Problems

19.1 Ohm's law   20.

What voltage is needed to make 6 C of charge traverse a 100-Ω resistor in 1 min?

- a. The required voltage is 1×10^{-3} V.
- b. The required voltage is 10 V.
- c. The required voltage is 1,000 V.
- d. The required voltage is 10,000 V.

21.

Resistors typically obey Ohm's law at low currents, but show deviations at higher currents because of heating. Suppose you were to conduct an experiment measuring the voltage, V, across a resistor as a function of current, I, including currents whose deviations from Ohm's law start to become apparent. For a data plot of V versus I, which of the following functions would be best to fit the data? Assume that a, b, and c are nonzero constants adjusted to fit the data.

- a. $V = aI$

- b. $V = aI + b$

- c. $V = aI + bI^2$

- d. $V = aI + bI^2 + c$

22.

A battery of unknown voltage V_1 is attached across a resistor R_1. You add a second battery with $V\_2 = 9.0\,\text{V}$ in series with V_1 so that the voltage across R_1 is now $V\_1 + V\_2$ and measure $0.3\,\text{A}$ of current through resistor R_1. You add a third battery with $V\_3 = 9.0\,\text{V}$ in series with the first two batteries so that the voltage across R_1 is $V\_1 + V\_2 + V\_3$ and measure $0.4\,\text{A}$ of current through R_1. What is the resistance of R_1?

- a. $23.25\,\Omega$
- b. $21.75\,\Omega$
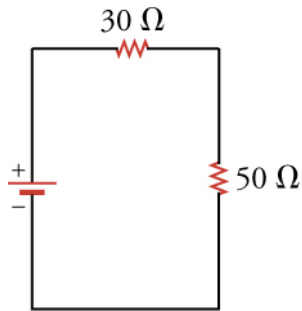- c. $31.33\,\Omega$
- d. $90\,\Omega$

19.2 Series Circuits   23.

What is the voltage drop across two 80-Ω resistors connected in series with 0.15 A flowing through them?

- a. 12 V
- b. 24 V
- c. 36 V

d. 48 V

24.

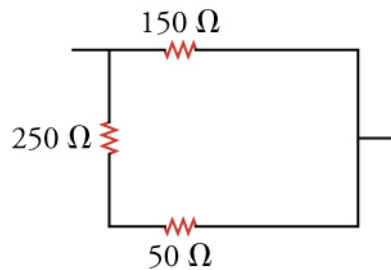In this circuit, the voltage drop across the upper resistor is 4.5 V. What is the battery voltage?

30 Ω

50 Ω

a. 4.5V
b. 7.5V
c. 12V
d. 18V

19.3 Parallel Circuits   25.

What is the equivalent resistance of this circuit?

150 Ω

250 Ω

50 Ω

a. The equivalent resistance of the circuit is 32.7 Ω.
b. The equivalent resistance of the circuit is 100 Ω.
c. The equivalent resistance of the circuit is 327 Ω.
d. The equivalent resistance of the circuit is 450 Ω.

26.

What is the equivalent resistance of the circuit shown below?
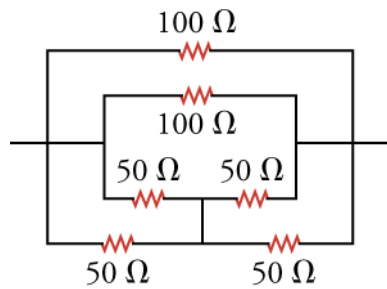
a. The equivalent resistance is 25 Ω.
b. The equivalent resistance is 50 Ω.
c. The equivalent resistance is 75 Ω.
d. The equivalent resistance is 100 Ω.

19.4 Electric Power   27.

When 12 V are applied across a resistor, it dissipates 120 W of power. What is the current through the resistor?

a. The current is 1,440 A.
b. The current is 10 A.
c. The current is 0.1 A.
d. The current is 0.01 A.

28.

Warming 1 g of water requires 1 J of energy per . How long would it take to warm 1 L of water from 20 to 40 °C if you immerse in the water a 1-kW resistor connected across a 9.0-V batteries aligned in series?

a. 10 min
b. 20 min
c. 30 min
d. 40 min