

# Bouncing Balls Kit

In this kit you will have the following experiments:

1. What makes a ball bouncy?  
Designed by Jack Ridgway and Ben Hess
2. Energy's Shocking Secret  
Designed by Cassie Fix and Griffin Rauber

These kits are designed to explore the properties of bouncing balls. What makes a ball bouncy explores how different balls change the “bounciness”. And Energy's Shocking Secret expands and looks at different types of shock absorption.

This kit contains some of the materials needed, but we highly encourage you to explore how you can use the stuff around your house. Be creative, be curious, and have fun!

## Kit Contents

- 1 Golf ball
- 2 Bouncy Balls
- 2 Wooden Beads
- 1 squishy ball



# What Makes a Ball Bouncy?

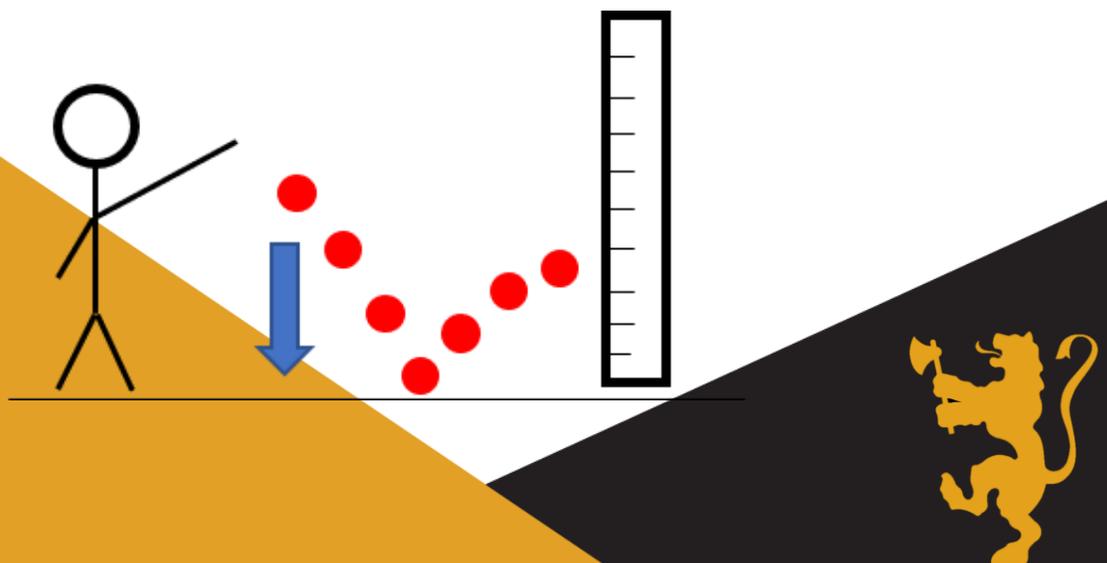
In this lab we will explore why some types of balls bounce higher than others.

## Materials:

- Balls to bounce: bouncy ball, metal balls, any other balls you have.
- For you to source: Measuring Stick/Tape, Stopwatch, surface
- Suggested: phone to record motion

## Instructions:

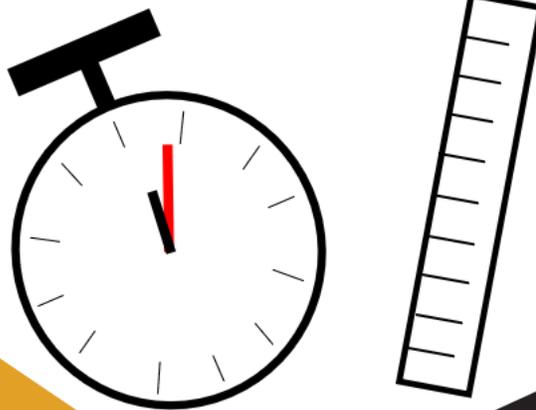
Set up your measuring stick so that it is upright above a hard floor. Take out the balls and see how high they bounce. What can you change to make them bounce higher? Which ball is the bounciest? We will explore these question in the pages ahead.



# Students

Procedure:

1. Take the bouncy ball and another ball from the kit.
2. Drop these two balls from the same height, a height of 1 foot (30 cm) works well. Which ball bounces higher?
3. Repeat step two and write down how high the ball bounces after 1 bounce, 2-bounces.
4. Drop them again, this time use the stopwatch to measure how long they bounce before they stop bouncing at all.
5. Compare the differences between the two balls and think about the following questions:
  - a. Which ball bounces for a longer time?
  - b. Do the highest bouncers also bounce the longest?
  - c. What is the cause of the balls bouncing? What is the force behind the bounce?
6. Repeat this process with marbles or any other balls you want to test. Does the height you drop it at change the results? Try and find the bounciest ball in your house!





# Parents/Teachers

The purpose of this first part is just to start thinking about the motion of bouncing and try to describe the motion with specific numbers (here that is height and time). Essentially, it introduces a fundamental aspect of Physics which is taking measurements of observations and using the measurements to better understand your surroundings. This aspect should be your focus while guiding your students through the process. Because this is the focal point of the initial experiment, the answers to the questions are not as important as the process.

So what actually makes the ball bouncy? We can think of the ball like a spring. The more the ball compresses when it hits the ground, the higher it will bounce. The height of the bounce also depends on what the ball is made of. Just like how a stiff spring will provide a greater force than a loose spring, some materials will be better for bouncing than others.

However, a bounce is an interaction between the ball and the ground. We tried changing the surface of the ball, but what happens if we change the surface of the ground? (See Energy's Shocking Secrets)

# ENERGY'S SHOCKING SECRETS

Let's look at shock absorption and how energy is involved in this process! Shock involves when energy is transferred between objects due to a force. Shock absorption is seen everyday, in simple things such as a swaying tree, basketball rim, or even from the joints in our body. It is important to look at materials, time, and the force acting on an object to determine how well shock can be absorbed.

## INSTRUCTIONS:

Start by making a prediction based on the 3 objects ranking them in order from least to greatest in which one absorbs the shock the best.

To explore you will drop each object from various heights repeating. Write down what you saw when the ball hit the ground. How high did it bounce? What did it sound like? Did the shape of the ball change?

What happens if you do the same experiment on a different surface? Did the results change?

In each case what is absorbing the shock?

## MATERIALS:

- Squishy ball
- Rigid ball
- Semi-firm ball





# PARENT/TEACHER INFORMATION:

For further explanation on these concepts explore this website:

<https://kids.britannica.com/kids/article/energy/353100>

## Concepts to understand in this lab:

- Energy
- Energy Conservation

## Types of Energy seen in this lab:

- Gravitational Potential Energy
- Kinetic Energy
- Sound Energy
- Elastic Potential Energy

## KEY TAKEAWAYS:

- Energy is never lost, but can be transferred
- Different properties of an object can change how the energy is transferred
- There are several different types of energy
- The shock can be absorbed by either the surface or the ball.

All objects start at the same height so therefore they have the same potential energy. As the balls fall to the ground, the potential energy turns into kinetic energy. The balls have their maximum kinetic energy right before they hit the ground. As the object hits the floor, the energy is transformed again. If the sound is loud, a lot of energy was transformed into sound energy. If the ball is deformed energy was transformed into elastic potential energy. This is ideal for shock absorption. If it doesn't ricochet then the energy is lost to heat energy and can't be used to make the ball move anymore. Both the surface and the ball can absorb the shock.