Electric Circuit

Any path along which electrons can flow.

For a continuous flow of electrons

there must be a complete circuit

with no gaps or break in a circuit.

Series Circuit:

Same current exists almost immediately

In all three lamps

And also in the battery

There is ONLY ONE path of electrons through the circuit.

Electric current has only a single pathway through the circuit (like flow of traffic in one lane)

Break in a circuit happens

by burning out of one of the lamp filaments

or by break in connections

(like a car having flat tires in single lane flow of traffic)

A break anywhere in the path results in an open circuit

And flow of electrons ceases

None of the lamps glowing

In series circuit:

Total Resistance:

Rtotal = R1 + R2 + R3

Current in the circuit:

I = V/ Rtotal

Total voltage in the voltage supply

V = Vtotal = V1 + V2 + V3

Total Energy = I2R \* time

Etotal = E1 + E2 + E3

Parallel circuits

Electrical devices connected to the same two points of an electric circuit

A break in any one path does not interrupt the flow of charge in other parts

(e.g., driving on 280 which has 3 parallel lanes)

Voltage is same across each device:

V = V1 = V2 = V3

The current divides among the parallel branches

I = I1 + I2 + I3

The total resistance is

* 1/ Rtotal = 1/R1 + 1/R2 + 1/R3

If R1 = R2 = R3 = 1 ohm

Then Rtotal = 0.33 ohm

* 1/ Rtotal = 1/R1 + 1/R2 + 1/R3 + 1/R4

If R1 = R2 = R3 = R4 = 1 ohm

Then Rtotal = 0.25 ohm

Rtotal < the R of any branch

**Check Point page 416**

1. What happens to current in other lamps, if one lamp in a series circuit burns out?
2. What happens to the brightness of light from each lamp in a series circuit when more lamps are added to the circuit?

**Check Point page 417**

1. What happens to the current in other lamps, if one of the lamps in a parallel circuit burns out?
2. What happens to the brightness of light from each lamp in a parallel circuit when more lamps are added in parallel?
3. What happens to the current in the battery when more lamps are added in parallel?

**Exercises page 421-422**

31. To connect a pair of resistors so that their combined (equivalent) resistance will be less than resistance of either one, should you connect them in series or in parallel?

33. Between current and voltage, which remains the same for a 10 ohm and a 20 ohm resistor in parallel in a parallel circuit?

43. Consider a pair of flashlight bulbs connected to a battery. Will they glow brighter if they are connected in series or in parallel? Will the battery run down faster if they are connected in series or in parallel?

45. If several bulbs are connected in series to a battery, they may feel warm to the touch but not visibly glow. What is your explanation?

47. As more and more bulbs are connected in series to a flashlight battery, what happens to the brightness of each bulb? Assuming that heating inside the battery is negligible, what happens to the brightness of each bulb when more and more bulbs are connected in parallel?99

51. Your friend says that the equivalent (combined) resistance of resistors connected in parallel is always less than the resistance of the smallest resistor. Do you agree?

53. Your electronics friend need a 10 ohm resistor, but only has 40 ohm resistors. He can you combine them to produce an equivalent resistance of 10 ohm?

55. When two identical resistors are connected in parallel, which of the following is same for both resistors-

a. voltage across each

b. power dissipated in each

c. current through each

Do any of your answers change if the resistors were different from each other?