

## Unit C – Practical 7

### *Effect of damping on oscillations*

#### Safety

Wear protective glasses. Be careful not to drop the masses.

#### Apparatus and materials

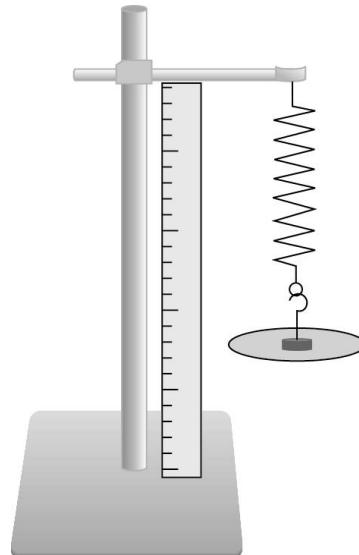
- stand and clamp
- helical steel spring
- mass hanger (50g)
- adhesive putty
- circles of five different radii (e.g. 2 cm, 4 cm, 6 cm, 8 cm, 10 cm) from thick cardboard
- stopwatch
- fiducial mark
- ruler

#### Introduction

In this practical, you will investigate the effect of damping on a spring–mass oscillating system. You will add cardboard circles of increasing diameter to increase the air resistance, which will increase the damping of the system and thus reduce the time it takes for the oscillations to stop.

#### Procedure

- 1 Secure the spring with the clamp and position it so that it is overhanging the bench.
- 2 Attach the mass hanger at the free end of the spring and use a fiducial mark to point the equilibrium position.
- 3 Stretch the spring a certain distance from the equilibrium position (e.g. 2 cm), which is the initial amplitude of the oscillation. Make sure that you stretch the spring vertically so that you will have only a vertical movement, not swinging.
- 4 The moment you release the spring, begin the stopwatch. Observe the spring and measure the time it takes for the oscillation to stop. (In practice, you could assume that the oscillation has stopped when the amplitude has become very small compared to its initial value.)
- 5 Repeat step 4 another four times and calculate the average time. Record your measurements together with a value for the surface area of the card in a suitable table.
- 6 Use a small amount of adhesive putty to attach the smallest circular card at the bottom of the mass hanger. Make an effort to align the centre of the card with the centre of the mass hanger.
- 7 Keeping the same initial amplitude, repeat steps 3–5.
- 8 Repeat the process for all diameters of circular cards.



- 9 Plot a graph of time for oscillations to stop against surface area of card. Is there any relationship?

**Questions**

- 1 The mass–spring system loses energy. Is the law of conservation of energy broken?
- 2 Measure the period of oscillations once for the largest diameter disk and once without any cardboard disk. What do you observe?