TITLE – OHMIC RESISTORS

OBJECTIVES

1. To learn how to use the VOM, DMM, and HP-DMM to measure DC-Voltage and DC-Current
2. Calculate the resistance of two resistors graphically using the characteristic curve and compare with the expected value.

EQUIPMENT

1. HP-DMM (used as an ammeter)
2. Hand-held DMM (used as a voltmeter)
3. VOM
4. Power Supply
5. ≈100 Ω resistor, ≈ 600 Ω
6. 5 leads, alligator clips, 2 power cords
7. 2 dry-cell batteries

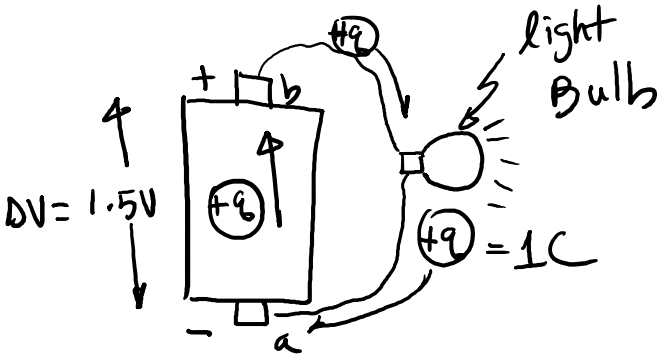
THEORY

1. i = current = dq/dt = time-rate of flow of charge through the cross-sectional area of a conductor
2. R = Resistance = a measure of the opposition that a material (resistor) presents to the flow of charge.
3. ΔV = potential difference (voltage, potential) = A measure of the change in electric potential energy that a charge gains/loses as it moves between two points in an E-field. Mathematically it is given by:

$$\Delta V = -\int_1^2 \vec{E} \cdot d\vec{s} = \frac{\Delta U}{q}$$

4. The SI unit of potential difference is the Volt)V: 1V = 1 J/1C

One Volt is equivalent to one Joule per Coulomb. If the **electric potential difference** between two locations is 1 volt, then one Coulomb of charge will gain 1 joule of **potential** energy when moved between those two locations.



$$\Delta U = q\Delta V$$

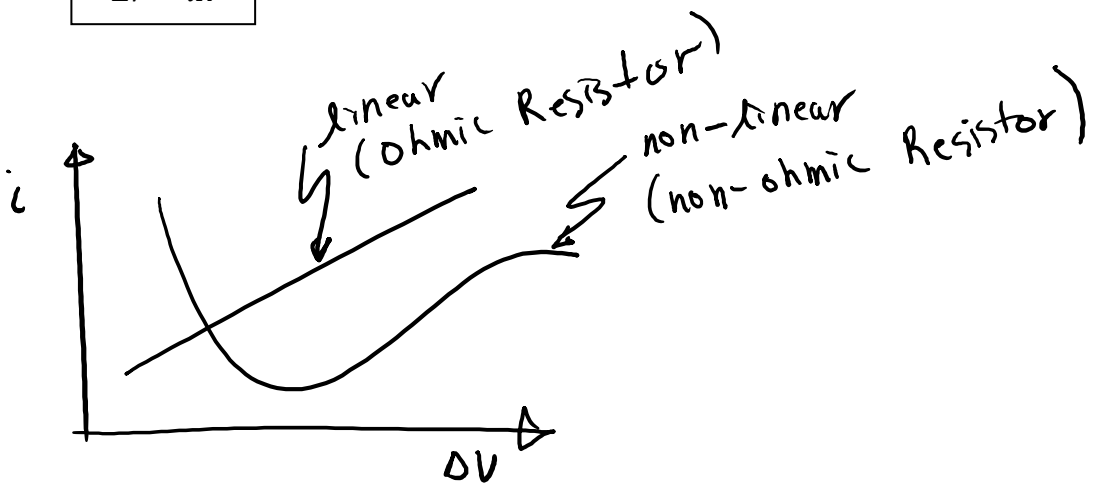
$$\Delta U_{a\to b} = q\Delta V_{a\to b}$$

$$\Delta U_{a\to b} = 1C(1.5V)$$

$$= 1C\left(\frac{1.5J}{1C}\right) = \boxed{1.5J}$$

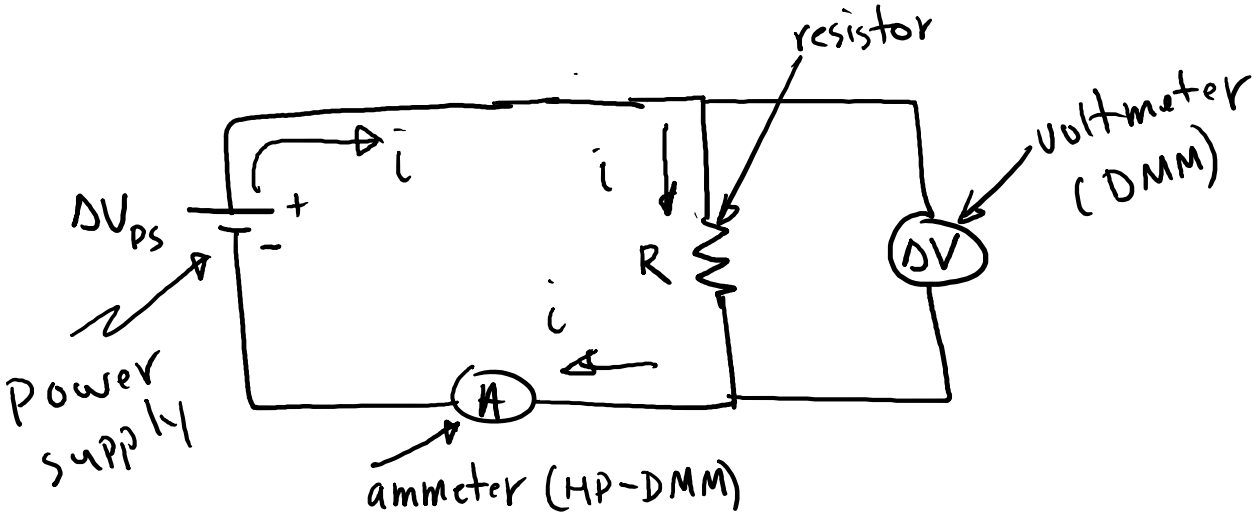
5. Ohm's Law relates V, i, and R. It is given by:

$$\Delta V = iR$$ Ohm's Law



PROCEDURE

1. Measure the DC-Voltage of two difference dry-cell batteries and compare with the expected measured value.
2. Setup the following circuit:



3. Adjust ΔV_{out} to collect 10 data points for ΔV and i.
4. Make a graph on EXCEL of i vs. ΔV and obtain the equation of the best curve-fit. Make sure graph is labeled properly!
5. Calculate resistance of resistor from equation of best-curve fit and compare with expected measured value.