Scope:

- Use of multi-meters to measure voltage and current of voltage source - resistor circuits
- Use the color code for resistors
- Make measurements in series and parallel circuits
- Use the breadboard
- Study the concepts of open and short circuit
- Learn to present laboratory results in a professional manner

Home preparation:

- Review chapters 1 and 2 of Hambley.
- Read through the experiment.
- **Calculate the theoretical values for all electrical parameters you will be measuring in lab.**
- Create tables in your notebook to record calculated and measured results of the experiment.

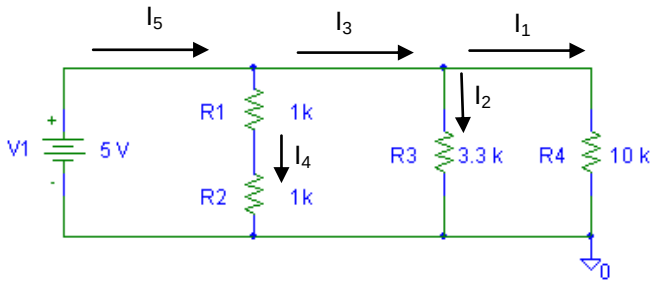
Laboratory experiments:

1) Using a resistor band color code chart, determine the color codes of all resistors to be used in this lab and record the colors in you notebook (use the format of Table 2.1 below).

Table 2.1: Resistor Colors					
Resistor Nominal Value (Ω)	Color Band 1	Color Band 2	Color Band 3	Color Band 4	Color Band 5?
1 kΩ					
3.3 kΩ					
10 kΩ					

2) Breadboard the circuit shown in Figure 2.1, using the DMM to set the power supply voltage. Measure the indicated currents. RECALL that you need to put the meter in series with the branch in the proper polarity in order to measure each current.

Figure 2.1



V_1 =	I_3 =
I_1 =	I_4 =
I_2 =	I_5 =

⇨Calculate the ratio $R_{in} = V_1/I_5$ (Note: This ratio is called *input resistance*, which is the equivalent resistance "seen" by the voltage source). R_{in} = _____.

⇨How does I_5 compare with the sum of $I_3 + I_4$? What circuit law refers to this summation?

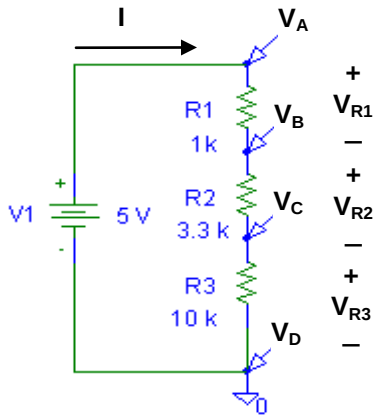
⇨Can you find other similar relations in this circuit?

3) Disconnect one of the terminals of the resistor R4 in the circuit shown in Fig. 2.1, and repeat the measurements you did in (2). Present the results of your home calculations and the experiments (2) and (3) in Table 2.2.

Table 2.2: Parallel Circuit Calculations and Measurments				
	Fig. 2.1 *With R4 included*		Fig. 2.1 *WITHOUT R4 included*	
Currents	Calculated Values	Measured Values	Calculated Values	Measured Values
I_1				
I_2				
$I_1 + I_2$				
I_3				
I_4				
$I_3 + I_4$				
I_5				

4) Breadboard the circuit shown in Figure 2.2 and measure the node voltages V_A, V_B, V_C, V_D with respect to the source voltage ground, and calculate the voltage drops across the resistors (V_{R1}, V_{R2}, V_{R3}) and the current through each circuit element.

Figure 2.2



V_1 =	V_A =
I =	V_B =
V_{R1} =	V_C =
V_{R2} =	V_D =
V_{R3} =	

⇨How does the sum of $V_{R1} + V_{R2} + V_{R3}$ compare with the applied voltage V1? What circuit law is verified?

⇨Calculate the ratio between applied voltage V1 and input current I, R_{in} = V1/I = _____.

5) Connect a jumper wire on your breadboard between the terminals of R_1 (you have established what is called a **SHORT CIRCUIT**). Repeat the measurements of (4).

⇨Present the results of experiment steps (4) and (5) in a format similar to Table 2.2.
(This table will include the results of your home calculations and your lab measurements.)