Lab: Potential Energy – Bouncy Ball Lab

Background Information: Energy cannot be created or destroyed. Stored energy is called **potential energy**, and the energy of motion is called **kinetic energy** (motion energy). Due to gravity, potential energy changes as the height of an object changes, this is called **gravitational potential energy**. The amount of gravitational potential energy depends on three factors: (1) the mass of the object, (2) the acceleration due to gravity (9.86 m/s^2 on the earth), and (3) the height of the object. The formula for gravitational potential energy is **GPE=mgh**= (mass x acceleration of gravity x drop height)

Objective: Determine the relationship between height and gravitational potential energy.

Question: 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: Manipulated variable (known information) is _____

Responding variable (unknown information) is _____

Constants (variables kept the same for accuracy) are _____

_____

Materials: bouncy ball, meter stick, masking tape, scale

Procedure:

1. Obtain the necessary materials and record the mass of your ball to the nearest 0.1 g. m(ball) =_____g=_____kg
2. 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.
3. You are to calculate the gravitational potential energy (GPE) for the ball at each drop height. Record GPE for each drop height in data table. Remember the formula is:
   GPE = ball mass x drop height x acceleration due to gravity
   ***NOTE: make sure the mass of your ball is in kg and the drop height is in meters.
4. 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.
5. Drop the ball 4 more times from **40 cm**, recording the bounce height each time, for a total of 5 drops.
6. 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.

7. For Trial 3, drop the ball five times from **60 cm** and record the 5 bounce heights in the data table.
8. For Trial 4, drop the ball five times from **70 cm** and record the 5 bounce heights in the data table.
9. For Trial 5, drop the ball five times from **80 cm** and record the 5 bounce heights in the data table.
10. For Trial 6, drop the ball five times from **90 cm** and record the 5 bounce heights in the data table.
11. For Trial 7, drop the ball five times from **100 cm** and record the 5 bounce heights in the data table.
12. Calculate the average bounce height for all Trials.
13. Plot the average bounce heights on a line graph. Place the manipulated variable of drop height on the x-axis and place the responding variable of bounce height on the y-axis.

Observations and Data:

Mass of ball in kg=_____	**Gravitational Potential Energy**	**Bounce Height (cm)**					
Drop Height (cm)	**GPE= mgh**	**Drop 1**	**Drop 2**	**Drop 3**	**Drop 4**	**Drop 5**	**Average Bounce Height (cm)**
40							
50							
60							
70							
80							
90							
100							

Graph: Label the x axis and y axis and plot data.

Drop Height vs. Average Bounce Height

Analysis Questions:

1. Describe the relationship between drop height and the bounce height.

2. Compare your gravitational potential energy to your bounce height for each trial. Describe the relationship between GPE and bounce height.

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

4. As the ball falls towards the ground, which type of energy is increasing and which type of energy is decreasing?

5. As the ball rises from a bounce, which type of energy is increasing and which type of energy is decreasing?

6. As all points while the ball is in the air, what is its acceleration? (Hint: acceleration is constant)

Conclusion: Write a conclusion for the experiment on the height of a bouncy ball and the amount of potential energy.

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