

A Middle School Survival Guide's

KINETIC & POTENTIAL ENERGY LAB

GREAT FOR: INTRODUCING ENERGY + HANDS ON LEARNING

Name: _____

Kinetic and Potential Energy Lab

KINETIC ENERGY IS THE ENERGY OF MASS IN MOTION. AN OBJECT THAT HAS MOTION, NO MATTER THE DIRECTION, HAS KINETIC ENERGY.
POTENTIAL ENERGY IS THE ENERGY THAT AN OBJECT HAS DUE TO ITS POSITION. THE RESULT OF GRAVITY PULLING DOWNWARD.

Task: Evaluate kinetic and potential energy changes in a bouncing tennis ball, golf ball, and ping pong ball.

Materials:
▶ tennis ball
▶ golf ball
▶ ping pong ball
▶ meter stick

Hypothesis:
If _____
then _____
because _____

Procedures:
1. Partner 1 holds or secures a meter stick vertically.
2. Partner 2 will hold the tennis ball at 30cm and release.
3. Partner 3 will observe the bounce-height of the dropped tennis ball and measure the height of the bounce ("rebound").
4. Repeat this for 3 trials and calculate the average.
5. Repeat steps 1-4 with a golf ball.
6. Repeat steps 1-4 with a ping pong ball.

Diagram: A diagram showing a ball being dropped from a height of 30 cm. The ball is shown at three positions: at the start (30 cm), at the bottom (0 cm), and at the rebound height. A meter stick is shown vertically next to the ball.

Date: Record your data in the charts below:

Tennis Ball Drop Data

Trial #	30 cm	50 cm	100 cm
1			
2			
3			
4			
Average			

Golf Ball Drop Data

Trial #	30 cm	50 cm	100 cm
1			
2			
3			
4			
Average			

Ping Pong Ball Drop Data

Trial #	30 cm	50 cm	100 cm
1			
2			
3			
4			
Average			

Name: _____

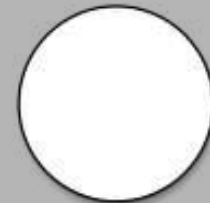
Kinetic and Potential Lab - Technology Tips

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DIRECTIONS: FOR THIS LAB, YOU WILL BE USING AN iPad OR iPhone DEVICE TO RECORD YOUR RESULTS. THE PURPOSE OF USING A DEVICE FOR RECORDING THE RESULTS WILL BE TO USE THE SLOW-MOTION RECORDING.

- Set up your lab experiment area as shown below. As explained in the lab, you will need a vertical meter stick secured or held in place.
- Before you start your experiment, find the "camera" feature on your iPad or iPhone. Your camera will most likely be in the default "PHOTO" mode. Slide to the left to the "SLO-MO" mode.
- Test recording the video and dropping a ball at the same time. At least one partner should be dropping the ball steadily near the meter stick and the other partner should be recording the drop.
- Review your "SLO-MO" video. Use the slow motion video to decrease human error of reading the "rebound height" of the dropped ball. View the video as many times as you need to get an accurate recording.

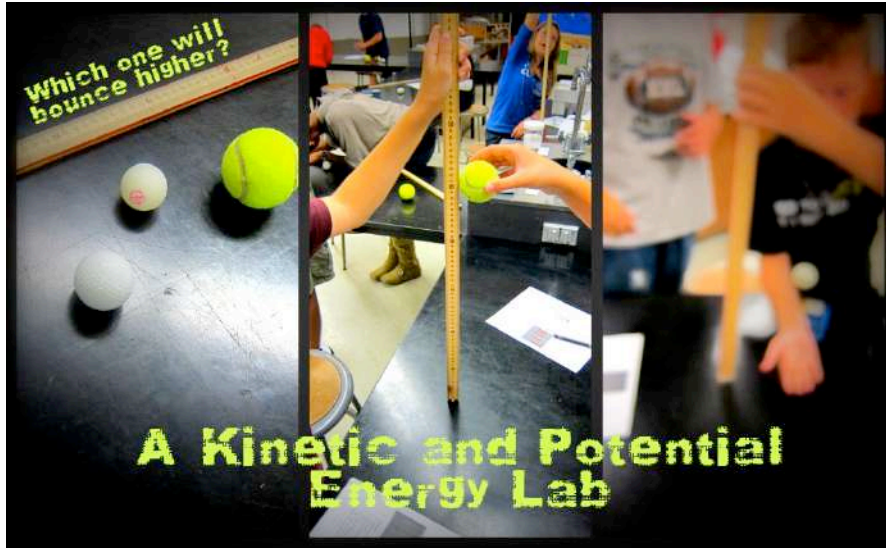
Diagram: A diagram showing a ball being dropped from a height of 30 cm. The ball is shown at three positions: at the start (30 cm), at the bottom (0 cm), and at the rebound height. A meter stick is shown vertically next to the ball.



Includes
2 versions
and tips for
recording
data with
technology!

About This Lab in the Classroom

TEACHER GUIDE



What you will need:

You will need tennis, golf, and ping-pong balls for each group. You can also modify this lab to use different types of sports balls. I have included lab sheets that allow for both. You will need one set of materials per each set of students who will be working as lab partners.

Student roles during this lab:

I have students work in groups of three with the roles of: measurer, recorder, dropper. Having groups of three keeps all students engaged for the duration of the lab. If you do need to have groups of four, I recommend adding a second “recorder”. You can explain that this position benefits from having a second “set of eyes”

How to enhance the lesson with technology:

Assign the “recorder” of the group to record the drop with an ipad, phone, or tablet. This will allow students to read the results with more accuracy or use features such as slowing their recording to view.

More tips and links to use with this activity:

Check out the online resources I share in my blog post. Any of the videos can be used for mini-lesson, review, or pre-teaching through a flipped classroom format:

<http://www.amiddleschoolsurvivalguide.com/2011/10/ball-drop-lab.html>

<http://www.amiddleschoolsurvivalguide.com/2011/10/physical-science-videos-part-ii.html>

The Lab Report:

The three page lab below prompts students to create a hypothesis, follow procedures, record data, answer analysis questions, and write a conclusion.

- **VERSION 1: (Seen below)** lists the featured three objects to drop: tennis ball, golf ball, and ping pong ball.
- **VERSION 2: (Not pictured)** has blank spaces for three chosen objects to be used. This allows for student-choice to choose sports balls such as baseballs, basketballs, soccerballs, softballs, bouncyballs, etc. etc.

NAME: _____

Kinetic and Potential Energy Lab

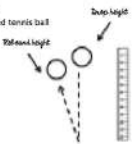
KINETIC ENERGY IS THE ENERGY OF MASS IN MOTION. AN OBJECT THAT HAS MOTION, NO MATTER THE DIRECTION, HAS KINETIC ENERGY.
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Task: Evaluate kinetic and potential energy changes in a bouncing tennis ball, golf ball, and ping pong ball.

Materials:
 ► tennis ball
 ► golf ball
 ► ping pong ball
 ► meter stick

Hypothesis:
 If _____
 then _____
 because _____

Procedures:
 1. Partner 1 holds or secures a meter stick vertically.
 2. Partner 2 will hold the tennis ball at 30cm and release.
 3. Partner 3 will observe the bounce-height of the dropped tennis ball and measure the height of the bounce ("rebound").
 4. Repeat this for 3 trials and calculate the average.
 5. Repeat steps 1-4 with a golf ball.
 6. Repeat steps 1-4 with a ping pong ball.



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Data: Record your data in the charts below:

Tennis Ball Drop Data

Trial #	30 cm	50 cm	80 cm
1			
2			
3			
4			
Average			

Golf Ball Drop Data

Trial #	30 cm	50 cm	80 cm
1			
2			
3			
4			
Average			

Ping Pong Ball Drop Data

Trial #	30 cm	50 cm	80 cm
1			
2			
3			
4			
Average			

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Analysis:
 1. What kind of energy does the ball have just before it is released? _____
 2. What kind of energy does the ball have as it strikes the floor? _____
 3. If 100% of the ball's kinetic energy was converted into potential energy, how high would it bounce? _____

How did the type of ball used affect your results? Why? _____

Conclusion:
 Write a conclusion that explains the purpose, hypothesis, procedures, data, and analysis of your lab experiment.

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The Technology Tips Page:

The technology tips page can be used with either version of the lab. It gives tips for using the "SLO-MO" feature of an iPad or iPhone to enhance recording of the data in this lab. The tips page can be passed out to the students or projected as a reminder for the whole class.

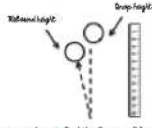

NAME: _____

Kinetic and Potential Lab - Technology Tips

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DIRECTIONS: FOR THIS LAB, YOU WILL BE USING AN IPAD OR IPHONE DEVICE TO RECORD YOUR RESULTS. THE PURPOSE OF USING A DEVICE FOR RECORDING THE RESULTS WILL BE TO USE THE SLOW-MOTION RECORDING.

1. Set up your lab experiment area as shown below. As explained in the lab, you will need a vertical meter stick secured or held in place.
2. Before you start your experiment, find the "camera" feature on your iPad or iPhone. Your camera will most likely be in the default "PHOTO" mode. Slide to the left to the "SLO-MO" mode.
3. Test recording the video and dropping a ball at the same time. At least one partner should be dropping the ball steadily near the meter stick and the other partner should be recording the drop.
4. Review your "SLO-MO" video. Use the slow motion video to decrease human error of reading the "rebound height" of the dropped ball. View the video as many times as you need to get an accurate recording.

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Kinetic and Potential Energy Lab

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Task: Evaluate **kinetic** and **potential energy** changes in a bouncing tennis ball, golf ball, and ping pong ball.

Materials:

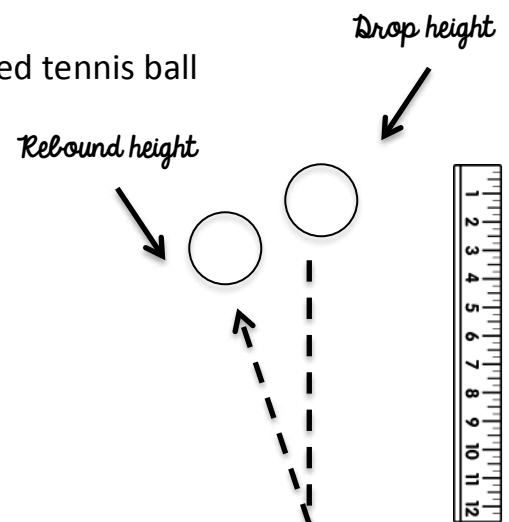
- | | |
|------------------|---------------|
| ▶ tennis ball | ▶ golf ball |
| ▶ ping pong ball | ▶ meter stick |

Hypothesis:

If _____
then _____
because _____.

Procedures:

1. Partner 1 holds or secures a meter stick vertically.
2. Partner 2 will hold the tennis ball at 30cm and release.
3. Partner 3 will observe the bounce-height of the dropped tennis ball and measure the height of the bounce ("rebound").
4. Repeat this for 3 trials and calculate the average.
5. Repeat 3 trials with the tennis ball at the heights of 50cm and 200cm, recording all data in the chart.
6. Repeat steps 1-5 with a golf ball.
7. Repeat steps 1-5 with a ping pong ball.



Data: Record your data in the charts below:

Tennis Ball Drop Data

Trial #	30 cm	50 cm	100 cm
1			
2			
3			
4			
Average			

Golf Ball Drop Data

Trial #	30 cm	50 cm	100 cm
1			
2			
3			
4			
Average			

Ping Pong Ball Drop Data

Trial #	30 cm	50 cm	100 cm
1			
2			
3			
4			
Average			

Analysis:

1. What kind of energy does the ball have just before it is released? _____
2. What kind of energy does the ball have as it strikes the floor? _____
3. If 100% of the ball's **kinetic energy** was converted into **potential energy**, how high would it bounce? _____

How did the type of ball used affect your results? Why? _____

Conclusion:

Write a conclusion that explains the purpose, hypothesis, procedures, data, and analysis of your lab experiment.

Name: _____

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Task: Evaluate **kinetic** and **potential energy** changes in three sports balls of your choice.

Materials:

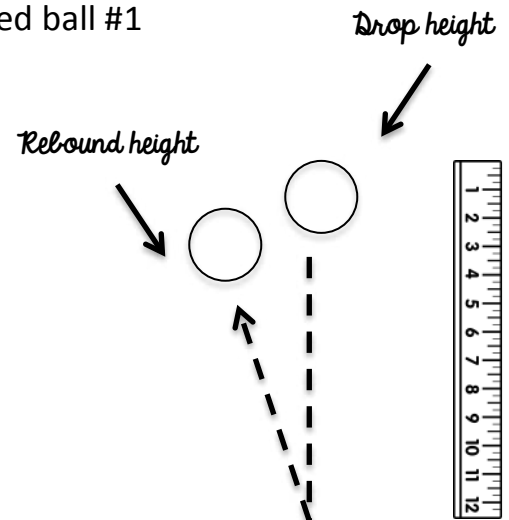
► _____ ball ► _____ ball
► _____ ball ► meter stick

Hypothesis:

If _____
then _____
because _____.

Procedures:

1. Partner 1 holds or secures a meter stick vertically.
2. Partner 2 will hold the tennis ball at 30cm and release.
3. Partner 3 will observe the bounce-height of the dropped ball #1 and measure the height of the bounce ("rebound").
4. Repeat this for 3 trials and calculate the average.
5. Repeat 3 trials with ball #1 at the heights of 50cm and 200cm, recording all data in the chart..
6. Repeat steps 1-5 with ball #2.
7. Repeat steps 1-5 with ball #3.



Data: Record your data in the charts below:

----- *Ball Drop Data*

Trial #	30 cm	50 cm	100 cm
1			
2			
3			
4			
Average			

----- *Ball Drop Data*

Trial #	30 cm	50 cm	100 cm
1			
2			
3			
4			
Average			

----- *Ball Drop Data*

Trial #	30 cm	50 cm	100 cm
1			
2			
3			
4			
Average			

Analysis:

1. What kind of energy does the ball have just before it is released? _____
2. What kind of energy does the ball have as it strikes the floor? _____
3. If 100% of the ball's **kinetic energy** was converted into **potential energy**, how high would it bounce? _____

How did the type of ball used affect your results? Why? _____

Conclusion:

Write a conclusion that explains the purpose, hypothesis, procedures, data, and analysis of your lab experiment.

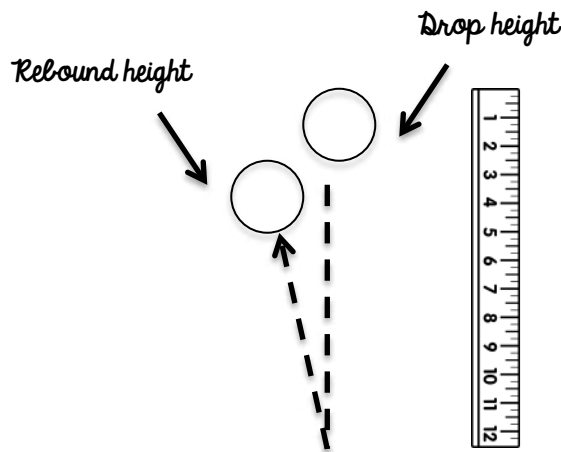
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DIRECTIONS: FOR THIS LAB, YOU WILL BE USING AN IPAD OR IPHONE DEVICE TO RECORD YOUR RESULTS. THE PURPOSE OF USING A DEVICE FOR RECORDING THE RESULTS WILL BE TO USE THE SLOW-MOTION RECORDING

1. **Set up your lab experiment area as shown below.** As explained in the lab, you will be need a vertical meter stick secured or held in place.

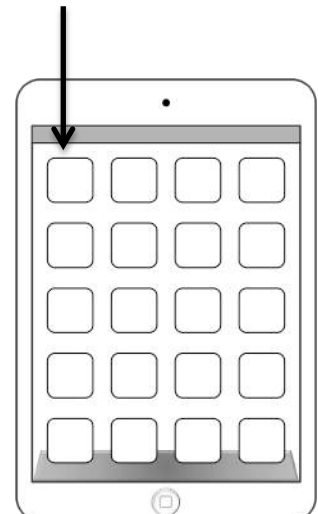


2. **Before your start your experiment, find the “camera” feature on your ipad or iphone.** Your camera will most likely be in the default “PHOTO” mode. Slide to the left to the “SLO-MO” mode.

3. **Test recording the video and dropping a ball at the same time.** At least one partner should be dropping the ball steadily near the meter stick and the other partner should be recording the drop.

4. **Review your “SLO-MO” video.** Use the slow motion video to decrease human error of reading the “rebound height” of the dropped ball. View the video as many times as you need to get an accurate recording.

Find the camera app on your screen...or by sliding open the locked ipad screen!



Kinetic and Potential Energy Lab

Answer Key

KINETIC ENERGY IS THE ENERGY OF MASS IN MOTION. AN OBJECT THAT HAS MOTION, NO MATTER THE DIRECTION, HAS KINETIC ENERGY.

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Task: Evaluate **kinetic** and **potential energy** changes in a bouncing tennis ball, golf ball, and ping pong ball.

Materials:

- ▶ tennis ball
- ▶ ping pong ball
- ▶ golf ball
- ▶ meter stick

Hypothesis:

If the ball is dropped from a given height

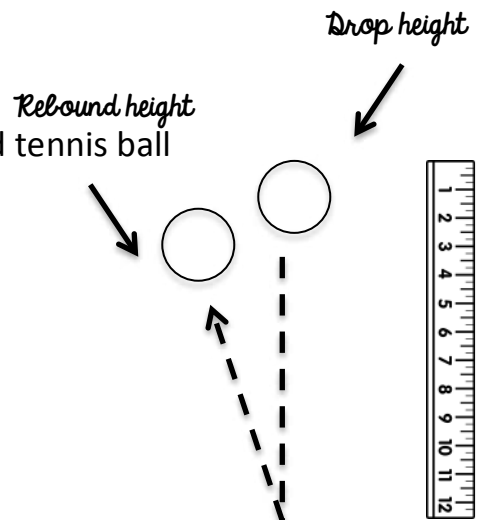
then it will bounce back to the original height it was dropped from

because potential energy will convert to kinetic energy.

or a student may say: "IF a ball is dropped from a given height, THEN it will bounce lower than the original height BECAUSE when potential energy converts to kinetic energy, some energy will be lost due to friction."

Procedures:

8. Partner 1 holds or secures a meter stick vertically.
9. Partner 2 will hold the tennis ball at 30cm and release.
10. Partner 3 will observe the bounce-height of the dropped tennis ball and measure the height of the bounce ("rebound").
11. Repeat this for 3 trials and calculate the average.
12. Repeat 3 trials with the tennis ball at the heights of 50cm and 200cm, recording all data in the chart.
13. Repeat steps 1-5 with a golf ball.
14. Repeat steps 1-5 with a ping pong ball.



Analysis:

1. What kind of energy does the ball have just before it is released? **Potential energy**
2. What kind of energy does the ball have as it strikes the floor? **Kinetic energy**
3. If 100% of the ball's **kinetic energy** was converted into **potential energy**, how high would it bounce? The ball would bounce back to the original height it was dropped from.

How did the type of ball used affect your results? Why? The type of ball affects the results because we saw that _____ ball bounced higher than _____ ball. The ball may have been affected by elastic energy from the bounce of the tennis ball or it may have been affected by friction affecting the balls differently when they bounced back.

Conclusion:

Write a conclusion that explains the purpose, hypothesis, procedures, data, and analysis of your lab experiment.

The purpose of this lab was to test kinetic and potential energy changes. The hypothesis was that if a ball was dropped from a given height it would bounce back to the original height it was dropped from because potential energy will convert to kinetic energy. The procedures were to use a meter stick to measure the drop heights and rebound bounce heights of a tennis ball, golf ball, and ping pong ball at 30cm, 50cm, and 200cm. The data showed that the tennis ball bounced to a height of _____, the golf ball bounced to a height of _____, and the tennis ball bounced to a height of _____. (Analysis: A further sentence or two may be needed to explain the data and trends from the data. The students should say that the rebound heights were or were not equal to the initial drop heights) (Reflect on hypothesis: The students should say "The original hypothesis was incorrect because..... OR The original hypothesis was correct because....." Any why)

Thank you for purchasing from A Middle School Survival Guide

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amiddleschoolsurvivalguideblog@gmail.com

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- >Zip-A-Dee-Doo-Dah Designs
- >Teacher Resource Force
- >Ashley Hughes
- >Glitter Meets Glue Designs



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