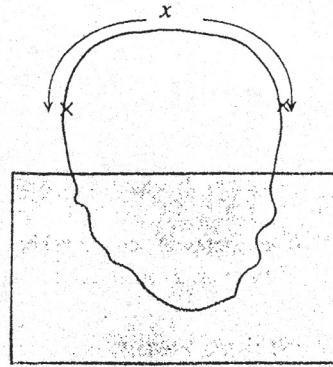


1996 A/L Structured Essay Question No (04)

A uniform resistive wire of total length  $L$  is joined end to end so as to form a loop. Part of this loop is inside an insulating block and only a portion of the loop is seen outside the block as shown in the figure.



By measuring the effective resistance  $R$  between any two outside points of length  $x$  of the loop, it is intended to determine the total length of the wire  $L$  and the resistivity of the material of the wire.

- (a) State the usual **laboratory method** that can be used for the accurate determination of  $R$ . (Ohmmeter or multimeter will **not** be accepted as an answer).

- (b) Draw a clear circuit **diagram** of the experimental arrangement which you would use under (a)

- (c) Write down an expression for  $R$  in terms of the resistance per unit length of the wire  $k$ ,  $L$  and  $x$ .

- (d) (i) Re-arrange the variables of the above expression to get  $\frac{R}{x}$  on the left hand side.

- (ii) What quantities would you choose for the axes to obtain a straight line graph with the expression obtained in  $d$  (i) ?

For Y axis : .....

For X axis : .....

- (e) (i) From the above graph, how would you obtain the values for  $k$  and  $L$  ?

$k$  : .....

$L$  : .....

(ii) After obtaining a value for  $k$ , what additional measurement is needed to calculate the resistivity of the material of the wire ?

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(f) In such an experiment, when plotting the graph mentioned in  $d$  (ii), a student obtained a straight line parallel to the X axis. Give the reason for this.

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