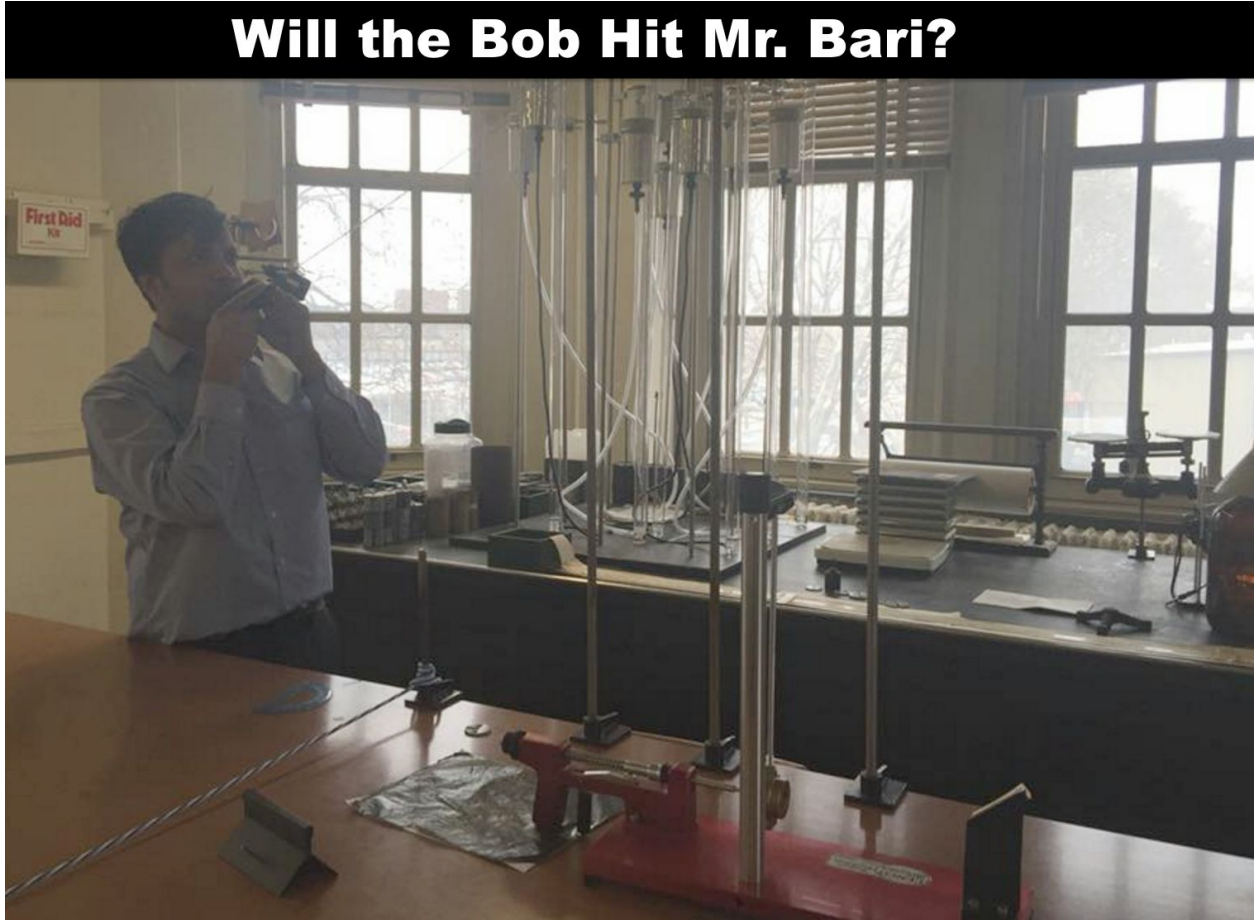


Quiz # 1

Advanced Pendulum's Lab

Date: 2/10/2016

Will the Bob Hit Mr. Bari?









Name:

Group # 1: Derick , Kelsey, Kenneth, Manuel, Eric, Boubakary, Steven and Eme

Group # 2: Irene, Luis, Hainsley, Ezekiel, Destin, Jared, Demitri, Ronnys and Chiz

DO NOW:

| <p>1</p> | <p>1a. If it takes 20 sec for 10 swings, back and forth, the period is -----</p> <p>1b. What about the frequency-----</p> <p>1c. Mr. Bari is sitting (Scenario 1) on a swing and swings back and forth with a period of 3.0 seconds. If he stands up (Scenario 2) on the swing the period of his swing will be...</p> <p>a) longer b) shorter c) unaffected.</p> | | |
|---|--|---|--|
| | <table border="1" style="width: 100%; text-align: center;"> <tr> <th style="width: 50%;">Scenario # 1</th> <th style="width: 50%;">Scenario # 2</th> </tr> </table> | Scenario # 1 | Scenario # 2 |
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PENDULUM LAB

Group # 1: Derick , Kelsey, Kenneth, Manuel, Eric, Boubakary, Steven and Eme

Group # 2: Irene, Luis, Hainsley, Ezekiel, Destin, Jared, Demitri, Ronnys and Chiz

Purpose

In this lab you will study the motion of a simple pendulum. A simple pendulum is a pendulum that has a small amplitude of swing, i.e., (angle is b/w 1 to 20 degree). Each student will work with his and her group to investigate following hypothesis: (1) Mass affects period; (2) Amplitude (angle) affects period and (3) Length affects period.

Equipment:

Pendulum support, various masses, protractor, meter stick, Stopwatch and Simulation (by now, you should know the location of the simulation)

Experiment #1: **MASS vs. PERIOD**

Hypothesis: Mass affects the period.

Procedure: Attach a string to a stand. At the end of the string, attach mass (e.g., 10 gram, 20 gram). Let's release the string and the mass and let it swing through the air. Use stopwatch/ phone to measure how long it takes for the mass to travel through the air and return to the starting point . Use different mass once you record the data. Please repeat this process three times.

| Trial | Mass (kg) | T (s) | Gravity | L (m) | Angle |
|-------|-----------|-------|---------|-------|-------|
| 1 | | | Earth | same | same |
| 2 | | | Earth | same | same |
| 3 | | | Earth | same | same |

| | Math (slope/equation of the line) | Graph |
|--|-----------------------------------|-------|
| | | |
| Decision: (i.e., Accept/ reject hypothesis. Explain) | | |

Experiment # 2: **Amplitude vs. PERIOD**

Hypothesis: Amplitude affects the period (As the degree of the release increases, so will the time.)

Procedure: You will test the time a 100g mass attached to a string takes to swing and return to its original position. We will then raise the degree of release (e.g., 5, 10, 15) and test the time, and then we will repeat two more times, total of three times.

| Trial | Degree | T (s) | Gravity | L (m) | Mass |
|-------|--------|-------|---------|-------|------|
| 1 | | | Earth | same | same |
| 2 | | | Earth | same | same |
| 3 | | | Earth | same | same |

| | | | | | |
|--|--|--|--|--|--|
| | | | | | |
|--|--|--|--|--|--|

| | | |
|--|-----------------------------------|-------|
| | Math (slope/equation of the line) | Graph |
| | | |
| Decision: (i.e., Accept/ reject hypothesis. Explain) | | |
| | | |

Experiment # 3 : **Length vs. PERIOD**

Hypothesis: Length does not affects the period (We don't think that the length of the string will affect the time)

Procedure: You will test the time a 100g mass attached to a string takes to swing and return to its original position. We will then raise the degree of release (e.g., 5, 10, 15) and test the time, and then we will repeat two more times, total of three times.

| Trial | L (m) | T (s) | Gravity | Amplitude | Mass |
|-------|-------|-------|---------|-----------|------|
| 1 | | | Earth | same | same |
| 2 | | | Earth | same | same |
| 3 | | | Earth | same | same |

| | | | | | |
|--|--|--|--|--|--|
| | | | | | |
|--|--|--|--|--|--|

| | Math (Be very careful) | Graph (Be very very careful) |
|--|------------------------|------------------------------|
| | | |
| Decision: (i.e., Accept/ reject hypothesis. Explain) | | |

Draw the velocity vector. Also draw the acceleration vector.

photogate timer

Pendulum: 1 2

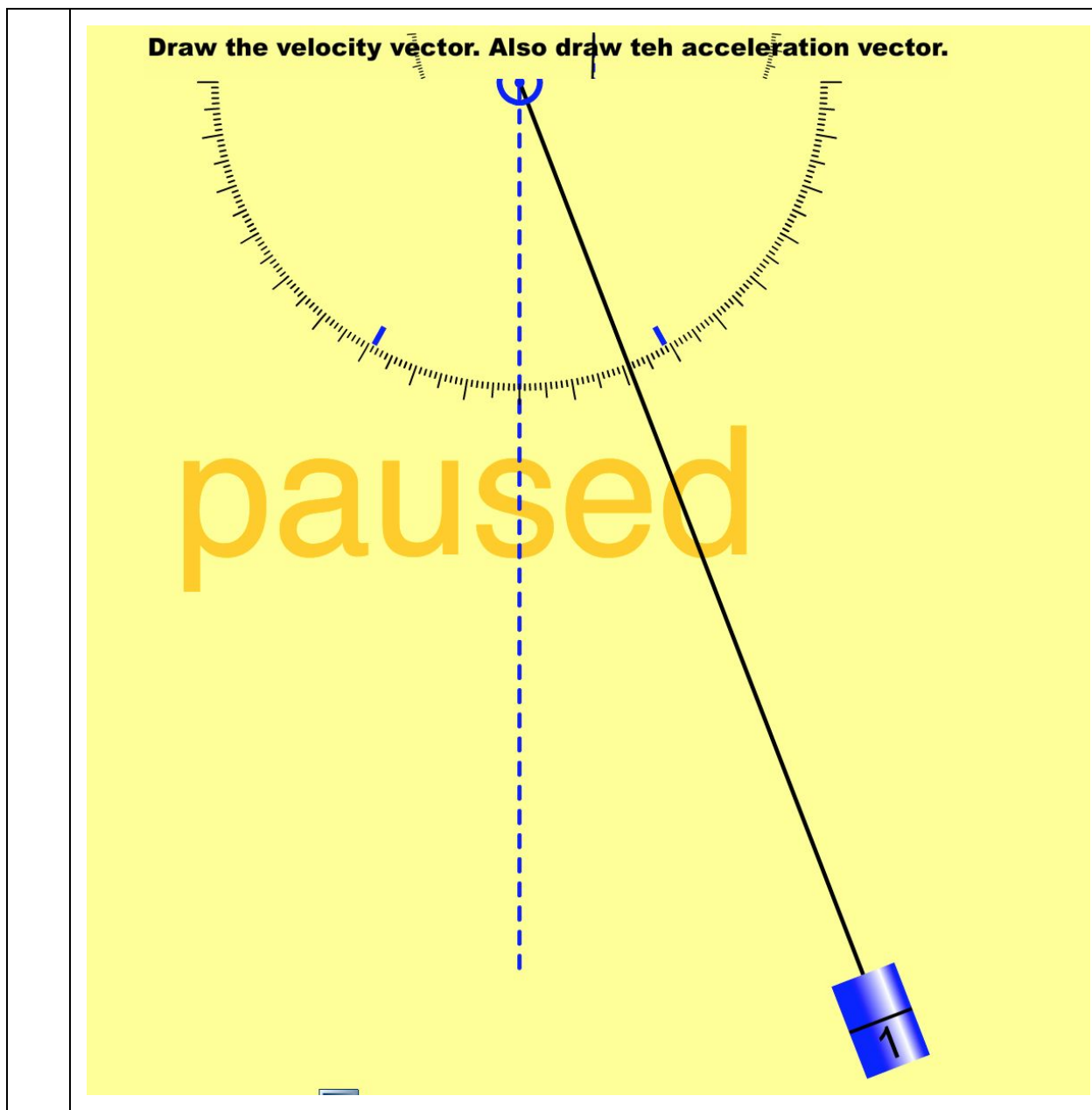
period: 1.9614 s

Start

80 100 120 140 160 180 cm

1

paused



Discussion Questions:

1. What is period? Find period, if frequency is $.5 \text{ Hz}$.
2. What is frequency? Find frequency, if period is 1 second.

3. What is the difference between period and frequency?
4. How does gravity affects the period of pendulum?
5. If length is 1 meter, mass is 1 kg, what should be the period here on the earth?
6. What about on the moon?
7. How about on the Jupiter?
8. What about at zero gravity?
9. What is restoring force?
10. What causes the oscillation of the pendulum about its equilibrium position?
11. Does the period depend on the mass?
12. Does it depend on the amplitude?
13. What about the length of the string?
14. Can we use pendulum for time keeping? Explain...
15. Does the amplitude of the swing increase of decrease over the time?
16. What is Isochronous? Why pendulum is so useful for time keeping?

History

In 1656 the Dutch scientist Christain Huygens built the first Pendulum Clock. This was a great improvement over existing mechanical clocks; their best accuracy was increased from around 15 minutes deviation a day to around 15 seconds a day. Pendulums spread over Europe as existing clocks were retrofitted with them. The English scientist Robert Hooke studied the Pendulum around 1666, consisting of a pendulum that is free to swing in two dimensions, with the bob rotating in a circle or ellipse. He used the motions of this device as a model to analyze the orbital motion of the planets. Hooke suggested to Isaac Newton in 1679 that the components of orbital motion consisted of inertial motion along a tangent direction plus an attractive motion in the radial direction. This played a part in Newton's formulation of the Law of Universal Gravitation. Robert Hooke was also responsible for suggesting as early as 1666 that the pendulum could be used to measure the force of gravity.

