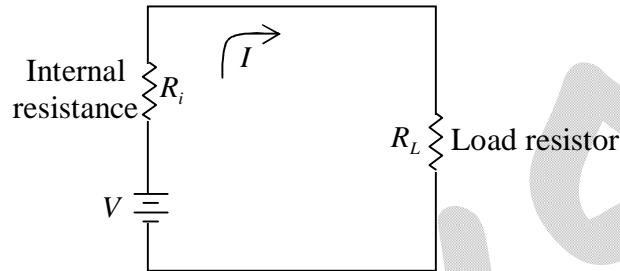## 1(e). Maximum Power Transfer Theorem

The maximum power is supplied by the voltage source and received by the load resistor if the value of the load resistor equals the value of the internal resistance of the voltage source. For maximum power transfer, then

$$R_L = R_i$$

Power received at the load is

$$P_L = I^2 R_L = \frac{V^2 R_L}{(R_i + R_L)^2} \text{ where } I = \frac{V}{R_i + R_L}$$

For maximum power

$$\frac{dP_L}{dR_L} = 0 \Rightarrow \frac{(R_i + R_L)^2 V^2 - V^2 R_L \times 2(R_i + R_L)}{(R_i + R_L)^4} = 0$$

$$\Rightarrow R_L = R_i$$

H.No. 40-D, Ground Floor, Jia Sarai, Near IIT, Hauz Khas, New Delhi-110016
Phone: 011-26865455/+91-9871145498
Website: www.physicsbyfiziks.com | Email: fiziks.physics@gmail.com

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