Swinging Pendulum Activity – Swinging Pendulum Worksheet

Data

- 1. Measure the mass of your weight.
- 2. Measure the distance from the ceiling to your weight.
- 3. Place two pieces of tape on the wall/other surface that are 50 cm apart with your weight in the middle.
- 4. Measure the height from the floor to the bottom of the weight when it is at equilibrium and again when the bottom is at one of the pieces of tape.
- 5. Record the time it takes for the weight to swing to the piece of tape on the other side (t_1) .
- 6. Record the time it takes for the weight to swing to the other side and back again (t_2) .
- 7. Perform three trials of this experiment.

Mass of Weight (kg)	Ceiling to Weight (m)	Floor to Weight At Equilibrium (m)	Floor to Weight At Tape (m)	t ₁ (s)	t ₂ (s)

8. Perform the same procedures as before, except adjust the pieces of tape to be 80 cm apart.

Mass of Weight (kg)	Ceiling to Weight (m)	Floor to Weight At Equilibrium (m)	Floor to Weight At Tape (m)	t1 (s)	t2 (s)

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Calculations and Results

1. Subtract t_2 from t_1 and calculate the average value for both set of trials.

Tape Separation: 50 cm

Tape Separation: 80 cm

t ₂ – t ₁ (s)	t ₂ – t ₁ (s)
Avg:	Avg:

2. Calculate the Potential Energy (PE) of the weight at the initial piece of tape for the two different tape separation values.

3. Calculate the Kinetic Energy (KE) and theoretical velocity of the weight at the bottom of its swing for the two tape separation values.

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- Name:
 - 4. Calculate the measured velocity of the weight and compare it with the theoretical velocity by using percent error.

Tape Separation: 50 cm

Potential Energy	Kinetic Energy	Theoretical	Measured	Percent Error
(Joules)	(Joules)	Velocity (m/s)	Velocity (m/s)	

Tape Separation: 80 cm

Potential Energy	Kinetic Energy	Theoretical	Measured	Percent Error
(Joules)	(Joules)	Velocity (m/s)	Velocity (m/s)	

5. Calculate the Theoretical period of the pendulum. Why do you only have to perform this calculation once and not for both of sets of trials.

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Energy of Motion: Lesson 1, Swinging Pendulum Activity – Swinging Pendulum Worksheet

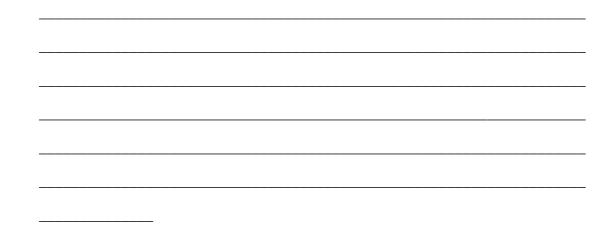
6. What was the measured period for each set of trials and what was the percent error for each case?

Date:

Theoretical	Measured Period	Measured Period	Percent Error –	Percent Error –
Period (s)	– 1st set (s)	– 2nd set (s)	1st set	2nd set

Further Learning

7. Account for the percent error between your measured periods and your theoretical periods.



8. Calculate how long you would have to make a pendulum so that it would have a period of one second.

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 Based on your calculations and results, would it be more efficient to have your pendulum with a period of one second swing from a higher height or a lower height? Explain.

10. You are an engineer working for an amusement park. They have asked you to develop one of the fastest roller coasters in the U.S., but they also want it to be cost efficient. Therefore, they do not want to have to use a lot of energy to break the roller coaster. How would you develop this ride so that it is still easily accessible to the amusement park guests?



