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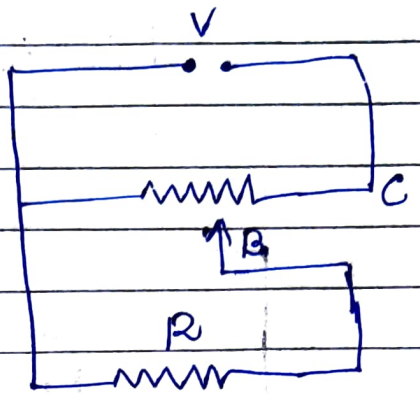
Home Assignment

1) $R_{Total} = \frac{\frac{R_0}{2} + \frac{R_0 \times R}{2}}{\frac{R_0}{2} + R}$

$= \frac{R_0 (R_0 + 4R)}{2(R_0 + 2R)}$



$I_{total} = \frac{V}{R_{Total}}$

Current through R

$= I_2 = I_{total} \times \frac{\frac{R_0 \times R}{2}}{\frac{R_0}{2} + R}$

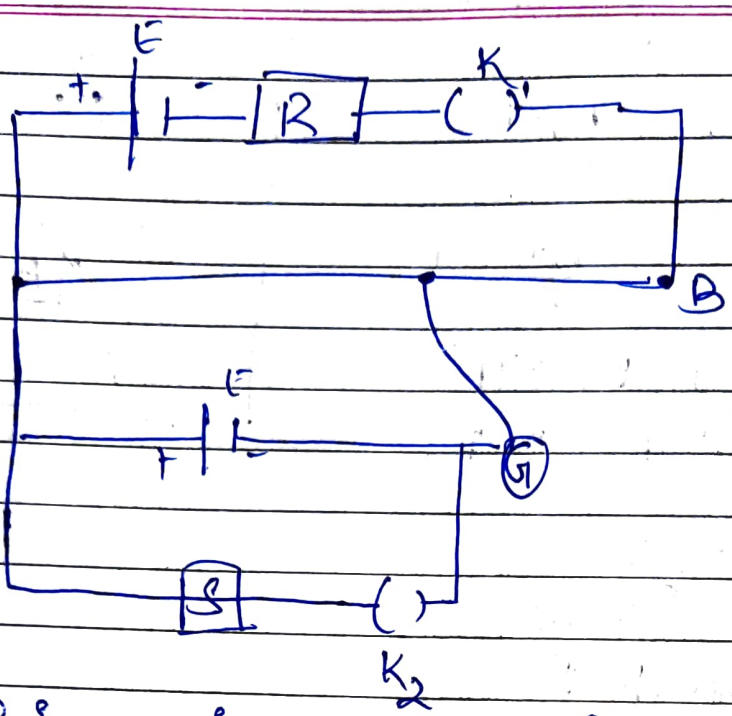
$= I_{total} \times \frac{R_0}{R_0 + 2R}$

$= \frac{V \cdot 2(R_0 + 2R)}{R_0 (R_0 \times 4R)} \times \frac{R_0 \times R}{R_0 + 2R}$

$= \frac{2VR_0R}{R_0(R_0 + 4R)}$

voltage across $R = I_2 R = \left(\frac{2VR}{R_0 + 4R}\right)$

2)



(i) By increasing resistance R the current through AB decrease so potential gradient decrease. Hence a greater length of wire would be needed for balancing the same potential difference so the null point would shift toward B.

(ii) By decreasing resistance S, the current through AB remain the same potential gradient does not change. As K_2 is open so there is no effect of s on null point.

3) Principal of potentiometer:-

The potential drop across the length of a steady current carrying wire uniform cross section is proportional to the length of the wire.

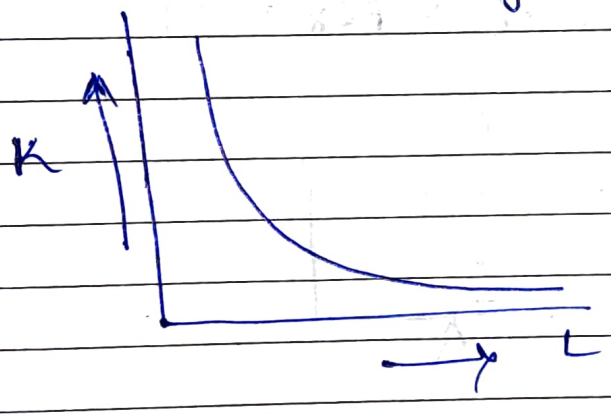
(i) we use a long wire to have a lower value ~~Get uniform~~ to potential gradient i.e a lower least count or greater sentivity of the potentiometer.

(ii) The area of cross-section has to be uniform to get a 'uniform wire' as per the principal of potentiometer.

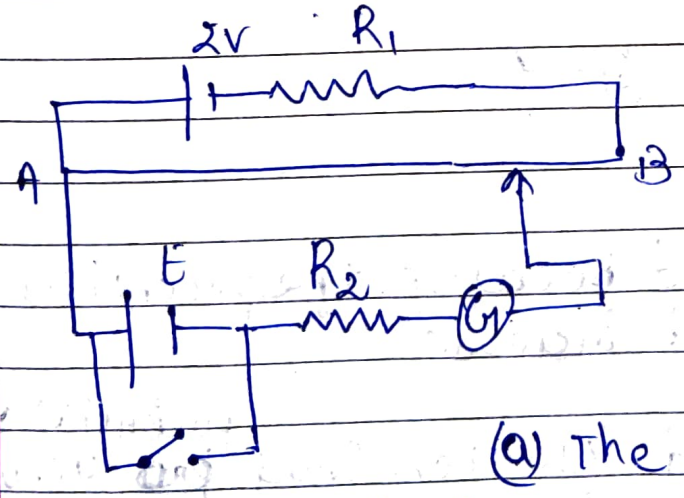
(iii) The emf of the driving cell has to be greater than the emf of the primary cell as otherwise no balance point would be obtained

(b) Potential gradient $K = \frac{V}{L}$

∴ The required graph is a shown below:-



4)



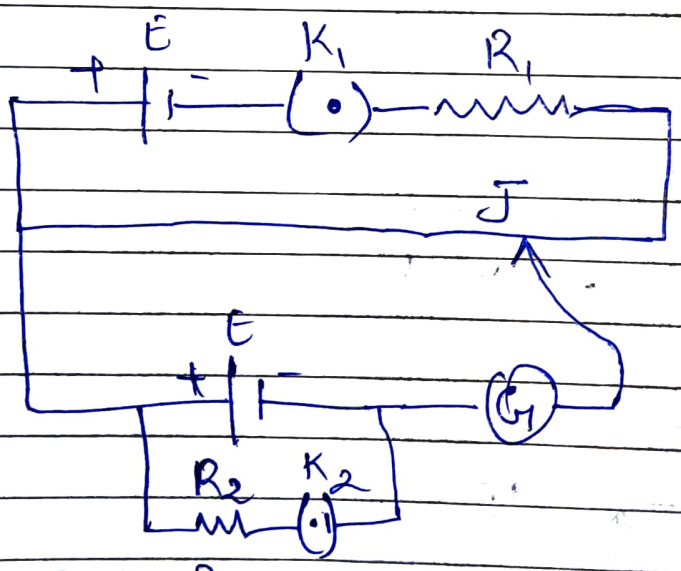
(a) The purpose of high resistance R_2 is to reduce the current through the galvanometer when jockey is far from balance point, this save the galvanometer and the cell from being damaged.

(b) When resistance R_1, is decreased the potential gradient of potentiometer wire increase, so balance point (J) shifts to longer length of wire.

(c) (i) The balance point is not ~~obtained~~ obtained because maximum emf across potentiometer wire is 2v.

(ii) When key (K) is closed, the terminal potential difference of cell is zero. So balance point cannot be between A and B (since $\xi v = Ke \Rightarrow e = 0$ for $v = 0$)

5)



(i) R_1 is increased because the potential gradient would increase.

(ii) R_2 is increased the terminal potential difference across the cell would increase.