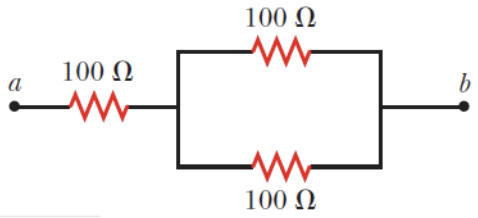
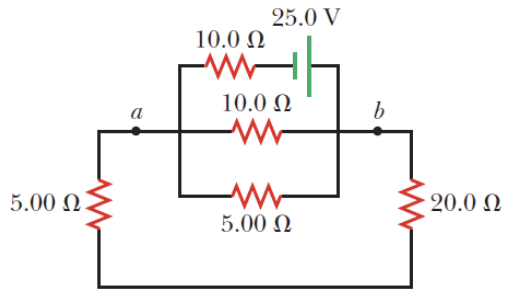
Chapter 28 Homework Problems

3. An automobile battery has an emf of 12.6 V and an internal resistance of 0.080 0 Ω. The headlights together have an equivalent resistance of 5.00 Ω (assumed constant). What is the potential difference across the headlight bulbs (a) when they are the only load on the battery and (b) when the starter motor is operated, requiring an additional 35.0 A from the battery?

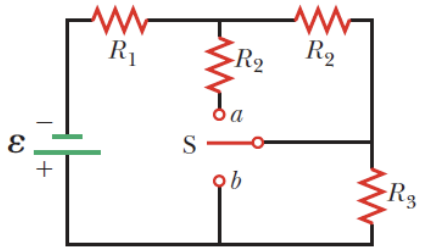
7. Three 100-Ω resistors are connected as shown in Figure P28.7. The maximum power that can safely be delivered to any one resistor is 25.0 W. (a) What is the maximum potential difference that can be applied to the terminals *a* and *b*? (b) For the voltage determined in part (a), what is the power delivered to each resistor? (c) What is the total power delivered to the combination of resistors?



9. M Consider the circuit shown in Figure P28.9. Find (a) the current in the 20.0-Ω resistor and (b) the potential difference between points *a* and *b*.

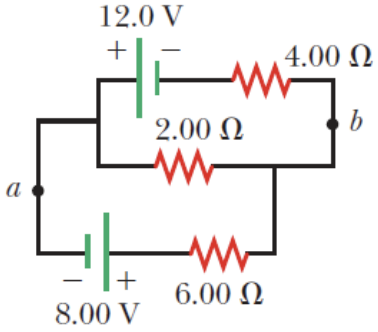


11. A battery with $\mathcal{E} = 6.00$ V and no internal resistance supplies current to the circuit shown in Figure P28.11. When the double-throw switch S is open as shown in the figure, the current in the battery is 1.00 mA. When the switch is closed in position *a*, the current in the battery is 1.20 mA. When the switch is closed in position *b*, the current in the battery is 2.00 mA. Find the resistances (a) R_1, (b) R_2, and (c) R_3.

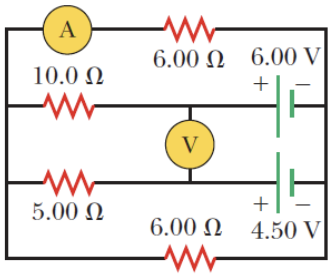


15. Two resistors connected in series have an equivalent resistance of 690 Ω. When they are connected in parallel, their equivalent resistance is 150 Ω. Find the resistance of each resistor.

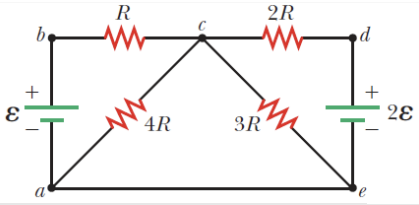
22. For the circuit shown in Figure P28.22, calculate (a) the current in the 2.00-Ω resistor and (b) the potential difference between points *a* and *b*.



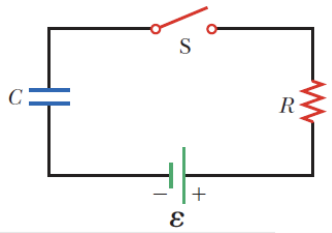
25. What are the expected readings of (a) the ideal ammeter and (b) the ideal voltmeter in Figure P28.25?



27. Taking $R = 1.00\ \text{k}\Omega$ and $\mathcal{E} = 250\ \text{V}$ in Figure P28.27, determine the direction and magnitude of the current in the horizontal wire between a and e.

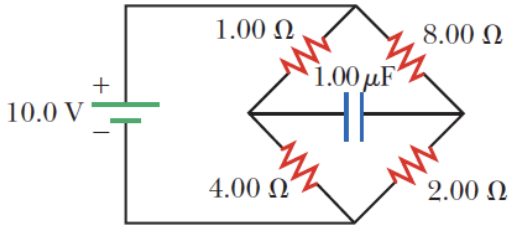


34. Consider a series RC circuit as in Figure P28.34 for which $R = 1.00\ \text{M}\Omega$, $C = 5.00\ \mu\text{F}$, and $\mathcal{E} = 30.0\ \text{V}$. Find (a) the time constant of the circuit and (b) the maximum charge on the capacitor after the switch is thrown closed. (c) Find the current in the resistor 10.0 s after the switch is closed.

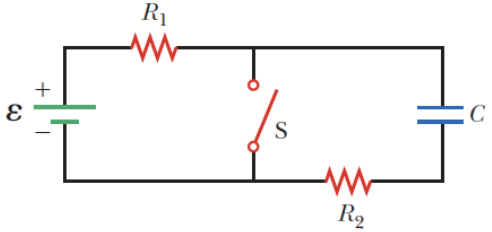


35. A 2.00-nF capacitor with an initial charge of 5.10 μC is discharged through a 1.30-kΩ resistor. (a) Calculate the current in the resistor 9.00 μs after the resistor is connected across the terminals of the capacitor. (b) What charge remains on the capacitor after 8.00 μs? (c) What is the maximum current in the resistor?

37. **M** The circuit in Figure P28.37 has been connected for a long time. (a) What is the potential difference across the capacitor? (b) If the battery is disconnected from the circuit, over what time interval does the capacitor discharge to one-tenth its initial voltage?



39. In the circuit of Figure P28.39, the switch S has been open for a long time. It is then suddenly closed. Take $\mathcal{E} = 10.0\ \text{V}$, $R_1 = 50.0\ \text{k}\Omega$, $R_2 = 100\ \text{k}\Omega$, and $C = 10.0\ \mu\text{F}$. Determine the time constant (a) before the switch is closed and (b) after the switch is closed. (c) Let the switch be closed at $t = 0$. Determine the current in the switch as a function of time.



53. (a) Calculate the potential difference between points a and b in Figure P28.53 and (b) identify which point is at the higher potential.