PhyzLab: Current Events V

a quantitative investigation of compound circuits

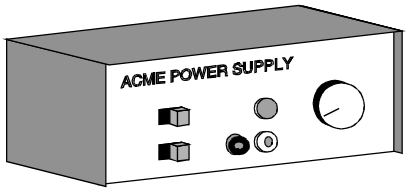
PERIOD	1.		
	2.		
GROUP	3.		
	4.		

• Purpose •

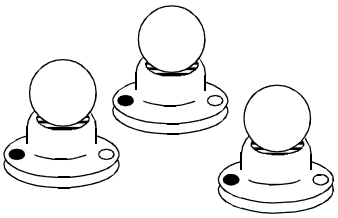
In this activity, you will measure current and voltage at various points in a compound circuit to see how the flow of charge and the energy of that charge are distributed in the circuit.

• Apparatus •

___ variable DC power supply (or 6 V lantern battery)
___ 3 miniature light bulbs in sockets (6.3 V) [#46]
___ 9 connecting wires
___ DC ammeter (0-1 A range)
___ DC voltmeter (0-10 V range) with test leads



DC power supply
NOTE: black terminal is negative

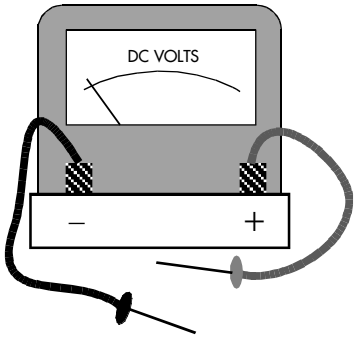


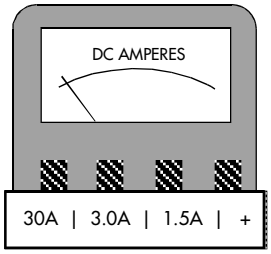
bulbs in sockets

connecting wires

THE TEST LEADS ARE ALWAYS CONNECTED TO THE VOLTMETER AND ARE NEVER CONNECTED TO THE AMMETER

voltmeter (with test leads)

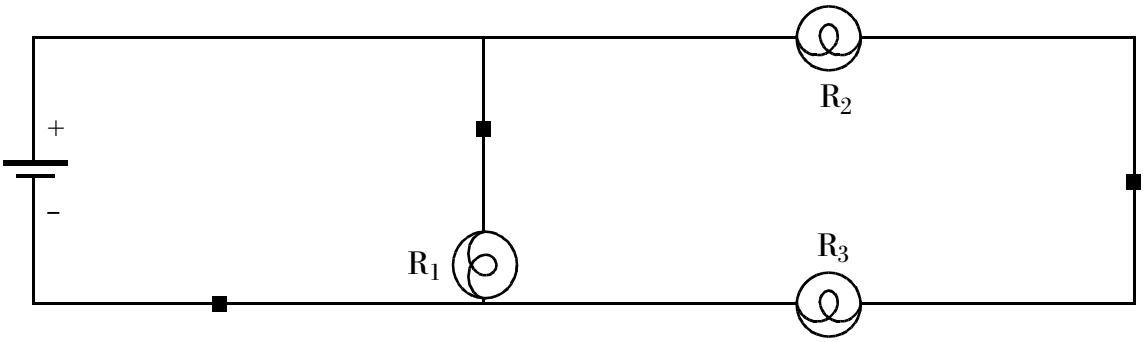




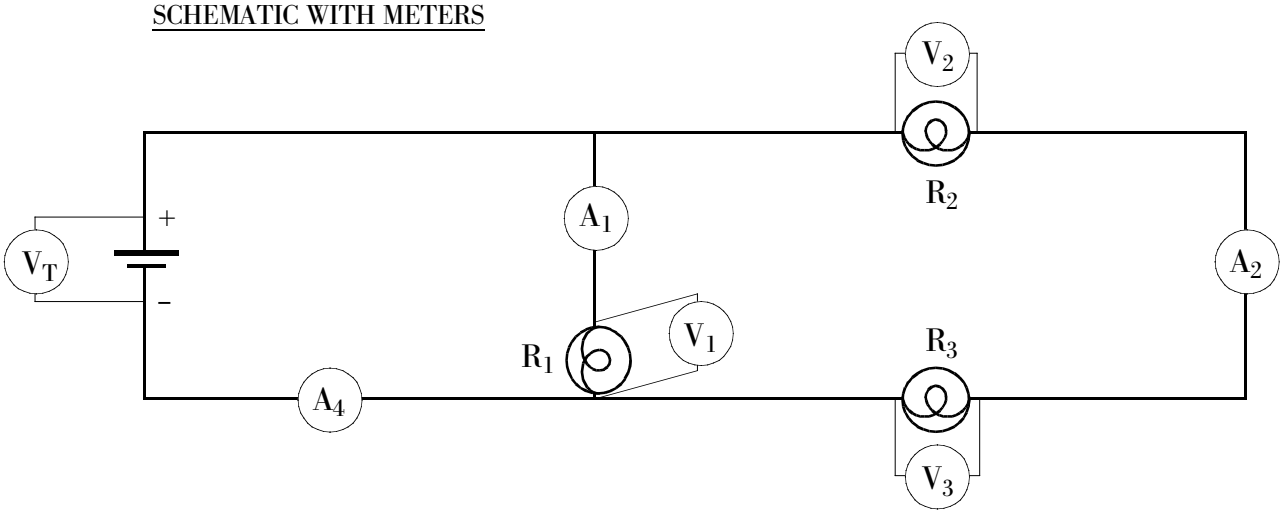
ammeter

1. COMPOUND CIRCUIT A: ONE BULB IN PARALLEL WITH TWO BULBS IN SERIES

a. **Construct** a circuit with three bulbs and **nine** wires as shown below.



SCHEMATIC WITH METERS



b. **Predict** the values *before* taking measurements (use V_T = 6.0 V):

V_T = 6.0V	V_1 = _____	I_1 = _____
	V_2 = _____	I_2 = _____
	V_3 = _____	I_3*= _____
		I_4 = 0.30 A

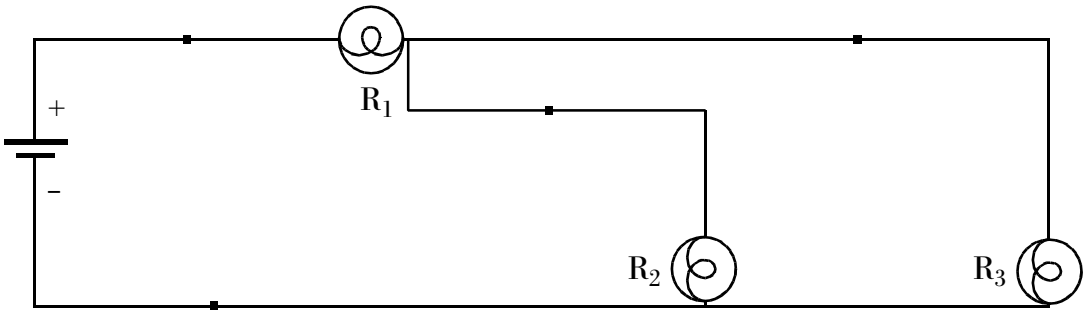
c. Set the terminal voltage to 6.0 V and **measure** all quantities listed above and record the values below.

V_T = 6.0V	V_1 = _____	I_1 = _____
	V_2 = _____	I_2 = _____
	V_3 = _____	I_3*= _____
		I_4 = _____

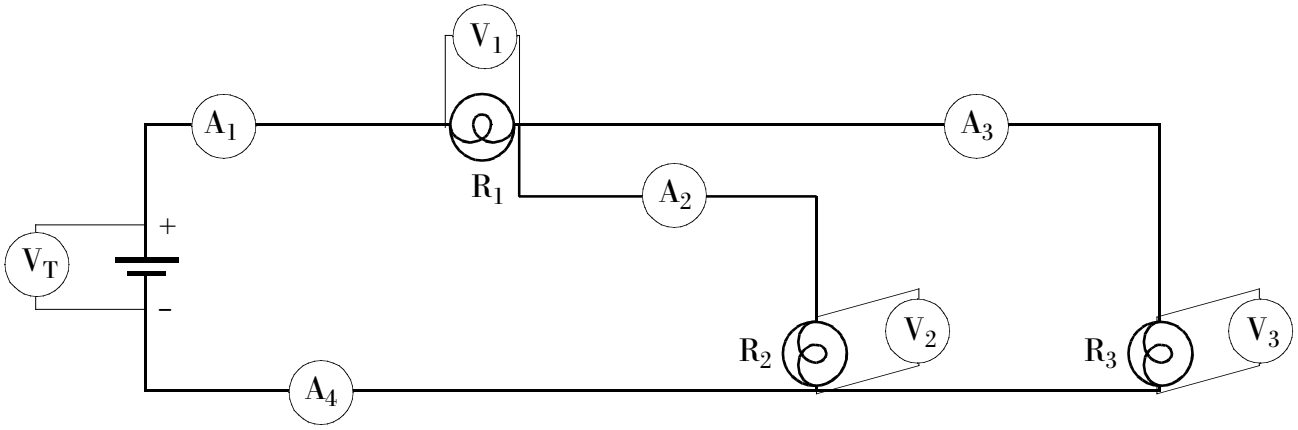
*I_3 is equal to I_2; both are measured by A_2.

2. COMPOUND CIRCUIT B: ONE BULB IN SERIES WITH TWO BULBS IN PARALLEL

a. **Construct** a circuit with three bulbs and **nine** wires as shown below.



SCHEMATIC WITH METERS



b. **Predict** the values *before* taking measurements (use V_T = 6.0V):

V_T = 6.0V V_1 = _____ I_1 = 0.30 A

V_2 = _____ I_2 = _____

V_3 = _____ I_3 = _____

I_4 = _____

c. Set the terminal voltage to 6.0 V and **measure** all quantities listed above and record the values below.

V_T = 6.0V V_1 = _____ I_1 = _____

V_2 = _____ I_2 = _____

V_3 = _____ I_3 = _____

I_4 = _____

• Data and Calculations •

1. COMPOUND A: ONE BULB IN PARALLEL WITH TWO BULBS IN SERIES. V_T = _____

	Voltage (V)	Current (A)	Resistance ( )	Power (W)
B_1				
B_2				
B_3				
Tot				

^ Use V_T ^ Use I_4

Power sum ($P_1 + P_2 + P_3$): _____

2. COMPOUND B: ONE BULB IN SERIES WITH TWO BULBS IN PARALLEL. V_T = _____

	Voltage (V)	Current (A)	Resistance ( )	Power (W)
B_1				
B_2				
B_3				
Tot				

^ Use V_T ^ Use I_4

Power sum ($P_1 + P_2 + P_3$): _____

• Analysis •

1. Calculations of Resistance and Power

Calculate the resistance and power of each bulb and for each circuit in the lab. Record the values in the data table.

2. Compound Circuit A

a. In a series circuit, each bulb gets the same current. And the current in each bulb is equal to the total current in the circuit. In a parallel circuit, the current divides among the bulbs; the sum of the currents in the bulbs is equal to the total current in the circuit. What happens to the current in ***this*** circuit?

b. In a series circuit, the voltage is divided equally among the bulbs; the sum of the voltages across the bulbs is equal to the total voltage provided by the power supply. In a parallel circuit, the voltage across each bulb is the same. And the voltage across each bulb is equal to the terminal voltage of the power supply. What happens to the voltage in ***this*** circuit?

3. Compound Circuit B

a. What happens to the current in ***this*** circuit?

b. What happens to the voltage in ***this*** circuit?