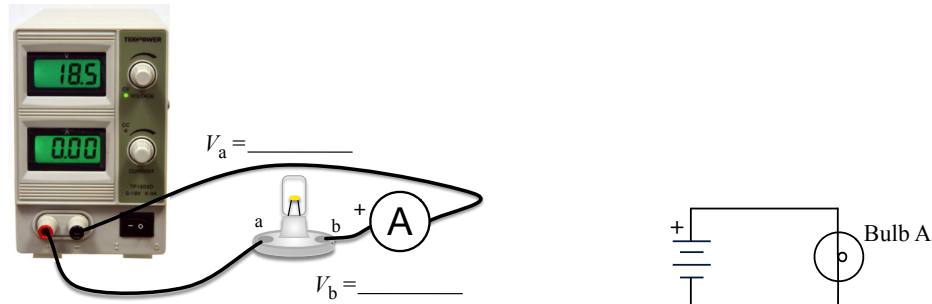


Circuit 1: A single bulb

1. Find out from your teacher what the voltage rating is on the light bulbs that you are using, and write it down here: _____ Set your power supply at or below this value, and keep it there for this entire investigation.
2. Make a complete (or “closed”) circuit that makes one light bulb (call it Bulb A) glow as shown in the realistic diagram on the left and the schematic diagram on the right.



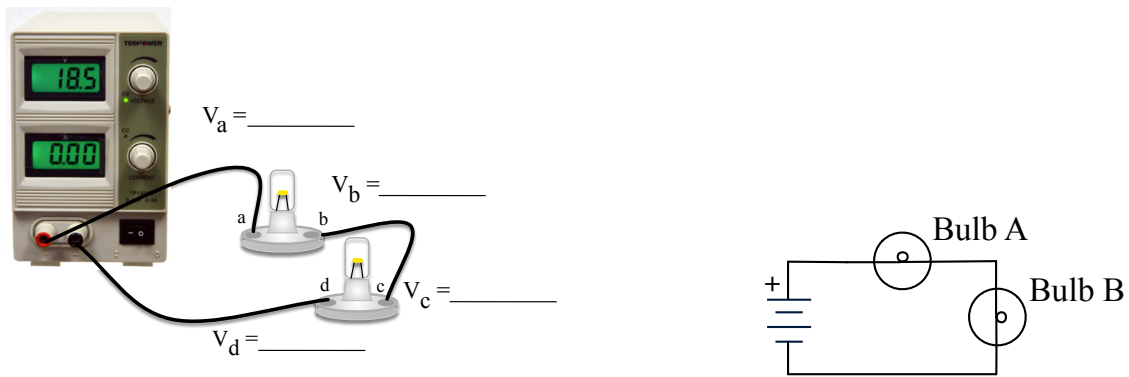
3. Sketch an arrow on the schematic diagram above to indicate the direction of conventional current flow, which is from the positive terminal to the negative terminal.
4. Why does the tungsten filament in Bulb A get hot?
5. What are the potentials on the two sides of the Bulb A? $V_a =$ _____ $V_b =$ _____

What is the difference between these two potentials? _____ This potential difference is called the “voltage across” the bulb.

6. in your schematic diagram encircle the location at which the most potential energy is being lost.

Circuit 2: Two Bulbs in Series

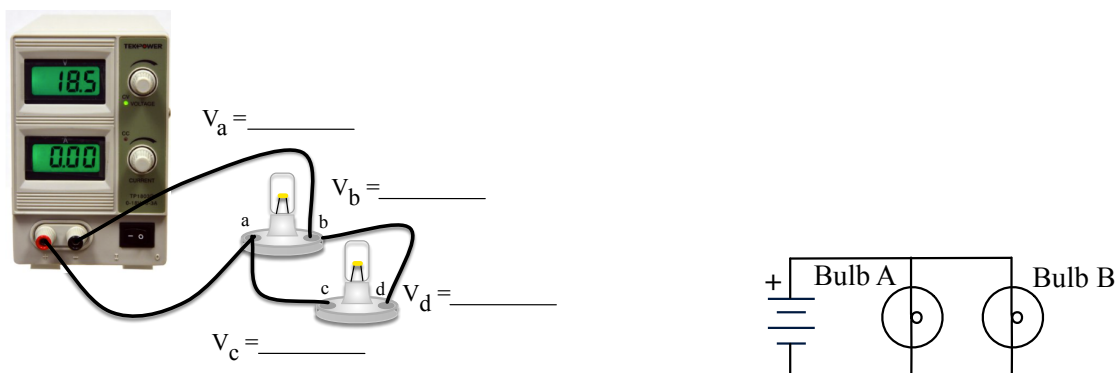
7. Connect a second light bulb (call it Bulb B) in series as shown below. We will call this Circuit 2.



8. How brightly does Bulb A burn compared to Bulb B?
9. How brightly do the bulbs burn compared to the one in the first circuit?
Dimmer / Same as in Circuit 1 / Brighter
10. In your estimation how does the electric current through Bulb A compare to the electric current through Bulb B? **Less than / Same as / Greater than**
What is your evidence?
11. Sketch an arrow on each connecting wire in the schematic diagram to indicate the direction of conventional electric current in that wire.
12. On the diagram above write down the potentials at the two terminals and at each screw of the two light bulbs (V_a, V_b, V_c, V_d).
13. What is the voltage across Bulb A? _____
14. What is the voltage across Bulb B? _____
15. What happens to Bulb A when you unscrew it?
Goes out / Gets dimmer / Stays the same / Gets brighter
16. What happens to Bulb B when you unscrew Bulb A?
Goes out / Gets dimmer / Stays the same / Gets brighter

Circuit 3: Two Bulbs in Parallel

17. Assemble Circuit 3 as shown below:



18. How brightly do the bulbs burn compared to the bulb in Circuit 1?
Dimmer / Same as in Circuit 1 / Brighter

19. How brightly do the bulbs burn compared to the bulbs in Circuit 2?
Dimmer / Same as in Circuit 2 / Brighter
20. Sketch an arrow on each connecting wire in the schematic diagram to indicate the direction of conventional electric current in that wire.
21. Measure and record on the diagram above the potentials at the terminals and at the screws for each bulb.
22. What is the voltage across Bulb A? _____
23. What is the voltage across Bulb B? _____
24. What happens to Bulb A when you unscrew it?
Goes out / Gets dimmer / Stays the same / Gets brighter
25. What happens to Bulb B when you unscrew Bulb A?
Goes out / Gets dimmer / Stays the same / Gets brighter
26. If two points in a circuit are directly connected by copper wire, what can we say about how the potentials at these two points compare?

Three Bulbs: Life Gets Harder

There are four different circuits that you can make with three identical bulbs by arranging them in various series and parallel combinations. Your charge here is to 1) make all four circuits, 2) sketch the schematic diagram for each circuit, labeling the bulbs with A, B, and C on the diagram, and 3) rank the brightnesses of the bulbs from least to greatest, noting ties when brightnesses are equal, and 4) describe what happens to the other bulbs' brightnesses when each of them is removed.

Circuit I Schematic Diagram:

Ranking Bulbs from Least to Greatest Brightness:

Changes caused by unscrewing a bulb

Bulb A	Bulb B	Bulb C
Bulb A is removed	Brighter / Unchanged Dimmer / Off	Brighter / Unchanged Dimmer / Off
Brighter / Unchanged Dimmer / Off	Bulb B is removed	Brighter / Unchanged Dimmer / Off
Brighter / Unchanged Dimmer / Off	Brighter / Unchanged Dimmer / Off	Bulb C is removed

Circuit II Schematic Diagram

Ranking Bulbs from Least to Greatest Brightness:

Changes caused by unscrewing a bulb

Bulb A	Bulb B	Bulb C
Bulb A is removed	Brighter / Unchanged Dimmer / Off	Brighter / Unchanged Dimmer / Off
Brighter / Unchanged Dimmer / Off	Bulb B is removed	Brighter / Unchanged Dimmer / Off
Brighter / Unchanged Dimmer / Off	Brighter / Unchanged Dimmer / Off	Bulb C is removed

Circuit III Schematic Diagram

Ranking Bulbs from Least to Greatest Brightness:

Changes caused by unscrewing a bulb

Bulb A	Bulb B	Bulb C
Bulb A is removed	Brighter / Unchanged Dimmer / Off	Brighter / Unchanged Dimmer / Off
Brighter / Unchanged Dimmer / Off	Bulb B is removed	Brighter / Unchanged Dimmer / Off
Brighter / Unchanged Dimmer / Off	Brighter / Unchanged Dimmer / Off	Bulb C is removed

Circuit IV Schematic Diagram:

Ranking Bulbs from Least to Greatest Brightness:

Changes caused by unscrewing a bulb

Bulb A	Bulb B	Bulb C
Bulb A is removed	Brighter / Unchanged Dimmer / Off	Brighter / Unchanged Dimmer / Off
Brighter / Unchanged Dimmer / Off	Bulb B is removed	Brighter / Unchanged Dimmer / Off
Brighter / Unchanged Dimmer / Off	Brighter / Unchanged Dimmer / Off	Bulb C is removed