

# Physics II

## Resistance

$$V = IR \quad \text{Ohm's law}$$

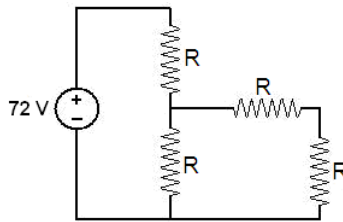
$$R_{\text{equivalent}} = R_1 + R_2 \quad \text{Equivalent for two resistors in series}$$

$$R_{\text{equivalent}} = \frac{1}{\frac{1}{R_1} + \frac{1}{R_2}} \quad \text{Equivalent for two resistors in parallel}$$

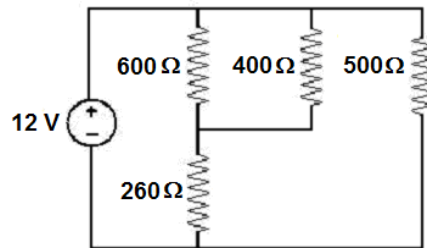
$$\text{Power} = VI \quad \text{Power in general for electric devices}$$

$$\text{Power} = RI^2 = \frac{V^2}{R} \quad \text{Power in case of resistors}$$

**Problem 1.-** Find the current passing through the voltage source if all the resistors shown in the circuit have the value  $R = 210 \Omega$ .

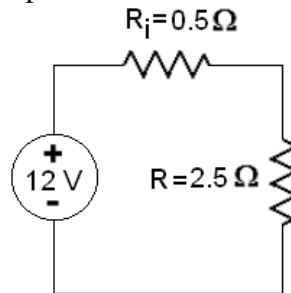


**Problem 2.-** Calculate the equivalent resistance from the point of view of the 12V voltage source.



**Problem 3.-** A model of a battery is represented by an ideal 12-V voltage source in series with an internal resistance of  $0.5\Omega$

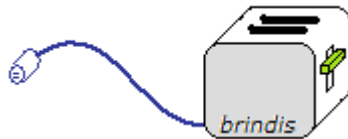
Calculate the power delivered to a lamp whose resistance is  $2.5 \Omega$



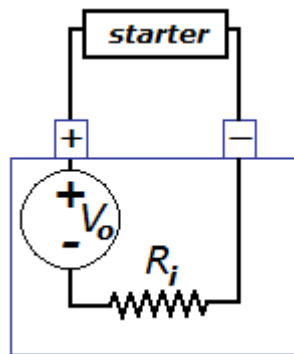
**Problem 4.-** A toaster draws 8.0A when plugged into a 115V line.

(a) What is the resistance of the toaster?

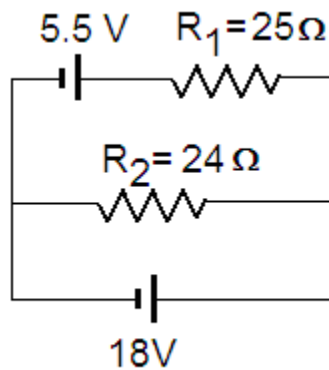
(b) How much charge passes through the resistance in 3 minutes (for this calculation assume that the current is DC)



**Problem 5.-** What is the internal resistance of a 12-volt car battery if the terminal voltage is 9.5volts when the starter draws 125 amps?



**Problem 6.-** Determine the magnitude and direction (to the left or to the right) of the current through  $R_1$ .



**Problem 7.-** A 12V-battery has an internal resistance of  $0.05\Omega$  Calculate the power delivered to a starter motor that can be modeled as a resistance of  $0.07\Omega$

**Problem 8.-** A headlamp in a car is rated 75W at 12V.

Calculate:

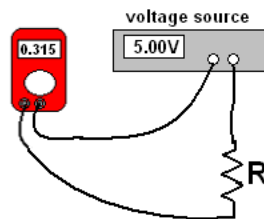
(a) its resistance and

(b) the current when working at the nominal voltage of 12V.

**Problem 9.-** Is it true that a good ammeter should have very high resistance?

**Problem 9a.-** Is it true that a good voltmeter should have very high resistance?

**Problem 10.-** The fuse in a multimeter is rated 315mA. Calculate the minimum resistance that we need to connect in series with a voltage source of 5 volts if we don't want to blow the fuse. Consider the internal resistance of the instrument to be  $1.5 \Omega$  when used as an ammeter.



**Problem 11.-** Specify units used for resistance, electric field and current.

**Problem 12.-** Calculate the equivalent resistance from the point of view of the 5V voltage source.

