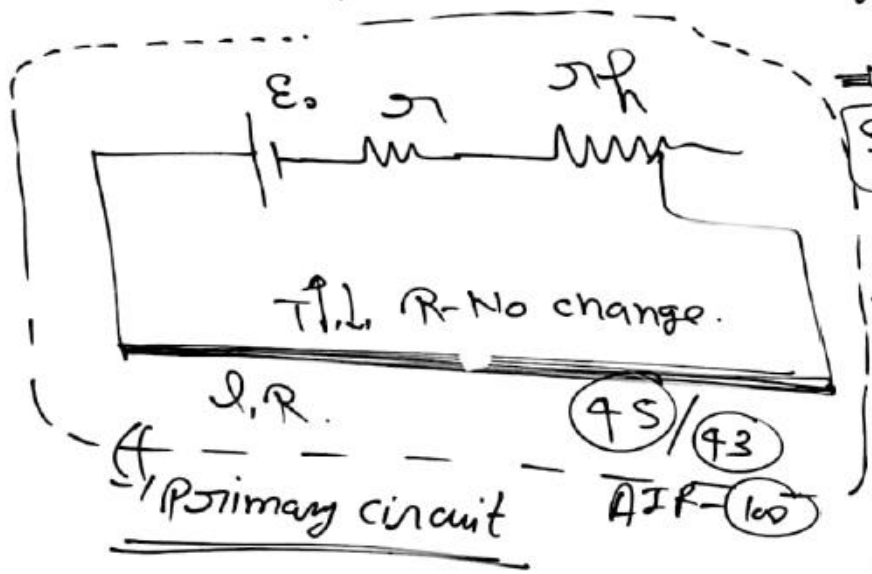
Necessity of Potentiometer-



⇒ Potentiometer wire

⇒ Made of Manganin, Eureka, Constantan - Alloy

$S = \frac{m}{ne^2\tau}$

⇒ due to high Specific resistance / resistive

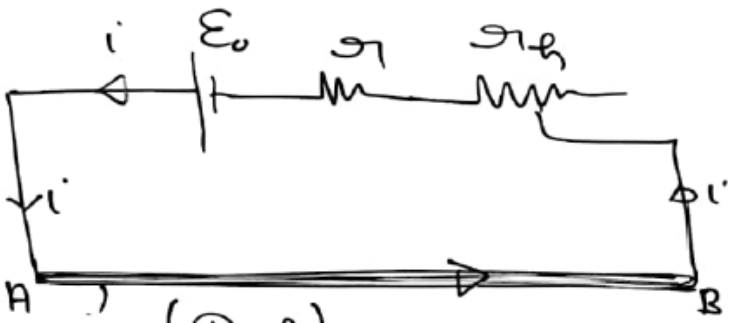
S → high

⇒ Manganin, Eureka

α → very low

T↑ ⊗ T↓ - S almost No change

Primary circuit of Potentiometer:-



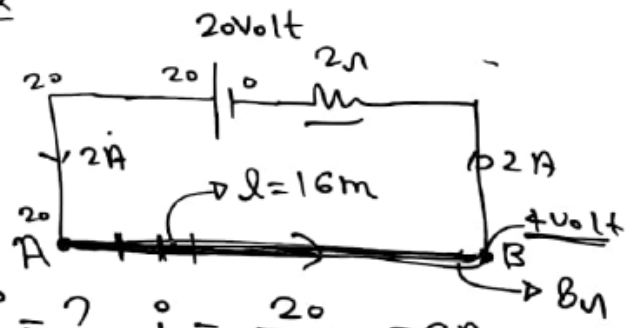
(i) $i = \dfrac{\mathcal{E}_0}{r + R + r_h}$

(ii) Potential difference across A.B,

$$V_{AB} = iR = \frac{\mathcal{E}_0}{(r + R + r_h)} \times R$$

(iii) Potential gradient $x = \dfrac{V_{AB}}{l}$

Ex



(i) $i = ?$ $\quad i = \dfrac{20}{10} = 2\,Amp$

(ii) $V_{AB} = 2 \times 8 = 16\,Volt$

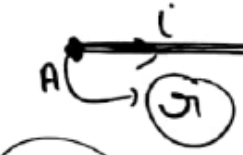
(iii) Potential gradient $x = \dfrac{V_{AB}}{l}$

$$x = \frac{16\,Volt}{16\,m} = 1\,Volt/m$$

$$x = \frac{\Delta V}{l} = \frac{V_B - V_A}{l} = \frac{-16\,V}{16\,m} = -1\,Volt/m$$

Primary circuit of Potentiometer:

$x \Rightarrow$ Potential gradient.



$V_{AB} = V$ Volt

$l_{AB} = l$

$R_{AB} = R$

NCERT ⇓ Given

$$X = \frac{V_{AB}}{l}$$

$$X = \frac{iR}{l}$$

Potential gradient $X \rightarrow \rho, \sigma$.

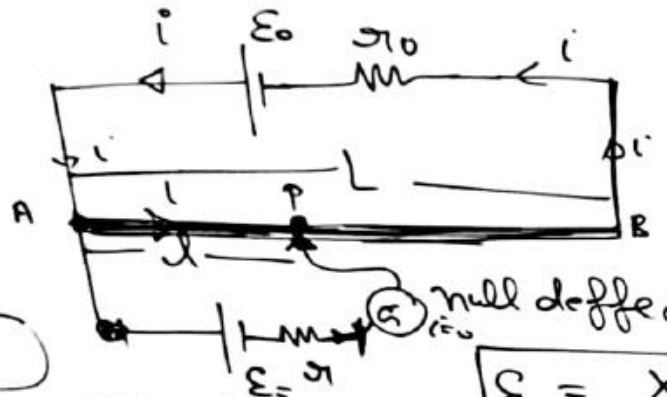
$$R = \frac{\rho l}{A}$$

$$\uparrow R = \frac{\rho l}{A}$$

$$x \propto \frac{1}{(\text{reading})^2}$$

Application of potentiometer :-

(i) To find Emf of cell. $(\varepsilon = x\ell)$



$x\ell$

$\varepsilon = x\ell$

$\varepsilon = x \cdot \ell$

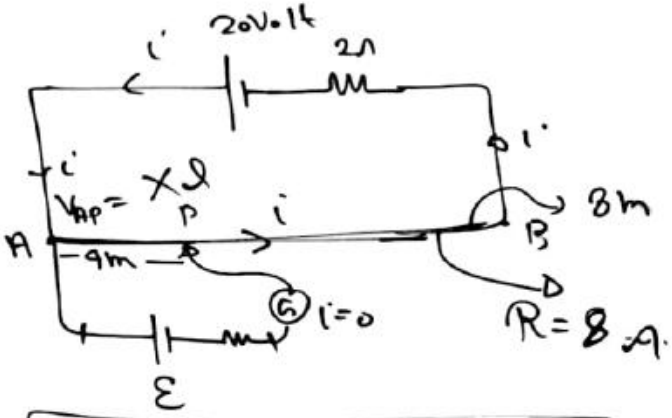
T.P = ε

$x \rightarrow \frac{V_{AB}}{L}$

x → Potential gradient

$V_{AP} = x\ell$

$\varepsilon = x \cdot \ell$



⇒ i in primary circuit

$i = \frac{20}{r_0} = 2$ Amp

$\varepsilon = 8$ Volt

$V_{AB} = 2 \times 8 = 16$ Volt

$x = \frac{V_{AB}}{\ell} = \frac{16}{8} = 2$ Volt/m

$\varepsilon = x\ell \Rightarrow \frac{2\text{Volt}}{\text{m}} \times 4\text{m} = 8$ Volt

Application of potentiometer :-

(b) Compare of Emf of two cell :-