

## Series & Parallel Circuits Lab WS

### I. Series Circuits (Simulation Only)

Use the CCK (Circuit Construction Kit) simulation to build the circuits below with a battery at about *12 volts* and light bulbs (represented by the ~ symbol). Turn on the voltmeter and ammeter to measure voltage of the battery and current into it. Complete the data table as shown and record the apparent brightness of the bulb.

Figure 1

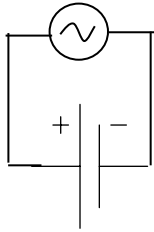


Figure 2

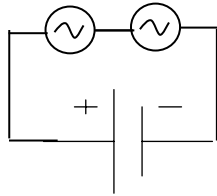
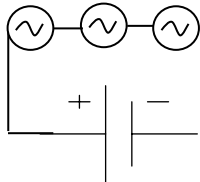


Figure 3



# of bulbs	Battery voltage (v)	Current into battery (A)	Brightness of bulbs
1			
2			
3			

- Summarize the relationships you observed and explain what you think is happening.
- How does changing the battery voltage affect your results?
- Practice using the voltmeter and realistic ammeter in several circuits. Describe how using a voltmeter is different from using an ammeter.

### II. Parallel Circuits (Simulation Only)

Redo Part I but use figures 4-6 for the circuits. Make a new table and answer questions a) and b) above.

Figure 4

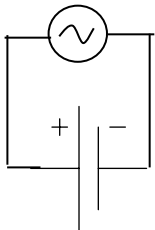


Figure 5

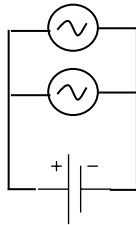
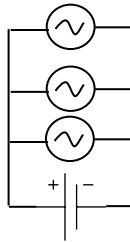


Figure 6



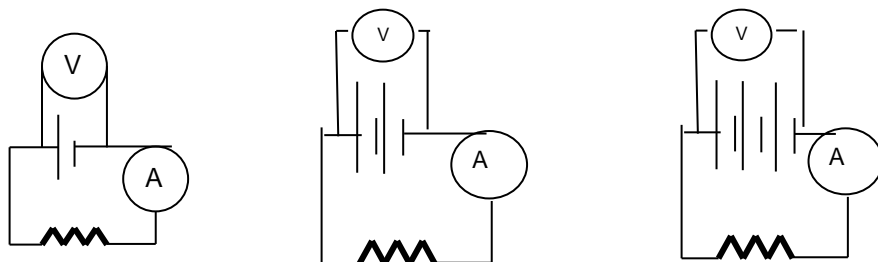
### III. Actual Resistors

Get a resistor and click the 'values' option to find its resistance  $R$  (in ohms). Get a battery and measure the voltage. Calculate the current ( $I$ ) that *should* run through the circuits when the resistor is hooked up to one, two, or all three batteries.

Batteries	Total voltage (V)	Resistance ( $\Omega$ )	Calculated Current (A)
1			
1+2			
1+2+3			

(Continued on next page)

Now *build* the following circuits in the simulation. Use the voltmeter and ammeter to get your readings where shown on the diagram (V for voltage, A for current) by changing the mode and moving it. *Voltage is measured across the circuit, and current is measured with the meter in the circuit.* Record your data in a table like the one below.

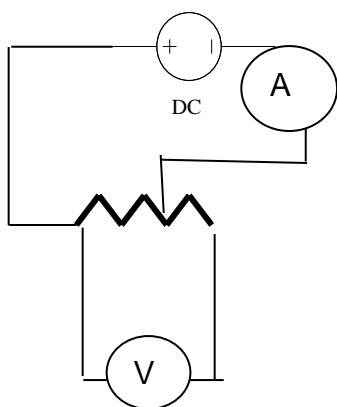


Batteries	Measured Voltage (V)	Measured Current (A)
1		
1+2		
1+2+3		

- Explain what might be happening to cause the change in current as batteries are added.
- How are current and battery voltage related? Sketch a graph of current and voltage.
- What does the slope of the current and voltage graph represent?

#### IV. Variable Resistors

Use a resistor connected to the batter set on 3 volts to make a circuit. Then use the voltmeter and ammeter to read the current and voltage where indicated. Vary the resistance of the resistor by moving the slider. Make a data table using with at least 10 resistances for the resistor.



- Sketch a graph showing the relationship between resistance and current.
- Is the relationship between current and resistance proportional or inversely proportional? Please explain your reasoning.