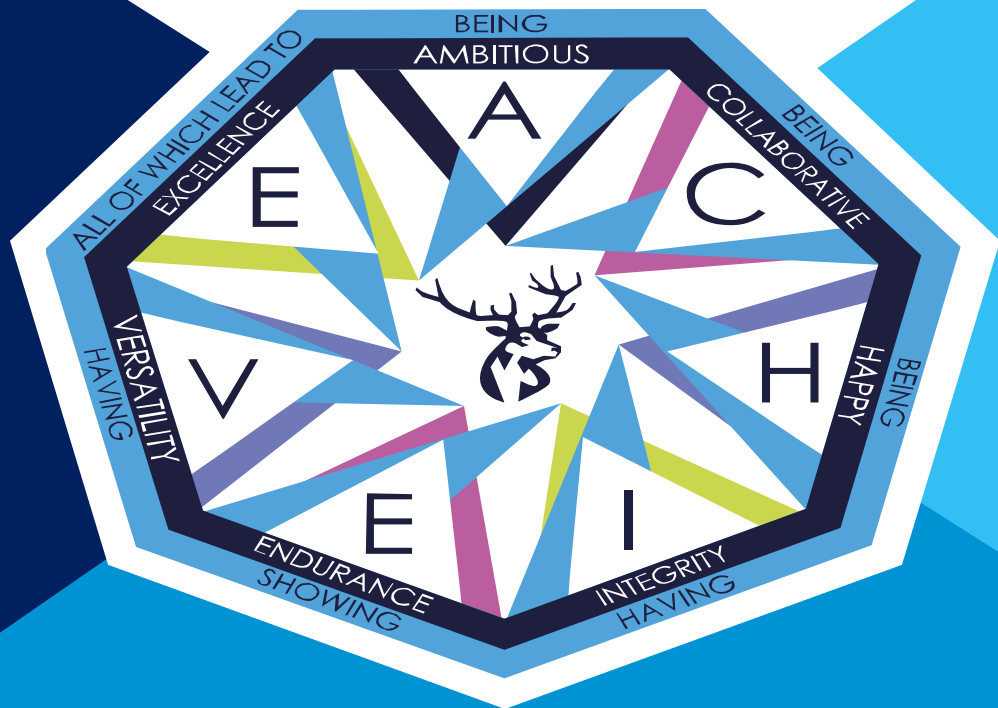


**FURZE  
PLATT**  
SENIOR SCHOOL



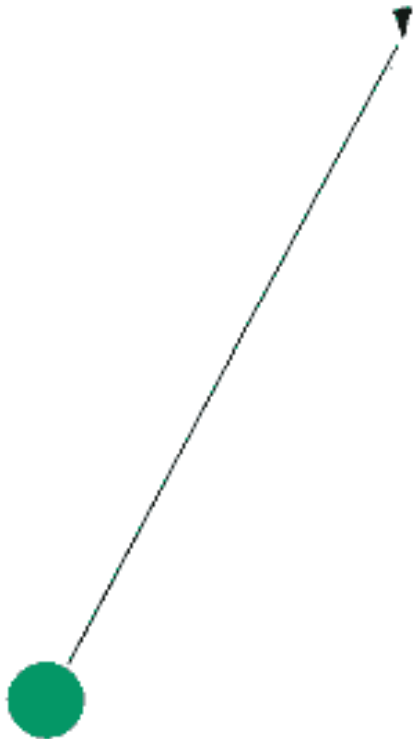
# SIXTH FORM TASTER DAY - PHYSICS LESSON 2

Mr Wright

June 2025

# A-level Physics Taster lesson 2

## – Mr Wright



Discuss with the person next to you:

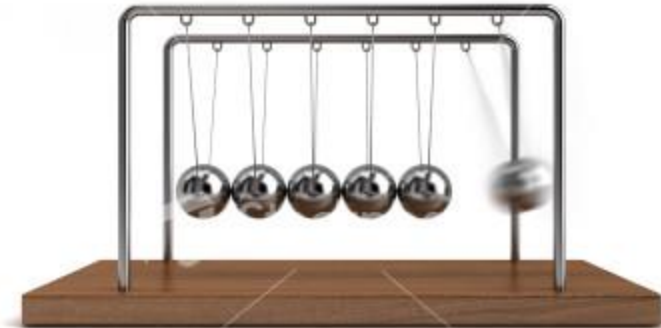
Name as many situations/ objects that use a pendulum as possible.



What do all these...



...have in common?



# Time period of a pendulum

Pendulums have been used as timing devices for centuries.

What do you think might affect the *time period* (time taken for one swing)?

- Length of pendulum?
- Initial speed?
- Size/Mass of pendulum?
- Amplitude of swing?

Today *you* are going to find out..



# To investigate pendulums and relate their use to the real world.

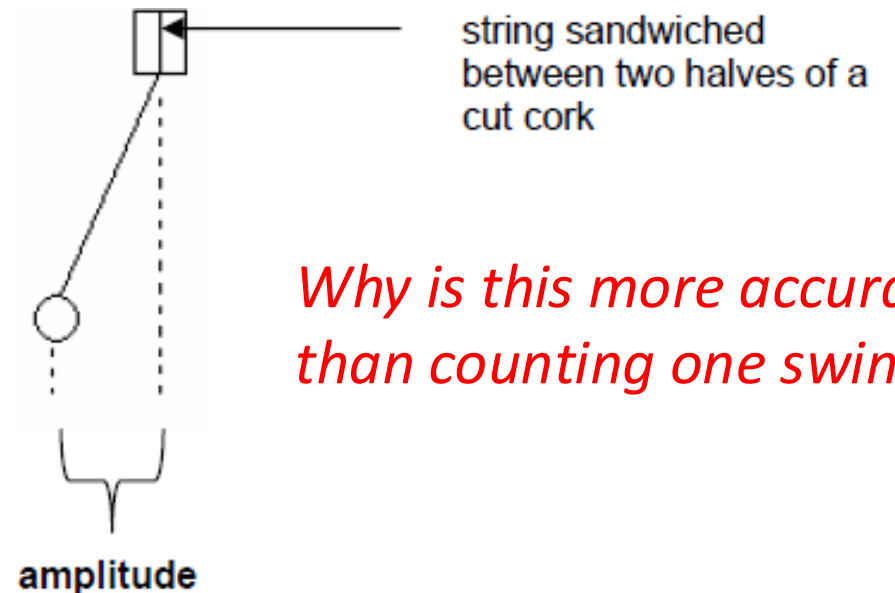
## Aim

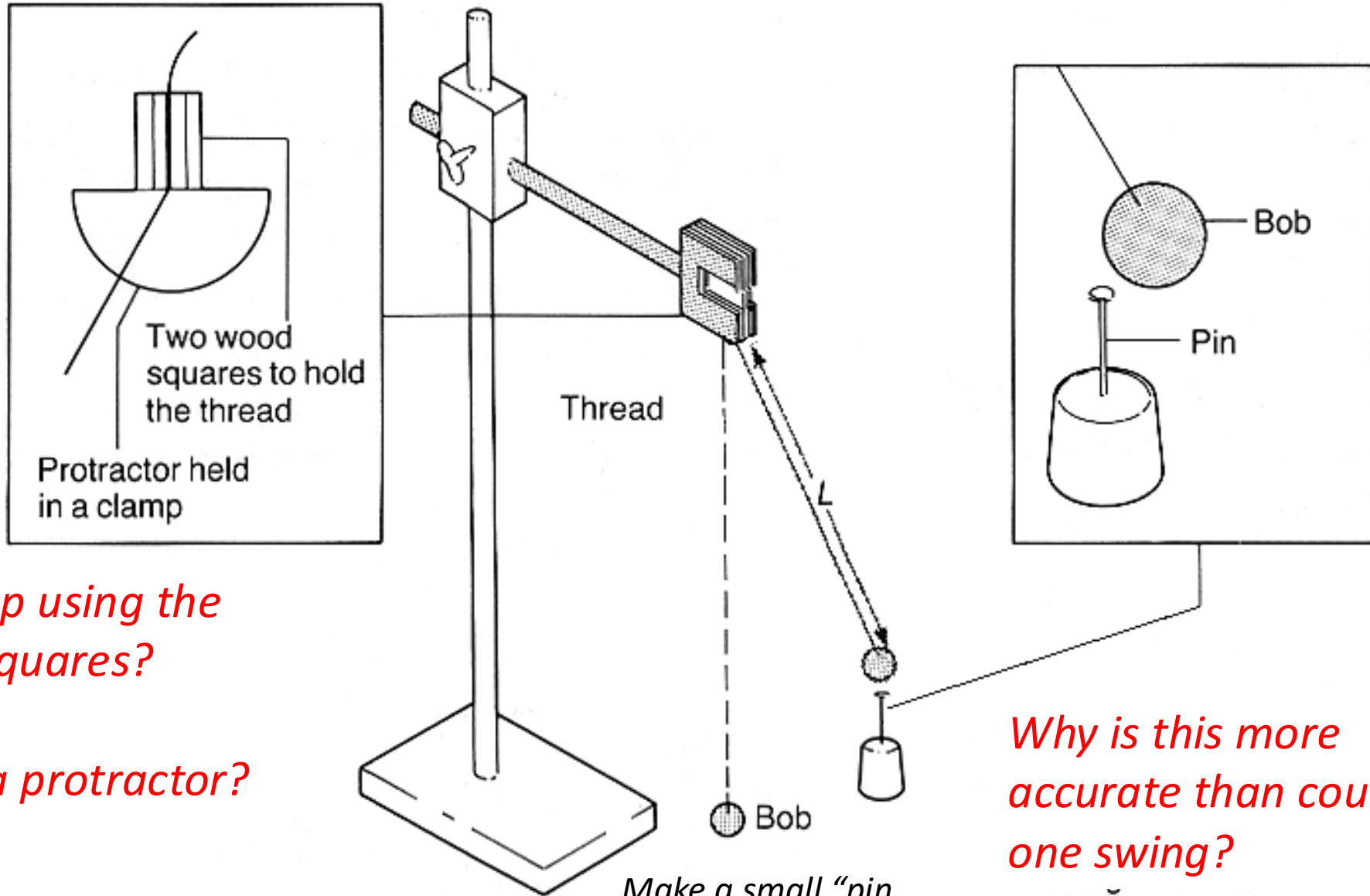
- To investigate which factors affect the period of a simple pendulum
- To measure the time period of a pendulum and use it to find “g”

## Method

- Construct a simple pendulum by tying the mass hanger (the pendulum bob) to the end of a piece of string.
- Sandwich the other end of the string between two halves of a cut cork and clamp the pendulum with a clamp attached to a stand.
- Make sure that the stand is G-clamped to the bench so that it does not topple over.

- The **time period** is the time taken for one complete swing – from the pendulum to pass the same point twice
- The most **accurate** way to measure the time period is to measure for 10 swings, then divide by 10
- The **amplitude** is the maximum displacement from the vertical.





*Why clamp using the wooden squares?*

*Why use a protractor?*

*Why is this more accurate than counting one swing?*

*Make a small "pin shape" out of blue tack*

# Investigation: What affects the time period of a simple pendulum? Choose your experiment

## Experiment 1: Changing the amplitude

- Pull the pendulum bob to one side and let go.
- Count 10 complete swings past the pin marker, and stop the watch
- Record this time, and then divide it by 10 to find the time period.
- *Repeat with the pendulum bob released from different angles, and record your results*

### **Evaluation questions 1**

- a) What effect, if any, does the initial amplitude have on the time period?
- b) Explain your findings
- c) How many different angles did you try? Why should you not try angles that are too high?

## Experiment 2: Changing the mass

- Pull the pendulum bob to one side and let go.
- Count 10 complete swings past the pin marker, and stop the watch
- Record this time, and then divide it by 10 to find the time period.
- *Repeat, keeping the initial amplitude the same and alter the mass of the pendulum bob by adding blue tac to it, weigh on scales*

### **Evaluation questions 2**

- a) What effect, if any, does the mass of the pendulum bob have on the time period?
- b) How many different masses did you try? Do you think that this number was sufficient?

## Experiment 3: Changing the length

- Pull the pendulum bob to one side and let go.
- Count 10 complete swings past the pin marker, and stop the watch
- Record this time, and then divide it by 10 to find the time period.
- *Repeat, keeping the initial amplitude and mass the same, and alter the length of the pendulum by pulling it through the wooden blocks. Measure the length and record your results*

### **Evaluation questions 3**

- a) What effect, if any, does the length of the pendulum have on the time period?
- b) Plot a graph of length against time period.
- c) What shape is the graph line? What does this tell you about how the time period changes with length?

# Equation of motion for a simple pendulum

Time period of a swinging pendulum:

$$T = 2\pi \sqrt{\frac{L}{g}}$$

T: Time period (s)

L: Length of pendulum (m)

g: acceleration due to gravity (or gravitational field strength),  $\text{m/s}^2$  or  $\text{N/kg}$

# Pendulum

$$T = 2\pi \sqrt{\frac{L}{g}}$$

So how can we affect the time period of a pendulum?

Longer string →

Smaller  $g$  →

Larger mass →

# Finding “g”

- Measure the length of your pendulum and record it
- Pull the pendulum bob to one side and let go.
- Count 10 complete swings past the pin marker, and stop the watch
- Record this time, and then divide it by 10 to find the time period.
- Repeat with another length of pendulum
- *Use the equation to calculate “g” for each length.*  
*What do you notice?*

*Extension 1: What would this experiment look like if you carried it out on the Moon? Calculate specific numbers*

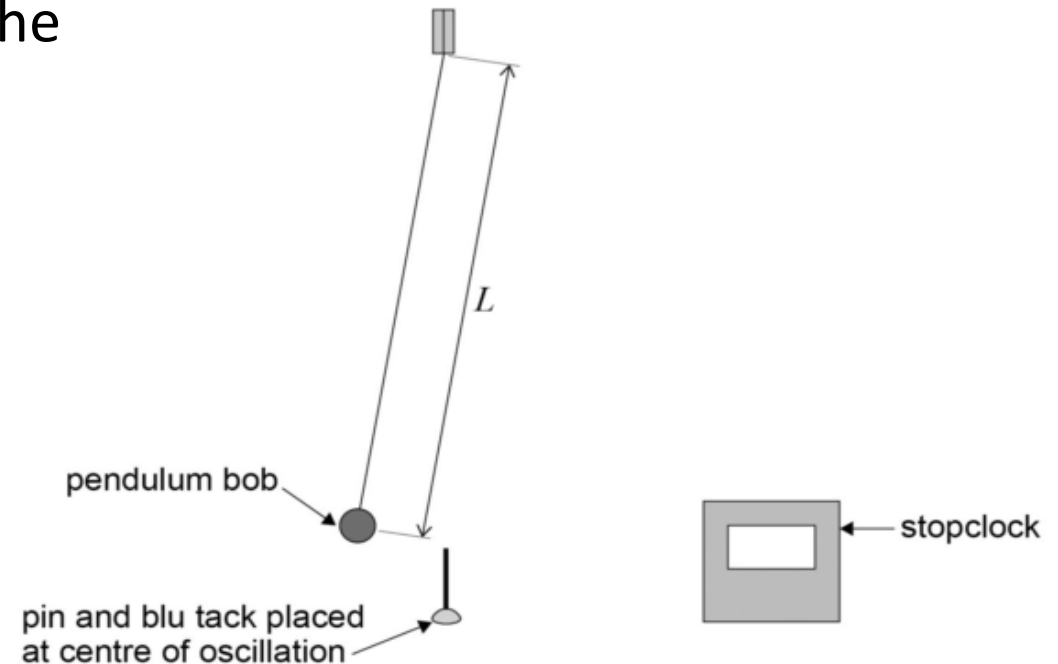
*Extension 2: How could you use energy transfers to calculate the maximum speed a pendulum should have? Use the speed sensors to check your results...*

$$T = 2\pi \sqrt{\frac{L}{g}}$$

T: Time period (s)

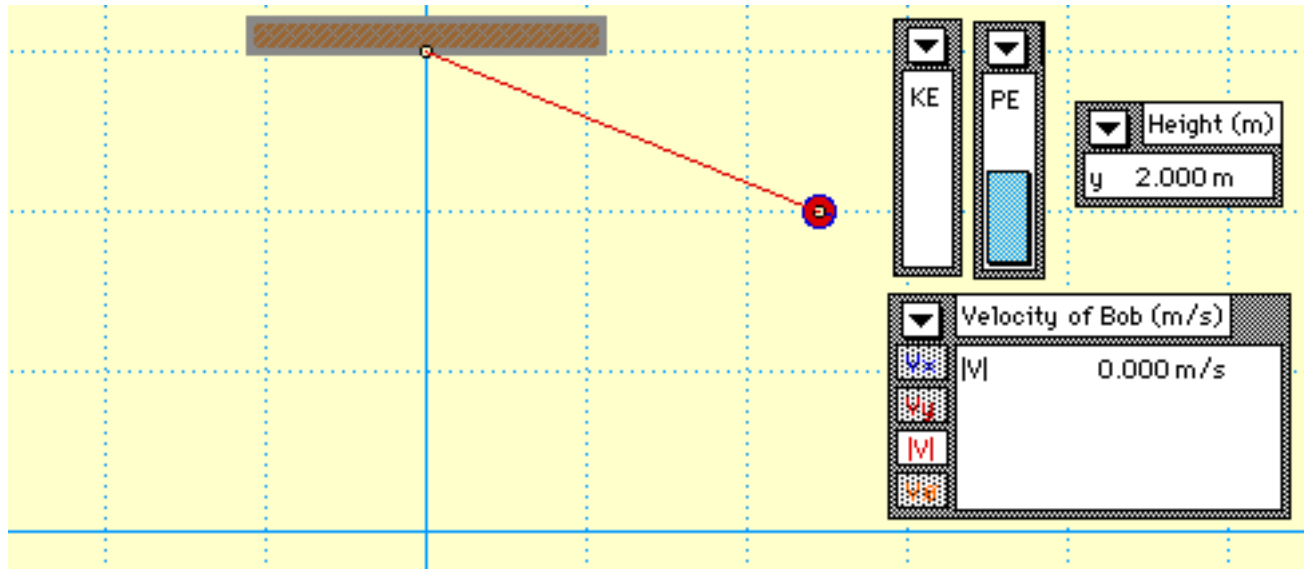
L: Length of pendulum (m)

g: acceleration due to gravity, m/s<sup>2</sup>



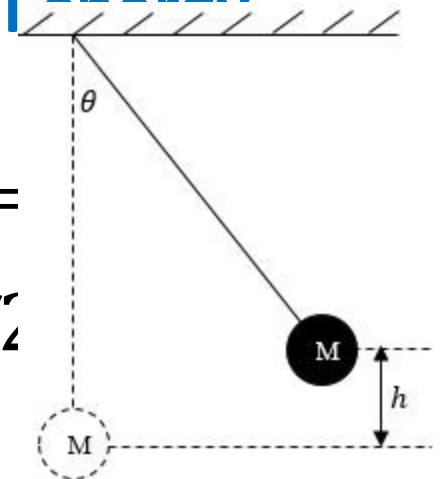
# Extension 2

*How could you use energy transfers to calculate the maximum speed a pendulum should have? Use the speed sensors to check your results...*



**Kinetic energy = Gravitational Potential**

$$\frac{1}{2}mv^2 =$$
$$v = \sqrt{2}$$



[https://phet.colorado.edu/sims/html/pendulum-lab/latest/pendulum-lab\\_en.html](https://phet.colorado.edu/sims/html/pendulum-lab/latest/pendulum-lab_en.html)

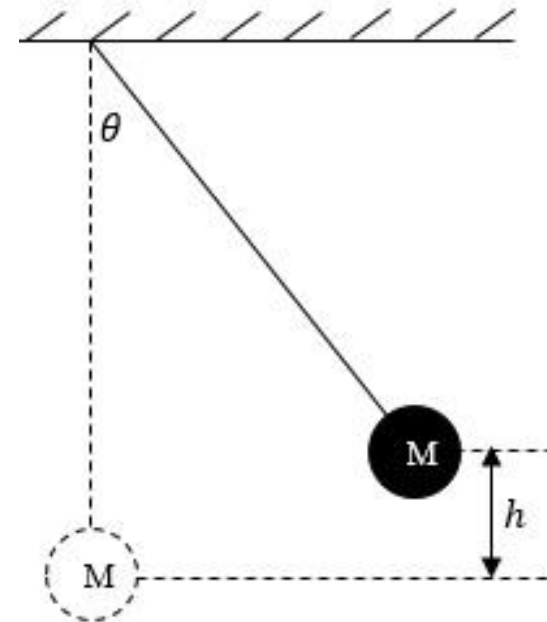
# Extension 2

*How could you use energy transfers to calculate the maximum speed a pendulum should have? Use the speed sensors to check your results...*

**Kinetic energy = Gravitational  
Potential energy**

$$\frac{1}{2}mv^2 = mg\Delta h$$

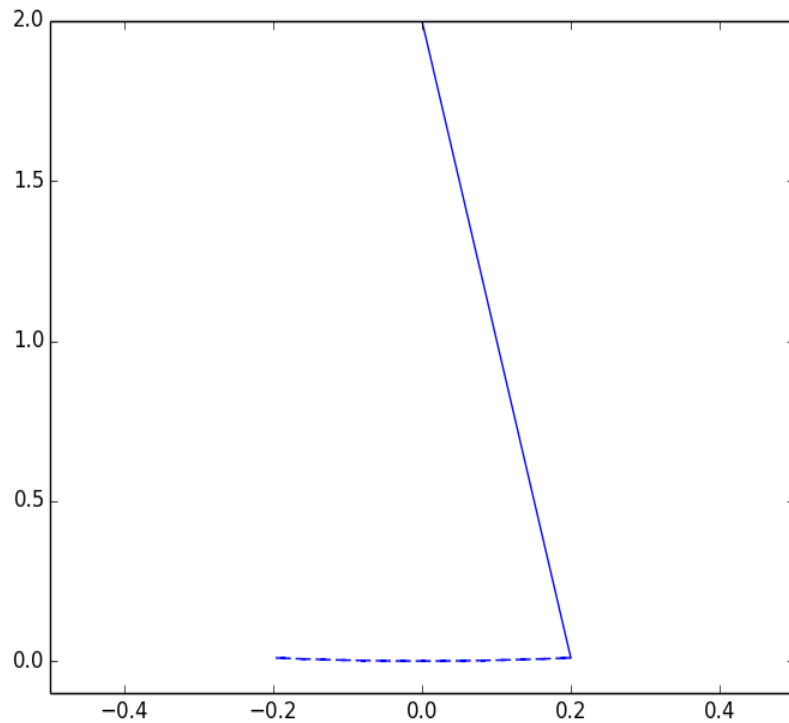
$$v = \sqrt{2g\Delta h}$$



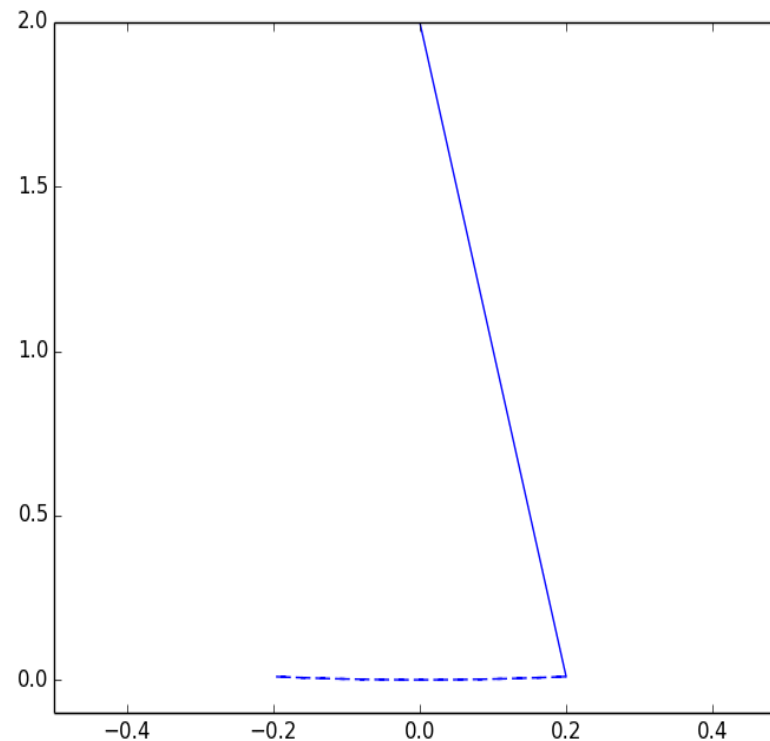
# Extension 1: Pendulums and gravity

Which pendulum would you find on Jupiter, Earth or the moon?  
What would a pendulum look like with no gravity?

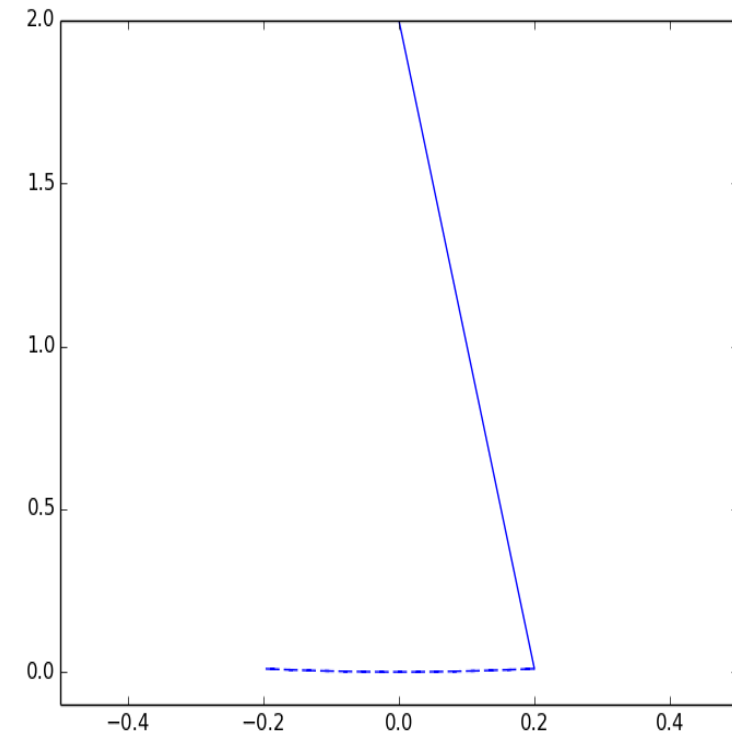
Moon



Earth



Jupiter (greatest gravity)

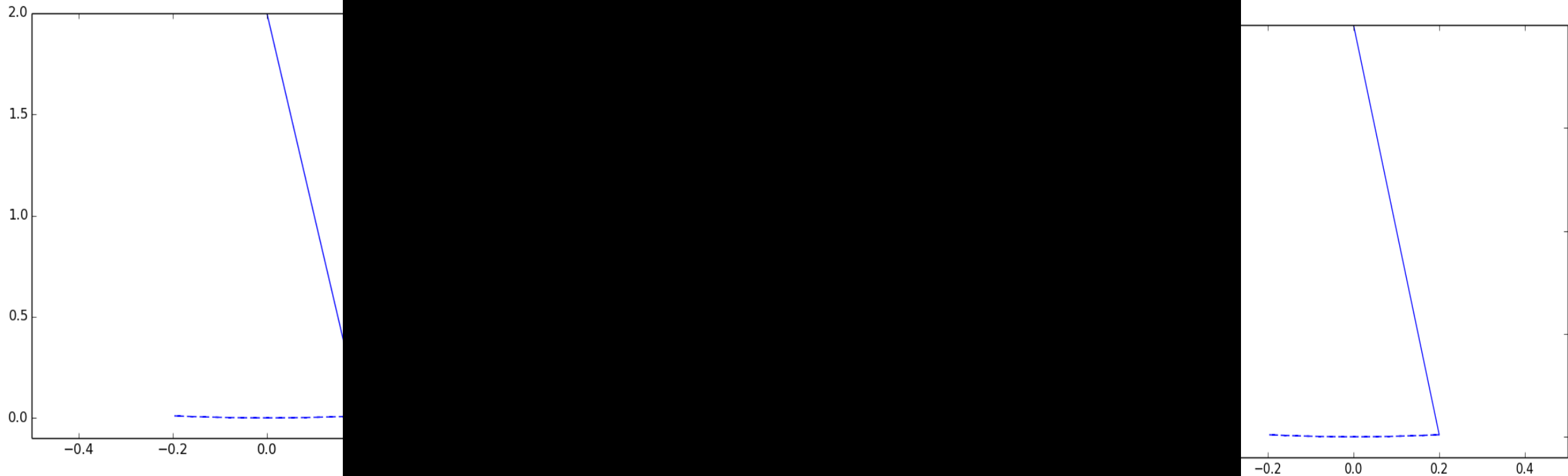


# Pendulums and gravity

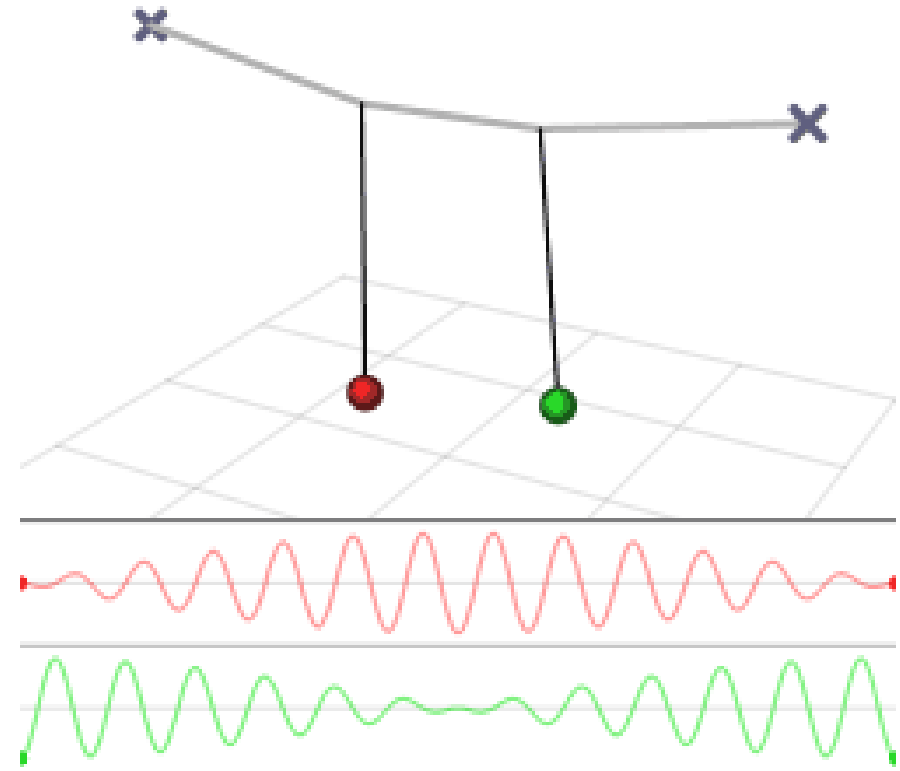
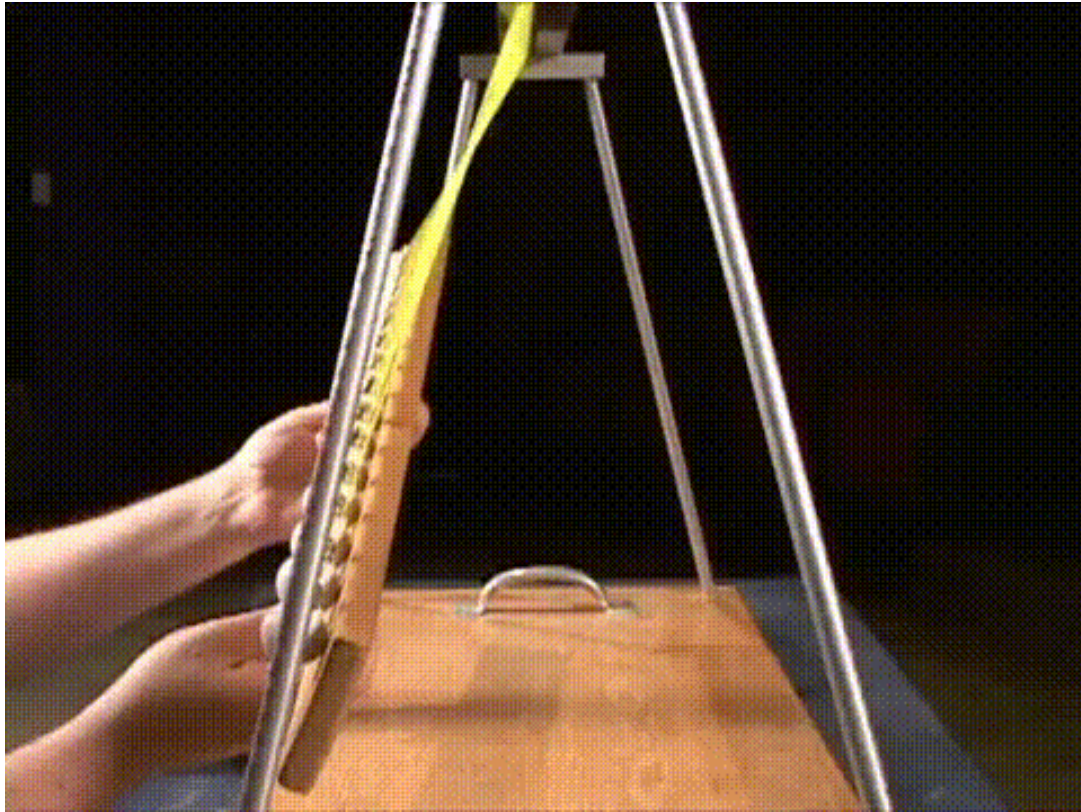
Which pendulum would you find on Jupiter, Earth or the moon?

What would a pendulum look like with no gravity?

**In free-fall on the I.S.S.**



# Other pendulums...



# Holiday homework...

- **Purple “AS Head Start to Physics” book** - make notes on each page and complete questions on lined paper, *and mark/correct using answers at the back*
- **Physics Handbook:** Read through the book, YouTube, and website recommendations, access as much as you can over the summer
  - Then read through and complete questions on standard form and other practical skills

These are the hardest parts of the GCSE course, and give you practice at all the skills required of an A-level Physicist!

\*Introductory test (first week back) will be based on this content\*

