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1. The aim of this experiment is to determine the acceleration (g) due to gravity. Proceed as follows:

Set up the apparatus as shown in figure 1 below.

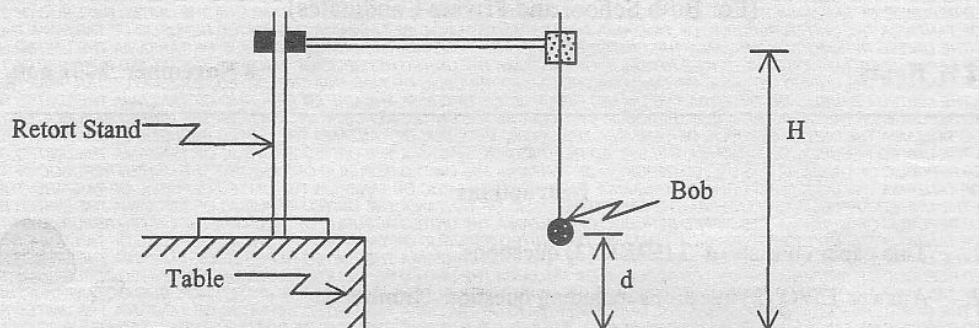
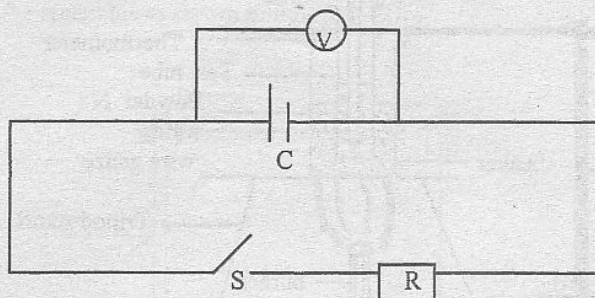


Figure 1

- (a) Suspend the pendulum from a fixed point using the retort stand such that it is a distance $d = 10$ cm from the floor. H is the height of the point of suspension above the floor.
- (b) Displace the pendulum through a small angle $\theta \approx 10^\circ$ to one side and record the time t for 10 complete oscillations hence find the periodic time T for one complete oscillation.
- (c) Vary d in intervals of 10 cm to obtain five more values of d and repeat the procedure in (b) above.
- (d) Tabulate your results for the values of d , t , T and T^2 .
- (e) Plot the graph of T^2 against d
 - (i) Determine the slope of the graph.
 - (ii) Determine the intercept along the d axis.
 - (iii) What does the intercept along d axis in (ii) above represent?
 - (iv) If $T^2 = -\frac{4\pi^2}{g}d + \frac{4\pi^2}{g}H$ is the equation for the motion of the pendulum, calculate the acceleration due to gravity of the pendulum.
- (f) Mention any three sources of errors of the experiment.

3. You are provided with dry cells(s) C, a resistance box R, a voltmeter V, a switch S and connecting wires. Arrange the apparatus as shown in the diagram below.



Proceed as follows:

- (i) Using a resistance of $R = 1 \Omega$ in the resistance box, close the switch and record the reading V , as indicated by the voltmeter.
- (ii) Repeat the procedure in (i) above for values of $R = 2, 4, 5$ and 10Ω .
- (iii) Tabulate your observations as shown below:

$R (\Omega)$	V (volts)	$\frac{1}{V}$	$\frac{1}{R}$
1			
2			
3			
4			
5			
10			

- (a) Plot a graph of $\frac{1}{V}$ against $\frac{1}{R}$
- (b) From your graph in (a) above
 - (i) read and record N which is the value of $\frac{1}{V}$ when $\frac{1}{R}$ is zero. Find $\frac{1}{N}$.
 - (ii) read and record M which is the value of $\frac{1}{R}$ when $\frac{1}{V}$ is zero. Find $\frac{1}{M}$.
- (c) Show how $\frac{N}{M}$ is related to G , where G is the slope of the graph.
- (d)
 - (i) What is the magnitude of the current supplied by the cell?
 - (ii) What is the physical meaning of $\frac{1}{N}$ and $\frac{1}{M}$ from the graph in (a) above?