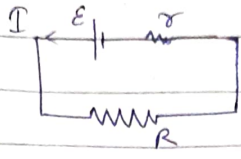


Lecture - 4 Electromotive force & ohm's law

- Electromotive force (emf) - \mathcal{E}

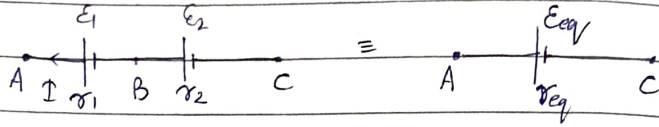


$$V = \mathcal{E} - I r$$

$$I R = \mathcal{E} - I r$$

$$I = \frac{\mathcal{E}}{R + r}$$

- Cells connected in series



$$V_{AC} = (\mathcal{E}_1 + \mathcal{E}_2) - I(r_1 + r_2)$$

$$V_{AC} = \mathcal{E}_{eq} - I r_{eq}$$

$$\mathcal{E}_{eq} = \mathcal{E}_1 + \mathcal{E}_2$$

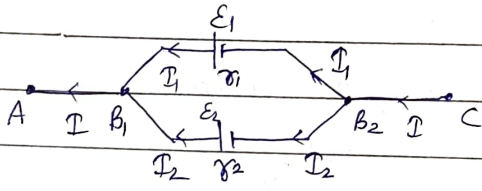
$$r_{eq} = r_1 + r_2$$

For n-cells/batteries

$$\mathcal{E}_{eq} = \mathcal{E}_1 + \mathcal{E}_2 + \dots + \mathcal{E}_n$$

$$r_{eq} = r_1 + r_2 + \dots + r_n$$

- Cells connected in series



$$I = I_1 + I_2$$

$$V = \mathcal{E}_1 - I r_1$$

$$V = \frac{\mathcal{E}_1 r_2 + \mathcal{E}_2 r_1}{r_1 + r_2} - I \frac{r_1 r_2}{r_1 + r_2}$$

$$V = \mathcal{E}_{eq} - I r_{eq}$$

$$\frac{1}{r_{eq}} = \frac{1}{r_1} + \frac{1}{r_2}$$

$$\frac{\mathcal{E}_{eq}}{r_{eq}} = \frac{\mathcal{E}_1}{r_1} + \frac{\mathcal{E}_2}{r_2}$$

For n-cells/batteries

$$\frac{1}{r_{eq}} = \frac{1}{r_1} + \frac{1}{r_2} + \dots + \frac{1}{r_n}$$

$$\frac{\mathcal{E}_{eq}}{r_{eq}} = \frac{\mathcal{E}_1}{r_1} + \frac{\mathcal{E}_2}{r_2} + \dots + \frac{\mathcal{E}_n}{r_n}$$