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| *Figure 1. The bounce height of the ball will be less than the drop height of the ball due to energy transferred out of the ball.* |

**BALL BOUNCE INVESTIGATION**

**Introduction:** Scientists define **energy** as the ability to do work or to cause change. Energy can be observed in many different forms, including one type of energy known as mechanical energy. **Mechanical energy** is the energy that an object has as a result of its motion or position. There are two kinds of mechanical energy, kinetic energy and potential energy.

**Kinetic energy** is called “the energy of motion”. The kinetic energy of an object depends on its mass and how fast it is moving. The faster an object moves, the more kinetic energy it has. **Potential energy** is the energy that is stored in an object based on its position. One type of potential energy is **gravitational** potential energy, which depends on the height of an object and its mass. The higher the object rises, the more gravitational potential energy it has. Another type of potential energy is **elastic** potential energy. This type of energy is stored in an object when it is stretched or compressed. For example, when you compress a spring, you are storing elastic potential energy in the spring.

One of the most important laws of physics states that energy is neither created nor destroyed. This means that the total amount of energy in a system will be the same at the beginning and end of any process. This key principle is called the **law of conservation of energy**. However, energy does not always exist in the same form; it can be **converted** from one form to another and **transferred** from one object to another.

Usually, when a ball bounces, you will observe that *the bounce height is lower than the height the ball was dropped from*. On the surface, it may seem that some of the gravitational potential energy the ball had when it was dropped is lost, in other words, *it may appear that the ball is not following the law of conservation of energy*! However, when you consider that *energy can be converted and transferred*, it becomes logical that the ball will not bounce back to the original drop height.

So, where did the “lost” energy go if it is no longer in the ball after it bounces? Each ball has different properties that will cause energy to be converted and transferred differently, affecting the bounce height of each ball differently. Some will transfer more energy causing a lower bounce height, while others will transfer less energy causing a higher bounce height.

**Task:** Design an investigation that will help you ***create a rule or equation*** to explain how much energy is transferred out of the ball when it bounces and ***predict*** how high each ball will bounce when dropped from 2.5 meters.

**Guiding Question:** **How high will each ball bounce when dropped from 2.5 meters?**

***Note*** *– Do not drop a ball from this height during your investigation…that would defeat the purpose of a prediction!*

**Materials:**  You will have access to the following materials during your investigation:

* tennis ball
* racquet ball
* 3rd ball (your choice)
* 2 meter sticks
* other (please ask first)

**Safety:** Balls should only be dropped, never thrown or tossed. Do not stand on tables or chairs.

**Getting Started:** Have a purpose; don’t simply start dropping balls without a plan!

* What type of investigation will you set up? An experiment? A systematic observation?
* What data will you need to record? How will you collect this data?
* How many trials will you run? Will you calculate any averages? If so, from what data?

**Thinking About the Process:** It’s all about patterns!

* How can you organize your data to illuminate patterns?
* What patterns exist in the data?
* How can you use those patterns to make a prediction?

**Arriving at a Conclusion:** Using patterns to make a conclusion.

* Test out your method of predicting by dropping the ball from various heights and predicting the bounce height.
* If necessary, refine your methods based on the results of the testing.