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Equivalent Resistance

Devices connected in parallel offer a resistance to the flow of charge through the circuit. The total resistance (or *equivalent resistance*) is related to the resistance of the individual devices which are connected in parallel. The equivalent resistance can be determined with the equation

$$\frac{1}{R_{equivalent}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$

The electric potential difference across each branch is the product of the equivalent resistance and the total current (outside the branches).

Use the diagram below at the right in order to answer questions #9-#13. **PSYW**

9. Determine the equivalent resistance of the circuit at the right.
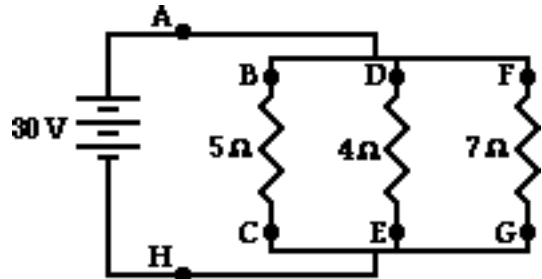
10. Determine the overall current in the circuit (as determined at position A or H).

11. Determine the electric potential difference (i.e. voltage drop) across the 5-Ω resistor (from B to C).

12. Determine the current through the 5-Ω resistor (from B to C).

13. Determine the current through the 7-Ω resistor (from B to C).

14. **TRUE or FALSE:**

    If resistors are connected in parallel, then the electric potential difference (i.e., voltage drop) will be greatest across the resistor with the greatest resistance.

14. **TRUE or FALSE:**

    If resistors are connected in parallel, then the current will be the same through each resistor.

15. A 2-Ω and a 4-Ω resistor are connected in a parallel circuit. The electric potential difference (i.e., voltage drop) across the 4-Ω resistor will be ___ the electric potential difference across the 2-Ω resistor.
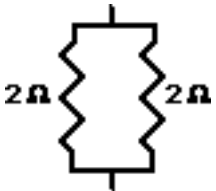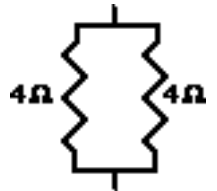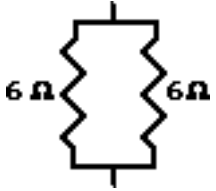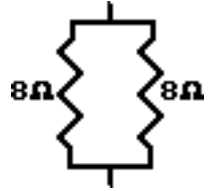   a. two-times more than   b. two times less than   c. the same size as
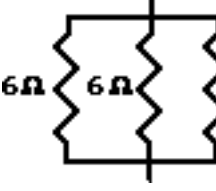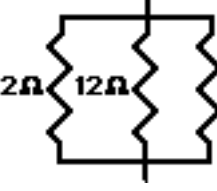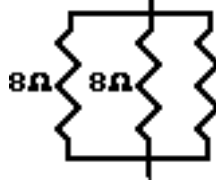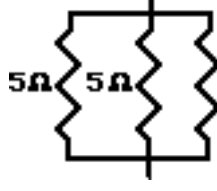
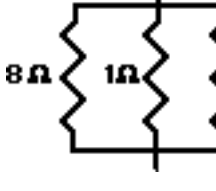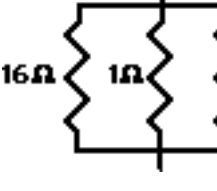16. A 2-Ω and a 4-Ω resistor are connected in a parallel circuit. The current through the 4-Ω resistor will be ___ the current through the 2-Ω resistor.
    a. two-times more than   b. two times less than   c. the same size as

Electric Circuits

17. For each of the following branched systems, determine the equivalent resistance.

a. 2Ω 2Ω — is equivalent to _____ Ω	b. 4Ω 4Ω — is equivalent to _____ Ω
c. 6Ω 6Ω — is equivalent to _____ Ω	d. 8Ω 8Ω — is equivalent to _____ Ω
e. 6Ω 6Ω 6Ω — is equivalent to _____ Ω	f. 12Ω 12Ω 12Ω — is equivalent to _____ Ω
g. 8Ω 8Ω 8Ω — is equivalent to _____ Ω	h. 5Ω 5Ω 5Ω — is equivalent to _____ Ω
i. 8Ω 4Ω — is equivalent to _____ Ω	j. 8Ω 2Ω — is equivalent to _____ Ω
k. 8Ω 1Ω 1Ω — is equivalent to _____ Ω	l. 16Ω 1Ω 1Ω — is equivalent to _____ Ω

18. Four resistors are connected in a parallel circuit. Three of the resistance values are known - 3 Ω, 4 Ω and 6 Ω. The overall or equivalent resistance of the four resistors must be _____ Ω. (Choose the one answer that is most informative.)
   a. greater than 3   b. greater than 6   c. greater than 13
   d. less than 13   e. less than 3   f. ... it is impossible to tell.