

1. You are required to determine the radius of gyration k of a triangular plate. Proceed as follows:
 - (a) Clamp a pin tightly between the two pieces of wood provided.
 - (b) Suspend the triangular plate from a hole nearest the point marked G on the plate (fig. 1). Record the distance of suspension from G as h (in meters).

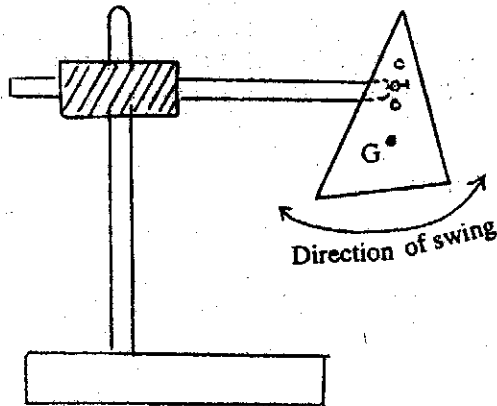


Figure 1

- (c) Determine the time t for 10 small oscillations of the plate and hence the periodic time T . Repeat the procedure for five other holes and record the corresponding values of h , t and T .
- (d) Plot a graph of $T^2 h$ (ordinates) against h^2 (abscissae)
- (e) Find the slope of the graph in (d) above.
- (f) Given that $T^2 h = \frac{4\pi^2}{g}(k^2 + h^2)$, determine the radius of gyration, k , of the triangular plate. (20 marks)

2. You are required to determine the refractive index of the transparent liquid labelled S by using a converging lens and a plane mirror. Proceed as follows:

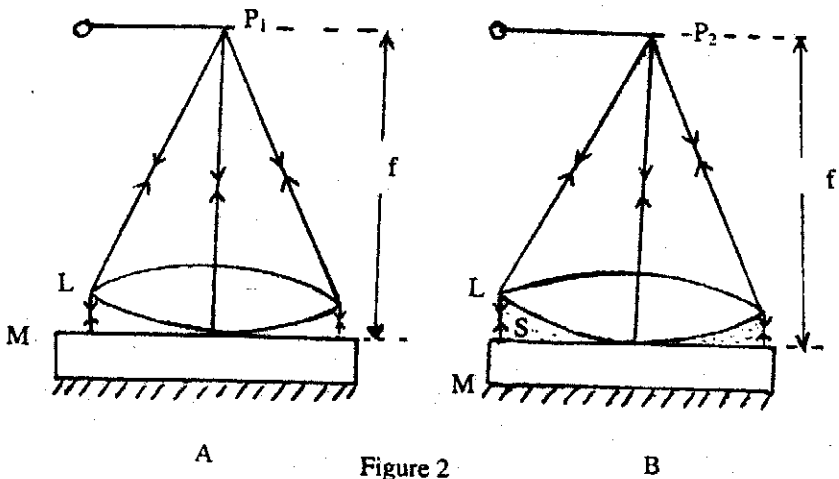


Figure 2

- (a) Place the mirror M and lens L (of known radius of curvature r) provided on a horizontal smooth surface as shown in figure 2A. Fix the pin p provided horizontally in a clamp so that its tip is vertically above the centre of the lens L .
- (b) Place your eye at least 25 cm above the pin then adjust it until at P_1 it has no parallax with its inverted image. Measure the distance f . Repeat this procedure of the no parallax position two more times and each time measure the distance (f).

- (c) Then moisten the mirror with a little of the given transparent liquid S so that the space between L and M is filled with the liquid S (figure 2B). Find the new position P₂ of no parallax and measure the distance f'. Repeat this procedure of no parallax position two more times.
- (d) Tabulate your results as follows:

				AVERAGE
f = P ₁ M (cm)				
f' = P ₂ M (cm)				

- (e) Find the focal length, f_L of liquid S given that

$$\frac{1}{f_L} = \frac{1}{f'} - \frac{1}{f}$$

- (f) Calculate the refractive index, η_L, of liquid S give that

$$\frac{1}{f_L} = (\eta_L - 1) \frac{1}{r}$$

where r is the radius of curvature of the lens used.

- (g) State the sources of error in your experiment.

(15 marks).

3. You are required to determine the resistance R of the potentiometer wire. Proceed as follows:

- (a) (i) Set up the potentiometer circuit which includes the wire Q, connected between the key, K, and the terminal B as shown in Figure 3. E₁ is accumulator (3V)

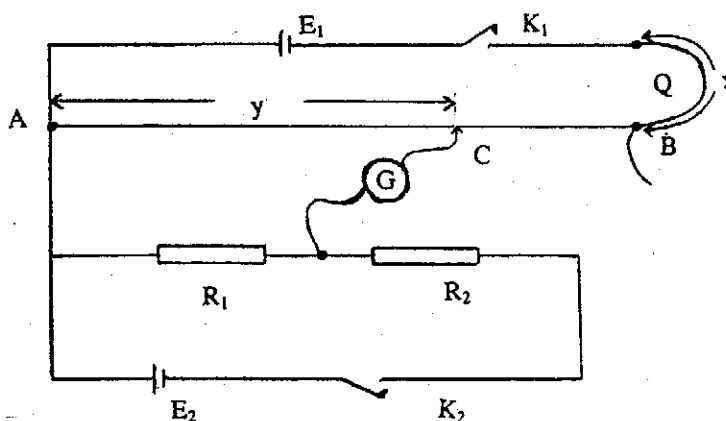


Fig. 3

- (ii) Set up the secondary circuit which consists of two resistors, R₁ and R₂ connected in series with the dry cell E₂ as shown in figure 3. R₁ = 5 Ω and R₂ = 10 Ω.
- (iii) Connect the positive terminal of R₁ to point A and its other terminal to the galvanometer G.
- (b) (i) With the length x of wire Q equal to 100cm in the circuit, close the keys K₁ and K₂ and determine the balance length y along AB. Record y in cm and open K₁ and K₂.
- (ii) By reducing the length of the wire Q by 15cm at a time repeat the procedure in (b) (i) for five more values of x. Record the values of x and y in a table.
- (iii) Replace the wire x with the standard resistor R_s of 2 Ω and determine the balance length y_s.

(c) y is related to x by the equation $y = a\rho x + aR$,
where a is a constant ρ is the resistance per unit length of wire Q and R is the resistance of the potentiometer wire AB.

(i) Plot a graph of y against x

(ii) Determine the value of $x = x_0$ when $y = y_0$.

(iii) Determine the slope of the graph and the y – intercept.

(iv) Hence compute the value of R

Given: $\rho = 2 \Omega \text{ cm}^{-1}$

x_0

(d) State any precautions you have taken in this experiment.

(15 marks)