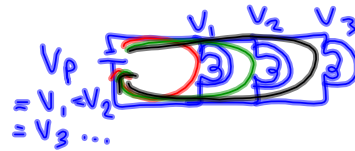
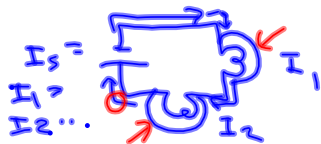
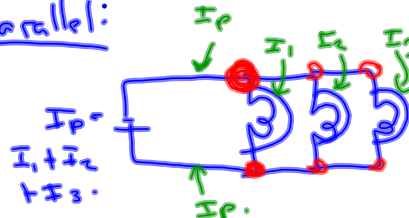


SPH3U 11.6 Kirchhoff's Laws**1. Kirchhoff's Laws**

Kirchhoff's Voltage Law (KVL):	The total voltage increase at the source = total voltage decrease in the rest of a circuit.
series	$V_{\text{series}} = V_1 + V_2 + V_3 + \dots$
parallel	$V_{\text{parallel}} = V_1 = V_2 = V_3 = \dots$

SeriesParallel

Kirchhoff's Current Law (KCL):	I entering a junction = I leaving the junction in a complete circuit.
series	$I_{\text{series}} = I_1 = I_2 = I_3 = \dots$
parallel	$I_{\text{parallel}} = I_1 + I_2 + I_3 + \dots$

Series:Parallel:

If a ~~6.0 V~~ battery with ~~0.20 A~~ of current is connected to three identical light bulbs in series, what is the voltage and current of each light bulb?

$$I_{\text{series}} = I_1 = I_2 = I_3 = 0.20 \text{ A.}$$

$$\begin{aligned} \therefore I_1 &= 0.20 \text{ A} \\ I_2 &= 0.20 \text{ A} \\ I_3 &= 0.20 \text{ A.} \end{aligned}$$

$$V_{\text{series}} = V_1 + V_2 + V_3 = 6.0 \text{ V.}$$

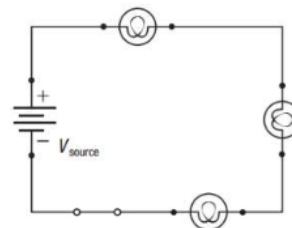
$$6.0 \text{ V} = 3 \text{ V}$$

$$V = \frac{6.0}{3} = \underline{\underline{2.0 \text{ V}}}$$

$$\therefore V_1 = 2.0 \text{ V}$$

$$V_2 = 2.0 \text{ V}$$

$$V_3 = 2.0 \text{ V.}$$



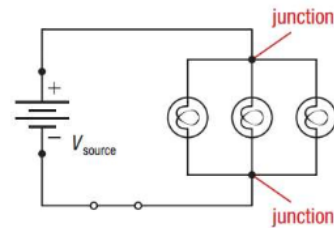
If a 6.0 V battery with 0.30 A of current is connected to three identical light bulbs in parallel, what is the voltage and current of each light bulb?

$$V_{\text{parallel}} = V_1 = V_2 = V_3 = \underline{\underline{6.0 \text{ V}}}.$$

$$I_{\text{parallel}} = I_1 + I_2 + I_3 = 0.30 \text{ A}.$$

$$0.30 \text{ A} = 3I$$

$$I = \frac{0.3}{3} = \underline{\underline{0.10 \text{ A}}}.$$



Analyze this mixed circuit. Find each unknown voltage and current, given the following information: $V_{\text{source}} = 40 \text{ V}$, $V_1 = 10 \text{ V}$, $V_3 = 20 \text{ V}$; $I_{\text{source}} = 0.40 \text{ A}$, $I_3 = 0.10 \text{ A}$.

$$\textcircled{1} \quad V_1 = 10 \text{ V}$$

$$I_1 = 0.40 \text{ A}$$

$$\textcircled{2} \quad V_2 = 40 \text{ V} - V_1 - V_3 = 10 \text{ V}$$

$$I_2 = 0.40 \text{ A}.$$

$$\textcircled{3} \quad V_3 = 20 \text{ V}$$

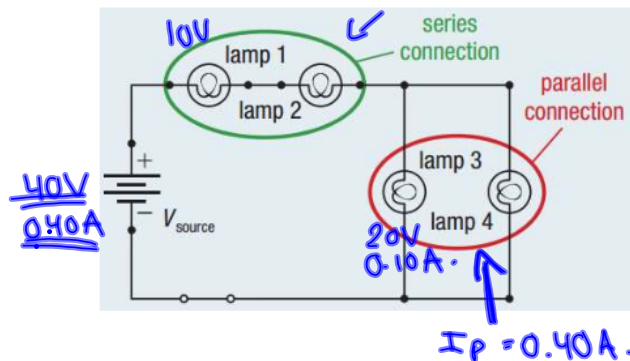
$$I_3 = 0.10 \text{ A}.$$

$$\textcircled{4} \quad V_4 = 20 \text{ V}.$$

$$I_4 = 0.40 \text{ A} - I_3 = 0.30 \text{ A}.$$

$$\textcircled{\text{Source}} \quad V_{\text{source}} = 40 \text{ V}$$

$$I_{\text{source}} = 0.40 \text{ A}$$



Homework: page 522:

#1-2