03-02 Conservation of Energy Lab *Name: _____*

Objective

- Use conservation of energy to find the final speed of a falling object.

Materials

- Small rubber ball
- Meter stick
- Balance
- PASCO Wireless Smartgate
- iPad with SPARKvue

Observe:

1. Work is force × displacement. Work and energy are similar concepts. Energy is work that has not happened yet. To find out how much energy an object has above the earth, the force is its weight and the displacement is the height. $PE = mgh$
2. Drop the ball from about 1 m onto the ground.
    a. What happens to the speed as it falls? _____
    b. What happens to the kinetic energy as it falls? _____
    c. What happens to the potential energy as it falls? _____

Hypothesis:

3. Write a hypothesis about the relationship between the potential energy before the ball falls and the kinetic energy as the ball hits the ground. _____

Test:

4. Find the mass of the ball. *m* = _____ kg
5. Find the potential energy of the ball at 1 m above the ground. Record it in the table.
6. Find the potential energy of the ball at 2 m above the ground.
7. When you drop the ball, the height decreases until the height is zero at the ground. What is the potential energy of the marble on the ground? _____

Height	Potential Energy	Speed 1	Speed 2	Speed 3	Average Final Speed at Ground	Kinetic Energy at Ground
1 m						
2 m						

8. Open the SPARKvue app on the iPad and select **Build Experiment** from the main screen.
    a. Select the top **1 window layout** from the right.
    b. Select the **1.23** to get a display.
    c. Turn on your smartgate and tap the Bluetooth icon in the SPARKvue app. Connect to your smartgate.
    d. Select **Smart Gate Only**.
    e. Select **Smart Gate Timer** from the drop down menu and tap **OK**. Then tap **Done**.
    f. You should now be back at your screen reading 0.00. In the top right, tap **Select Measurement** and tap **Speed Between Gates**.
9. Set it on the ground so that you can drop the ball between the ends of the arms. There are 2 laser switches between the arms of the smartgate that can be used to measure speed of on object passing between the arms.
10. Drop the ball from 1 m three times and record the speeds. Then find the average final speed.
    a. Each time you record data press the **start** button. **Stop** it after it records the data.
11. Calculate the kinetic energy the ball had at the ground using the average final speed.
12. Repeat steps 10-11 dropping the ball from 2 m.
13. What is the percent difference between the PE at the beginning and the KE at the ground for the 1 m fall? _____
    $\%\ diff = \frac{theoretical - experimental}{theoretical} \times 100\%$
    where PE it the theoretical and KE is the experimental.
14. What is the percent difference between the PE at the beginning and the KE at the ground for the 2 m fall? _____

Conclusion:

15. What does this tell you about the PE and KE when objects fall? _____