

**Part I – Simple Circuit**

1. Create a circuit with one battery, one light bulb, and one ammeter. Select the voltmeter too as you will be using it.

Battery Voltage ( $V_T$ )	$I_T$	$V_T \div I_T$
9 V		
12 V		
15 V		
18 V		

Table 1 – One light bulb; a simple circuit.

**Part II – Two Lights in Series**

1. Insert another light bulb in series with the setup from Part I.

Battery Voltage ( $V_T$ )	$I_T$	$V_T \div I_T$	$V_1$	$V_2$	$V_1 \div I_T$	$V_2 \div I_T$
9 V						
12 V						
15 V						
18 V						

Table 2 – Two light bulbs in series

**Part III – Three Lights in Series**

1. Insert a third light bulb in series with the setup described above and fill in the data table tomorrow.

Battery Voltage ( $V_T$ )	$I_T$	$V_T \div I_T$	$V_1$	$V_2$	$V_3$	$V_1 \div I_T$	$V_2 \div I_T$	$V_3 \div I_T$
9 V								
12 V								
15 V								
18 V								

Table 3 – Three light bulbs in series

**Part IV – Two Lights in Parallel**

1. Create a circuit with a battery, two lights in parallel, and three ammeters (one ammeter to record the current going through each bulb and one to record the current coming out of the battery).

Battery Voltage ( $V_T$ )	$I_T$	$V_T \div I_T$	$V_1$	$V_2$	$I_1$	$I_2$	$V_1 \div I_1$	$V_2 \div I_2$
9 V								
12 V								
15 V								
18 V								
21 V								

Table 4 – Two lights in parallel.

**Part V – Three Lights in Parallel**

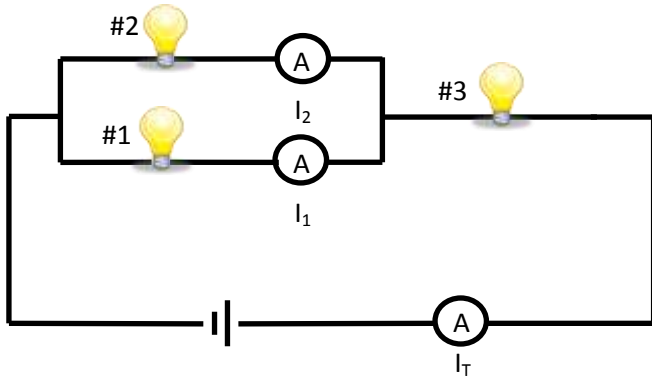
1. Insert a third light that is parallel with the circuit above and an ammeter to measure its current.

Battery Voltage ( $V_T$ )	$I_T$	$V_T \div I_T$	$V_1$	$V_2$	$V_3$	$I_1$	$I_2$	$I_3$	$V_1 \div I_1$	$V_2 \div I_2$	$V_3 \div I_3$
9 V											
12 V											
15 V											
18 V											
21 V											

Table 5 – Three lights in parallel.

**Part VI – Two lights in Parallel and in Series to a Third**

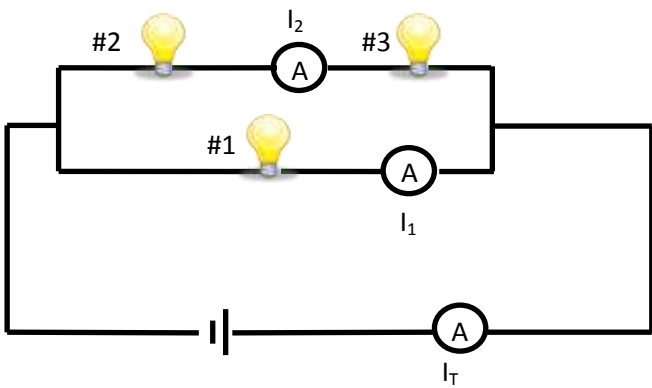
1. Create the following circuit with the PHET computer program and fill in data table 6:



Battery Voltage ( $V_T$ )	$I_T$	$V_T \div I_T$	$V_1$	$V_2$	$V_3$	$I_1$	$I_2$	$V_1 \div I_1$	$V_2 \div I_2$	$V_3 \div I_T$
9 V										
12 V										
15 V										
18 V										
21 V										

Table 6 – Combining parallel and series circuits.

2. Create the following circuit with the PHET computer program and fill in data table 7:



Battery Voltage ( $V_T$ )	$I_T$	$V_T \div I_T$	$V_1$	$V_2$	$V_3$	$I_1$	$I_2$	$V_1 \div I_1$	$V_2 \div I_2$	$V_3 \div I_2$
9 V										
12 V										
15 V										
18 V										
21 V										

Table 7 – Combining parallel and series circuits.

**Analysis Questions**

- For the lights in series, what do the voltage drops add up to? What did you notice about the battery voltage divided by the current?
- For the lights in parallel, what do the individual currents add up to? How does each voltage drop compare to the voltage of the battery?
- The overall resistance in a circuit is calculated by dividing the battery voltage by the current coming from the battery. If you have two resistors (light bulbs) should they be connected in series or parallel to have the lowest possible resistance?
- Explain the differences observed in the two tables for Part VI.