Gravitational Potential Energy

Part 1: Height and gravitational potential energy

**Aim:**

To investigate the relationship between height and potential energy.

**Background:**

Dropping a golf ball from a few centimetres onto your head does not hurt. Yet, on a golf course having that same golf ball fall from high in the air onto your head is quite dangerous. There is a relationship between the energy of a falling object and the height from which it falls. To investigate this relationship we will drop golf balls into small containers of water. The size of the splashed water will help indicate how much energy the golf ball had.

**Hypothesis:**

As a golf ball's initial drop height is increased when dropped into shallow water, the radius of the splashed water \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

Independent variable: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Dependent variable: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Two Controlled variables: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Equipment:** Metre ruler, plastic container, golf ball, water supply.

**Diagram:**

**Procedure:**

**Observations:**

|  |  |  |
| --- | --- | --- |
| Starting Height (cm) | Radius of splash (cm) | Description of Observation |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

**Graph:** Do on graph paper.

**Analysis:**

1. What type of energy did the ball have while you held it in the air, above the water?
2. What type of energy did the ball have while it hit the water's surface?
3. The ball stopped when it hit the water. Where did the ball's energy go?
4. Draw a flow chart for the transformations of energy that occurred during this experiment.
5. What does the size of the splash have to do with kinetic energy of the ball?
6. What does the kinetic energy of the ball have to do with the starting gravitational potential energy of the ball?
7. Describe the shape of the graph you produced.
8. Using the shape of the graph, describe the relationship between starting height and the gravitational potential energy of the ball.

**Conclusion:**

**Evaluation:** How could you improve this experiment to reliably and validly test the hypothesis? Why is a golf ball a better object than a tennis ball in this experiment?

Gravitational Potential Energy

Part 2: Mass and gravitational potential energy

**Aim:**

To investigate the relationship between mass and potential energy. Using the experimental setup of part 1 (height and gravitational energy) as a guide, design an experiment the help determine the relationship between the mass of an object and its gravitational potential energy. You should be sure to include :

1. Hypothesis
2. Equipment
3. Procedure with diagram
4. Observations (Table and graph)
5. Analysis of the observations (describe shapes in the graph that reveal relationships)
6. Conclusion
7. Evaluation