponds to the amplitude of the seismograph. The bar and marker shared the same relationship with the table and the frame. The more the frame moved, the greater the amplitude on the seismograph.

In order to further investigate this problem, next time I would try the experiment on a different surface and would add additional movements of varying forces for further readings on the seismograph.

## Lab Report Form

(Name)\_\_\_\_\_ (Date) \_\_\_\_\_

Title:

Purpose/Problem:

Introduction:

Hypothesis:

Materials/Supplies:

Procedure:

Observations and Data:

Conclusion/Summary:

This lab (experiment) investigated \_\_\_\_\_. In order to study the problem we \_\_\_\_\_. My results showed \_\_\_\_\_, thus proving my hypothesis was \_\_\_\_\_. I believe the results are (accurate/inaccurate) because \_\_\_\_\_. In order to further investigate this problem, next time I would \_\_\_\_\_.

### Additional Tips

- Do draw a picture of the experiment, if appropriate.
- Don't say that the purpose was accomplished and then say nothing substantially more. You must include data from the lab results to demonstrate that the purpose was accomplished.
- Don't give the procedure again.
- Don't list the data again. It was already listed in the data (chart, table, etc.). You are to discuss and draw conclusions from the data.
- Don't forget to break up your ideas with more than one paragraph, if necessary. (This is referred to as an essay!)



## Lab Report Rubric

Criteria	1	2	3	4	5
<b>Purpose</b>	<ul style="list-style-type: none"> <li>• Purpose is not identified</li> <li>• Relevant variables are not described</li> </ul>	<ul style="list-style-type: none"> <li>• Purpose is somewhat vague</li> <li>• Relevant variables are not described</li> </ul>	<ul style="list-style-type: none"> <li>• Purpose is identified</li> <li>• Relevant variables are described in somewhat unclear manner</li> </ul>	<ul style="list-style-type: none"> <li>• Purpose is identified</li> <li>• Relevant variables are described</li> </ul>	<ul style="list-style-type: none"> <li>• Purpose is clearly identified</li> <li>• Relevant variables are described</li> </ul>
<b>Hypothesis (optional)</b>	<ul style="list-style-type: none"> <li>• Predicted results and hypothesized relationship between variables not stated</li> </ul>	<ul style="list-style-type: none"> <li>• Predicted results and hypothesized relationship between variables are unclear</li> </ul>	<ul style="list-style-type: none"> <li>• Predicted results and hypothesized relationship between variables stated and appear reasonable</li> </ul>	<ul style="list-style-type: none"> <li>• Predicted results and hypothesized relationship between variables stated</li> </ul>	<ul style="list-style-type: none"> <li>• Predicted results and hypothesized relationship between variables clearly stated and reasonable</li> </ul>
<b>Materials (optional)</b>	<ul style="list-style-type: none"> <li>• There is not a list of the necessary lab materials</li> </ul>	<ul style="list-style-type: none"> <li>• Most lab materials included</li> </ul>	<ul style="list-style-type: none"> <li>• All necessary lab materials included but not listed in any particular order</li> </ul>	<ul style="list-style-type: none"> <li>• All necessary lab materials included and listed</li> </ul>	<ul style="list-style-type: none"> <li>• All necessary lab materials included and listed in an organized manner</li> </ul>
<b>Procedure (optional)</b>	<ul style="list-style-type: none"> <li>• Procedures are not listed</li> </ul>	<ul style="list-style-type: none"> <li>• Procedures are listed but not in clear steps</li> </ul>	<ul style="list-style-type: none"> <li>• Procedures are listed in clear steps but not numbered and/or in complete sentences</li> </ul>	<ul style="list-style-type: none"> <li>• Procedures are listed in clear steps</li> <li>• Each step is numbered and in a complete sentence</li> </ul>	<ul style="list-style-type: none"> <li>• Procedures are listed in clear steps</li> <li>• Each step is numbered and in a complete sentence</li> <li>• Diagrams are included to describe the set-up</li> </ul>
<b>Data</b>	<ul style="list-style-type: none"> <li>• Data is not represented or is not accurate</li> </ul>	<ul style="list-style-type: none"> <li>• Data lacks precision</li> <li>• Greater than 20% difference with accepted values</li> </ul>	<ul style="list-style-type: none"> <li>• Good representation of the data using tables and/or graphs</li> <li>• Less than 15% difference with accepted values</li> <li>• Precision is acceptable</li> </ul>	<ul style="list-style-type: none"> <li>• Accurate representation of the data using tables and/or graphs</li> <li>• Data is fairly precise</li> <li>• Less than 10% difference with accepted values</li> </ul>	<ul style="list-style-type: none"> <li>• Accurate representation of the data using tables and/or graphs</li> <li>• Graphs and tables are labeled and titled</li> <li>• Less than 5% difference with accepted values</li> <li>• Data is precise</li> </ul>
<b>Analysis</b>	<ul style="list-style-type: none"> <li>• Trends/patterns are not analyzed</li> <li>• Questions are not answered</li> <li>• Analysis is not relevant</li> </ul>	<ul style="list-style-type: none"> <li>• Trends/patterns are not analyzed</li> <li>• Answers to questions are incomplete</li> <li>• Analysis is inconsistent</li> </ul>	<ul style="list-style-type: none"> <li>• Trends/patterns are logically analyzed for the most part</li> <li>• Questions are answered in complete sentences</li> <li>• Analysis is general</li> </ul>	<ul style="list-style-type: none"> <li>• Trends/patterns are logically analyzed</li> <li>• Questions are answered in complete sentences</li> <li>• Analysis is thoughtful</li> </ul>	<ul style="list-style-type: none"> <li>• Trends/patterns are logically analyzed</li> <li>• Questions are answered thoroughly and in complete sentences</li> <li>• Analysis is insightful</li> </ul>
<b>Error Analysis (optional)</b>	<ul style="list-style-type: none"> <li>• There is no discussion of experimental errors</li> </ul>	<ul style="list-style-type: none"> <li>• Some experimental errors are identified</li> </ul>	<ul style="list-style-type: none"> <li>• Experimental errors and their effects are discussed</li> </ul>	<ul style="list-style-type: none"> <li>• Experimental errors are determined</li> <li>• Their effects are discussed</li> </ul>	<ul style="list-style-type: none"> <li>• Experimental errors are determined</li> <li>• Their effect and ways to reduce errors are discussed</li> </ul>
<b>Conclusion</b>	<ul style="list-style-type: none"> <li>• No conclusion was included or shows little effort and reflection on the lab</li> </ul>	<ul style="list-style-type: none"> <li>• A statement of the results is incomplete with little reflection on the lab</li> </ul>	<ul style="list-style-type: none"> <li>• A statement of the results of the lab indicates whether results support the hypothesis</li> </ul>	<ul style="list-style-type: none"> <li>• Accurate statement of the results of the lab indicates whether results support the hypothesis</li> <li>• Possible sources of error identified</li> </ul>	<ul style="list-style-type: none"> <li>• Accurate statement of the results of lab indicates whether results support hypothesis</li> <li>• Possible sources of error and what was learned from the lab discussed</li> </ul>

## Lab Report Rubric

Criteria	2	3	4	5
<b>Purpose or Research Question</b>	<ul style="list-style-type: none"> <li>• Purpose is somewhat vague</li> <li>• Relevant variables are not described</li> </ul>	<ul style="list-style-type: none"> <li>• Purpose is identified</li> <li>• Relevant variables are described in somewhat unclear manner</li> </ul>	<ul style="list-style-type: none"> <li>• Purpose is identified</li> <li>• Relevant variables are described</li> </ul>	<ul style="list-style-type: none"> <li>• Purpose is clearly identified</li> <li>• Relevant variables are described</li> </ul>
<b>Hypothesis (optional)</b>	<ul style="list-style-type: none"> <li>• Predicted results and hypothesized relationship between variables are unclear</li> </ul>	<ul style="list-style-type: none"> <li>• Predicted results and hypothesized relationship between variables stated and appear reasonable</li> </ul>	<ul style="list-style-type: none"> <li>• Predicted results and hypothesized relationship between variables stated</li> </ul>	<ul style="list-style-type: none"> <li>• Predicted results and hypothesized relationship between variables clearly stated and reasonable</li> </ul>
<b>Procedure (optional)</b>	<ul style="list-style-type: none"> <li>• Procedures are listed but not in clear steps</li> </ul>	<ul style="list-style-type: none"> <li>• Procedures are listed in clear steps but not numbered and/or in complete sentences</li> </ul>	<ul style="list-style-type: none"> <li>• Procedures are listed in clear steps</li> <li>• Each step is numbered and in a complete sentence</li> </ul>	<ul style="list-style-type: none"> <li>• Procedures are listed in clear steps</li> <li>• Each step is numbered and in a complete sentence</li> <li>• Diagrams are included to describe the set-up</li> </ul>
<b>Data</b>	<ul style="list-style-type: none"> <li>• Data lacks precision</li> <li>• Greater than 20% difference with accepted values</li> </ul>	<ul style="list-style-type: none"> <li>• Good representation of the data using tables and/or graphs</li> <li>• Less than 15% difference with accepted values</li> <li>• Precision is acceptable</li> </ul>	<ul style="list-style-type: none"> <li>• Accurate representation of the data using tables and/or graphs</li> <li>• Data is fairly precise</li> <li>• Less than 10% difference with accepted values</li> </ul>	<ul style="list-style-type: none"> <li>• Accurate representation of the data using tables and/or graphs</li> <li>• Graphs and tables are labeled and titled</li> <li>• Less than 5% difference with accepted values</li> <li>• Data is precise</li> </ul>
<b>Analysis</b>	<ul style="list-style-type: none"> <li>• Trends/patterns are not analyzed</li> <li>• Answers to questions are incomplete</li> <li>• Analysis is inconsistent</li> </ul>	<ul style="list-style-type: none"> <li>• Trends/patterns are logically analyzed for the most part</li> <li>• Questions are answered in complete sentences</li> <li>• Analysis is general</li> </ul>	<ul style="list-style-type: none"> <li>• Trends/patterns are logically analyzed</li> <li>• Questions are answered in complete sentences</li> <li>• Analysis is thoughtful</li> </ul>	<ul style="list-style-type: none"> <li>• Trends/patterns are logically analyzed</li> <li>• Questions are answered thoroughly and in complete sentences</li> <li>• Analysis is insightful</li> </ul>
<b>Conclusion</b>	<ul style="list-style-type: none"> <li>• A statement of the results is incomplete with little reflection on the lab</li> </ul>	<ul style="list-style-type: none"> <li>• A statement of the results of the lab indicates whether results support the hypothesis</li> </ul>	<ul style="list-style-type: none"> <li>• Accurate statement of the results of the lab indicates whether results support the hypothesis</li> <li>• Possible sources of error identified</li> </ul>	<ul style="list-style-type: none"> <li>• Accurate statement of the results of lab indicates whether results support hypothesis</li> <li>• Possible sources of error and what was learned from the lab discussed</li> </ul>