Student’s Name:

Instructor’s Name:

Class Name:

Date when Due:

Works Cited

Lab Report

The Potentiometer

**Purpose**

To assemble the precision null reading instrument for measuring the voltage

**Part A: Usage of the slide bridge as the variable-voltage** source

**Theory**

The potentiometer is three terminal resistors with rotating or sliding contact which creates the adjustable voltage divider. When just two terminals have utilized the wiper one end, it will be a rheostat or variable resistor. It is essentially a voltage divider that is used in measuring the voltage. They are mostly used as the control devices like volume controls on the audio equipment.

A metal with cross-sectional area A and length x has a resistance of:

$$R\_{x}=ρI/A$$

Whereby the $ρ$= resistivity of the metal in Ω.m

Assuming that the voltmeter is ideal the internal resistance $R\_{v}=\infty \_{s}$ so that $I\_{v}=0$ through the voltmeter, hence the voltage reading shall be given as $V\_{x}=I R\_{x}=\left(\frac{ρI}{A}\right)x…\left(1\right)$

Where $I=\frac{V\_{a}}{R\_{t}}=\frac{voltage of the power supply}{total R of the I-m wire}=const.$

Hence we see that $R\_{x}∝x$…(2)

**Material**

1-m Bridge, power supply, voltmeter and cables

**Method**

DC circuit is set up as shown in the diagram below to prove the voltage versus position on the bridge

Circuit Diagram



**Procedure**

1. The circuit is set up as shown above. The DC voltage Vo was set at 2V. Vo=Vx when X=1m
2. The slide is then moved and touch the wire at the positions provided in the table. Every time measure Vx and it is filled in the table.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| X | cm | 0.0 | 10.0 | 20.0 | 30.0 | 40.0 | 50.0 | 60.0 | 70.0 | 80.0 | 90.0 | 100 |
| Vx | V | 0.0 | 0.2 | 0.4 | 0.6 | 0.8 | 1.0 | 1.2 | 1.4 | 1.6 | 1.8 | 2.0 |

1. Graph of Vx vs X is drawn on the full page with X along the x-axis. Best-fitting straight line is drawn. The graph is drawn to verify the validity of the equation 2

**Discussion**

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From the graph, it is evident that Vx is proportional to X hence the equation 2 R\_x∝x has been proved. Resistance in a wire is affected by the material of the wire, the thickness of the wire and the length of the wire. In a wire, the resistance increases when the length of the wire increases and as the thickness of the wire decreases. The resistance of an electrical component is defined as the ratio of the voltage to the current that flows through it

 

When the resistance in a wire is constant is a considerable range, Ohm’s law could be applied for predicting the behavior of the material.

**Conclusion**

In conclusion, assemble of the precision null reading instrument for measuring the voltage was done. The experiment also proved that that Vx is proportional to X hence the equation 2 R\_x∝x was proved. Resistance in a wire is affected by the material of the wire, the thickness of the wire and the length of the wire.

**Part B: Usage of the bridge as the potentiometer**

**Purpose**

To use the bridge as the potentiometer

**Theory**

In the circuit diagram below, the slide position x is adjusted till the galvanometer G reading is recorded as zero. A galvanometer is a sensitive ammeter. It reads zero when the voltage V in across the power cell is equal to the Vx and by using the two different cells, one that is known voltage Vk and the other as the unknown voltage Vu. Using equation 1, the slide position of the cells with the Vo=0

$$V\_{k}=(\frac{ρI}{A})x\_{a}$$

By combining the two we attain $V\_{u}=(^{x\_{u}}/\_{x\_{k}})V\_{k}$

Circuit diagram



**Procedure**

1. The circuit is set up as shown in the diagram above and replacing the Dc voltmeter with the power cell, and galvanometer is done in series. By using the voltmeter, Vo is verified to be 2 V at the power supply.

2. The first’s cell is the black student cell with Vk of 1.02V. The slide position that produces the null reading on the galvanometer is done xk=45.5 cm

3. The student cell is replaced with the dead dry cell. The new slide position is measured, and it gives the null reading Xu 72 cm

4. By using equation 3, the unknown voltage established Vu=1.6v

5. The circuit is then connected with the voltmeter, and the cell is parallel to measure the voltage of the cell V’u=1.5V

Results and Discussions

Discrepancy

%D=(Vu-V’u/V’u)\*100

Vu=1.6v

V’u=1.5V

(1.6-1.5/1.5)\*100

D=6.67%

**Sources of errors**

Parallax error while reading the distance and voltage

Resistance present in the circuit

Inherent error resulting from malfunctioning of the equipment of measurement like the voltmeter

**Conclusion**

In conclusion, the bridge was used as the potentiometer. The discrepancy of 6.67% was found in the values of V’u and Vu. The sources of error causing the discrepancy compromise of parallax error while reading the distance x and voltage V, resistance present in the circuit and inherent error resulting from malfunctioning of the equipment’s of measurement like the voltmeter