

- 5 A potentiometer circuit that is used as a means of comparing potential differences is shown in Fig. 5.1.

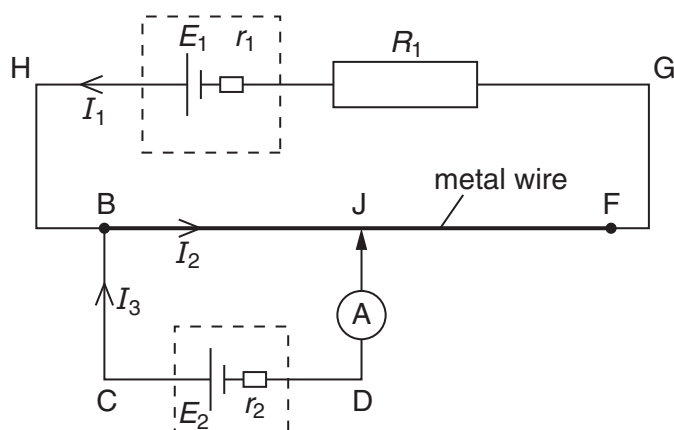


Fig. 5.1

A cell of e.m.f. E_1 and internal resistance r_1 is connected in series with a resistor of resistance R_1 and a uniform metal wire of total resistance R_2 . A second cell of e.m.f. E_2 and internal resistance r_2 is connected in series with a sensitive ammeter and is then connected across the wire at BJ. The connection at J is halfway along the wire. The current directions are shown on Fig. 5.1.

- (a) Kirchhoff's laws to obtain the relation
- between the currents I_1 , I_2 and I_3 ,
.....[1]
 - between E_1 , R_1 , R_2 , r_1 , I_1 and I_2 in loop HBJFGH,
.....[1]
 - between E_1 , E_2 , r_1 , r_2 , R_1 , R_2 , I_1 and I_3 in the loop HBCDJFGH.
.....[2]
- (b) The connection at J is moved along the wire. Explain why the reading on the ammeter changes.
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.....[2]