Name _____
Physics 200
Chapter 21.3 Notes and Practice – Kirchoff's Rules

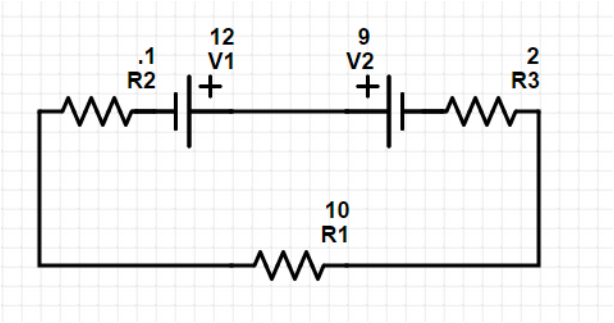
KIRCHHOFF'S RULES

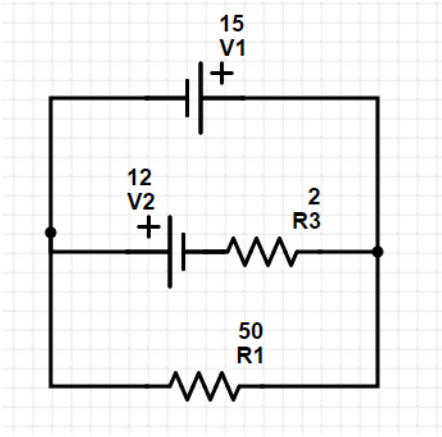
- Kirchhoff's first rule—the junction rule. The sum of all currents entering a junction must equal the sum of all currents leaving the junction.
- Kirchhoff's second rule—the loop rule. The algebraic sum of changes in potential around any closed circuit path (loop) must be zero.

1. When applying Kirchhoff's first rule, the junction rule, you must label the current in each branch and decide in what direction it is going. For example, in Figure, Figure, and Figure, currents are labeled I_1, I_2, I_3, and I, and arrows indicate their directions. There is no risk here, for if you choose the wrong direction, the current will be of the correct magnitude but negative.
2. When applying Kirchhoff's second rule, the loop rule, you must identify a closed loop and decide in which direction to go around it, clockwise or counterclockwise. For example, in Figure the loop was traversed in the same direction as the current (clockwise). Again, there is no risk; going around the circuit in the opposite direction reverses the sign of every term in the equation, which is like multiplying both sides of the equation by -1.

- When a resistor is traversed in the same direction as the current, the change in potential is $-IR$. (See Figure.)
- When a resistor is traversed in the direction opposite to the current, the change in potential is $+IR$. (See Figure.)
- When an emf is traversed from – to + (the same direction it moves positive charge), the change in potential is +emf. (See Figure.)
- When an emf is traversed from + to – (opposite to the direction it moves positive charge), the change in potential is –emf. (See Figure.)

Kirchoff's Laws #1. Find the correct current in each branch of each circuit.

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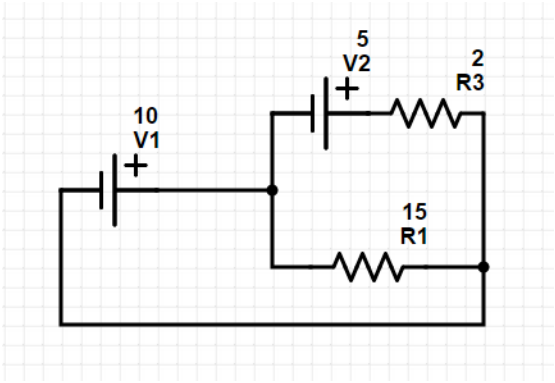
V1
12
V2
2
R3
50
R1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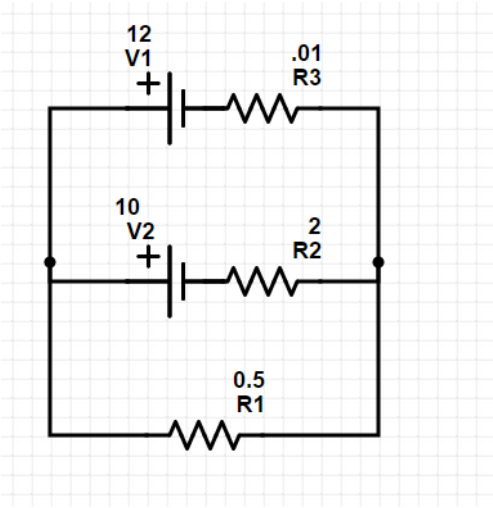
V2
2
R3
10
V1
15
R1


12
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R3
10
V2
2
R2
0.5
R1