

# Why Do Some Things Stop While Other Things Keep Moving?

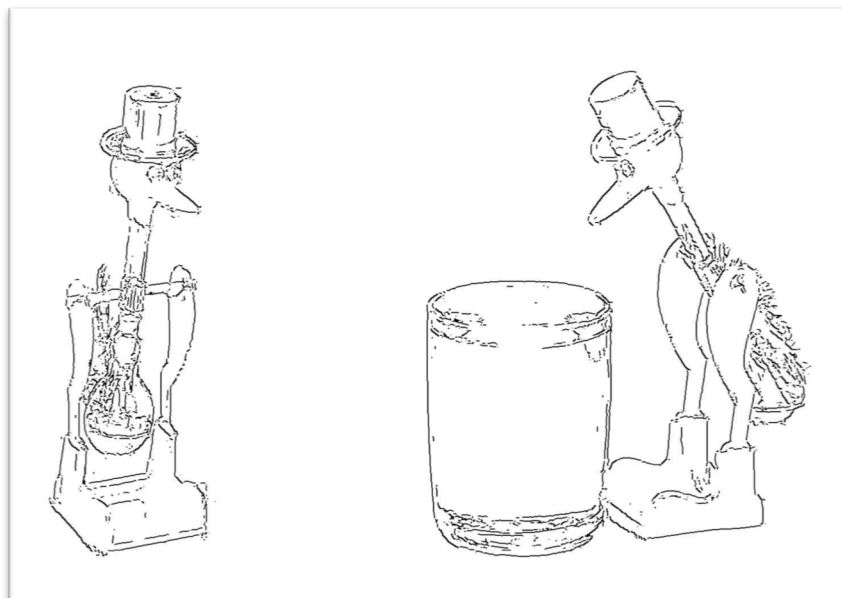
7<sup>th</sup> Grade Physics Unit Materials

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## How Will I Be Graded?

Assessment is an important tool for providing you with feedback to help them improve. Your progress will be reported using grade reports in Edline. This means that most assignments will be evaluated on a 4-point rubric with the following values:

### How to Read Your Scores on Assignments

<b>Rubric Value:</b>	<b>What it Means:</b>	<b>Should you redo this assignment?</b>
<b>Mastery</b>	I can do this well enough to teach others.	No. You have finished this assessment.
<b>Proficient</b>	I am able to do this.	You can if you are not satisfied.
<b>Developing</b>	I am in the process of learning to do this.	You must redo this assignment.
<b>Beginning</b>	I have not started learning to do this.	You must redo this assignment.

### Can I Redo an Assignment?

With the exception of Exit Slips, all assignments can be redone. You are encouraged to work on an assignment until you have a score that is satisfactory to both you and your teacher. Mrs. Ostrowski and Mr. Bingaman are satisfied with ratings of "proficient" or better. You may set higher standards for yourself. If an assignment does not meet these standards they should be redone until you have learned to complete them satisfactorily.

For a complete explanation of how to redo an assignment or retake a test please visit us at:

**[www.south7thscience.com](http://www.south7thscience.com)**

# Lesson 1: How Do These Things Work?

## Activity 1.1

**+** Safety

Be sure to follow any instructions at each station. Do not touch items that are labeled with a Do Not Touch sign.

**Purpose**

You will be shown a series of devices and toys. Use the space below to generate questions about what you have seen.

**Word Wall:**

Perpetual Motion: \_\_\_\_\_

**Your Progress:**

- Mastery
- Proficient
- Developing
- Beginning

What questions do you have about this station?	What is the answer to this question? (To be answered at the end of the unit)
Pendulums:	
Dippy Birds:	

What questions do you have about this station?	What is the answer to this question? (To be answered at the end of the unit)
Coffee Cans:	
Spinning Tops:	
Honda Commercial:	

## Lesson 1: What is Energy?

### Brain Building Broadcast: Let's Get Moving!

#### Purpose

Watch the video located at any one of the following addresses:

<http://goo.gl/WQf5iQ>

<http://vimeo.com/79395231>

<http://www.youtube.com/watch?v=4u4mjw8LII0>



#### Your Progress:

- Mastery
- Proficient
- Developing
- Beginning

#### Questions

Watch the video carefully. When the video gets to the first **stop sign, pause** and fill in this table:

Scenario	Does it involve energy?	Why or why not?
Moving Bus		
Moving Bike		
Falling Feather		
Spinning Disco Ball		
Rolling Basketball		
Walking Toy Robot		
Spinning Top		

*(Continue the assignment on the other side of this paper.)*

Continue watching the video until you get to the **second stop sign**. **Pause** the video and fill in this table:

Scenario	Rank 1-4	Explain why:
Moving Bus		
Spinning Disco Ball		
Spinning Top		
Moving Bike		

Continue watching the end of the video and then answer these questions:

As a car travels down a highway, it travels at a speed of 70 miles per hour. It burns fuel as it moves. What happens to the mass of the car as the fuel is burned?

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How does this affect the kinetic energy of the car?

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Julia enjoys bowling. One day, just for fun, she decided to try bowling with a volleyball instead of a bowling ball. Will this make it easier or harder to knock over the pins?

Explain your answer:

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## Lesson 2: What Determines the Amount of Kinetic Energy?

### Activity 2.1

#### Purpose

Conduct an experiment in which you find what factors affect the amount of kinetic energy in an object.

#### + Safety

Use the canned goods as directed in the lab. Failure to do so may cause them to break open.

#### Your Progress:

- Mastery
- Proficient
- Developing
- Beginning

#### Word Wall:

Experiment: \_\_\_\_\_

Kinetic energy: \_\_\_\_\_

### Variables for Experiment 1

What is the independent variable (manipulated variable) for this experiment?

\_\_\_\_\_

What is the dependent variable (measured/ responding variable) for this experiment?

\_\_\_\_\_

What are the controlled variables (variables that stays the same) for this experiment? (State at least 3)

\_\_\_\_\_

\_\_\_\_\_

### Data Table for Experiment 1

Use this data table to record the measurements from your experiment:

Speed	Starting Thickness (mm.)	Ending Thickness (mm.)	Amount of "Squish" (KE) (mm)
Drop			
Throw			

## Variables for Experiment 2

What is the independent variable (manipulated variable) for this experiment?

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What is the dependent variable (measured/ responding variable) for this experiment?

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What are the controlled variables (variables that stays the same) for this experiment? (State at least 3)

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## Data Table for Experiment 2

Use this data table to record the measurements from your experiment:

Mass	Starting Thickness (mm.)	Ending Thickness (mm.)	Amount of "Squish" (KE) (mm)
Light			
Heavy			

## Analysis

1. The \_\_\_\_\_ and \_\_\_\_\_ an object, the **MORE** kinetic energy it has.

2. Which was easier to keep constant- mass or speed? Why?

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3. How would accuracy of the experiment change in you measure the change in thickness in multiple places on the clay instead of just one place?

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## Lesson 2: Where Do We See Kinetic Energy in the Real World?

### Article Review

Read one of the following articles and circle the one you pick:

#### Bullet Proof Super Material

<http://goo.gl/vH8ppi>

<http://theweek.com/articles/470303/bulletproof-super-material-thats-paperthin>

#### Physics of Roller Coasters

<http://goo.gl/PIYfHi> (\*Note: "I" is an upper case letter "i")

<http://www.scientificamerican.com/article/shriek-science-simple-physics-powers-extreme-roller-coasters/>

#### Impact Craters Formation

<https://goo.gl/P6rELs>

<https://solarsystem.nasa.gov/deepimpact/science/cratering.cfm>

### Response Questions

Summarize the article in three sentences. Use your own words.

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How is this information useful to its readers?

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#### Your Progress:

- Mastery
- Proficient
- Developing
- Beginning

What is the coolest thing you learned from this article?

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How does this article relate to our current unit of study?

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What is the most important word in the article?

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What are three words that were challenging or new to you? What do they mean?

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What is one thing you found confusing, or still have a question about after reading this article?

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## Lesson 3: What is the connection between height and energy?

### Activity 3.1

#### Purpose

Conduct an experiment in which you find the relationship between the height that a can is dropped and the amount of kinetic energy.

#### + Safety

Use the canned goods as directed in the lab. Failure to do so may cause them to break open.

#### Your Progress:

- Mastery
- Proficient
- Developing
- Beginning

#### Word Wall:

Gravitational energy: \_\_\_\_\_

#### Variables

What is the independent variable (manipulated variable) for this experiment?

\_\_\_\_\_

What is the dependent variable (measured/ responding variable) for this experiment?

\_\_\_\_\_

What are the controlled variables (variables that stays the same) for this experiment? (State at least 3)

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

## Data Table

Use this data table to record the measurements from your experiment:

Height of Can		Starting Thickness	Thickness #1	Thickness #2	Thickness #3	Average	Average Thickness Change	Average for both cans
Height = 20 cm	Tuna							
	Beans							
Height = 40 cm	Tuna							
	Beans							
Height = 60 cm	Tuna							
	Beans							

What is the relationship between height and energy?

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From which dropping height was the average change in thickness the greatest?

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What are the advantages of calculating an average value when doing an experiment?

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## Lesson 3: How Does Energy Covert in a Pendulum?

### Brain Building Broadcast: Myth Busters Pendulum Swing

#### Purpose

Watch the video located at any one of the following addresses:

<http://goo.gl/Wddlk>

<http://vimeo.com/54962660>

<http://www.youtube.com/watch?v=43w1TyrSql8&feature=youtu.be>



#### Your Progress:

- Mastery
- Proficient
- Developing
- Beginning

After carefully watching the video, answer the following questions:

1. (Multiple-Choice) What is the main myth Mr. Bingaman and Ms. Wong want to bust?
  - a. If you push away a pendulum and move forward, it will come back and hit you in the face.
  - b. If you let go of a pendulum and move forward, it will come back and hit you in the face.
  - c. If you push away a pendulum and stay still, it will come back and hit you in the face.
  - d. If you let go of a pendulum and stay still, it will come back and hit you in the face.
  
2. (Multiple-Choice) Which statement is **TRUE** when the box is at 100% gravitational energy?
  - a. The box is moving.
  - b. The box also has kinetic energy.
  - c. The box is above the reference point.
  - d. The box has no height.
  
3. (Multiple-Choice) What happens to the gravitational energy when the box falls?
  - a. The gravitational energy disappears.
  - b. The gravitational energy becomes kinetic energy.
  - c. The gravitational energy increases.
  - d. The gravitational energy remains constant.
  
4. (Multiple-Choice) When is a pendulum moving the **FASTEST**? **Select 2 correct answers.**
  - a. When the pendulum is at its lowest point.
  - b. When the pendulum is at its highest point.
  - c. When the pendulum has 100% kinetic energy.
  - d. When the pendulum has 100% gravitational energy.
  
5. (Multiple-Choice) When is a pendulum moving the **SLOWEST**? **Select 2 correct answers.**
  - a. When the pendulum is at its lowest point.
  - b. When the pendulum is at its highest point.
  - c. When the pendulum has 100% kinetic energy.
  - d. When the pendulum has 100% gravitational energy.



Lesson 3: What Decides How Fast a Pendulum Swings?

Activity 3.2

Purpose

Conduct an experiment with your partner that changes some characteristic of a pendulum. Look for a response in the number of swings the pendulum can make in one minute. Answer the following questions as you perform your experiment.

Your Progress:

- Mastery
- Proficient
- Developing
- Beginning

Word Wall Words

Pendulum: \_\_\_\_\_

What is the independent variable for this experiment? (Circle One)

Length of the string      Mass of the pendulum      How far we pull it back

What is the dependent variable for this experiment?

The period of the pendulum. (How many swings occur in 1 minute)

What characteristics of the pendulum will you need to keep constant during this experiment?

\_\_\_\_\_

\_\_\_\_\_

Data

	Trial 1	Trial 2	Trial 3	Average

What conclusions can you draw from your experiment?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_





## Lesson 4: How Do I Make A Graph?

### Brain Building Broadcast: Graphing

#### Purpose

Watch the video located at any one of the following addresses:

<http://goo.gl/PxGGcU>

<https://www.youtube.com/watch?v=xMx5pH1MPqs>

<https://vimeo.com/109846330>



#### Your Progress:

- Mastery
- Proficient
- Developing
- Beginning

#### Questions:

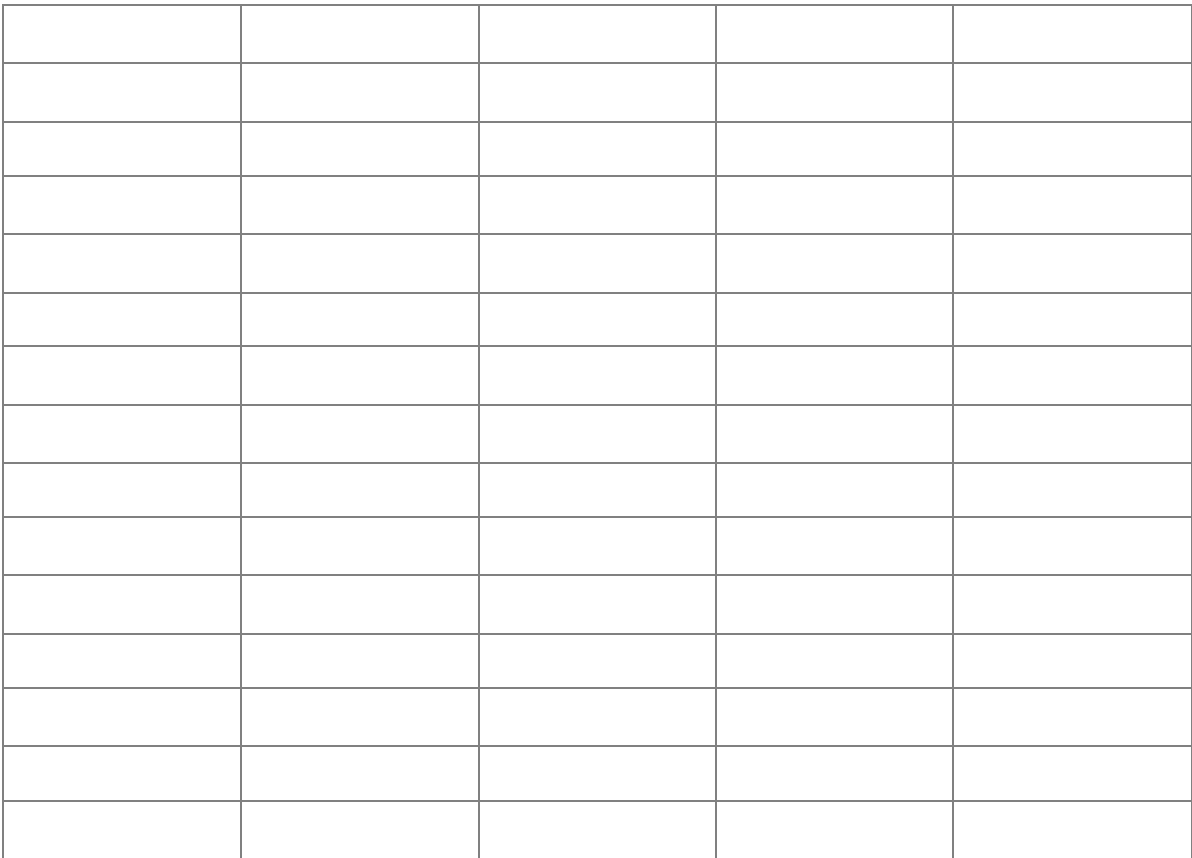
1. The \_\_\_\_\_ variable belongs on the y-axis. The \_\_\_\_\_ variable belongs on the x-axis.
2. What is the **dependent variable** on the graph entitled, "Brand of Candy Bars Chosen"?
  - a. Brand of candy bar
  - b. Time
  - c. Candy consumed
  - d. Number of bars taken
3. What is the **independent variable** on the graph entitled, "Calories of Candy Consumed Over Time"?
  - a. Brand of candy bar
  - b. Time
  - c. Candy consumed
  - d. Number of bars taken
4. Which graph required units for the dependent variable?
  - a. Brand of Candy Bars Chosen
  - b. Candy Bars Used Over Time
  - c. Calories of Candy Consumed Over Time
5. A \_\_\_\_\_ shows what part of a graph a color or symbol represents. In the graph "Candy Bars Used Over Time", the \_\_\_\_\_ colored line represents the number of candy bars Mr. Bingaman ate.
6. If the independent variable is an idea or category you make a \_\_\_\_\_ graph.  
If the independent variable is a number you make a \_\_\_\_\_ graph.

Practicing your graphing skills:

Three students decided to run an experiment to find out which costume would cause people to give out the most candy. Each block they walked, they stopped to count their pieces of candy. They collected their data on a table below:

Blocks Walked	Mummy	Zombie	Witch
1	5	7	6
2	11	13	12
3	17	22	18
4	22	28	24

Use the data from the table to draw a **line graph** in the grid below. Be sure to include all of the parts discussed in the checklist at the end of the movie.



## Lesson 4: What Happens as a Ball Bounces?

### Activity 4.1

#### Purpose

Conduct an experiment with your partner that measures the change in bounce height of a bouncing ball as it bounces. Answer the following questions as you perform your experiment.

#### + Safety

Use the super balls only to perform the lab. Throwing the balls around the room is unacceptable.

#### Variables

What is the independent variable (manipulated variable) for this experiment?

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What is the dependent variable (measured/ responding variable) for this experiment?

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What are the controlled variables (variables that stays the same) for this experiment? (State at least 3)

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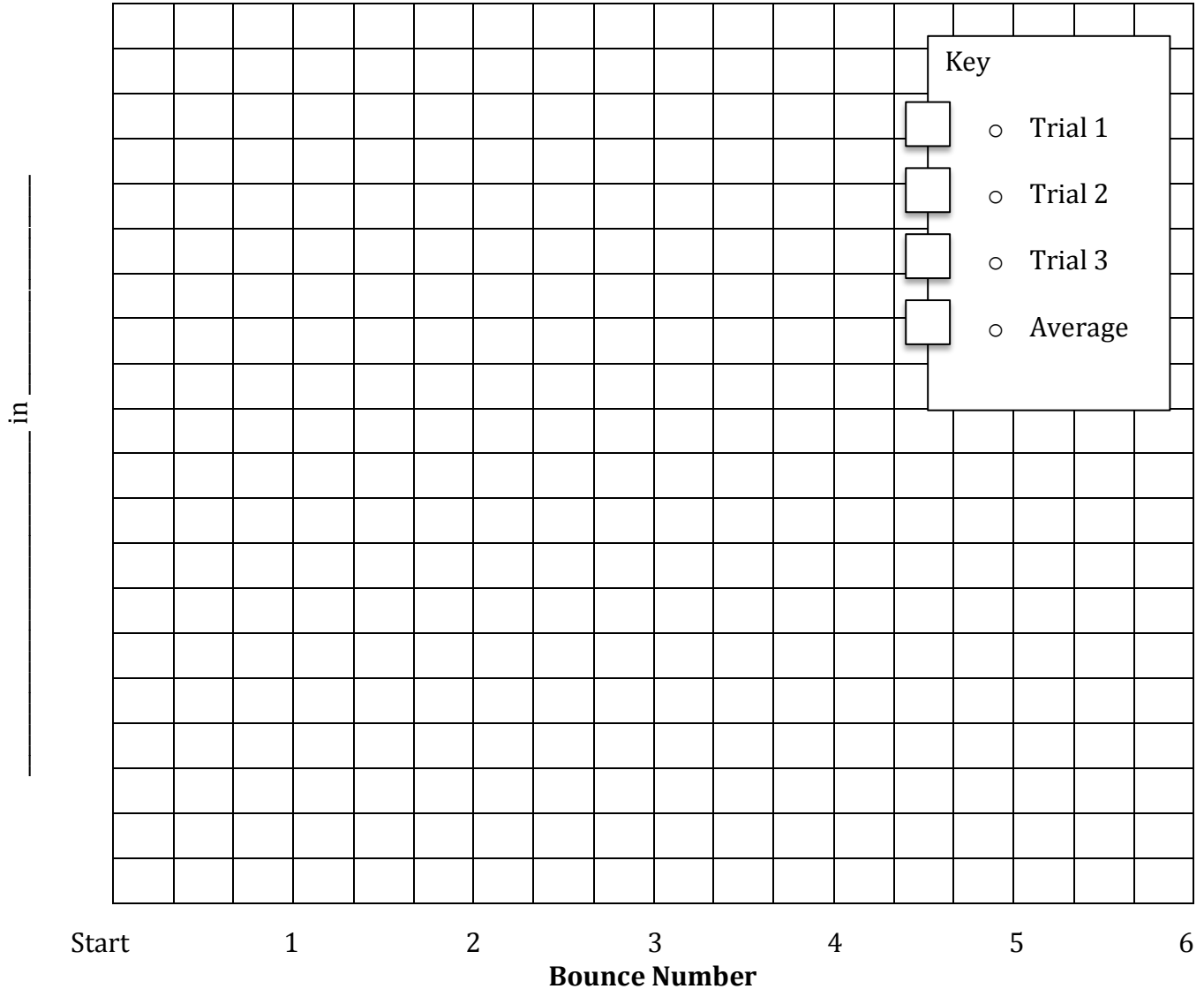
#### Data

	Trial 1	Trial 2	Trial 3	Average
Starting Height:	100 cm	100 cm	100 cm	100 cm
Bounce 1:				
Bounce 2:				
Bounce 3:				
Bounce 4:				
Bounce 5:				
Bounce 6:				

#### Your Progress:

- Mastery
- Proficient
- Developing
- Beginning

## The Height of Ball Based on Bounce Number



### Instructions for Creating a Line Graph:

1. Label the Y axis of this graph with the dependent variable and units
2. Number the Y axis so that it goes from 0cm to 100 cm.
3. Choose a color for each line and color the key.
4. Plot the data using the color you have chosen.
5. Connect the points with a smooth line using a straight edge.

What happens to the amount of gravitational energy the ball has, as it bounces? Explain why you think this happens.

## Lesson 4: How Do I Do a Controlled Experiment?

### BBB: Cardinal Red- Identifying Variables

Watch the video located at any one of the following addresses:

<http://goo.gl/OrkG5V>

<http://www.youtube.com/watch?v=1OnEJtg6lYI&feature=youtu.be>



#### Your Progress:

- Mastery
- Proficient
- Developing
- Beginning

### Word Wall:

Independent variable: \_\_\_\_\_

\_\_\_\_\_

Dependent variable: \_\_\_\_\_

\_\_\_\_\_

Controlled variables: \_\_\_\_\_

\_\_\_\_\_

### Matching:

1. Match the variables to the example in the video, and their descriptions.

\_\_\_\_\_ The load being carried by the person

A. Independent Variable

\_\_\_\_\_ The stride length of the person

B. Dependent Variable

\_\_\_\_\_ The type of surface being walked on

C. Controlled Variable

\_\_\_\_\_ The angle of the floor

\_\_\_\_\_ The height of the person

\_\_\_\_\_ The variable that is measured for a response

\_\_\_\_\_ The variable that needs to stay the same, for fairness

\_\_\_\_\_ The variable the experimenter changes

**Multiple-Choice:**

2. In Activity 3.1 we dropped canned beans on clay from different heights, we had many controlled variables. Which best describes a controlled variable from this experiment? (Circle one)

- a. The clay
- b. The mass of the clay
- c. The ruler
- d. The height should be the same
- e. The squish of the clay

3. Mr. Bingaman likes to drop water balloons off the roof. He decides to do an experiment to see if different size water balloons fall at different speeds. He makes three water balloons. Each one uses the exact same type of balloon, but with different amounts of water. He carefully checks the wind speed and direction to be sure it is stable, and drops each balloon, careful to release them the same way and from the same height. He times each on as he drops them to see how long it takes to hit the ground.

Which of the following is the independent variable? (Circle all that apply)

- a. The amount of water in the balloon
- b. The type of balloon
- c. The height the balloon is dropped from
- d. The time it takes to hit the ground
- e. Wind speed and direction
- f. The method of releasing the balloon

Which of the following is the dependent variable? (Circle all that apply)

- a. The amount of water in the balloon
- b. The type of balloon
- c. The height the balloon is dropped from
- d. The time it takes to hit the ground
- e. Wind speed and direction
- f. The method of releasing the balloon

Which of the following are controlled variables? (Circle all that apply)

- a. The amount of water in the balloon
- b. The type of balloon
- c. The height the balloon is dropped from
- d. The time it takes to hit the ground
- e. Wind speed and direction
- f. The method of releasing the balloon

# Lesson 4: How Does The Energy We Put Into a Toy Compare to The Energy That Comes Out?

## Activity 4.2

### Purpose

Design an experiment with your group that involves one of the toys provided. The experiment should relate to our studies of elastic energy and should demonstrate the relationship between the elastic energy put into the toy, and the kinetic energy that it becomes. Answer the following questions as you perform your experiment.

### + Safety

Use the elastic toys only to perform the lab. Be careful not to overload the toy as it may become damaged.

What is the independent variable (manipulated variable) for this experiment?

\_\_\_\_\_

What is the dependent variable (measured/ responding variable) for this experiment?

\_\_\_\_\_

What are the controlled variables (variables that stays the same) for this experiment? (State at least 3)

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

### Data

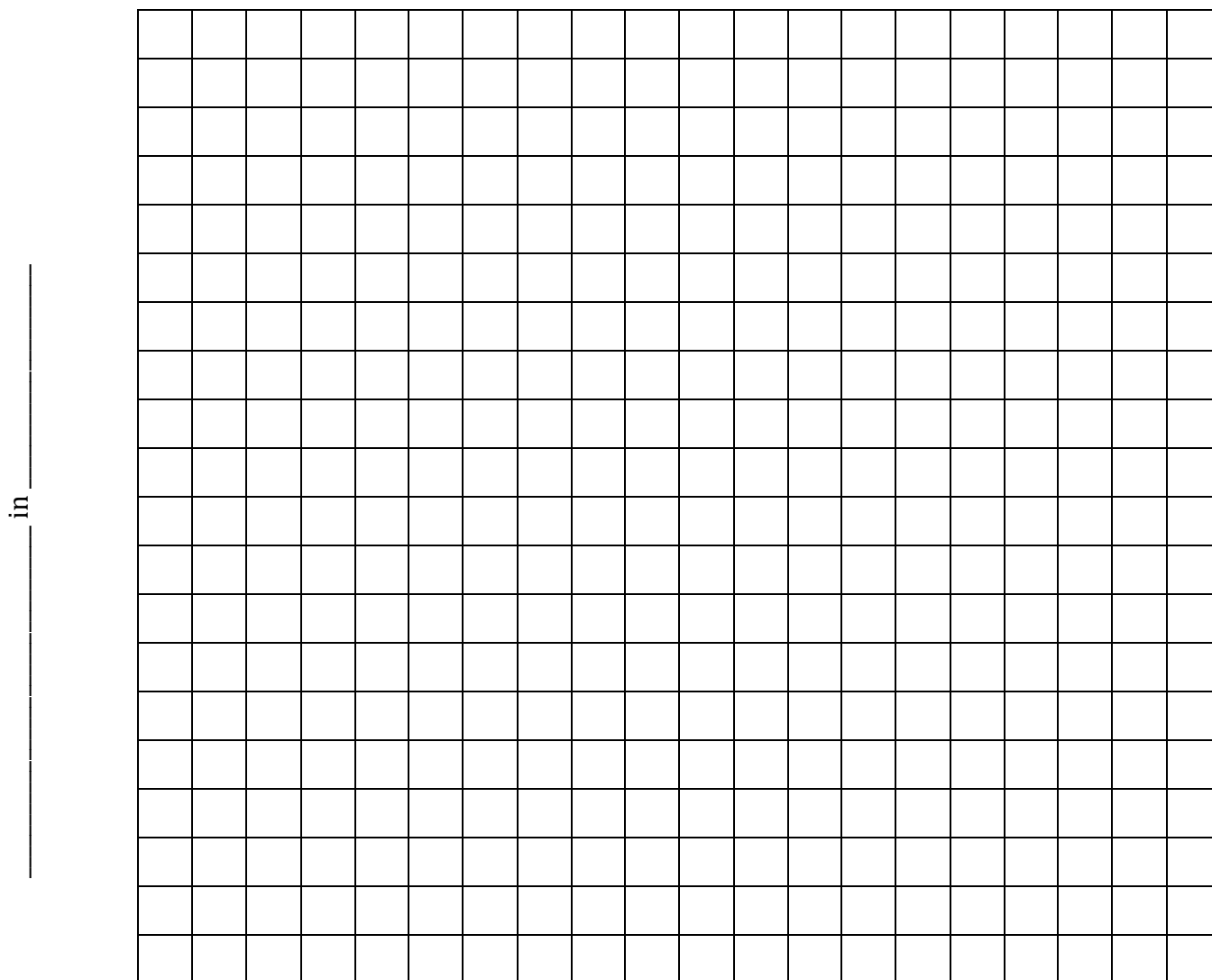

### Your Progress:

- Mastery
- Proficient
- Developing
- Beginning

Create a line graph to display your results.

- Labeled X axis with the independent variable, and units.
- Labeled Y axis with the dependent variable, and units.
- Create a key that identifies the colors used and plot the data from your experiment.
- Give the graph an appropriate title that describes both variables.

Title: \_\_\_\_\_



\_\_\_\_\_ in \_\_\_\_\_

What conclusions about elastic energy can you draw from your experiment?

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## Lesson 4: How Do I Make a Presentation?

### BBB: Presentations

#### Purpose

Watch the video at one of the following addresses:

<http://goo.gl/gQ44o7>

<http://www.youtube.com/watch?v=BIbACnT-Ed0>



#### Your Progress:

- Mastery
- Proficient
- Developing
- Beginning

Watch the video carefully and be sure that you understand the lesson. Re-watch any part of the video that is unclear to you. After watching the video carefully, answer the following questions:

#### Questions

1. What was wrong with the first title slide, Mr. Bingaman and Mrs. Ostrowski. (Ms.Wong) presented?

- A. The text was too small and difficult to see.
- B. The color of the text did not show up well on the background.
- C. The animation was too long.
- D. All of the above were a problem.

2. Why is reading a slide to the audience a problem?

- A. You are not facing your audience.
- B. You are projecting your voice in the wrong direction.
- C. Slides should not have a lot of words on them, just pictures and bullets.
- D. All of the above are a problem.

3. Label each of the items below **Do** if they are something you want to do during a presentation, and **Do Not** if they are something to avoid during a presentation.

\_\_\_\_\_ Copy a thumbnail from Google and stretch it until it fits the slide.

\_\_\_\_\_ Decide who will speak during each slide before your presentation.

\_\_\_\_\_ Use note cards, or practice what you will say so that you can face your audience.

\_\_\_\_\_ Speak loudly, even when it is not your turn to present.

\_\_\_\_\_ Use long, elaborate animations to make text more interesting.

\_\_\_\_\_ Write your ideas out completely in the slides so that the audience can read everything.

\_\_\_\_\_ Make the background and text colors that contrast each other.

\_\_\_\_\_ Use images in graphs instead of writing a lot of text.



## Lesson 4: Where Do We See Elastic Energy in the Real World?

### Article Review

Read one of the following articles and circle the one you pick:

#### ACL Injuries in Youth Sports

<http://goo.gl/nKGUI8> (\*Note: The "l" is a lower case "L")

<http://newyork.cbslocal.com/2016/05/30/acl-injuries-youth-sports-jag-physical-therapy-peter-schwartz/>

#### Why Physicists Love Super Balls

<https://goo.gl/TPhEDE>

<http://www.scientificamerican.com/article/shriek-science-simple-physics-powers-extreme-roller-coasters/>

#### Study: Kenyan Runners' Calves Have Elastic Advantages

<http://goo.gl/ax8ypM>

<http://www.runnersworld.com/newswire/study-calves-of-elite-kenyan-runners-have-greater-elasticity>

### Response Questions

Summarize the article in three sentences. Use your own words.

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How is this information useful to its readers?

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#### Your Progress:

- Mastery
- Proficient
- Developing
- Beginning

What is the coolest thing you learned from this article?

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How does this article relate to our current unit of study?

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What is the most important word in the article?

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What are three words that were challenging or new to you? What do they mean?

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What is one thing you found confusing, or still have a question about after reading this article?

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## Lesson 4: Elastic Toy Investigation: Post Lab Assessment

### Activity 4.3

#### Purpose

Demonstrate your understanding of the process used in the lab by answering the following questions:

#### Your Progress:

- Mastery
- Proficient
- Developing
- Beginning

Carol and Amy want to investigate how the number of winds on a wind-up robot affects the number of steps the robot can take. The girls decided to test 2 wind-ups, 4 wind-ups, and 6 wind-ups. Carol and Amy used the same robot toy for their entire experiment. They always tested their robot on the tile floor of their classroom. They also chose to work in a place on the floor that had no incline. Carol and Amy did three trials for their experiment. Here is their data table below:

*Number of Wind-ups versus Number of Steps (By Carol and Amy)*

Number of wind-ups	Trial 1 Steps	Trial 2 Steps	Trial 3 Steps	Average # of Steps
2 wind-ups	5 steps	4 steps	5 steps	
4 wind-ups	10 steps	12 steps	13 steps	
6 wind-ups	21 steps	18 steps	19 steps	

1. Which of the following is an **independent variable** of the experiment? (Circle all that apply)
  - a. The number of steps the robot takes
  - b. The floor has no incline
  - c. The number of wind-ups on the robot
  - d. The floor's material is tile
  - e. The toy robot is always the same
2. Which of the following is a **dependent variable** of the experiment? (Circle all that apply)
  - a. The number of steps the robot takes
  - b. The floor has no incline
  - c. The number of wind-ups on the robot
  - d. The floor's material is tile
  - e. The toy robot is always the same
3. Which of the following is a **controlled variable** of the experiment? (Circle all that apply)
  - a. The number of steps the robot takes
  - b. The floor has no incline
  - c. The number of wind-ups on the robot
  - d. The floor's material is tile
  - e. The toy robot is always the same

4. Calculate the average robot steps and **complete Carol and Amy's data table**. Please include proper **unit**.
5. What is a conclusion that Carol and Amy may make from their data table?
  - a. The greater the number of wind-ups, the less steps the robot takes.
  - b. The greater the number of wind-ups, the more steps the robot takes.
  - c. The number of wind-ups has no impact on the number of steps the robot takes.
  - d. There is not enough information to form a conclusion.
6. Luke and John did the same experiment as Carol and Amy. Below is their data table. They are confused about why their robot's wind-ups do not show the same pattern as Carol and Amy's data. **Based on John and Luke's data table**, can you give them **two pieces of specific advice** about what they can do to improve or correct their experiment?

*Number of Wind-ups versus Number of Steps (By Luke and John)*

Number of wind-ups	Trial 1 Steps	Trial 2 Steps	Trial 3 Steps	Average # of Steps
2 wind-ups	4 steps	4 steps	5 steps	13 steps
4 wind-ups	10 steps	12 steps	2 steps	8 steps
6 wind-ups	20 steps	22 steps	21 steps	21 steps

Advice 1:

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Advice 2:

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## Lesson 5: What is an Energy Transfer vs. Conversion?

### BBB: Rube Goldberg Highlights

Watch the video located at any one of the following addresses:

<http://goo.gl/1HxdoZ>

<https://vimeo.com/84866416>

<https://www.youtube.com/watch?v=nYWKq4KusDo>



### Your Progress:

- Mastery
- Proficient
- Developing
- Beginning

After carefully watching the video, answer the following questions:

### Word Wall:

Conversion: \_\_\_\_\_  
\_\_\_\_\_

Transfer: \_\_\_\_\_  
\_\_\_\_\_

### Identify:

Sort these examples as examples of **conversion** of energy (C) or **transfer** of energy (T).

- \_\_\_\_\_ Your foot kicks a soccer ball.
- \_\_\_\_\_ A book falls off a table.
- \_\_\_\_\_ A bowling ball hits a set of pins.
- \_\_\_\_\_ A spring pops into the air.
- \_\_\_\_\_ A ball rolls down a ramp.

### Short Answer:

Can all the energy transfers and conversions of the Honda commercial be explained with the three energies that we currently know? (KE, GE, and EE). Why or why not?





## Lesson 5: How Does The Surface Affect the Jumping Frog Toy?

### Activity 5.1

#### Safety

Use the toy frogs only to perform the lab. Do not misuse the lab equipment.

#### Purpose

The main question is: what type of surface will allow a frog to jump a greater distance? Conduct an experiment that measures the jumping distance of a toy frog on different surfaces. Answer the follow the questions before your start your experiment.

#### Variables

What is the independent variable (manipulated variable) for this experiment?

\_\_\_\_\_

What is the dependent variable (measured/ responding variable) for this experiment?

\_\_\_\_\_

What are the controlled variables (variables that stays the same) for this experiment? (State at least 3)

\_\_\_\_\_

\_\_\_\_\_

#### Data

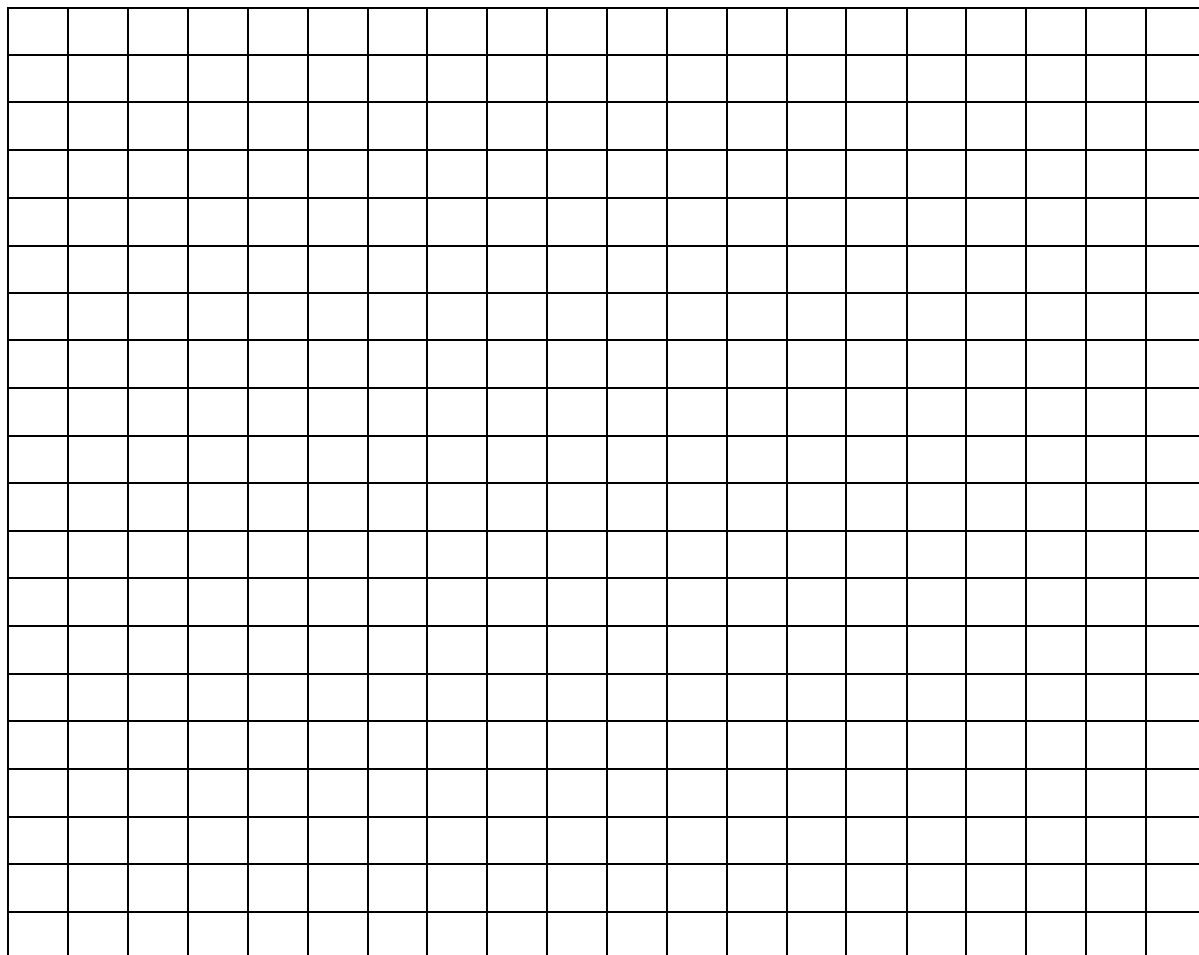
Type of Surface:	Trial #1	Trial #2	Trial #3	Average

#### Your Progress:

- Mastery
- Proficient
- Developing
- Beginning

Use this grid to create a bar graph with your **average** for each type of surface.

- Labeled X axis with the independent variable.
- Labeled Y axis with the dependent variable, and units.
- Plot the data from your experiment and create a bar for each average..
- Give the graph an appropriate title that describes both variables.



How does the surface affect the distance the toy frog can jump?

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Do you think this is because the surface adds energy to the toy? Explain your thinking.

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## Lesson 6: What is Elastic Energy?

### BBB: Raiders of the Lost Coffee Can

Watch the video located at any one of the following addresses:

<http://goo.gl/sBJQ6G>

<https://vimeo.com/81956640>

<https://www.youtube.com/watch?v=TYnQrhWG35k&feature=youtu.be>



#### Your Progress:

- Mastery
- Proficient
- Developing
- Beginning

### Word Wall:

Elastic Energy: \_\_\_\_\_

### Questions:

1. (Multiple-Choice) Why does a basketball bounce **up**?
  - a. Kinetic energy converts to elastic energy that converts to gravitational energy.
  - b. Elastic energy converts to kinetic energy that converts to gravitational energy.
  - c. Gravitational energy converts to kinetic energy that converts to gravitational energy.
  - d. Kinetic energy converts to gravitational energy.
2. (Multiple-Choice) Is clay elastic? Why or why not?
  - a. Yes- clay can be deformed and it returns to its original shape by itself.
  - b. Yes- clay cannot be deformed and it does not return to its original shape by itself.
  - c. No- while clay can be deformed, it does not return to its original shape by itself.
  - d. No- clay cannot be deformed, but it does return to its original shape by itself.
3. (Multiple-Choice) Darts are released during this video. Examine the device that releases the darts. What is the order of energy conversions?
  - a. Kinetic energy → gravitational energy → elastic energy → kinetic energy
  - b. Elastic energy → gravitational energy → kinetic energy → elastic energy
  - c. Elastic energy → kinetic energy → gravitational energy → kinetic energy
  - d. Kinetic energy → elastic energy → kinetic energy → gravitational energy
4. (Short Answer) Based on the information in the video, elastic energy might be involved in the coffee can. Explain how you think the coffee can works below.



## Lesson 6: What Type of Surface Will Allow a Ball to Roll a Greater Distance?

### Activity 6.1

#### Purpose

Conduct an experiment that measures rolling distance of a foam ball on different surfaces when it rolls down a ramp. Answer the following questions before you start your experiment.

#### + Safety

Use the toy balls only to perform the lab. Do not misuse the lab equipment.

#### Variables

What is the independent variable (manipulated variable) for this experiment?

---

What is the dependent variable (measured/ responding variable) for this experiment?

---

What are the controlled variables (variables that stay the same) for this experiment? (State at least 3)

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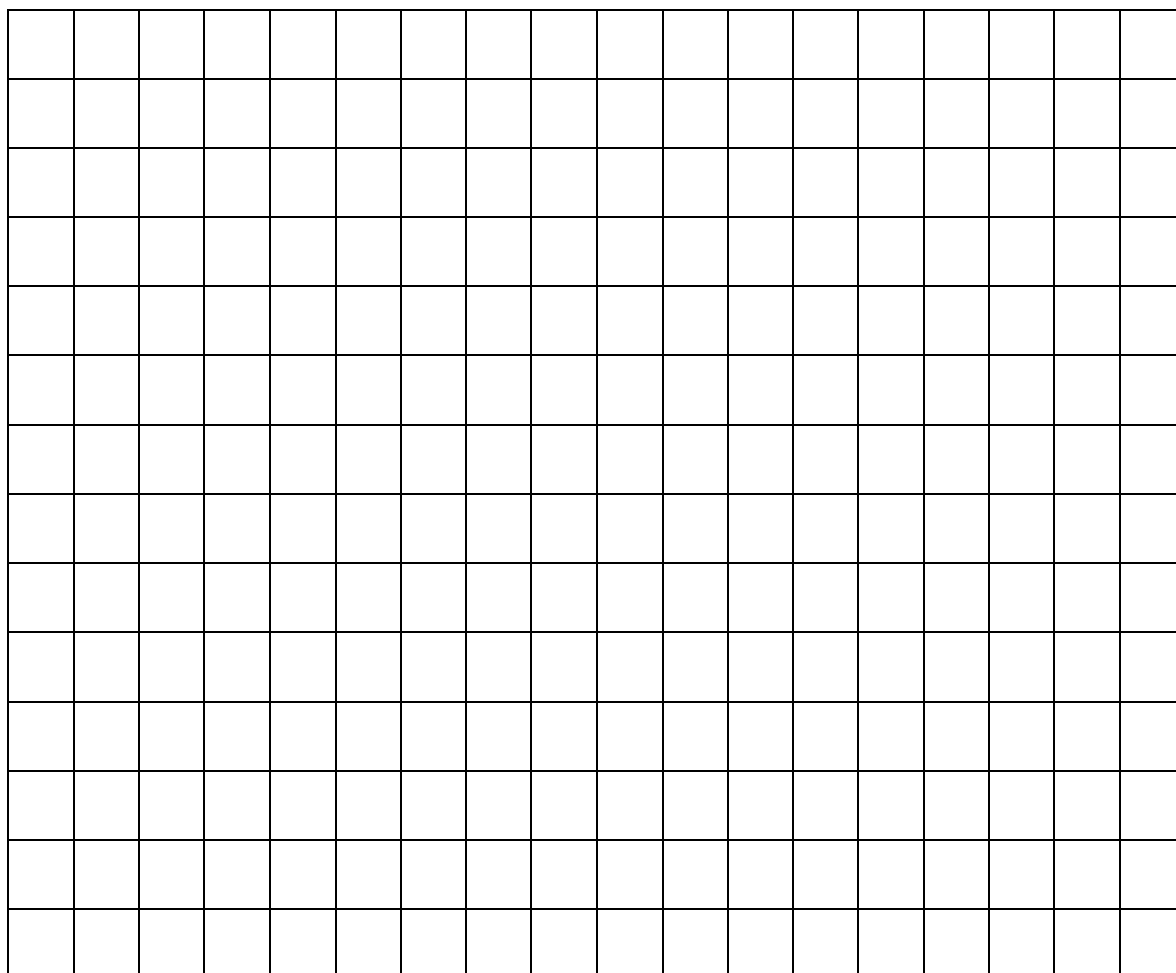
#### Your Progress:

- Mastery
- Proficient
- Developing
- Beginning

#### Data

Trial #	Distance Traveled on Tile (cm.)	Distance Traveled on Carpet (cm.)
Trial 1		
Trial 2		
Trial 3		
Trial 4		
Trial 5		
Average Distance		

Use this grid to create a graph with your 5 trials (same color) and average (different color) for each type of surface. Be sure that the graph has all of the correct parts.



As the ball rolls down the ramp, what type of energy **conversion** happens?

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How do the different surfaces affect the kinetic energy of the ball after it rolls down the ramp?

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What happens to the kinetic energy of the ball?

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## Lesson 6: How Does Thermal Energy Affect a System?

### Activity 6.2

#### Purpose

Two investigations will be used to look at the relationship between thermal energy and motion.

#### + Safety

Use the toy balls only to perform the lab. Do not misuse the lab equipment.

#### Word Wall:

Thermal Energy: \_\_\_\_\_

\_\_\_\_\_

#### Procedure 1

Have one lab partner hold up a sheet of paper vertically. Hold the two ball bearings in your hand firmly and strike them together with the paper caught in between. Observe what has happened to the paper.

1. How does the kinetic energy change from before and after the collision of the steel balls? Explain your answer.

\_\_\_\_\_

2. Describe the elasticity of the steel balls. Explain your answer.

\_\_\_\_\_

3. Write your observations about the mark showing where the steel balls collided with the paper. Be specific.

\_\_\_\_\_

\_\_\_\_\_

4. What happened to the kinetic energy from the collision between the steel balls?

\_\_\_\_\_

\_\_\_\_\_

#### Your Progress:

- Mastery
- Proficient
- Developing
- Beginning

5. If we replaced the steel balls with two racket balls, will you get the same result? Why or why not? Explain your answer in terms of different types of **energies**.

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## Procedure 2

1. Fill a beaker with **200 ml** of **cold water** from the pitcher in from of the room. Do not include ice in your 200 ml.
2. Ask your teacher to fill your second beaker with **200 ml** of **hot water**.
3. Put one drop of food dye into the beaker of hot water. Time how long it takes for the dye to uniformly spread throughout the water. Write the time here: \_\_\_\_\_
4. Put one drop of food dye into the beaker of cold water. Time how long it takes for the dye to uniformly spread throughout the water. Write the time here: \_\_\_\_\_
5. How does temperature influence the speed that dye spreads out in a liquid? Why do you think this happens?

- 
- 
- 
6. Draw a picture below of the motion of the dye particles in hot versus cold water. **Use arrows** to indicate the **speed** the molecules are moving in each temperature.

7. Describe the kinetic energy of water molecules that are hot verses cold.



## Lesson 6: What Happened to the Kinetic Energy When We Dropped the Can on the Clay?

### Activity 6.3

#### Purpose

You will collect data as a class to determine: *What happens to kinetic energy when something falls?* A can of baked beans will be dropped 30 cm. onto a ball of clay. Inside the ball of clay is a temperature probe. After the can is dropped, the clay will be rotated one quarter. This process is to be repeated. With each drop we would like to measure if the temperature of the clay changes.

#### Variables

What is the independent variable (manipulated) for this experiment?

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What is the dependent variable (measured/ responding) for this experiment?

---

What are the controlled variables (stays the same) of this experiment? (State at least 3)

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#### Data

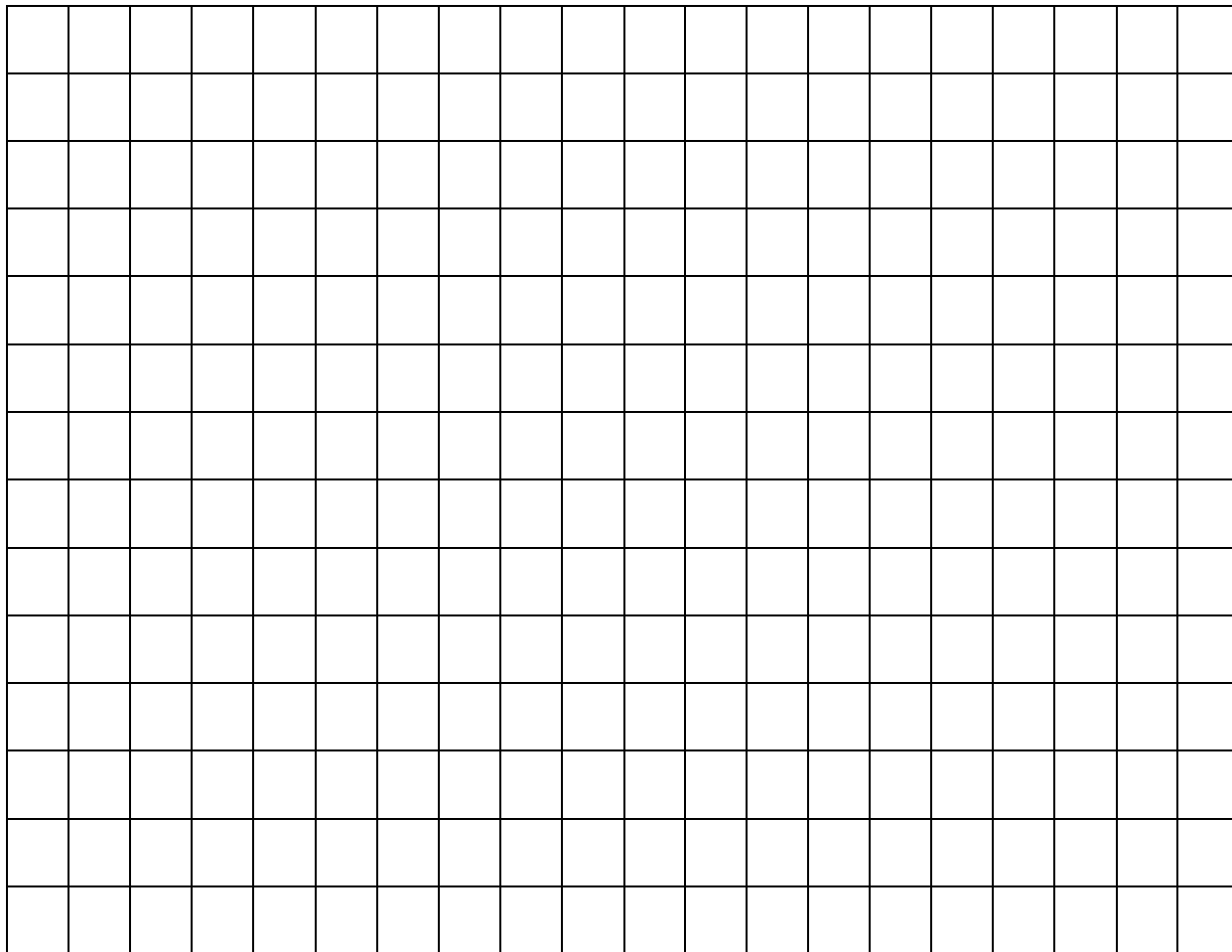
Drop #	Temperature (°C)	Drop #	Temperature (°C)	Drop #	Temperature (°C)
Initial		7		14	
1		8		15	
2		9		16	
3		10		17	
4		11		18	
5		12		19	
6		13		20	

#### Your Progress:

- Mastery
- Proficient
- Developing
- Beginning

## Graph

Use this grid to create an appropriate graph of your data. Be sure that the graph has all of the correct parts.



A student makes the following claim: *Gravitational energy converts to kinetic energy when the baked beans can falls. When the baked bean can hits the ground, the kinetic energy disappears.*

Is the student's claim correct? Why or why not? What **evidence** (DATA) do you have to support or refute the student's claim?

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## Lesson 7: Where Do We See Sound Energy in the Real World?

### Article Review

Read one of the following articles and circle the one you pick:

#### Rockin' Responsibly with Fleetwood Mac

<http://goo.gl/wHclME> (\*Note: The "l" is a lower case "L")  
[http://www.hearnet.com/features/articles/artist\\_article\\_hth2.shtml](http://www.hearnet.com/features/articles/artist_article_hth2.shtml)

#### How Do Ultrasounds Work?

<http://goo.gl/YvaUwk>  
<http://science.howstuffworks.com/ultrasound.htm/printable>

#### Noise Induced Hearing Loss

<http://goo.gl/ptmyYb>  
<http://american-hearing.org/disorders/noise-induced-hearing-loss/>

### Word Wall:

Sound Energy (together in class): \_\_\_\_\_  
\_\_\_\_\_

### Response Questions

Summarize the article in three sentences. Use your own words.

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How is this information useful to its readers?

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### Your Progress:

- Mastery
- Proficient
- Developing
- Beginning

What is the coolest thing you learned from this article?

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How does this article relate to our current unit of study?

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What is the most important word in the article?

---

What are three words that were challenging or new to you? What do they mean?

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What is one thing you found confusing, or still have a question about after reading this article?

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## Lesson 8: How Does Temperature Change During a Chemical Reaction?

### Activity 8.1

#### Purpose

You have seen in the thermal clay activity that gravitational energy can be transferred to kinetic energy and that kinetic energy can be transferred to thermal energy when a can falls on a ball of clay. Today you will see another type of energy that can turn into thermal energy.

#### ✚ Safety

- Copper chloride can irritate your skin and eyes. If you get the liquid on your hands or in your eyes, flush it with cold water. Wear goggles at all times.
- Be careful of glassware. Notify the teacher if glassware breaks.
- Dispose of all chemicals in the sinks.

#### Word Wall:

Chemical Energy: \_\_\_\_\_

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#### Review

In chemistry we learned that we can make new stuff from old stuff during a chemical reaction. The atoms of the reactants rearrange themselves to make a product. One of our indications of a chemical reaction was a change in temperature. It so happens that a temperature change is related to thermal energy.

You will once again combine aluminum foil with copper chloride and you will also combine steel wool with copper chloride. Rather than focusing on the new substances made in a chemical reaction, you will focus on the transfer of chemical energy into thermal energy.

#### Procedure

1. Put on your goggles.
2. Take a beaker containing 50 ml of copper chloride from the table. Carefully carry it to your lab table.
3. Place a thermometer in the beaker and turn it on.
4. Crumple up the 2 g. sheet of aluminum foil into a loose ball.
5. Place the ball of aluminum foil into the beaker with the copper chloride. **Keep the thermometer submerged in the liquid.** You may push the aluminum with the stirring rod if you want.
6. Record the temperature of the contents of the beaker every 10 seconds for 3 minutes.
7. Dump the contents of the beaker into the sink and rinse it thoroughly. Return the beaker to the front table.
8. Repeat steps 2-7 replacing the aluminum with steel wool.
9. Graph your data as stated in the direction on the next page.

#### Your Progress:

- Mastery
- Proficient
- Developing
- Beginning

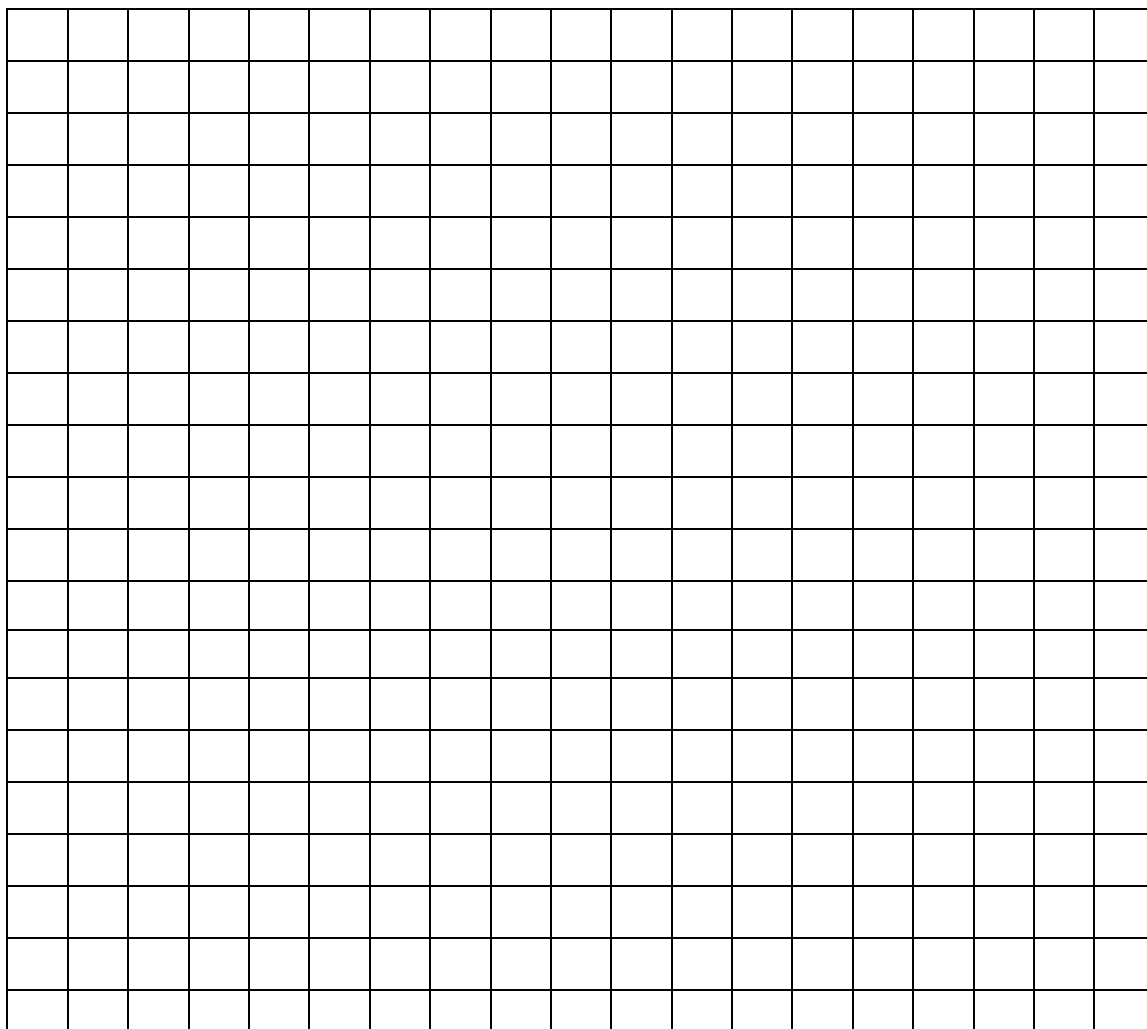
## Data

Time	Aluminum + Copper Chloride Temperature (°C)	Steel Wool + Copper Chloride Temperature (°C)
(Starting Temperature)		
0:10		
0:20		
0:30		
0:40		
0:50		
1:00		
1:10		
1:20		
1:30		
1:40		
1:50		
2:00		
2:10		
2:20		
2:30		
2:40		
2:50		
3:00		

### Graph

Create a line graph of temperature (y-axis) versus time (x-axis). There should be 2 different colored lines to represent the 2 metals added to the copper chloride.

Title: \_\_\_\_\_



### Conclusion

Which combination of metal and copper chloride produces greatest thermal energy?

\_\_\_\_\_

Notice the temperature peaks and then drops. Why is the thermal energy no longer produced?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_





## Lesson 8: What Are Some Examples of Renewable Energy?

### Article Review

Read one of the following articles and circle the one you pick:

#### How Do Hybrid Cars Work?

<http://goo.gl/f0aZs9> (\*Note: The "0" is the number zero).

<http://abcnews.go.com/Technology/Hybrid/story?id=97518&page=1>

#### Turning Landfill Waste into Energy for New York

<http://goo.gl/xw3DXm>

<http://www.nytimes.com/interactive/2013/09/15/nyregion/from-garbage-to-energy-at-fresh-kills.html>

#### Pros and Cons of Wind and Solar Energy

<http://goo.gl/EqvxYQ>

<http://www.npr.org/templates/story/story.php?storyId=129253742>

### Response Questions

Summarize the article in three sentences. Use your own words.

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How is this information useful to its readers?

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#### Your Progress:

- Mastery
- Proficient
- Developing
- Beginning

What is the coolest thing you learned from this article?

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---

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---

How does this article relate to our current unit of study?

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What is the most important word in the article?

---

What are three words that were challenging or new to you? What do they mean?

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What is one thing you found confusing, or still have a question about after reading this article?

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Lesson 9: How Does The Voltage in a Circuit Affect the Brightness of a Light?

Activity 9.1

⚡ Safety

Do not leave the lights on longer than is required as it will deplete the batteries.

Purpose

Conduct an experiment with your partner that measures the change light output as read on a lux meter of a light bulb, as you add more batteries.

Your Progress:

- Mastery
- Proficient
- Developing
- Beginning

Word Wall:

Electrical Energy: \_\_\_\_\_

Light Energy: \_\_\_\_\_)

Variables

What is the independent variable (manipulated) for this experiment?

\_\_\_\_\_

What is the dependent variable (measured/ responding) for this experiment?

\_\_\_\_\_

What are the controlled variables (stays the same) of this experiment? (State at least 3)

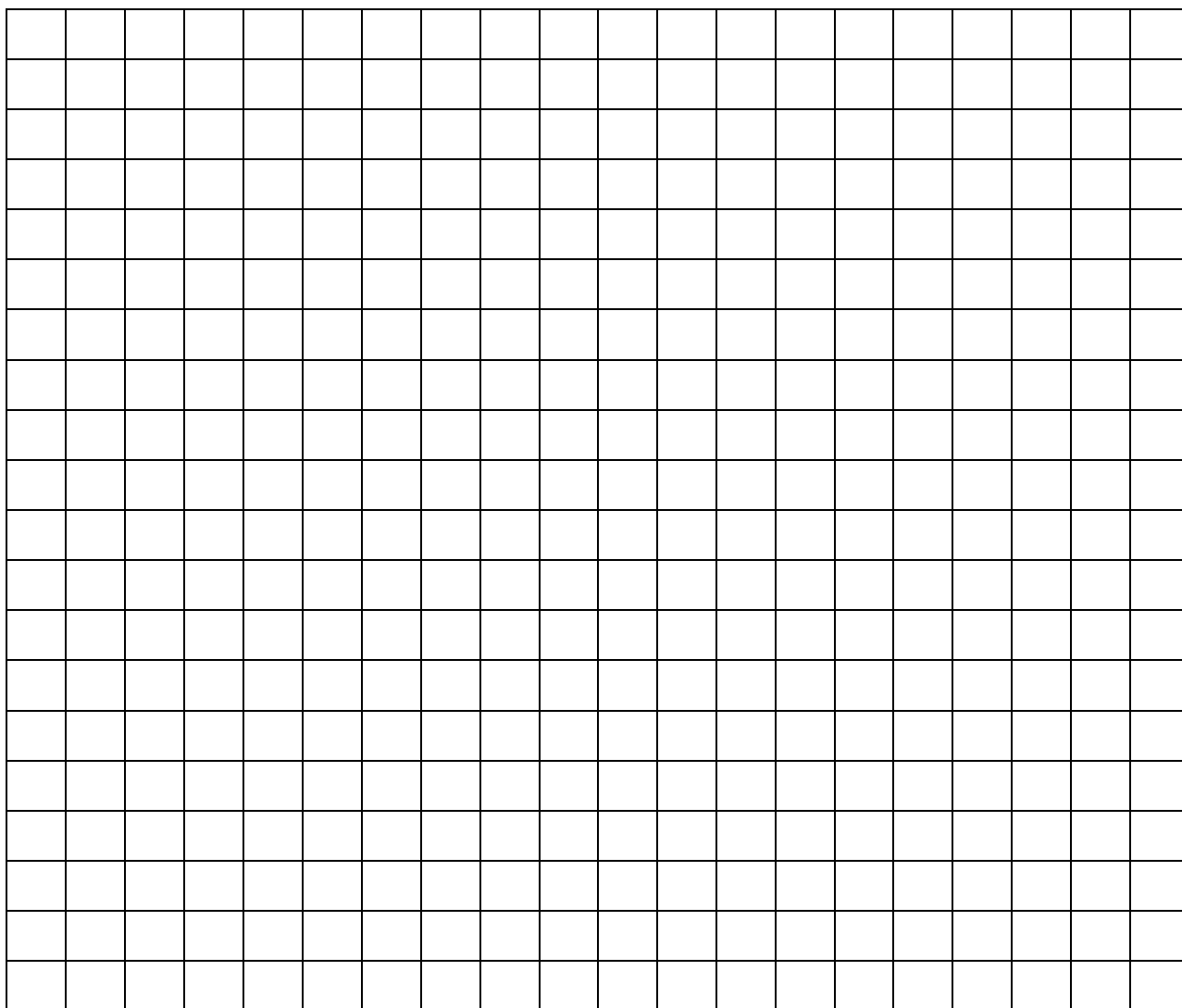
\_\_\_\_\_

\_\_\_\_\_

Data

Number of batteries	Voltage	Trial 1	Trial 2	Trial 3	Average
Zero	0 Volts				
One	1.5 Volts				
Two	3.0 Volts				
Three	4.5 Volts				
Four	6.0 Volts				

Use this grid to create a graph of your data.



What happens to the amount of light energy coming from the light bulb as you increase the voltage in the circuit? Explain why you think this happens.

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## Lesson 11: How Do Energy Conversions and Transfers Work?

### Activity 11.1

#### ✚ Safety

Be sure to follow any instructions at each station. Do not touch items that are labeled with a “Do Not Touch” sign.

#### Purpose

To review how different types of energy can be converted/ transformed or transferred. Also, the purpose of this activity is to add two more types of energy to our list.

#### Word Wall:

Transform: \_\_\_\_\_

Open System: \_\_\_\_\_

Closed System: \_\_\_\_\_

#### Directions

Write a 1 complete sentence to describe what is happening in the station. Draw a diagram to demonstrate the energy conversions you see. Be on the look out for 2 more energy forms to add to our list!

#### Symbols:

→ means “converts/transforms to”  
=>means “transfers to”

GE = Gravitational Energy  
KE = Kinetic Energy  
EE = Elastic Energy  
TE = Thermal Energy

SE = Sound Energy  
CE = Chemical Energy  
ELE = Electrical Energy  
LE = Light Energy

#### Your Progress:

- Mastery
- Proficient
- Developing
- Beginning

Description	Diagram
<p>Example:</p> <p>The alcohol under the spinning cup is lit on fire. As the heat rises the cup spins.</p>	<p>(Fire Burns)      (Cup Spins)</p> <p>CE → TE → KE =&gt; KE</p> <p>    ⬇ LE</p> <p>            (Hot Air Rises)</p>
Station 1:	

Station 2:	
Station 3:	
Station 4:	
Station 5:	
Station 6:	
Station 7:	
Station 8:	