WJEC Wales Physics A Level

SP Unit 3 02 : Vibrations

Practical notes

1. Measurement of *g* with a pendulum

Equipment:

- A string with a pendulum bob (of known mass) attached to the end
- Clamp stand
- Metre ruler
- Stopwatch

Method:

1. Attach a bob to the string and fix to the clamp stand, ensuring that the pendulum is 1m long (measured by the ruler).
2. Hold the bob so the string is horizontal and release.
3. When the bob reaches its amplitude on the other side, start the stopwatch.
4. Count ten complete oscillations (there and back) and then stop the stopwatch.
5. Divide the time by 10 to calculate the average time period.
6. Shorten the pendulum string by 10cm, so it measures 90cm.
7. Repeat.
8. Repeat with pendulums of lengths 80cm, 70cm, 60cm etc.
9. Plot a graph of time period², T^2, against length, L and draw a line of best fit.
10. Calculate the gradient of the line.
11. Find the inverse of the gradient, and multiply by $4\pi^2$ to calculate the value of g.

Safety:

- Falling masses may cause injury. Wear appropriate footwear and take care not to stand under any suspended masses.

Theory:

The method is based on the equation $T = 2\pi\sqrt{\frac{L}{g}}$

so $\frac{T^2}{2\pi} = \frac{L}{g}$

Rearranging this for g gives: $\frac{4\pi^2 L}{T^2} = g$

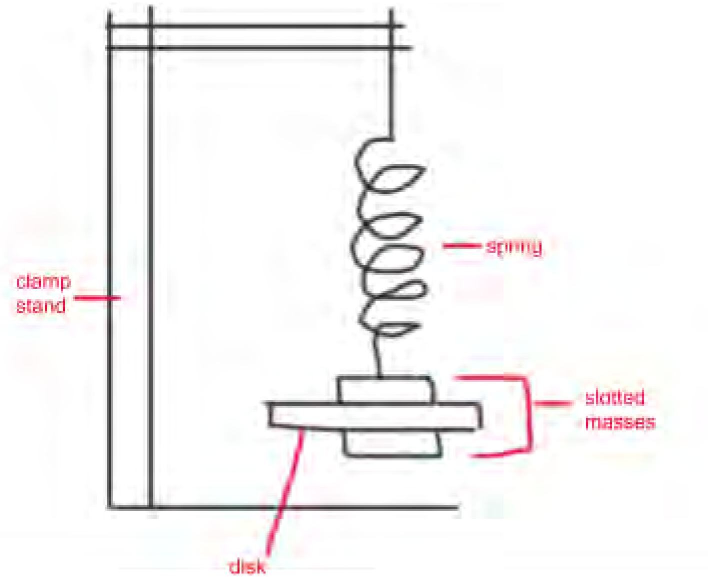
Your calculated value of g should be compared to the known value of g on the surface of the Earth: 9.81m/s.

2. Investigation of the Damping of a Spring

Equipment:

- Spring
- Set of cardboard disks of varying diameters, from 10-25cm
- Metre ruler
- Slotted masses and hangers
- Clamp stand

Method:



1. Set up the spring with the slotted masses attached, but no cardboard disk.
2. Hold or clamp the ruler next to the clamp stand, so the zero mark is level with the base of the clamp stand.
3. Pull the slotted mass down to the 5cm mark. Measure how far this is from the bottom of the slotted mass when unstretched. This is your amplitude for n = 0.
4. Every other bounce, record the depth (or amplitude) of the oscillation, alongside the number of oscillations, n. Continue for one minute.
5. Repeat two more times and calculate an average for each.
6. Repeat with disks attached between the slotted masses. Plot a graph of amplitude against n for each disk and compare.

Safety:

- Falling masses may cause injury. Wear appropriate footwear and take care not to stand under any suspended masses.
- Wear safety glasses in case the spring snaps