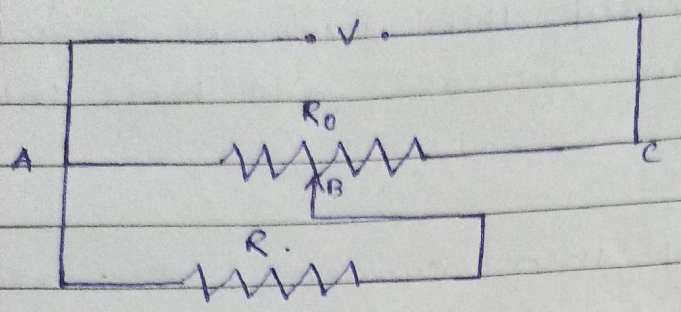
Date
Page

Home Assignment

1.



Here, $AB = \frac{AC}{2}$.

So, between the points A and B, the resistance will be halfed $= \frac{R_0}{2}$.

Let total resistance between A and B be R_1.

$$\Rightarrow \frac{1}{R_1} = \frac{1}{R} + \frac{1}{(R_0/2)}$$

$$= \frac{R_0 R}{R_0 + 2R}.$$

Now, total resistance between A and C will be the sum of resistance between A and B and B and C

$$\Rightarrow R_{total} = R_1 + R_0/2.$$

$\therefore$ Current flowing through the potentiometer,

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

$$= \frac{V}{R_1 + R_0/2}. \quad = \frac{2V}{2R_1 + R_0}.$$

Now, Voltage (V_1) for resistance between A and B.

$$V_1 = I R_1$$

$$= \left(\frac{2V}{2R_1 + R_0}\right) \times R_1$$

$$= \frac{2V}{2\left(\frac{R_0 * R}{R_0 + 2R}\right) + R_0} \times \frac{R_0 \times R}{R_0 + 2R}.$$

$$= \frac{2VR}{2R + R_0 + 2R}$$

$$\boxed{V_1 = \frac{2VR}{R_0 + 4R}}$$

2. a) By increasing resistance 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.

b) 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 null point.

3. a. i) Principle of potentiometer :

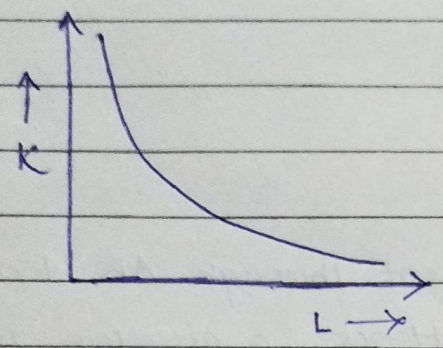
The potential drop across the length of a steady current carrying wire of uniform cross section is proportional to the length of the wire.

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

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

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

b. Potential gradient, $K = \frac{V}{L}$.



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 saves the galvanometer and the cell from being damaged.

b) When resistance R_1 is increased, the potential gradient of potentiometer wire decreases. The null point (J) shifts towards B.

c. 1. If the emf $\mathcal{E}$ becomes greater than 2V then the balance point will not be obtained.

2. Potential drop across the cell cannot become equal to potential across any two point of the curve. Potential difference across cell become zero.

5. a) If R_1 is ~~Increase~~ decreased then incurrent increases, ~~then~~ potential gradient increases and hence balancing length decreases.

b) When R_2 is decreased then current decreases, then the terminal potential difference across the unknown cell increases. Hence, the balancing length increases.