HOME ASSIGNMENT

(1) When the sliding contact is in middle, a resistance of $R_0/2$ is connected in series with a parallel combination of R and $R_0/2$.

$$R_{eq} = \frac{R_0}{2} + \frac{R_0}{2}$$

Current flowing through the circuit is given by:

$$I = \frac{V}{R_{eq}}$$

Potential across R is given by:

$$V_R = I\left(\frac{R_0}{2}\right)$$

$$V_R = \frac{V}{R_{eq}}\left(\frac{R_0}{2}\right)$$

Solving, $V_R = \frac{R}{4R + R_0} V$

(2)(i) By increasing R the current through AB decreases, so potential gradient decreases. Hence a greater length of wire would be needed for balancing the same potential difference. So the null point would shift towards B.

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

DOMS

3a) The potential drop across the length of a steady current carrying wire of uniform cross section is proportional to the length of the wire.

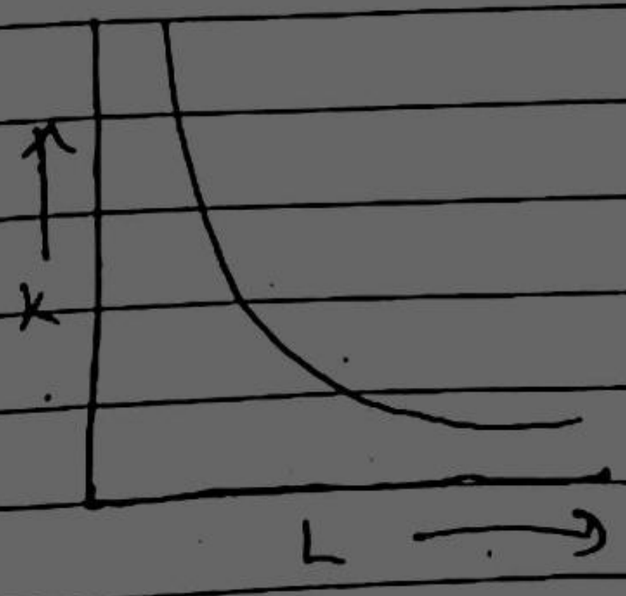
(i) We use a long wire to have a lower value of potential gradient i.e. a lower 'least count' or greater sensitivity of the potentiometer.

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

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

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

∴ The required graph is as shown below.



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

(ii) when Resistance R_1 is decreased, the potential gradient of potentiometer wire increases, so balance point (T) shifts to longer length of wire.

(iii) (i) The balance point is not obtained because maximum ~~terst~~ emf across potentiometer wire is 2 V.

(ii) when Key (K) is closed, the terminal potential difference of cell is zero; So balance point cannot be between A and B. (Since $V = Kl \Rightarrow l = 0$ for $V = 0$)

5(i) Decreases (K increases)

(ii) Increases (The terminal p.d. across the cell would increase).