Name/Period: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**BOUNCE**

**Background:**

**The Law of Conservation of Energy** states that energy cannot be created or destroyed, but can be transformed**.** In this activity we observe energy being transformed, although the total amount of energy remains the same.

Before dropping a ball, you must lift the ball up from its’ resting surface. When you do this, you are transferring energy from your muscles to the ball. You are giving the ball **potential energy**, specifically **gravitational potential energy**. Gravitational potential energy (GPE) is the energy gained by an object as its height above ground level in- creases. An object’s GPE is determined using this formula:

*GPE = height x weight*

Objects that are the same weight will gain more GPE the higher they are positioned. If one object is heavier than the other at the same height, the heavier object will have more GPE.

As the ball falls towards the ground, its gravitational potential energy is transformed into **kinetic energy**. The kinetic energy of an object is the energy it possesses due to its motion. The kinetic energy of the ball will continue increasing as the ball gains momentum, until it finally collides with a surface.

When the ball collides, the kinetic energy is transformed into other forms of energy. When a ball hits a surface, some energy is transformed into sound energy, some is transformed into thermal energy from the friction created, and some becomes elastic potential energy.

***PART I***

**Procedure**:

1. Starting at the floor, stretch the tape vertically against the wall or table leg.
2. Draw lines across the tape to mark ½ meter (50cm), ¾ meter (75cm), and 1 meter (100 cm) above the floor.
3. Hold the ball at the ½ meter mark and drop it. Observe carefully as the ball bounces back up.
4. Mark the height of the first bounce on the tape.
5. Use the meter stick to measure the height of the rebound bounce and record it in the data table.
6. Repeat steps 3 – 5 for a total of 5 trials.
7. Hold the ball at 75 cm, the ¾ meter mark, and repeat steps 3 – 6.

8. Hold the ball at the 1-meter mark and repeat steps 3 – 6.

9. Calculate the average for the fall for each drop height.

## Height of Rebound Data Table

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Golf Ball | | | | | | |
| Height of Drop | Trial 1 | Trial 2 | Trial 3 | Trial 4 | Trial 5 | Average |
| 50 cm |  |  |  |  |  |  |
| 75 cm |  |  |  |  |  |  |
| 100 cm |  |  |  |  |  |  |
| Ping-Pong Ball | | | | | | |
| Height of Drop | Trial 1 | Trial 2 | Trial 3 | Trial 4 | Trial 5 | Average |
| 50 cm |  |  |  |  |  |  |
| 75 cm |  |  |  |  |  |  |
| 100 cm |  |  |  |  |  |  |
| Tennis Ball | | | | | | |
| Height of Drop | Trial 1 | Trial 2 | Trial 3 | Trial 4 | Trial 5 | Average |
| 50 cm |  |  |  |  |  |  |
| 75 cm |  |  |  |  |  |  |
| 100 cm |  |  |  |  |  |  |

***PART II***

**Procedure**:

1. Find the ball of each ball.

2. Calculate the Gravitational Potential Energy (GPE) for each ball.

|  |  |  |
| --- | --- | --- |
|  | **Golf Ball** |  |
| MASS (GRAMS) | HEIGHT (CM) | MASS x HEIGHT x 9.8 = GPE (JOULES) |
|  | 50 cm |  |
|  | 75 cm |  |
|  | 100 cm |  |

|  |  |  |
| --- | --- | --- |
|  | **Ping-Pong Ball** |  |
| MASS (GRAMS) | HEIGHT (CM) | MASS x HEIGHT x 9.8 = GPE (JOULES) |
|  | 50 cm |  |
|  | 75 cm |  |
|  | 100 cm |  |

|  |  |  |
| --- | --- | --- |
|  | **Tennis Ball** |  |
| MASS (GRAMS) | HEIGHT (CM) | MASS x HEIGHT x 9.8 = GPE (JOULES) |
|  | 50 cm |  |
|  | 75 cm |  |
|  | 100 cm |  |

**Questions**

1. How does the bounce height of each ball compare to the height from which it was dropped?

2. What is the correlation between each ball’s kinetic energy and potential energy as it fell?

3. How does the height of the ball bouncing back relate the GPE of the ball? Explain you answer.

4. How does the mass of the ball bouncing back relate the GPE of the ball? Explain you answer.

5. How is the potential energy in the ball changed to kinetic energy in this investigation?

6. It has been stated that a ball will not bounce back to the starting height no matter what the starting position might be. Using evidence from the investigation, explain whether you think this statement is true.

**Crate a graph**

From the data collected, create a graph that demonstrates a relationship between bounce height and mass.

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