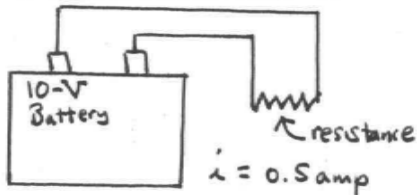


PROBLEM 2.37

KNOWN: Operating data are given for a 10-V battery providing current to a resistance.

FIND: Determine the resistance, in ohms, and the amount of energy transfer by work, in kJ.

SCHEMATIC & GIVEN DATA:



ANALYSIS:

$$\text{Resistance} = \frac{\text{Voltage}}{\text{Current}} = \frac{10 \text{ volts}}{0.5 \text{ amp}} \left| \frac{1 \text{ ohm}}{1 \text{ volt/amp}} \right| = 20 \text{ ohm} \quad \leftarrow$$

With Eq. 2.21 applied to the battery, which is discharging,

$$\dot{W} = (\text{voltage})(\text{current}) = (10 \text{ volt})(0.5 \text{ amp}) \left| \frac{1 \text{ Watt/amp}}{1 \text{ volt}} \right| = 5 \text{ Watt}$$

Then, for 30 minutes of operation,

$$W = \int \dot{W} dt = (5 \text{ watt})(30 \text{ min.}) \left| \frac{60 \text{ s}}{1 \text{ min}} \right| \left| \frac{1 \text{ J/s}}{1 \text{ watt}} \right| \left| \frac{1 \text{ kJ}}{10^3 \text{ J}} \right| = 9 \text{ kJ} \quad \leftarrow$$

\uparrow Constant