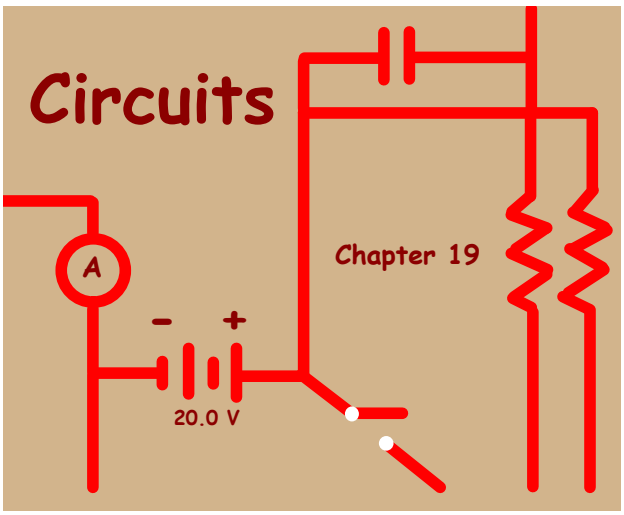
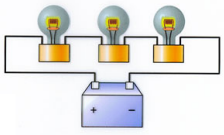


Circuit Symbols

Series and Parallel Circuits
Class Demonstration

Series Circuits



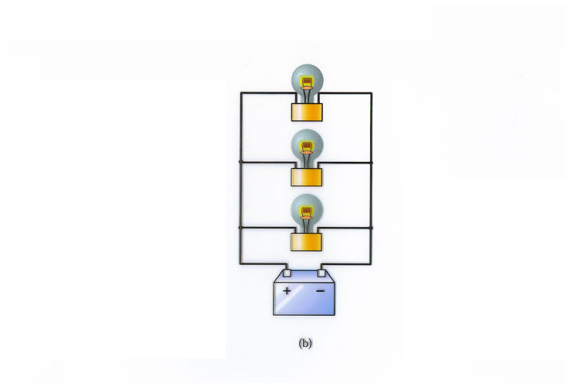
Concept of Equivalent Resistance
Equivalent Resistance for Series Circuits

For series circuits, the voltage across each resistor is additive:

$V = V_1 + V_2 + V_3 + \ldots$

Current is constant throughout the circuit.

Parallel Circuits



For parallel circuits, the current flowing through each branch is additive:

$I = I_1 + I_2 + I_3 + \ldots$

The current flowing into a junction must equal the current flowing out of the junction.

Voltage is constant across each branch.

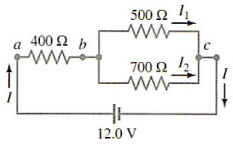
Equivalent Resistance for Parallel Circuits

Examples

Combination Series and Parallel Circuits

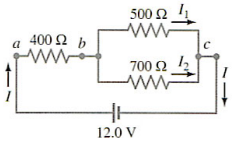
Example 19-4 pg. 526

How much current flows from the battery shown in the circuit?



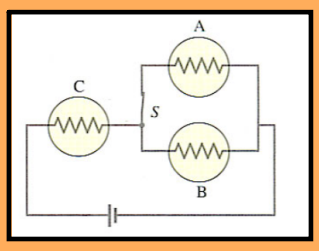
Example 19-4 pg. 526

How much current flows through the 500 Ω resistor shown in the circuit?



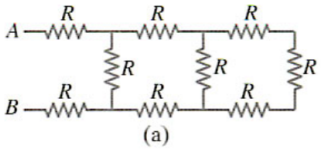
Concept ✓ Check:

When the switch "S" is closed, how will the brightness of bulbs A and B compare with that of C?
What happens when the switch is open?



Resistor Ladders

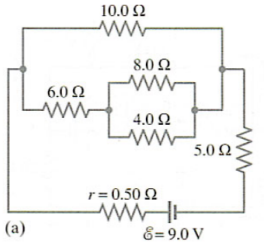
Estimate the equivalent resistance of the resistor ladder.

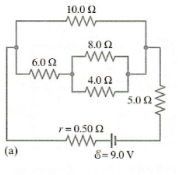


EMF ($\mathcal{E}$) and Terminal Voltage

Example 19-7 pg. 528

A 9.0V battery whose internal resistance r is 0.50 Ω is connected in the circuit shown.
How much current is drawn from the battery?
What is the terminal voltage of the battery?
What is the current in the 6.0 Ω resistor?





Circuits:
Verifying Ohm's Law

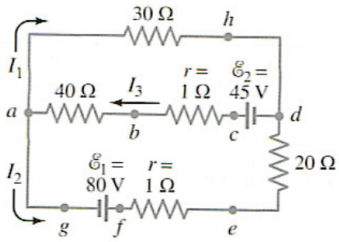
Kirchhoff's Rules

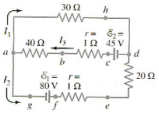
Junction Rule: at any point, the sum of all the currents entering the junction must equal the sum of all the currents leaving the junction.

Loop Rule: the sum of all the changes in potential around any closed path of a circuit must be zero.

NOTE: If a branch contains a battery, always assign the direction of "I" consistant with the definition of current flow.

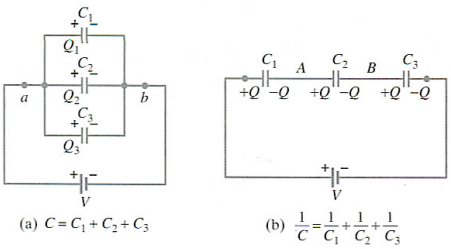
Example 19-8 pg. 530 Using Kirchhoff's Rules
Calculate I_1, I_2, and I_3





EMF's in Series
Battery Chargers

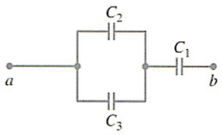
Capacitors in Circuits



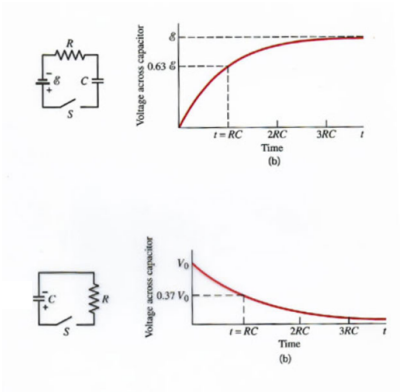
(a) $C = C_1 + C_2 + C_3$ (b) $\frac{1}{C} = \frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3}$

Example 19-10 pg. 534

Determine the capcitance in terms of C:



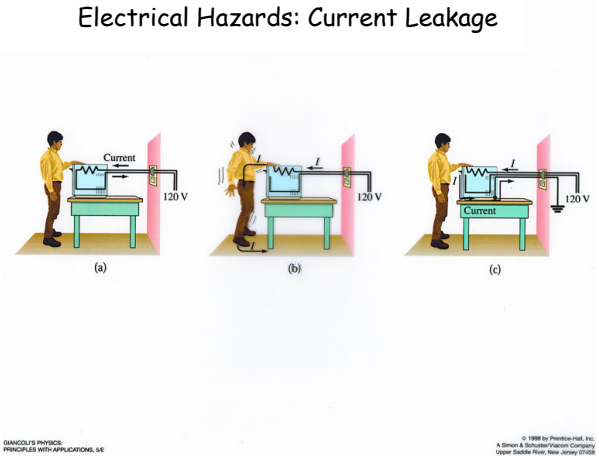
Capacitors and Resistors in circuits together; the R-C Circuit

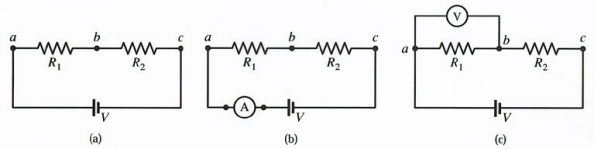


Example of an R-C circuit:

The Heart Pacemaker

Electrical Hazards: Current Leakage





Electrical Meters