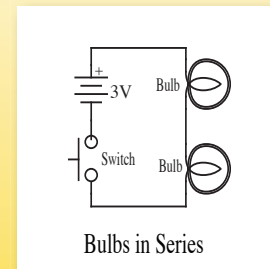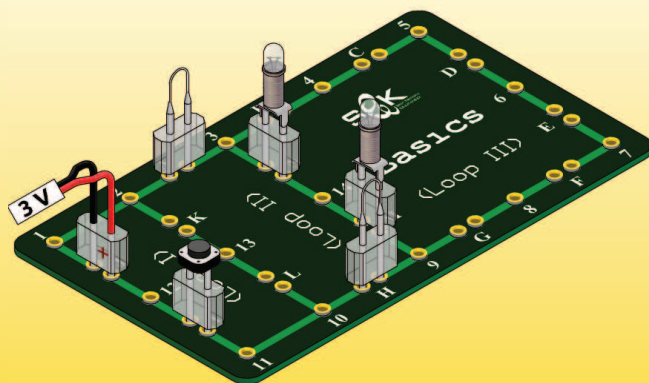Bulbs in Series

Objectives:

1. The student will build and explain the operation of simple series and parallel bulb circuits.
2. The student will investigate and compare the brightness of identical bulbs connected in series and in parallel.

Apparatus:

- Basics Board
- Voltage Source (PSB board)
- DMM
- Two Bulbs 3.8V
- Connection Wire
- Switch
- Jumpers

Procedure and Conclusions:

Bulbs in Series:

1. Using Loop I & II on Basics board build an electric circuit by inserting a switch at the pair (I), bulb 3.8V at the pair (M), another bulb 3.8V at the pair (N) and jumpers at the pairs (A) and (H), as shown in the above diagram.
2. Connect (3 volt) from PSB board to the pair (J) using a connection wire.
3. Press the switch button to close the circuit and see the brightness of the two bulbs.
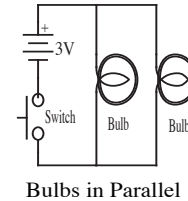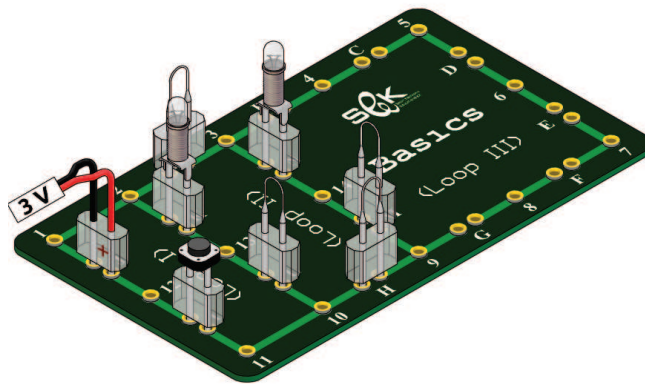4. Turn the selection dial of the DMM to DCV mode (range 20 V), insert the

DMM probes at the points (3) and (14) to measure the voltage across the first bulb, press the switch button and record the Voltmeter reading.

- The voltage you measured across the first bulb = ... volt.

5. Take the DMM probe off the point (3) and insert it at the point (9) to measure the voltage across the second bulb, press the switch button and record the Voltmeter reading.

- The voltage you measured across the second bulb = ... volt.

6. Remove the DMM probes, turn the selection dial of the DMM to DCA mode (range 200mA), then insert the DMM probes at the points of the pair (A) instead of the jumper. Push the switch button and record the value of the current passes through the circuit.

- The current passes through the bulbs (the circuit) = ... mA.

7. Insert a jumper at the pair (N) instead of the first bulb, press the switch button, compare the brightness of the second bulb with its brightness when was connected in series with the first bulb.

- The brightness of one bulb in a circuit is .... higher / lower ... than its brightness when it is connected in series with another identical bulb, because the current ... increases / decreases ... due to ... increase / decrease ... in the equivalent resistance of the circuit.
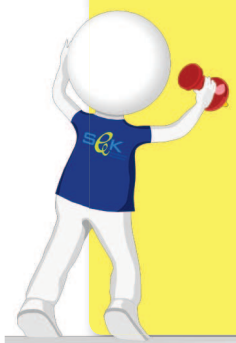
Notes:

- In a closed circuit contains identical bulbs connected in series, the total potential drop provided by the battery is divided equally among all the identical light bulbs.

Bulbs in Parallel:

Bulbs in Parallel

8. Insert a switch at the pair (I), bulb 3.8V at the pair (K), another bulb 3.8V at the pair (N) and jumpers at the pairs (A, H, M, L) as shown in the above diagram.

9. Connect (3 volt) from PSB board to the pair (J) using a connection wire.

10. Press the switch button, compare the brightness of the two bulbs in this case with their brightness when they were connected in series.

- The brightness of two identical bulbs connected in parallel is ... higher / lower ... than their brightness when connected in series. Explain this result by the equivalent resistance of the circuit.

11. Turn the selection dial of the DMM to DCV mode (range 20 V), insert the probes at the points (3) and (9) to measure the voltage across the two bulbs.

12. Remove the probes, turn the selection dial of the DMM to DCA mode (range 200mA), insert the probes at the pair (M) instead of the jumper, press the switch button to measure the current passes through the first bulb, and record the reading.

13. Insert a jumper at the pair (M) instead of the probes, insert the probes

at the pair (L) instead of the jumper so that to measure the current passes through the second bulb, press the switch button and record the obtained reading.

• Results table for Bulbs in Series and Parallel:

	Bulbs in Series		Bulbs in Parallel	
	Bulb 1	Bulb 2	Bulb 1	Bulb 2
Voltage (Volt)				
Current (mA)				
Brightness (high/low)				
Power (IxV) (Watt)				

Notes:

• In a parallel circuit, the voltage across each of the bulbs is the same, and the total current is the sum of the currents through each bulb.

Discussion

1. Discuss the brightness of light bulbs in a mixed series and parallel circuits.
2. Discuss power consumption in parallel and series circuits.