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ECE 401

Section 5

10/12

Laboratory #3 (Pre-Lab)

Objective:

The objective of this lab is for the student to become familiar with common measurement equipment used by the engineer, such as oscilloscopes and a digital multi-meter. The student will learn how to use the oscilloscope and to properly trigger it so that a steady display is obtained.

Equipment Required:

- Oscilloscope
 - An oscilloscope provides a graph of voltage in relation to time. This allows the observer to see how the voltage changes over time. This is most useful when dealing with periodic waveforms. An oscilloscope can give a graphical user interface to a waveform produced by a function generator.
- DC power supply
 - A device that transforms the A.C. input (~120 V) into a D.C. output. The output is independent from changes of load, temperature, and A.C. Supply.
- Benchtop Digital Multimeter
 - An electronic instrument used to measure electric voltage, current and resistivity. Multimeters provide the ability to measure different electrical signals as opposed to using individual meters.
- Assorted resistances
 - A collection of resistances that are used to alter the voltage across or the current through a circuit.
- Breadboard
 - A reusable base for prototyping electronics. Components can be plugged into board and conductive rails can carry current from component to component.
- Test leads
 - A pair of wires connected to conductive clips to temporarily join electrical equipment. They are used in conjunction with a DMM to measure electrical signals

Experiments:

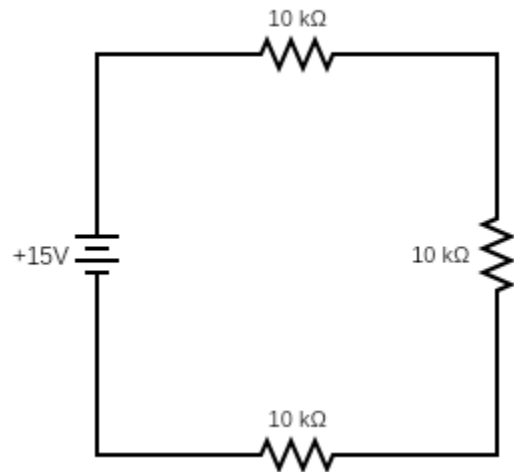
1.

Expected Results:

	R1	R2	R3	Total	
E	5	5	5	15	Volts

I	0.0005	0.0005	0.0005	0.0005	Amps
R	10,000	10,000	10,000	30,000	Ohms

Circuit:

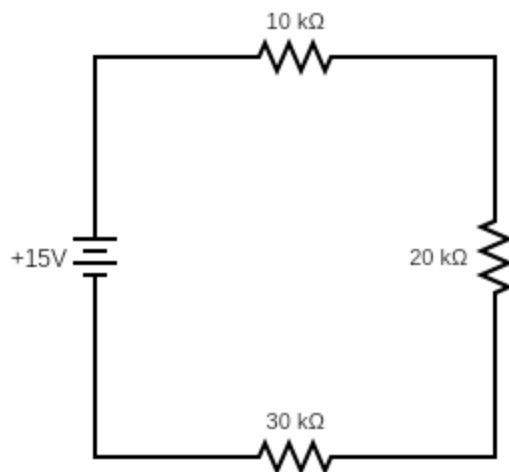


1a.

Expected Results:

	R1	R2	R3	Total	
E	2.5	5	7.5	15	Volts
I	0.00025	0.00025	0.00025	0.00025	Amps
R	10,000	20,000	30,000	60,000	Ohms

Circuit:



1b.

Comment:

At 20 volts, the current will increase 0.000083 amps to a new total current of 0.000333 amps.

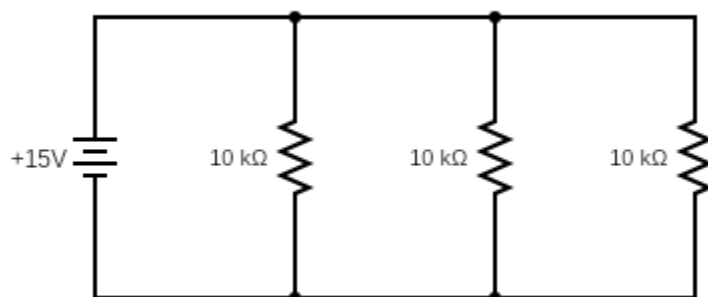
At 7.5 volts, the current will decrease 0.000125 amps to a new total current of 0.000125 amps.

2.

Expected Results:

	R1	R2	R3	Total	
E	15	15	15	15	Volts
I	0.0015	0.0015	0.0015	0.0045	Amps
R	10000	10000	10000	3333.333	Ohms

Circuit:



Comment:

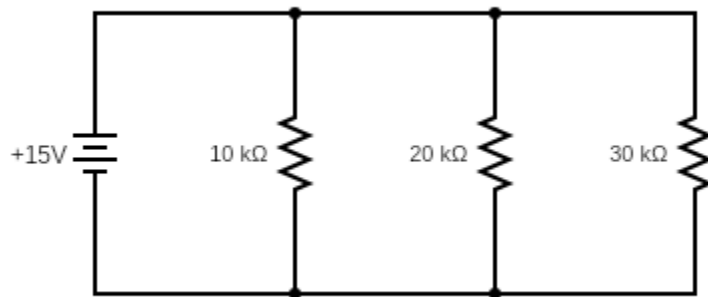
The current through each resistor sums to the total current of 0.0045 amps.

2a.

Expected Results:

	R1	R2	R3	Total	
E	15	15	15	15	Volts
I	0.0015	0.00075	0.0005	0.00275	Amps
R	10,000	20,000	30,000	5,454.545	Ohms

Circuit:

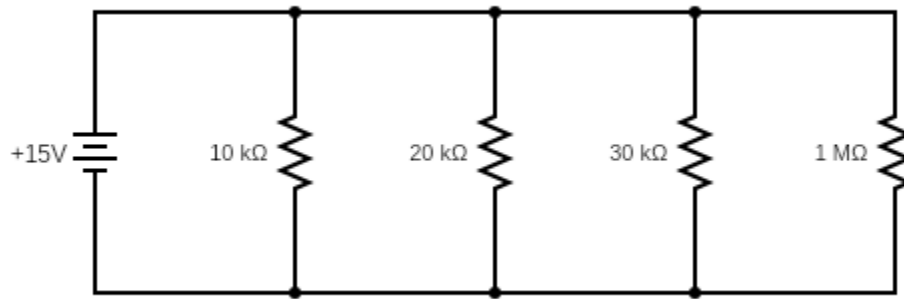


2b.

Expected Results:

	R1	R2	R3	R4	Total	
E	15	15	15	15	15	Volts
I	0.0015	0.00075	0.0005	0.000015	0.002765	Amps
R	10,000	20,000	30,000	1,000,000	5,424.955	Ohms

Circuit:



Comment:

The fourth resistance of 1M ohms does not significantly affect the equivalent resistance because $1/R_4$ is an extremely small number.

2c.

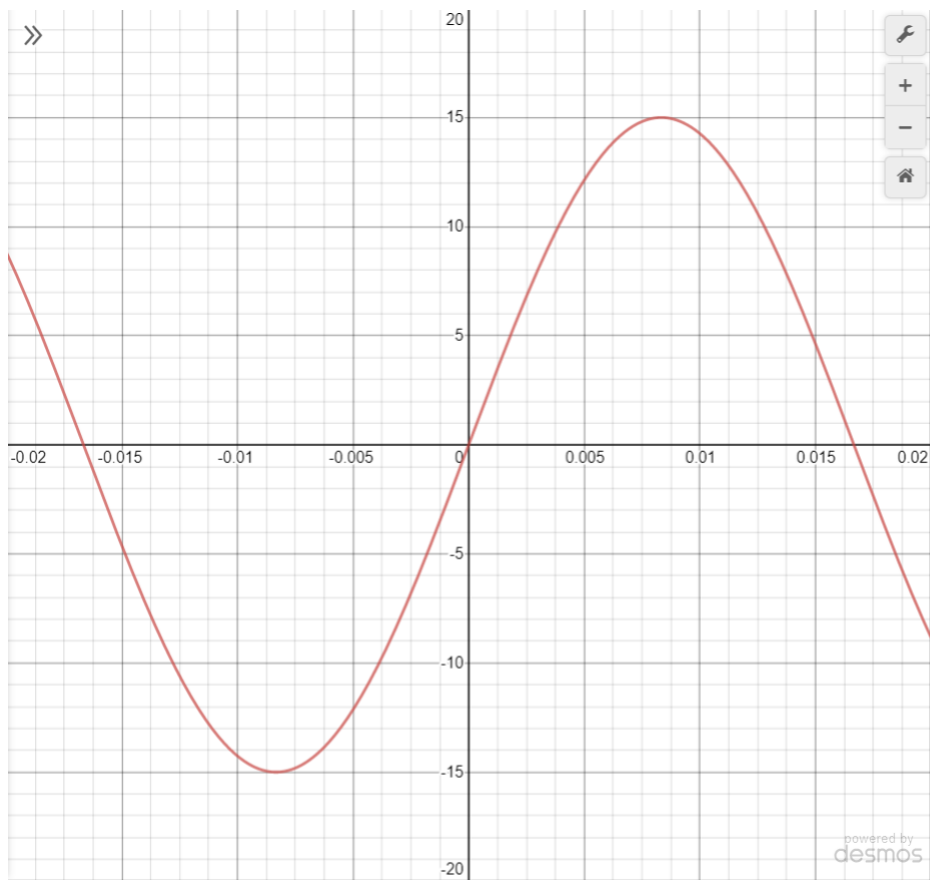
Comment:

At 20 volts, the current will increase 0.000917 amps to a new total current of 0.003667 amps.

At 7.5 volts, the current will decrease 0.001375 amps to a new total current of 0.001375 amps.

3.

Expected Results:



Comment:

What I would expect to see when I change the horizontal time base would be more or less peaks and troughs coming into view. It may look like the graph is getting horizontally stretched or compressed.