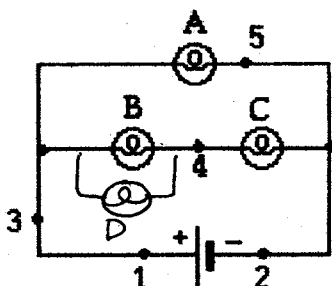


Name A. Volta Section _____ Date 2/2/07

Homework 23 #1: Many Element Circuits and Ohm's Law

Questions 1 through 6 refer to the circuit shown below. In this circuit, the battery maintains a constant potential difference between its terminals at points 1 and 2 (i.e. the internal resistance of the battery is considered negligible). The three light bulbs, A, B, and C, are identical.



- How do the brightnesses of the three bulbs compare to each other? Explain your reasoning.
Bulb A is brighter than B and C which have the same brightness. This is because the current thru A is larger because its parallel path has less resistance than the B+C path.
- (a) What happens to the brightness of each of the three bulbs when bulb A is unscrewed and removed from its socket? Explain your reasoning.
*A would go out of course.
 B+C would not change because the current thru that path would not change.*
- (b) What simultaneously happens to the current through points 3, 4 and 5? Explain your reasoning.
The current at 5 goes to zero. The current at 4 stays the same. The current at 3 decreases to be the same as 4.
- (a) What happens to the brightness of each of the three bulbs when bulb C is unscrewed and removed from its socket? Explain your reasoning.
*Bulb B would go out. Bulb C would also go out.
 Bulb A would not change brightness.*

(b) What simultaneously happens to the current through points 3, 4 and 5?
Explain your reasoning.

The current ~~in~~ at 4 would go to zero.

The current at 5 would not change.

The current at 3 decreases to equal the current at 5.

4. (a) What happens to the brightness of each of the three bulbs if a wire is connected from the battery terminal at point 1 to point 4?

B would go out and C would get as bright as A.
A would not change.

- (b) What simultaneously happens to the current through point 3?

The current at 3 would decrease.

- (c) What simultaneously happens to the potential difference across bulb B?

The potential difference across B goes to zero.

- (d) What simultaneously happens to the potential difference across bulb C?

The potential difference across C increases to become the terminal voltage.

- (e) What simultaneously happens to the potential difference between points 1 and 5? Explain your reasoning.

Nothing happens to the potential difference between 1 and 5. The two points are on either side of bulb A which has the terminal voltage across it.

5. What happens to the brightness of each of the three bulbs and to the current through point 2 if a wire is connected from the battery terminal at point 2 to the socket terminal at point 5?

Nothing happens because points 2 and 5 are at the same potential.

6. (a) What happens to the brightness of each of the three bulbs if a fourth bulb (D) is connected in parallel with bulb B (not in parallel with B and C). (Sketch the bulb on the circuit.)

Nothing happens to A. Bulb C gets brighter and B gets dimmer.

- (b) What happens simultaneously to the current through point 3?

The current thru 3 gets larger.

- (c) What happens simultaneously to the potential difference between points 3 and 4?

The potential difference between 3 and 4 decreases because the parallel combo of B and D has less resistance than B alone.

d) What happens simultaneously to the potential difference between points 4 and 2?

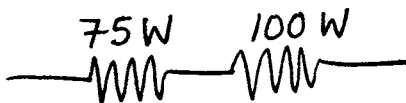
The potential difference between points 4 and 2 increases because the $3 \rightarrow 4$ drop decreased.

7. State Ohm's law in words. For what type of circuit elements does it correctly describe the behavior?

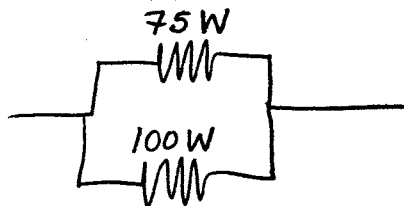
The ratio of the voltage drop across a device to the current through the device is a constant called resistance. It describes the behavior of resistors.

8. Draw diagrams for a 75 W and a 100 W resistor connected in series and connected in parallel:

SERIES:



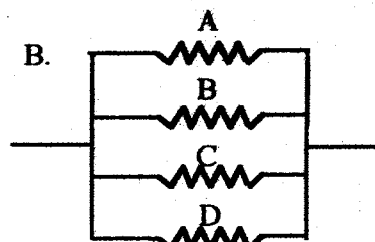
PARALLEL:



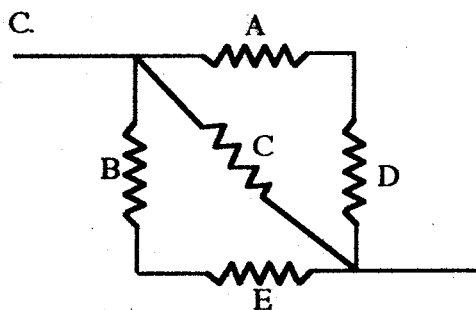
9. In the following circuits, tell which resistors are connected in series, which are connected in parallel, and which are neither in series or parallel.



A. A+B+C all in series with each other

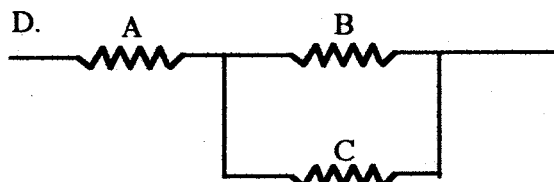


B. A+B+C+D all in parallel with each other



C. A+D are in series w/ each other
B+E " " " " "

(A+D), C, (B+E) are all in parallel with each other, where (A+D) represents the series combination of A and D.



D. A is in series with the parallel combination of B and C.