5 A wire BD has length 100 cm and resistance of 4.0 Ω. The ends B and D of the wire are connected to a cell X, as shown in Fig. 5.1.

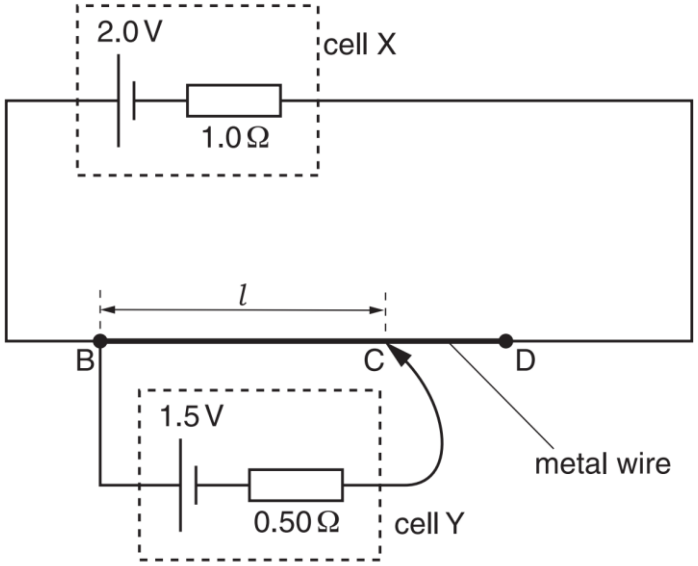

Fig. 5.1

The cell X has electromotive force (e.m.f.) 2.0 V and internal resistance 1.0 Ω.

A cell Y of e.m.f. 1.5 V and internal resistance 0.50 Ω is connected to the wire at points B and C, as shown in Fig. 5.1.

When the point C is at a distance l from point B, the current in cell Y is zero.

(a) Calculate

(i) the potential difference (p.d.) across the wire BD,

p.d. = ……V [2]

(ii) the distance l.

l = ……cm [2]

(b) Suggest and explain one way in which the circuit in Fig. 5.1 may be modified so that, when current in cell Y is zero, the distance l will be less than the value calculated in **(a)(ii)**.

……..

……..

…….....[2]

(c) From Fig. 5.1, cell Y is replaced with cell Z of the same e.m.f. but greater internal resistance.

State and explain, for the current in cell Z to be zero, whether the distance l will be greater than, equal to or less than the value calculated in **(a)(ii)**.

……..

……..

…….....[2]

[Total: 8]