NEATH PORT TALBOT COLLEGE
COLEG CASTELL NEDD PORT TALBOT

School of Maths & Science
Science Practical

Oscillating Springs

◆ Aim

To investigate the relationship between the mass on an oscillating spring and its period. To determine the value of the spring constant and confirm the equation $T = 2\pi \sqrt{(m/k)}$.

◆ Introduction

You will alter the mass attached to a spring and cause the spring to oscillate. By plotting a suitable graph the spring constant may be determined. An additional log graph can be used to confirm the equation $T = 2\pi\sqrt{(m/k)}$.

◆ Safety

Control Measures

- You are reminded of the need of good laboratory practice in order to maintain a safe working environment.
- **Goggles must be worn at all times.**

Hazards

General Danger Make sure that the retort stand is securely fastened to the bench using a G – clamp.

◆ Apparatus Required

Spring, retort stand and clamp x 2, mass holder, assorted masses, metre rule, adhesive tape, pointer, stopwatch.

◆ Procedure

1. Support the spring using a retort stand and clamp.
2. Using another retort stand and clamp, place a metre rule alongside the spring.
3. Attach a 100g mass holder to the spring.
4. Read the position of the bottom of the mass holder to the metre rule. This will be your "initial position". A pointer would help to read the measurements from the metre rule.
5. Pull down the spring by 10cm and release at the same time start the stopwatch. Time how long it takes for the spring to perform 20 oscillations. Record your results in a suitable table.
6. Repeat a further twice and determine the average time for 20 oscillations. Now determine the period.
7. Repeat. Increase the mass in steps of 100g, until you have reached about 700g.

You are told that the relationship between the period T of the spring and the mass on the spring ,m, is given by:

$$T = 2\pi \sqrt{(m/k)}$$

Where k is the spring constant.

8. Calculate the average time for 1 oscillation (T), then square this value.
9. Plot a graph of $(T)^2$ on the y axis against mass (m) on the x axis to determine the spring constant of the spring. Justify the number of significant figures in your final answer.

10. Next calculate ln T and ln m and plot a graph of ln T on the y - axis against ln m on the x - axis. Find the gradient of the graph. What does the gradient represent?

11. Determine the percentage uncertainty in the value of spring constant k.

12. Determine the percentage difference between the experimental value of the spring constant k, and the manufacturer's value of $29 Nm^{-1}$.

13. Using the graphs and your answers to the two sections above comment on the accuracy and reliability of the experiment.