

## Measuring Potential Difference and Current

### Introduction:

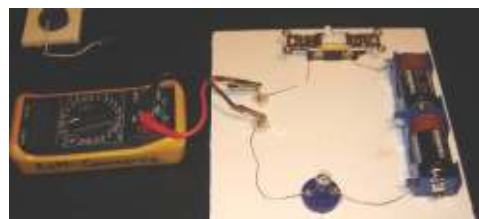
This purpose of this investigation is to use a multimeter to measure dc voltages and dc current. The multimeter is a common and useful instrument.

**Safety Note:** Your instructor needs to check your circuits before you switch on the power, to prevent damage to you and the instruments.

### Procedure:

#### Part I. Measuring Current with a Multimeter

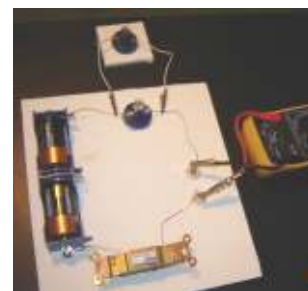
1. Set up the conductivity tester, and place the multimeter probes across the tester gap with the multimeter set on 10 A dc. The probes should be attached from the com (negative terminal) and 10A terminal, if you are using the Elenco meter. Other multimeters will have similar connections. The positive terminal should be at the terminal nearest the positive terminal of the battery. (see above)



2. Have your instructor check your circuit. Record the values. Turn off the circuit. If the meter shows a negative current, the meter is hooked up backwards. This may not damage the meter, if properly fused, but it is not desirable.

3. Change the meter to the 400mA scale. This will require changing the wires to the meter. Measure the current through the circuit, and record your values. Turn off the circuit.

4. Attach an additional bulb to the circuit (as shown right), and repeat the measurements in steps 2 and 3.

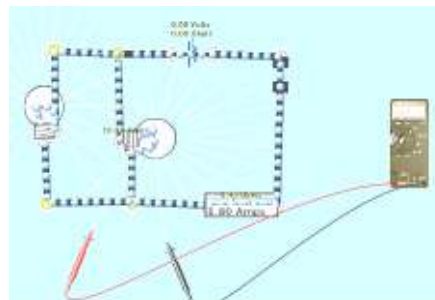


#### Part II. Measuring Voltage with a Multimeter

1. With a jumper wire across the gap in the conductivity tester board (in effect, making this a solid wire), set the multimeter to measure dc voltage with a 4 volt range. The wire from the COM port should be on the side of the bulb nearest the negative side of the battery, and the V (positive side) should be attached to the other side, facing the positive side of the battery pack. Have your instructor check your circuit.
2. Switch on the power, and measure the potential difference across the bulb. Record the values in the chart.
3. Move the voltmeter leads to measure the voltage across the battery pack, and record the values.

### Part III. \* Voltage and Current Simulator

1. Open the dc circuit simulation program at URL:  
[http://phet.colorado.edu/new/simulations/sims.php?sim=Circuit\\_Construction\\_Kit\\_DC\\_Only](http://phet.colorado.edu/new/simulations/sims.php?sim=Circuit_Construction_Kit_DC_Only).
2. Create a circuit with a battery, two bulbs, a switch, and an ammeter in series with the battery, placed as shown in the image. Close the switch, and run the simulation.
3. Use the voltmeter to measure the voltage across the battery and each bulb.
4. Use the non-contact ammeter to measure the current through each bulb and the regular ammeter to measure the current through the battery.
5. Record your values in the table on the Lab Report sheet.



## Measuring Potential Difference and Current Laboratory Report

### Part I. Measuring Current with a Multimeter

Sketch the circuit diagram for the single bulb, ammeter, and battery circuit in the space provided. Ask your instructor for assistance, if needed.

Situation	I (400 mA) scale	I (10A) scale
1 bulb		
2 bulbs		



### Part II. Measuring Voltage with a Multimeter

Sketch the circuit diagram for the two bulbs, multiple voltmeters measuring the voltage across two bulbs jointly, and battery. Ask your instructor for assistance, if needed.

#### Measurements with One Bulb Circuit:

Voltage (battery)	Voltage Across the Bulb

#### Measurements with Two Bulb Circuit:

Voltage (battery)	Voltage Across the Bulb



### Part III. \*Voltage and Current in Simulator

Voltage Values	Bulb Left (V)	Bulb Right (V)	Battery (V)
Current Values	Bulb Left (A)	Bulb Right (A)	Battery (A)

- In Part I, the current on the 400 mA scale and 10A scale of the multimeter may be different. Remembering that a perfect ammeter has zero resistance, which reading is better, and which setting had more resistance?
- For the circuits with two bulbs, these are in parallel with each other. What can you say from your observations about the voltage (potential difference) of two bulbs hooked up in parallel with each other?