Physics Formula Sheet

Chapter by chapter, topic by topic. Written by the PadhoNa team for quick revision.

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CHAPTER 20

Current Electricity

Current, drift velocity and Ohm's law

$$I = \frac{dq}{dt} = neAv_d, \qquad V = IR, \qquad R = \frac{\rho L}{A}$$

$$J = \sigma E, \qquad \rho = \frac{m}{ne^2\tau}, \qquad \mu = \frac{v_d}{E}$$

TEMPERATURE

$$R = R_0(1 + \alpha\,\Delta T)$$

STRETCHED WIRE

$$\text{length} \times n \;\Rightarrow\; R \times n^2 \text{ (same volume)}$$

Combinations and Kirchhoff's laws

$$\text{series } R = R_1 + R_2; \qquad \text{parallel } \frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}$$

KIRCHHOFF

$$\sum I = 0 \text{ (junction)}; \qquad \sum \Delta V = 0 \text{ (loop)}$$

WHEATSTONE BRIDGE BALANCED

$$\frac{P}{Q} = \frac{R}{S}$$

Cells, EMF and internal resistance

$$V = \varepsilon - Ir, \qquad I = \frac{\varepsilon}{R + r}$$

CELLS IN SERIES / PARALLEL

$$\varepsilon_{\text{eq}} = \sum \varepsilon_i,\ r_{\text{eq}} = \sum r_i; \qquad \varepsilon_{\text{eq}} = \frac{\sum \varepsilon_i/r_i}{\sum 1/r_i},\ \frac{1}{r_{\text{eq}}} = \sum \frac{1}{r_i}$$

MAXIMUM POWER

$$R = r: \quad P_{\max} = \frac{\varepsilon^2}{4r}$$

Heating effect and power

$$P = VI = I^2R = \frac{V^2}{R}, \qquad H = I^2Rt$$

Meter bridge, potentiometer and instruments

METER BRIDGE

$$\frac{R}{S} = \frac{l}{100 - l}$$

POTENTIOMETER

$$\frac{\varepsilon_1}{\varepsilon_2} = \frac{l_1}{l_2}; \qquad r = R\left(\frac{l_1}{l_2} - 1\right)$$

GALVANOMETER CONVERSIONS

$$\text{ammeter: } S = \frac{I_g G}{I - I_g}\ (\text{shunt}); \qquad \text{voltmeter: } R = \frac{V}{I_g} - G\ (\text{series})$$

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