CHAPTER 19: DC Circuits

Problems

19–1 Emf and Terminal Voltage

3. (II) What is the internal resistance of a 12.0-V car battery whose terminal voltage drops to 8.4 V when the starter draws 75 A? What is the resistance of the starter?

19–2 Resistors in Series and Parallel

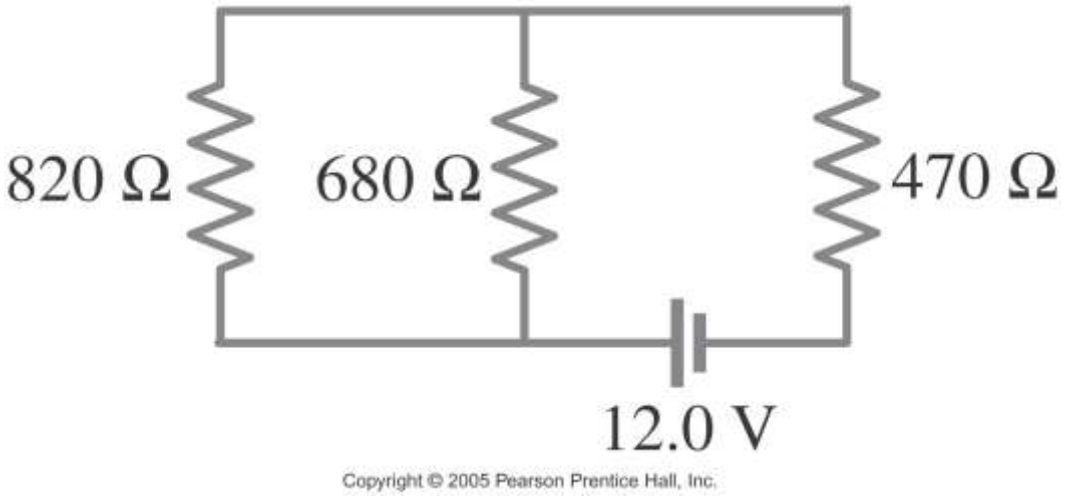
In these problems neglect the internal resistance of a battery unless the problem refers to it.

6. (I) Three 45-Ω lightbulbs and three 75-Ω lightbulbs are connected in series. (*a*) What is the total resistance of the circuit? (*b*) What is their resistance if all six are wired in parallel?

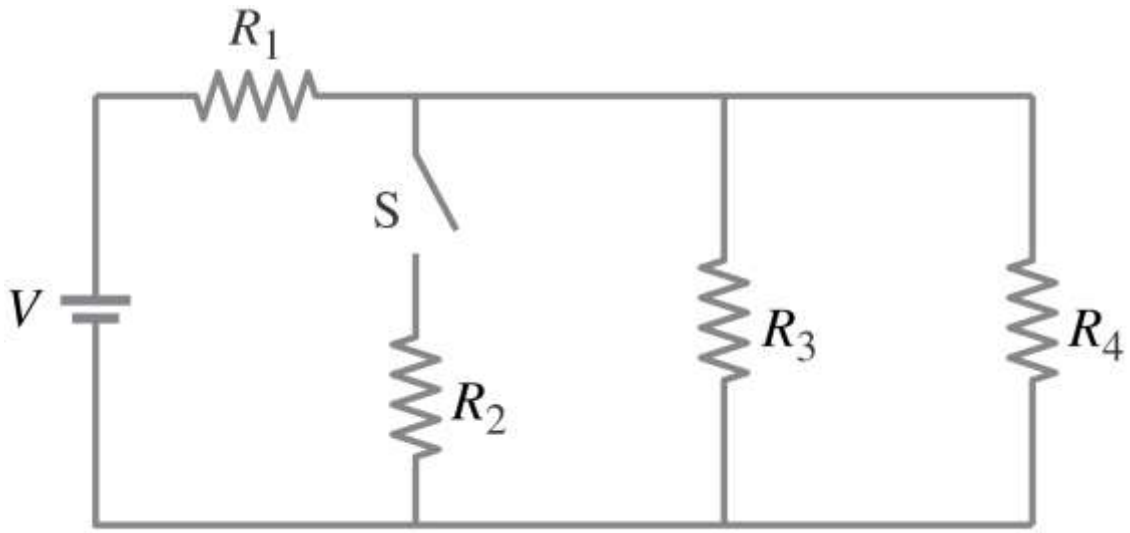
10. (II) Suppose that you have a 6.0-V battery and you wish to apply a voltage of only 4.0 V. Given an unlimited supply of 1.0-Ω resistors, how could you connect them so as to make a "voltage divider" that produces a 4.0-V output for a 6.0-V input?

13. (II) Eight identical lights are connected in series across a 110-V line. (*a*) What is the voltage across each bulb? (*b*) If the current is 0.50 A, what is the resistance of each bulb, and what is the power dissipated in each?

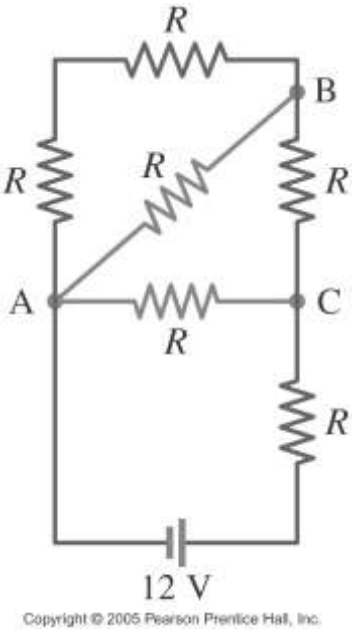
17. (II) Determine (*a*) the equivalent resistance of the circuit shown in Fig. 19–39, and (*b*) the voltage across each resistor.



19. (III) Consider the network of resistors shown in Fig. 19–40. Answer qualitatively: (*a*) What happens to the voltage across each resistor when the switch S is closed? (*b*) What happens to the current through each when the switch is closed? (*c*) What happens to the power output of the battery when the switch is closed? (*d*) Let $R_1 = R_2 = R_3 = R_4 = 125\,\Omega$ and $V = 22.0$ V. Determine the current through each resistor before and after closing the switch. Are your qualitative predictions confirmed?

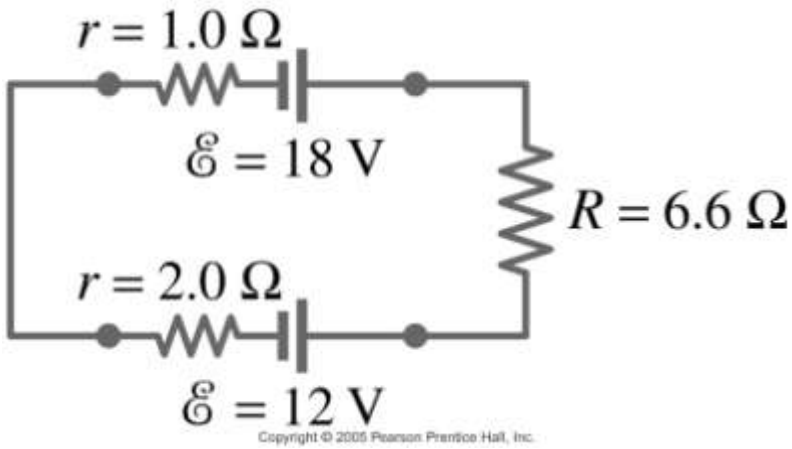


20. (III) What is the net resistance of the circuit connected to the battery in Fig. 19–41? Each resistance has $R = 2.8\,\text{k}\Omega$.

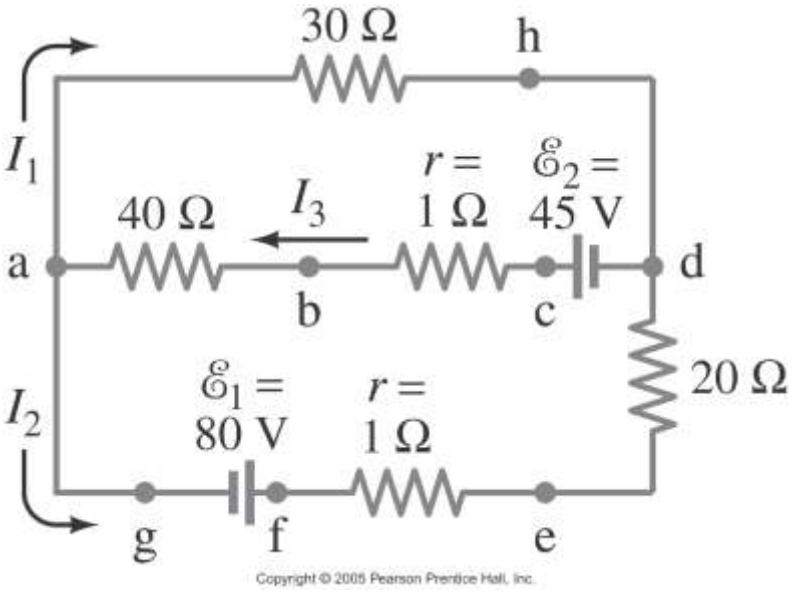


19–3 Kirchhoff's Rules

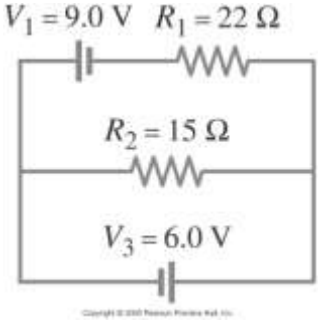
24. (II) Determine the terminal voltage of each battery in Fig. 19–44.



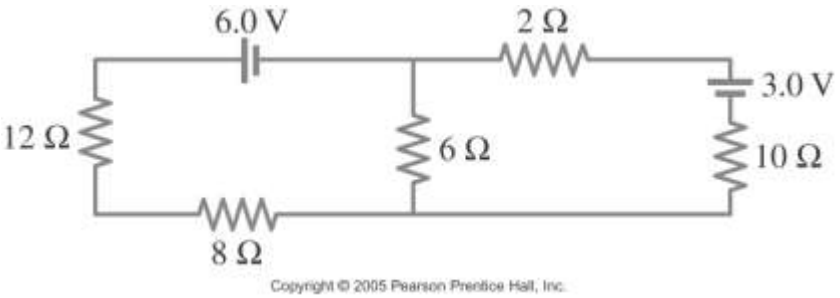
25. (II) (*a*) What is the potential difference between points a and d in Fig. 19–45 (same circuit as Fig. 19–13, Example 19–8), and (*b*) what is the terminal voltage of each battery?



27. (II) Determine the magnitudes and directions of the currents through R_1 and R_2 in Fig. 19–47.



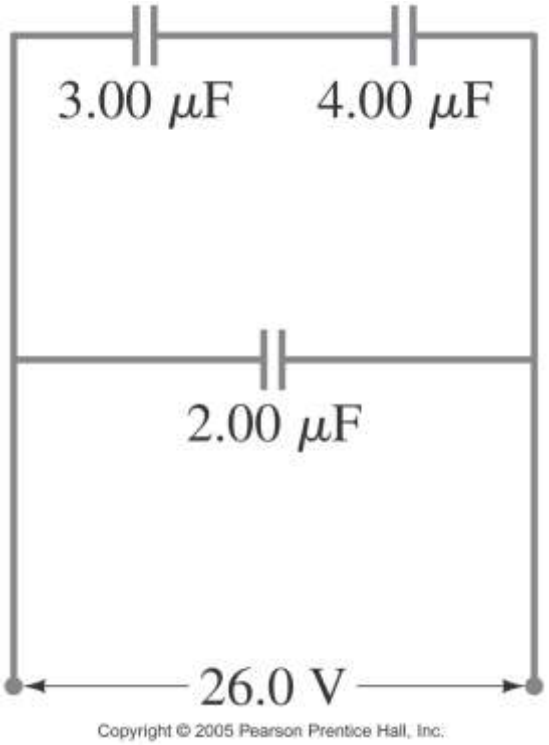
31. (II) Calculate the currents in each resistor of Fig. 19–49.



19–5 Capacitors in Series and in Parallel

35. (I) (*a*) Six 4.7-μF capacitors are connected in parallel. What is the equivalent capacitance? (*b*) What is their equivalent capacitance if connected in series?

38. (II) If 26.0 V is applied across the whole network of Fig. 19–52, calculate the voltage across each capacitor.



***41.** (II) Determine the equivalent capacitance of the circuit shown in Fig. 19–53

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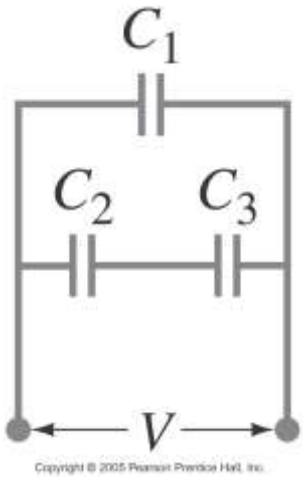

50. (II) In Fig. 19–56 (same as Fig. 19–20a), the total resistance is $15.0\,\text{k}\Omega$, and the battery's emf is 24.0 V. If the time constant is measured to be $35.0\,\mu\text{s}$, calculate (*a*) the total capacitance of the circuit and (*b*) the time it takes for the voltage across the resistor to reach 16.0 V after the switch is closed.