Review

- Current, voltage and resistance in a circuit obey Ohm’s Law $V = IR$, with $V$ in volts (V), I in amps (A) and R in ohms ($\Omega$).
- Power is the amount of energy used per second and is measured in Watts. 1 Watt is 1 Joule per second.
- A device which is connected to a voltage source $V$ and draws a current $I$, consumes an amount of power $P = I \times V$

P. 13—$P = I \times V \Rightarrow 12 \text{ W} = I \times 12 \text{ V} \Rightarrow I = 1 \text{ A}$

P. 14—$P = I \times V = 5 \text{ A} \times 10 \text{ V} = 50 \text{ W}$

P. 15—Two 1.5 volt batteries used in a chain provides 3 V

$\Rightarrow P = IV = 0.05 \text{ A} \times 3 \text{ V} = 0.15 \text{ W}$

P. 16—$P(1) = I \times V = 1.5 \text{ V} \times (2 \times 1.5 \text{ V}) = 4.5 \text{ W}$

$P(2) = I \times V = 1.5 \text{ A} \times (5 \times 1.5 \text{ V}) = 11.25 \text{ W}$

P. 17—$P(1) = 2 \text{ A} \times 1.5 \text{ V} = 3 \text{ W}$; In the second case each battery separately provides 3.0 W
P. 19—Each battery provides $1.5 \text{ V} \times 2 \text{ A} = 3 \text{ Watts of power} = 3 \text{ Joules/sec}$. The total energy provided by the battery is the power it provides each second multiplied by the amount of time that it is on: \[ \text{total energy} = \text{Power} \times \text{time} \]
Each battery is capable of providing 40,000 Joules of energy
\[ \Rightarrow 40,000 \text{ J} = 3 \text{ J/sec} \times t \Rightarrow t = 13,000 \text{ sec} = 222 \text{ min} = 3.7 \text{ hours} \]

P. 25—\[ \text{P} = \text{I} \times \text{V} = 600 \text{ A} \times 400,000 \text{ V} = 240,000,000 \text{ W} \] (240 megawatts)

P. 26—\[ 240,000,000 \text{ W} = \text{I} \times \text{V} = \text{I} \times 120 \text{ V} \Rightarrow \text{I} = 2,000,000 \text{ A} \] (2 million amps)

P. 27—\[ \text{V} = \text{IR} \Rightarrow \text{I} = \frac{\text{V}}{\text{R}} = \frac{5 \text{ V}}{100 \Omega} = 0.05 \text{ A} \]

P. 29—\[ \text{R} = \frac{\text{V}}{\text{I}} = \frac{1 \text{ V}}{10 \text{ A}} = 0.1 \Omega \]

P. 32—\[ \text{V} = \text{IR} = 0.120 \text{ A} \times 1000 \Omega = 120 \text{ V} \]