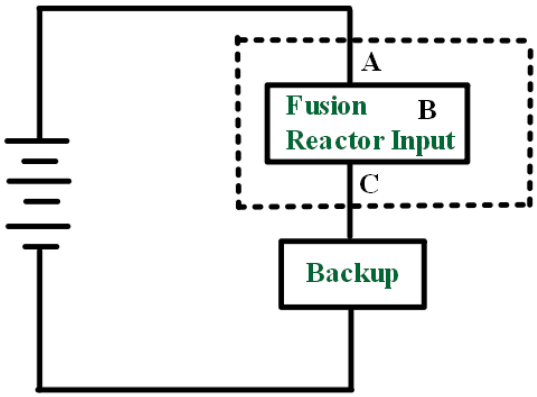
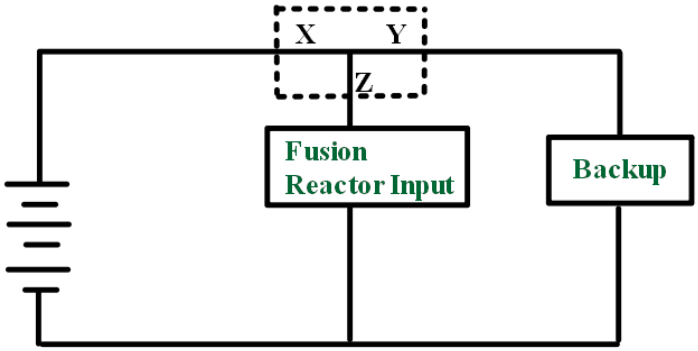
2. Han realizes the problem is with resister C, which is a switch for a backup system. Unfortunately he is not sure how the system should be wired, and so he has to consider the impact of voltages and currents on the components.

   a. How do the electron flow rates in A, B and C compare to each other?



A = entering the reactor
B = through the reactor
C = leaving the reactor



X = entering the junction
Y = on the way to the backup from the junction
Z = on the way to the reactor from the junction

   b. How does the potential at A, B and C compare to each other? Explain.

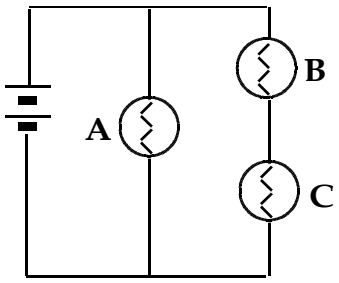
   c. How do the flow rates in X, Y and Z compare to each other?

   d. How does the potential at X, Y and Z compare to each other? Explain.

3. After careful consideration, he chooses the second wiring (the one on the right). Why do you think that might be?

4. You decide to change the lighting arrangement in your home. Instead of hiring an electrician, you hire your neighbor who says he, “knows all about ‘lectricity”.

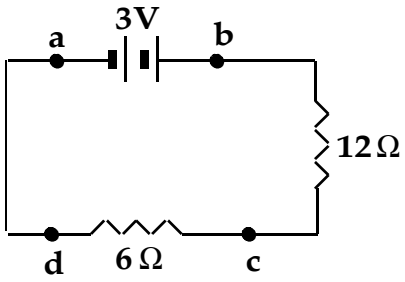
You’re incredibly surprised and shocked to discover that he didn’t do a very good job. Your three wall lights are not all the same brightness, even though the bulbs have the same power rating. Frustrated, you take a look at his wiring yourself, and find that the bulbs are set up as follows:



a) Assume all the bulbs have identical resistance. If the source voltage was 3 V, what would the voltage drop across each bulb be?

b) How does the flow rate through A compare to that through B?

c) How is the brightness of each bulb different? (Which are brighter? Which are dimmer?) Explain.



5. Consider the series circuit to the right.

a. What is the ΔV between:
a and b

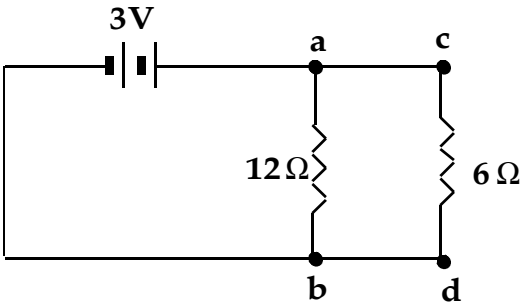
b and c

c and d

d and a

b. What is the current in this circuit?

c. What power is dissipated by each resistor?



6. Consider the parallel circuit at right.

a. Determine the equivalent resistance of the circuit.

b. What is the ΔV between:

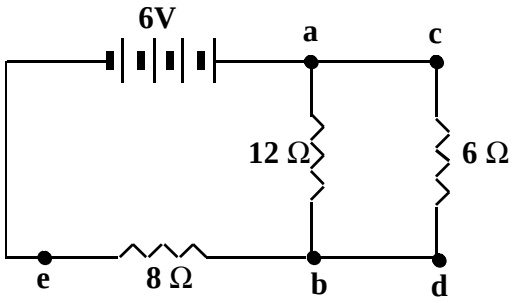
a and b

c and d

c. What is the current in the wire leading from the battery to point **a**? in each of the branches?

d. How much power is dissipated by each resistor?

7. Consider the combination circuit at right.

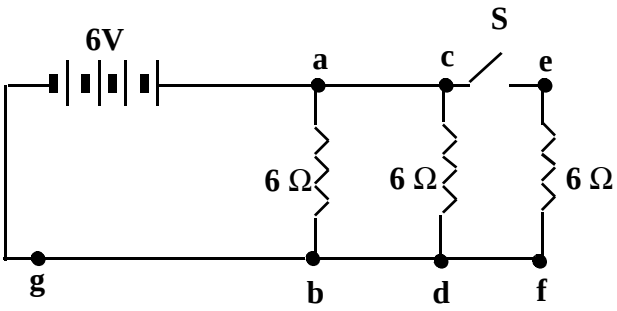


a. Determine the equivalent resistance of the circuit.

b. What is the current passing through each resistor?

c. What is the ΔV across each resistor?

d. What is the power dissipated by each resistor?



8. Suppose the switch in the circuit at right is closed. What effect does this have on:

a. the ΔV from a to b?

b. the current in the first two resistors?

c. the current through point g?

3. A 10 ohm and a 15 ohm resistor are connected in parallel and placed across the terminals of a 15 volt battery.

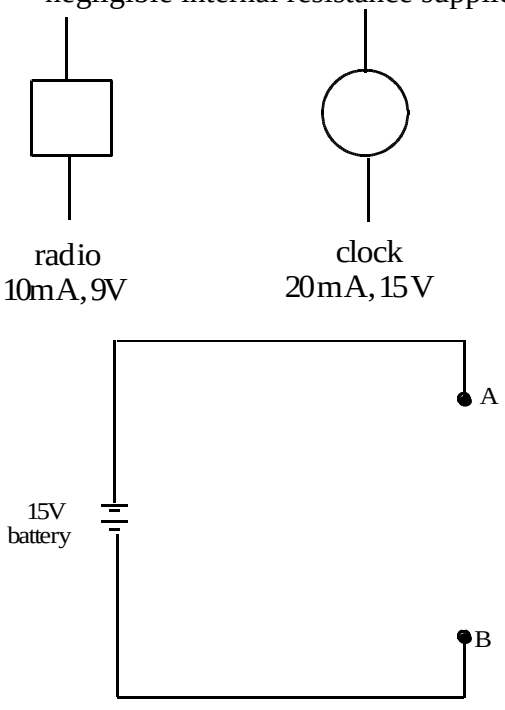
   a. Sketch the circuit diagram.

   b. Calculate the equivalent resistance of the circuit.

   c. Calculate the current through the entire circuit.

   d. Calculate the current in each branch.

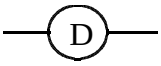
4. A cabin contains only two small electrical appliances: a radio that requires 10 milliamperes of current at 9.0 V, and a clock that requires 20 milliamperes at 15 V. A 15 V battery with negligible internal resistance supplies the electrical energy to operate the radio and clock.



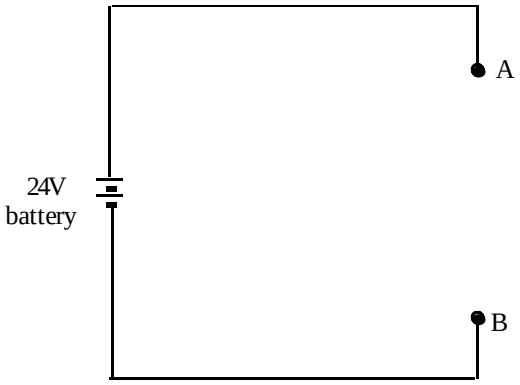
   a. Complete the diagram below to show how the radio, clock and a single resistor R can be connected between points A and B so that the correct potential difference is applied across each appliance. Use the symbols at right to indicate the clock and radio.

b. Calculate the resistance of R.

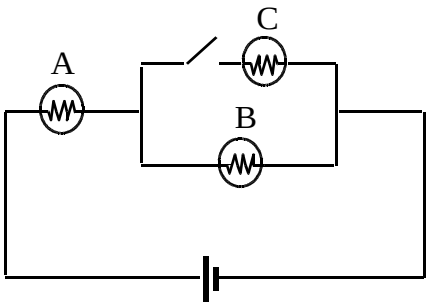
c. Calculate the electrical energy that must be supplied by the battery to operate the circuit for 1 minute.



5. The electrical device whose symbol is shown at right requires a terminal voltage of 12 V and a current of 2.0 A for proper operation.



Using only this device and one or more 3-**Ω** resistors, design a circuit so that the device will operate properly when the circuit is connected across a 24 V battery with negligible internal resistance.



6. Consider the circuit below. All the bulbs have resistance **R**.

a. What is the resistance of the circuit while the switch is open?

b. What is the resistance of the circuit when the switch is closed?

c. How does closing the switch affect the brightness of bulbs A and B? Explain in terms of current and potential drop.