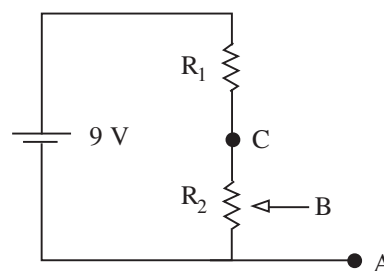


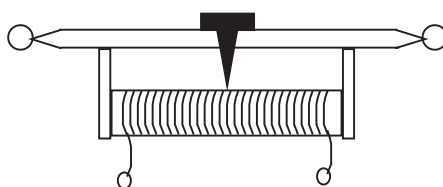
1992 A/L Structured Essay Question No (04)

The setup shown in the diagram is used to obtain a variable voltage in between the terminals  $A$  and  $B$ .  $R_1$  is a resistor with a fixed resistance while  $R_2$  indicates a Rheostat.



A variable voltage is obtained by moving the slider in the Rheostat. The internal resistance in the 9 V accumulator can be neglected and the total resistance of  $R_2$  is  $100\ \Omega$ .

- (a) If you have been told to use the Rheostat given below as the symbol  $R_2$ , to which terminals of the Rheostat should the  $A$ ,  $B$  and  $C$  points in the above circuit be connected? Show that by marking the relevant terminals as  $A$ ,  $B$  and  $C$ .



- (b) How would the current through the circuit would change, when the slider is moved up and down? Explain your answer.

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- (c) What is the minimum voltage that can be obtained across  $A$  and  $B$ ?

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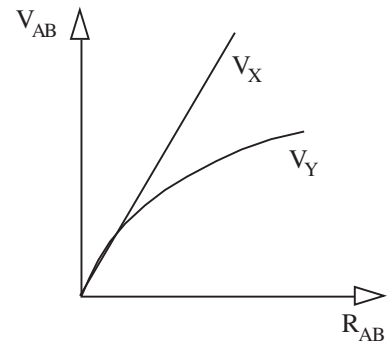
- (d) Calculate a suitable value for  $R_1$  in order to obtain a 5 V voltage in between  $A$  and  $B$ .

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- (e) Two graphs were drawn by a student by measuring the variation of  $V_{AB}$  with the resistance between  $A$  and  $B$  ( $R_{AB}$ ) with two different voltmeters,  $V_X$  and  $V_Y$ . Which voltmeter is more suitable to measure the voltage across  $A$  and  $B$ ? Explain your answer.



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- (f) When the accumulator was replaced with a 9 V cell while maintaining  $R_1$  at the value obtained in part (d) above, the maximum voltage that can be obtained across  $AB$  reduced down to 4.5 V from 5 V. What is the most probable reason for the above incident?

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- (g) Based on the data given in part (f) above, calculate an important parameter in the 9 V cell.

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- (h) If you need to maintain a constant voltage across  $AB$  for a long period of time with this setup, explain why the current flowing through the circuit should be reduced by taking large values for  $R_1$  and  $R_2$ .

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