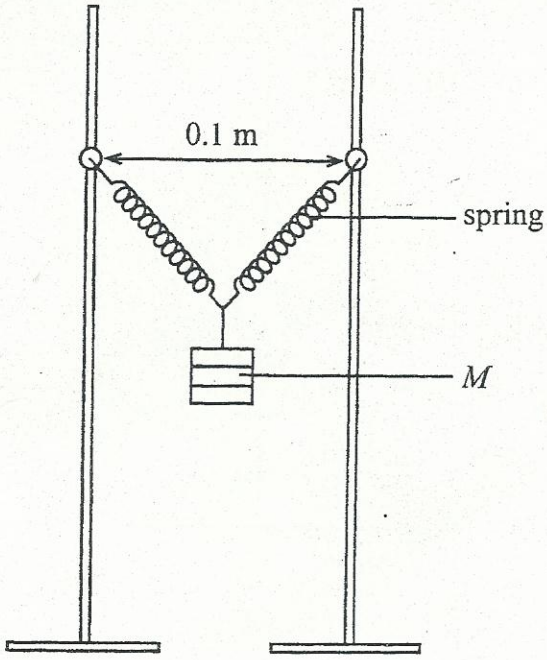
MARIME BLESSING 2 PHYSICS 4. J-Oe

It is recommended that you spend about 60 minutes on this question.

1 In this experiment you will be required to investigate the relationship between the period of oscillation (T) of a spring system and mass (M) loaded on it.

committee Committee

(a) Suspend M on the spring as shown in **Fig. 1.1** where M = 0.1 kg.



2π√

2π √

Fig. 1.1

The distance between the top ends of the springs is maintained at 0.1 m throughout the experiment.

(b) **(i)** Set M into vertical oscillations of small amplitude.

(ii) Make measurements to determine T for this mass M.

(iii) Repeat the measurements of T (up to six readings) for various values of M up to 0.6 kg.

(iv) Estimate the uncertainty in the smallest value of T and state **one** way in which this uncertainty may be reduced.

(c) Theory suggests that for any spring system

$$T = 2\pi\sqrt{\frac{M}{K}},$$

where K is the combined spring constant.

(i) Plot a graph of T^2 (y-axis) against M (x-axis).

(ii) Determine the gradient of the graph.

(iii) Determine the value of K.

(iv) Use your graph to calculate T for M equal to 0.35 kg.

DO NOT WRITE ON THIS SPACE.

It is recommended that you spend about 60 minutes on this question.

2 In this experiment, you will investigate the characteristics of a forward biased junction diode.

(a) Set up the circuit shown in **Fig. 2.1**. The diode D should be forward biased.

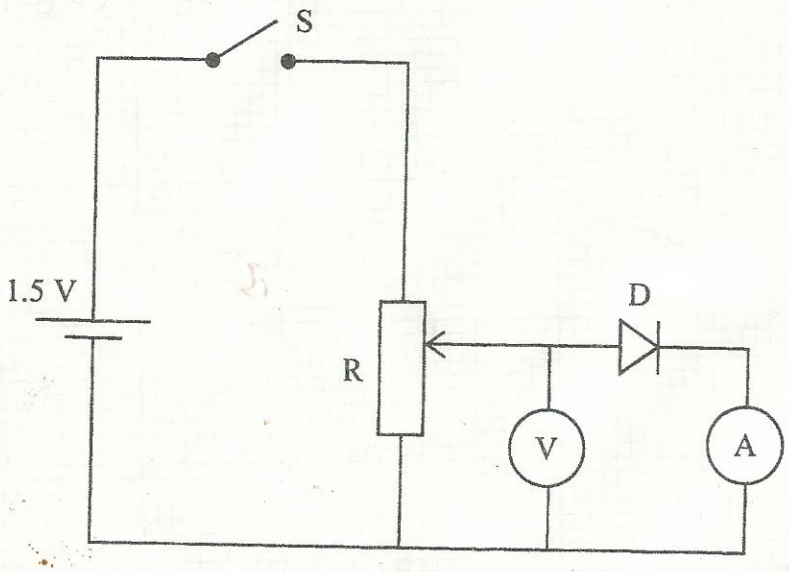


Fig. 2.1.

(b) **(i)** Close the switch S.

(ii) Adjust the variable resistor (R), so that the voltage (V) and current (I) are zero.

(iii) Adjust R, so that V increases in small steps from zero to the maximum possible value until you obtain 8 readings.

(iv) Record the values of V and I.

(c) Plot a graph of I against V.

Using the graph, calculate:

(i) the gradient of the graph at V = 0.7 V

(ii) the ratio $\frac{V}{I}$ at V = 0.7 V