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

**Roller Coaster Mass and Distance Lab**

**Purpose:**

1. Observe the effects mass and height in roller coasters.

2. Observe the conversions between kinetic and potential energy in roller coasters.

3. To relate mass, distance, and speed to potential and kinetic energy.

**Materials:**

Marble (various masses), red colored pencil, blue colored pencil, green colored pencil, tape, plastic cups, rollercoaster tracks, timer

**Procedures/Data:**

1. Design and construct a rollercoaster. The marble must be able to travel the whole length of the roller coaster. Your roller coaster should include:

a. 1 large hill

b. 1 loop/corkscrew

2. Create a model of your roller coaster in the space below. Draw the track that your group constructed. Color locations where the marble is affected by friction in green. Color the locations where potential energy is greatest in red. Draw red arrows to show how potential energy increases and decreases throughout the rollercoaster. Color the locations where kinetic energy is greatest in blue. Draw blue arrows to show how kinetic energy increases and decreases throughout the rollercoaster.

**TRIAL 1:**

3. Test your roller coaster three times collecting data after each test.

|  |  |  |  |
| --- | --- | --- | --- |
| Test # | Distance (meters) | Time (seconds) | Speed (meters/sec) |
| 1 |  |  |  |
| 2 |  |  |  |
| 3 |  |  |  |
| Average |  |  |  |

Now let’s select **ONE** independent variable to test. Circle your choice of variable:

**Mass of marble**:

You need one larger and one smaller marble. Do not change your track. You will be testing the effect of mass on speed.

**Height of marble drop**:

You will change your track to make the height the marble begins at a greater distance from the floor. Use only one size of marble.

**Create your own:**

One thing you would like to test? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

How will you accomplish this change? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Dependent Variable: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Three controls: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**TRIAL 2:**

Test your roller coaster three times collecting data after each test.

|  |  |  |  |
| --- | --- | --- | --- |
| Test # | Distance (meters) | Time (seconds) | Speed (meters/sec) |
| 1 |  |  |  |
| 2 |  |  |  |
| 3 |  |  |  |
| Average |  |  |  |

**Analysis/ Conclusion:**

1. After TRIAL 1 how did the height of your hill and loop impact the speed of the marble? Use the data to support your claim.

2. Explain how friction affects the motion of the marble.

3. Explain how the marble on the roller coaster was converted from potential energy to kinetic energy well as how the kinetic energy was converted to potential energy.

4. After TRIAL 2 how did the independent variable affect the speed of the marble?

Use the data to support your claim.

5. What data could you collect to find the potential energy of the marble as it traveled through the roller coaster?

6. If you could run the experiment again, explain one thing you might change to optimism your outcome.