

Swings and Pendulums – Worksheet

By Louise Lopes, based on the workshop investigation by Chris Hendricks

Introduction:

Swings can be a lot of fun on the playground as you experience the thrill of falling towards the earth, but have you ever wondered about the science surrounding them? Play swings are a type of pendulum, which describes a weight suspended by a string from a fixed point. In this investigation, you will be able to examine the physics behind them.

Question:

Observation: Observe children playing on swings.

Devise a scientific question for why children always appear to swing at different rates.

For example: *Is swing rate mostly affected by the weight/mass at the end of the swing, the height that the swing is released from (release angle) or the length of the chain/string?*

Aim: To discover the main factor that affects the swing rate of a pendulum.

Hypothesis: Write your predictions of the outcome below.

Plan:

These are the **materials** you will be using:

- A length of string (about 40cm long)
- 2 x 50g masses and a 50 g mass carrier
- Ruler
- Stopwatch
- Retort stand
- Bosshead
- Clamp
- Protractor.

Observe how the equipment can be set up at the front of the lab, and then collect the equipment from the trolley at the front of the lab.

Conduct:

1. Working in groups of 3 or 4, decide what factor affects the swing rate.



Hints to get started

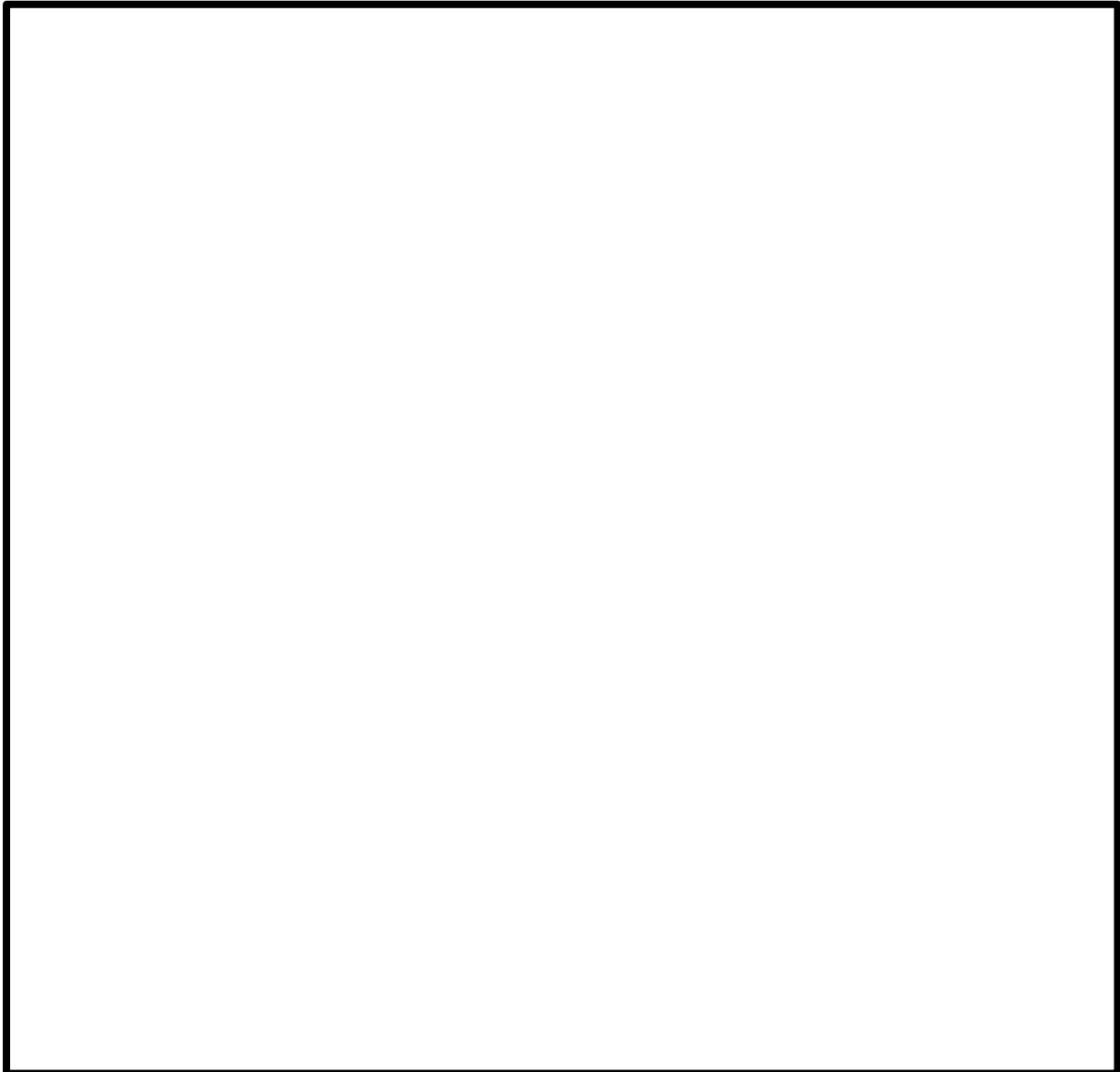
Time how long it takes a pendulum to make 10 swings (back and forth = 1 swing) using a 50g mass carrier, 30cm pendulum length (to base of bob) and a 30° release angle. Only change one factor at a time, for example try a base weight of 100g and then 150g, while keeping all other factors the same. Then keep the mass the same and change another factor, like the pendulum length.

2. Make sure you include repetition to be sure of your results.
3. The results table will help guide you through this experiment although you don't have to do it in the same order.
4. When you are sure of your answer, return your equipment to the trolley and return to discuss your results with other groups.

Mass (g)	Pendulum length (cm)	Release angle (°)	Time taken for 10 swings (s)			Average (s)
			1	2	3	
50	30	30				
100	30	30				
150	30	30				
100	20	30				
100	30	30				
100	40	30				
100	30	30				
100	30	45				
100	30	60				

Analysis:

Can you represent the data collected in a graphical form in order to better identify any patterns?

A large, empty rectangular box with a thick black border, intended for drawing a graph to represent data.

Problem-Solving:

Communicate your findings and discuss the science behind them.

- What did you find agreeing with the science you know?
- What new things did you learn?
- What did you find surprising?
- How would you improve your investigation?
- What else could you investigate?

Conclusion:

Check if you got the answers for your question.