

# 3C Pre-Lab Assignment

**Submit the answers to questions Slide 8 on Gradescope before Mon/Tue lab.**

# Energy in SHM

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➤ **Review energy in simple harmonic motion :**

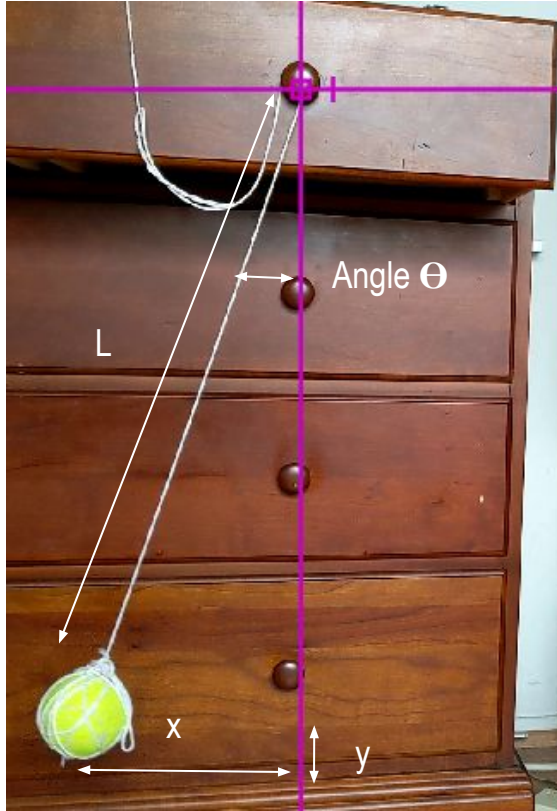
[https://openstax.org/books/university-physics-volume-1  
/pages/15-2-energy-in-simple-harmonic-motion](https://openstax.org/books/university-physics-volume-1/pages/15-2-energy-in-simple-harmonic-motion)

# Pendulum tracker data



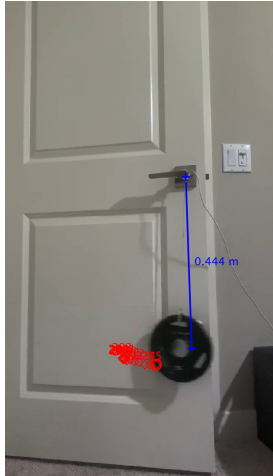
- Redo the pendulum tracker analysis by setting the origin of your coordinate system to the pivot point of your pendulum.

# Pendulum tracker data



- Track the bob of the pendulum and store the values of,  $x$  displacement,  $y$  displacement and the angle  $\theta$ . Find out how to identify the gravitational potential energy and kinetic energy in the system.
- Find the values of KE and PE (per unit mass) at three different frames. Submit the values of KE, PE and KE+PE (per unit mass) for the three frames with an associated picture of the frame.

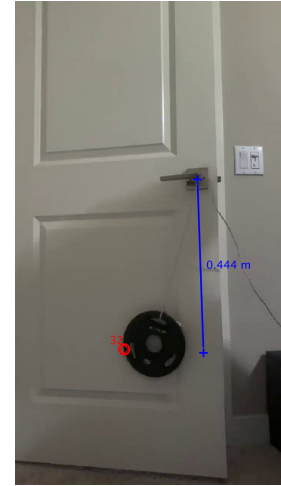
# 3 Frames



K: .886J  
U:  
K + U: 0.886J



K: 0J  
U: 1.11J  
K + U: 1.11J



K: 0J  
U: 0.846J  
K + U: 0.846J

# **Between-Labs Assignment (due by Wed/Thu Lab)**

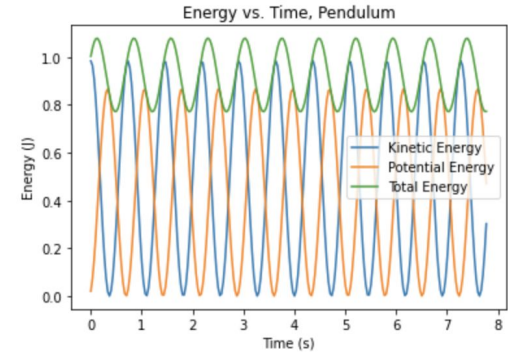
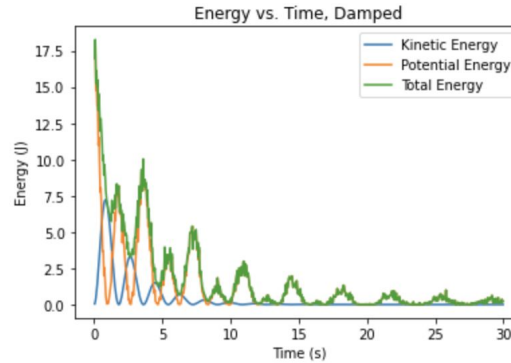
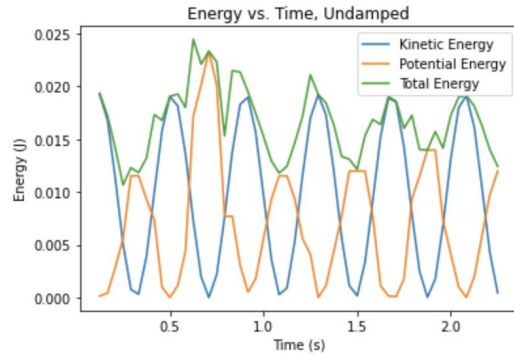
**Submit the answers to questions Slide 19 on  
Gradescope before Wed/Thu lab.**

# Energy plots

- Use the best-fit data from Lab 3A and plot the kinetic energy, potential energy and total energy (sum of KE and PE) vs time.
- What is the Q factor of the system from Lab 3A?
- Use the best-fit data from Lab 3B and plot the kinetic energy, potential energy and total energy (sum of KE and PE) vs time.
- What is the Q factor of the system in Lab 3B? Apply your best parameters to the formula below.
- Plot the KE, PE and total energy (per unit mass) for 5 oscillations of your pendulum data.

# Energy plots

- The Lab 3A Q factor is infinity because the system is undamped
- The Lab 3B Q factor is 5.26





# Review moment of inertia

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➤ **Review moment of inertia :**

<https://openstax.org/books/university-physics-volume-1/pages/10-4-moment-of-inertia-and-rotational-kinetic-energy>

➤ **Review torque :**

<https://openstax.org/books/university-physics-volume-1/pages/10-6-torque>

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# Review Physical pendulum

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- Review physical pendulums :  
<https://openstax.org/books/university-physics-volume-1/pages/15-4-pendulums>
  - 2 min video demonstrating difference in time periods for simple and physical pendulums.
  - 7 min video going over principles of simple and physical pendulums.
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# Physical pendulums

- Find some cardboard boxes to use as Physical pendulums for Lab 3D. Cut out two different shapes - one in a rectangular shape and the other in a equilateral triangle shape - like the examples shown below.

