OL-35 Ohm's Law

OBJECTIVE

Learn to build a simple circuit with one resistor and one DC source.

Use PhET interactive simulation tool (Circuit Construction Kit AC Prototype) to build circuits and verify Ohm's Law.

If the link does not work, google *Phet* – open *phet interactive simulations* – click *physics* – select *electricity magnetism and circuits* – select *Circuit Construction Kit DC – Virtual Lab*. (Select the one that shows the symbol that looks like an "S". The ones showing a cup with vapors coming out use java and require download.

Here is the link for this:

https://phet.colorado.edu/en/simulation/circuit-construction-kit-dc-virtual-lab

THEORY

Ohm's Law states that the electric current I passing through a resistor with resistance R is proportional to the voltage (electric potential difference) V across the resistor and inversely proportional to the resistance R

$$I = \frac{V}{R} \qquad (1)$$

EQUIPMENT

PhET interactive simulation tool (Circuit Construction Kit: DC - Virtual Lab)

https://phet.colorado.edu/en/simulation/circuit-construction-kit-dc-virtual-lab

For guidance on how to use the simulation, tool, see OL-00 PhET Simulation Tool Instructions for Electric Circuits Labs.

PROCEDURES

1. Build the circuit as shown in Figure 1 using the PhET Simulation Tool.
2. Set the DC Power Source to 12.0 V.
3. Create three resistors R_1 =10.0 Ω, R_2 =20.0 Ω, and R_1 =30.0 Ω. Putting each resistor into the circuit one at a time, measure voltage using the voltmeter and record the values on Table 1. Note that the volt-meter should be parallel with the resistor.

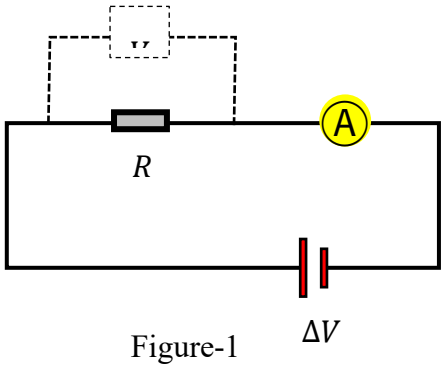

Figure-1

4. With the power source still set at 12.0 V, measure the current of each resistor and record the values on Table 1. The ammeter should be in series with the resistor. You must first cut the circuit and open it with two disconnected ends and then plug in the ammeter. Please

refer to “PhET Simulation Tool Instructions for Electric Circuits Labs” for how to measure current.

5. Avoid the common mistake of connecting the ammeter directly to the power supply’s two terminals.
6. Compare the calculated and measured currents in Table 1 and find the percentage difference.
7. Put the 10.0 Ω resistor in the circuit and increase the voltage of the power supply from $1\ V$ to $5\ V$ using $1\ V$ increments. Using the method outlined in step 4, measure the current at each step. Record the voltage and current values in Table 2.
8. Plot the voltage-current curve and find the slope of the line. The slope of the line will be the resistance.
9. Compare the measured with the known values of the resistance values and find the percentage error.

In you report, include screenshots of the circuits that you make for doing this Lab.

DATA TABLE 1

DC Power Source: 12.0 V

Resistance	Measured Voltage	Calculated Current (Equation 1)	Measured Current	% difference in the current
10.0 Ω				
20.0 Ω				
30.0 Ω				

DATA TABLE 2

Resistance: 10.0 Ω

Voltage (volt)	Measured Current (ampere)	Slope (equals resistance) (ohm)	% error in resistance
1.00 V			
2.00 V			
3.00 V			
4.00 V			
5.00 V			