Experiment 2: The Compound Pendulum

1 In this experiment, you will be required to investigate how the period of oscillation of a metre rule is affected by the position of a mass attached to it.

(a) (i) Pass the pin through the small hole at the top of the rule, and firmly clamp the cork so that the rule hangs vertically and can swing freely in a vertical plane as shown in Fig. 1.1.

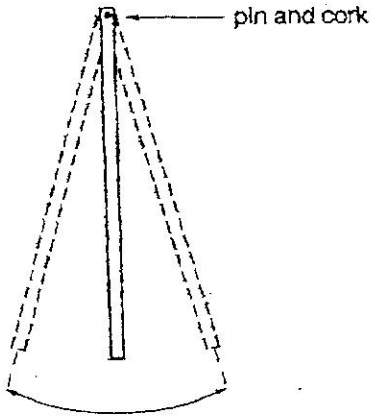

Fig. 1.1

(ii) Attach the 100 g mass close to the bottom of the rule. Measure and record the distance d between the pin and the centre of the mass. Describe how you made this measurement.

(iii) Slightly displace the rule, so that it performs *small* oscillations. Make and record measurements in order to determine a value for the period T of these oscillations.

(iv) Repeat the experiment for different values of d until you have a total of five sets of readings for d and T. Values of d should not be less than 30 cm.

(b) Theory predicts that T and d are related by the expression

$$T^2 = \frac{4\pi^2(I + md^2)}{k},$$

where $m = 0.10$ kg and I and k are constants.

(i) Tabulate values of T^2 and d^2.

(ii) Justify the number of significant figures which you have quoted for T^2 and for d^2.

(iii) Plot these values of T^2 and d^2 on the graph grid on page 5.

(iv) Draw the best straight line to fit your points.

(c) By taking appropriate measurements from your graph, determine numerical values, including appropriate units, for k and I.