Circuit Stations Lab-tivity

General Directions:

- Each station has a circuit already connected. You can touch the wires in order to trace where they are going (instead of just looking from afar) but do not disconnect anything. Follow the directions for each station
- The terms "power supply" and battery are interchangeable.
- Each station requires you to draw circuit diagrams. Be certain you include any voltmeters and ammeters in your drawing.
- **Do not** leave the power supply on for extended amounts of time. Always turn it off before leaving.

Station 1

This outlet box is not wired the same way outlets in your home would be. The two white outlets are each connected in parallel to the 120V "wall" and function like normal outlets in your home. The two beige outlets are connected to 120V, but they are in series.

Plug in the two 15W bulbs to both the series and parallel plugs and notice the difference. What is the difference?

What happens to the total power output of the bulbs when they are connected in parallel? What happens to the total power output when they are connected in series?

Now connect a 25W bulb and a 15W bulb in series. Which one is brighter?

Neither series bulb has 120V across it. When connected in series, what do you know about the two voltages?

Which bulb has more voltage across it when connected in series?

Station 2

A 38W and 95W bulb are connected to a 20V battery. How are they connected?

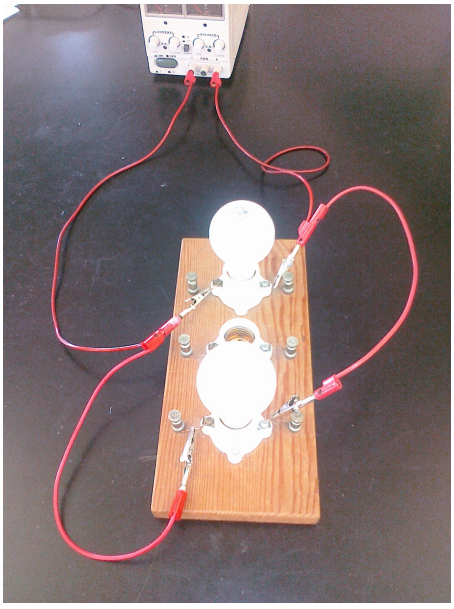
Which bulb is brighter?

Does the wire color (red/black) matter?

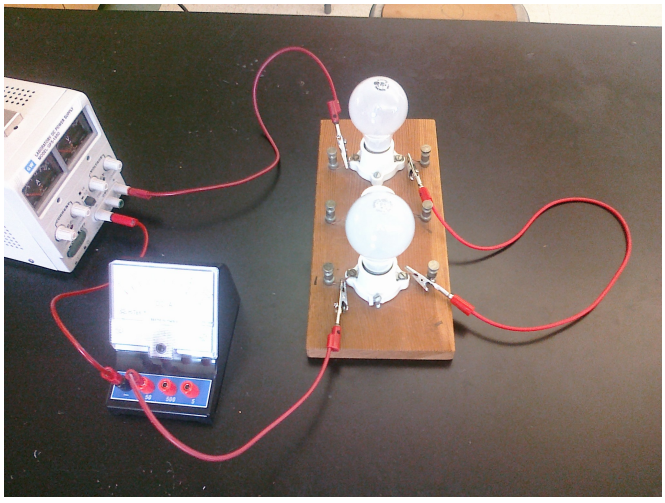
Are they actually producing the number of Watts listed?

Unscrew the 38W bulb. What happens?

Draw a circuit diagram.

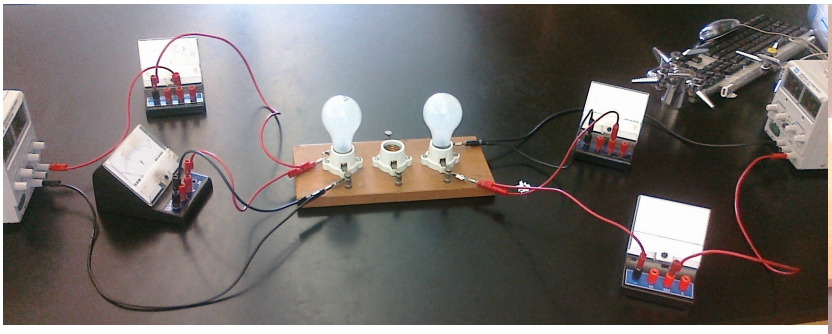


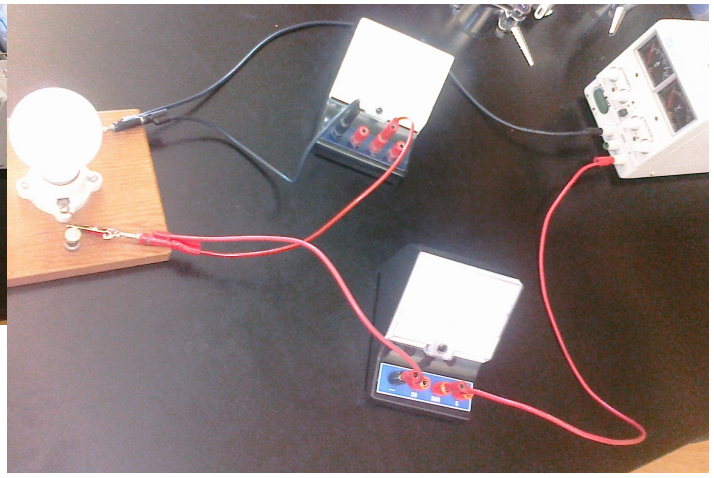
Station 3



A 38W and 95W bulb are connected in series to a 20V battery. Draw a circuit diagram.
Which is brighter? Unscrew the 95W bulb. What happens?

Station 4





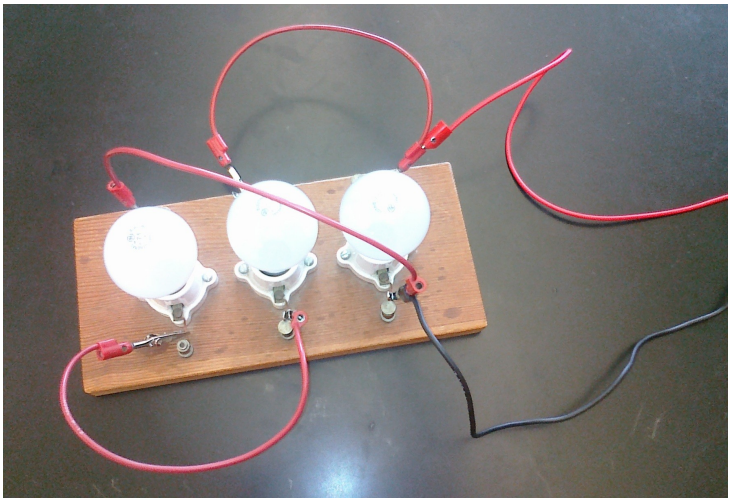
Both of these bulbs are connected to the separate batteries in the same way. Draw a circuit diagram for the connection (only draw one since they are the same.)

Turn on the power supply and take a reading of voltage and current. Calculate the resistance of each bulb.
Remember to use the correct units.
Calculate the actual power output based on these numbers

95W bulb	57W bulb
V=_____	V=_____
I=_____	I=_____
R=_____	R=_____
P=_____	P=_____

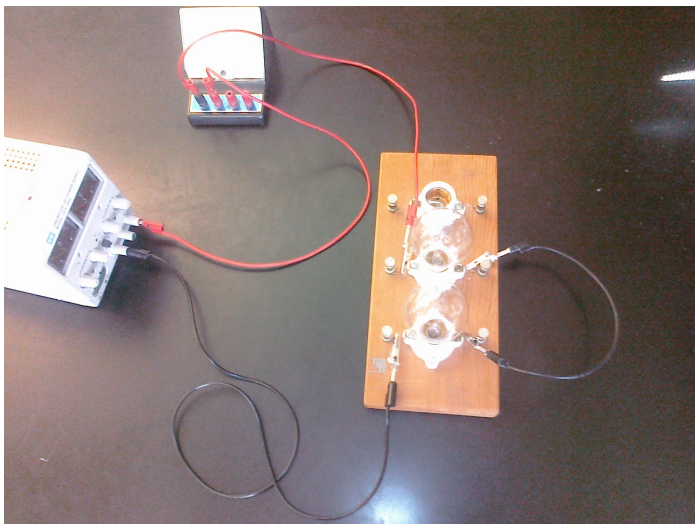
Which bulb appears brighter?

Station 5



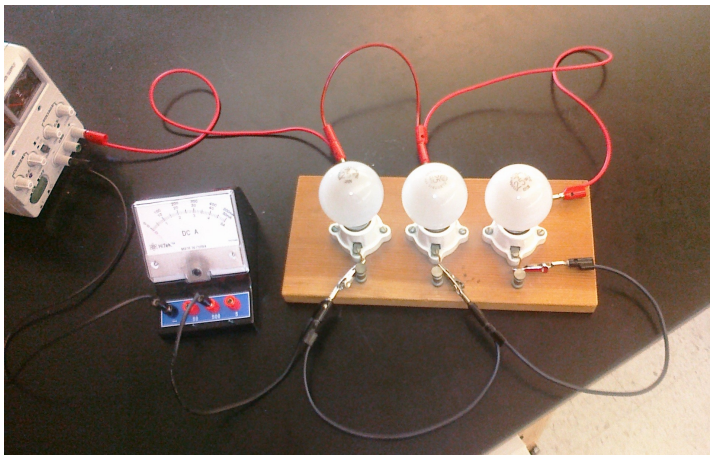
Three 71W bulbs are connected. Draw a circuit diagram. They are all connected to the battery and have current running through them. You may turn on the power supply and observe which bulb(s) are brighter to help you determine which bulbs are in series or parallel

Station 6



Two 100W bulbs are connected to a 20V battery.
Draw a circuit diagram.
Turn the power supply on and observe the bulbs.
Are they lit? What happens when you unscrew one of the bulbs?

Station 7



Three 25W bulbs are connected. Draw a circuit diagram.
What happens when you unscrew one of the bulbs?

Conclusion questions:

Look at the top of the bulbs for the voltage they are meant to be used with. This is called the operating voltage. Calculate the operating current and operating resistance for these two power bulbs:

P= 95W

V=_____

I=_____

R=_____

P= 57W

V=_____

I=_____

R=_____

Compare these resistances to what you found earlier with a much lower voltage.
Do lightbulbs have the same voltage when connected to 15V and 120V?

Draw a circuit diagram for how the outlets in Station 1 are connected.

Why don't you want your house outlets connected in series? Give two reasons.