

Practical 2 – Topic 4

SHM oscillations

Described below is the simple version of this experiment in which a stopwatch is used to measure period. A better version would be to use a light gate connected to an electronic timer for measuring period and an even better arrangement would be the use of force and motion sensors throughout.

A student report using sensors is also included.

Criteria assessed

- DCP
- CE

Materials needed

- Springs
- Clamps
- Spring
- Various masses
- Ruler
- Stopwatch (or if available, force and motion sensors connected to a computer)

What to do – 1

The tension in the spring is given by $T = kx$, where x is the extension of the spring.

- Attach various different masses to the end of the spring and measure the corresponding extension.
- By means of a suitable graph, determine the constant k , its unit and its uncertainty.

What to do – 2

- Place a mass at the end of the spring and let the mass achieve its equilibrium position.
- Push the mass up above its equilibrium position by a small amount and let go.
- Time 10 or 20 oscillations of the mass and by so, by dividing the time by 10 or 20, determine the period of oscillations.
- Repeat with other masses.

It is known that $T = 2\pi\sqrt{\frac{m}{k}}$

- Find out how the relevant variables must be plotted so that you can verify this equation.
- Use the graph to calculate the constant k .
- Does your graph pass through the origin as theory suggests? Comment and explain.
- Does the value you get for k agree with the value you found in the first part of the experiment?

Note 1: Sometimes the spring will begin to oscillate sideways like a pendulum. This can be eliminated by attaching the spring to the stand with a string of length about 20 cm.

Note 2: This experiment can be greatly improved if motion and/or force sensors are available, as shown in the student report that follows. However, even more interesting results are obtained if a piece of cardboard is attached to the oscillating mass by a piece of tape or glue. By using cardboard pieces of different area the effect of damping may be investigated by observing how the amplitude decreases.