Name _____   Class _____   Date _____

Lab: Potential Energy - Ball Bounce Lab

Background Information: Energy can not be created or destroyed.   Stored energy is called potential energy, and the energy of motion is called kinetic energy.   Due to gravity, potential energy changes as the height of an object changes, this is called gravitational potential energy.

Objective: to determine the relationship between height and gravitational potential energy.

Problem: How does the drop height (gravitational potential energy) of a ball affect the bounce height (kinetic energy) of the ball?

Hypothesis: **If** the gravitational potential energy (*drop height*) of a ball is increased, **then** the kinetic energy (*bounce height*) will (increase/decrease/remain the same) **because** _____

_____

_____

_____

Variables: Independent variable (known information) is _____

   Dependent variable (unknown information) is _____

   Constants (variables kept the same for accuracy) are_____

_____

Materials: List all the materials used in this experiment. _____

_____

_____

Procedure: Follow the steps below to conduct your experiment. Be sure to record all data and any observations during the experiment. *__Follow all safety rules__*.

1. Tape the meter stick to the side of the lab table with the 0-cm end at the bottom and the 100-cm end at the top. Be sure that the meter stick is resting flat on the floor and is standing straight up.
2. Choose a ball type and record the ball type in the data table.
3. Use the triple beam balance to determine the mass of the ball and record the ball's mass in the data table.
4. Calculate the gravitational potential energy (GPE) for the ball at each drop height. Record GPE in data table.
   a. GPE = ball mass x drop height
5. For Trial 1, hold the ball at a height of **40 cm**, drop the ball carefully and observe the bounce height. Record the bounce height in the data table.
6. Drop the ball 4 more times from **40 cm**, recording the bounce height each time, for a total of 5 drops.
7. For Trial 2, repeat steps 5 and 6 but drop the ball from a height of **50 cm**. Record the 5 bounce heights in the data table.
8. For Trial 3, drop the ball five times from **60 cm** and record the 5 bounce heights in the data table.
9. For Trial 4, drop the ball five times from **70 cm** and record the 5 bounce heights in the data table.
10. For Trial 5, drop the ball five times from **80 cm** and record the 5 bounce heights in the data table.
11. For Trial 6, drop the ball five times from **90 cm** and record the 5 bounce heights in the data table.
12. For Trial 7, drop the ball five times from **100 cm** and record the 5 bounce heights in the data table.
13. Repeat steps 2 through 12 for a different type of ball.
14. Calculate the average bounce height of the 5 drops for each drop height. Record the average bounce height in the data table. Calculate the average bounce height for all Trials.
    a. To calculate average: Add the 5 bounce heights for a trial then divide the total by 5 drops. Example for Trial 1: drop1 + drop2 + drop3 + drop4 +drop5 = total; total divided by 5 = average bounce height.
       i. *Sample: Trial 1: 5+6+5+5+7 = 28   28/5 = 5.6 average bounce height.*
15. Plot the average bounce heights on a line graph. Place the independent variable of drop height on the x-axis and place the dependent variable of bounce height on the y-axis. Label the line with the ball type.
16. *CHALLENGE*: Repeat all necessary steps for a third ball type and include this data on the graph.
17. Answer discussion questions and write your lab summary.

Data:

Ball Type:	Ball Mass (g) = ____ .							
	Gravitational Potential Energy (GPE)	**Bounce Height (cm)**						
<u>Drop Height (cm)</u>	GPE = mass x height	<u>Drop 1</u>	<u>Drop 2</u>	<u>Drop 3</u>	<u>Drop 4</u>	<u>Drop 5</u>	<u>Average Bounce Height</u>
40							
50							
60							
70							
80							
90							
100							

Ball Type:	Ball Mass (g) = ____ .							
	Gravitational Potential Energy (GPE)	**Bounce Height (cm)**						
<u>Drop Height (cm)</u>	GPE = mass x height	<u>Drop 1</u>	<u>Drop 2</u>	<u>Drop 3</u>	<u>Drop 4</u>	<u>Drop 5</u>	<u>Average Bounce Height</u>
40							
50							
60							
70							
80							
90							
100							

Discussion Questions: Answer using complete sentences.
1. Describe the relationship between drop height and the bounce height. _____

_____

Was the relationship the same for both ball types that you tested? _____
2. Compare your gravitational potential energy to your bounce height for each trial. Describe the relationship between GPE and bounce height. _____

_____

_____

3. Look at the results of both ball types you tested.
   a. Which ball type had the most gravitational potential energy? _____
   b. Which ball type has the most mass? _____
   c. Describe the relationship between mass and GPE. _____

_____

4. What are the variables that affect gravitational potential energy of an object? _____

_____

_____

Conclusion: Write a conclusion, using complete sentences, that states the following: if your hypothesis was supported or negated; and what the real answer to the problem is. _____

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Summary: Write a three paragraph summary using our standard format (1. what you were doing and why you were doing it, 2. what you learned while doing this experiment, and 3. how what you learned relates to your life). _____

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