Project 1 Report

Graded

Student

Julia Laine

Total Points

59 / 110 pts

Question 1

Procedure

25 / 40 pts

- ✔ **– 10 pts** Task 1: Circuit schematic should be designed
- ✔ **– 10 pts** Task 2: Circuit schematic should be designed
- ✔ **– 10 pts** Task 2: Procedure should be more descriptive
- **+ 15 pts** Point adjustment

1 schematics should not be hand-drawn, use Multisim for the schematics

Question 2

Results

25 / 60 pts

Experiment 1

- ✔ **– 5 pts** No Error on measurements
- ✔ **– 5 pts** Discussion does not inlcude improvement
- ✔ **– 10 pts** discussion does not include reliability of results

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Experiment 2

- ✔ **– 5 pts** discussion does not include error
- ✔ **– 5 pts** discussion does not include improvement
- ✔ **– 5 pts** discussion does not include reliability of results

Question 3

Bonus Experiment

9 / 10 pts

- ✔ **– 0 pts** Correct
- **– 1 pt** Used hand drawn schematics

Question assigned to the following page: 1

Project 1

Author: Julia Laine
Section: 002 (Raquel?)
Date: 10/5/2023

Procedure - Experiment 1

Circuit in Figure 1 was built with the components listed in Table 1. The voltage was measured across A to B. Multiple voltage measurements were taken (figure 2) with the distance of Ni-Chrome wire changed by 5cm each time.

Figure 1: Wheatstone bridge used in Experiment 1.

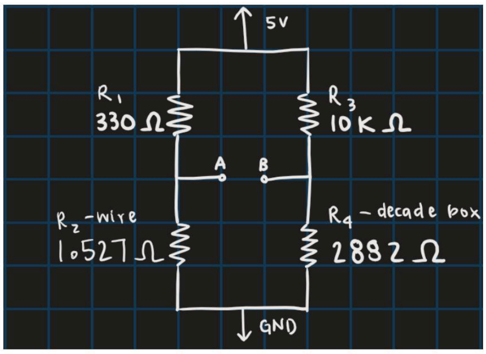

Table 1: Component values for circuit in Figure 1

Component	Figure 1
R_1	10kΩ
R_2	20kΩ
R_3	Ni-Chrome Wire .36mm
R_4	Decade Box

First R_1 was connected to 5v. Next the Ni-Chrome wire was attached to R_1 and ground. R_3 was then connected to 5v and R_4 (the decade box). R_4 is connected to ground. Voltage was measured across a-b and the decade box (R_4) was adjusted to get the voltage as close to 0 as possible. Multiple measurements were taken at various distances of Ni-Chrome wire to see the error.

Question assigned to the following page: 1

Procedure - Experiment 2

The circuit in figure 2 was built using the components listed in table 2. The voltage was measured from B to A. The voltage was measured at various light levels.

Figure 2: Wheatstone bridge used in Experiment 2.

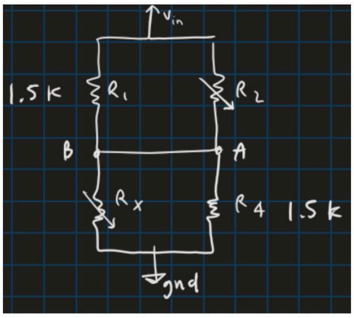

Table 2: Component values for circuit in Figure 1

Component	Figure 2
R_1	1.5k
R_2	LDR1
Rx	LDR2
R4	1.5

First R_1 was connected to 5v and a LDR. That LDR was connected to ground. A different LDR was connected to 5v. A 1.5k resistor (R_4) was connected to the second LDR and ground. Voltage was measured across B – A.

Question assigned to the following page: 2

Results - Experiment 1

Table 3: Resistance from Ni-Chrome wire obtained from the wheatstone bridge

Distance (cm)	Resistance (Ω)
25	2.5
20	2.036
0.15	1.527
0.1	1.018
0.05	0.509

The resistance is obtained by multiplying the distance of wire used by the constant 10.18. The constant 10.18 is the amount of ohms/meter for Ni-Chrome wire with a radius of .36mm. As the distance decreased, the resistance decreased. This was expected since resistance of this wire is found by multiplying the constant by the distance used.

Table 4: Resistance from Ni-Chrome wire measured by multimeter

Distance (m)	Resistance (Ω)
0.05	0.53
0.1	0.944
0.15	1.337
0.2	1.757
0.25	2.145
0.3	2.551
0.35	2.963
0.4	3.362

The resistance that was obtained from using the wheatstone bridge was very similar to the resistance obtained from the multimeter in table 4. This verifies that the multimeter is correct since wheatstone bridges are known to be more precise. The percent error between the two was below ten percent for most values. There is error because it is difficult to get exact distance and the difference in voltage between a and b was not perfectly zero.

Commented [A1]: Measured data is plotted as points, trendline/ theoretical/dense data can be plotted as lines.

Question assigned to the following page: 2

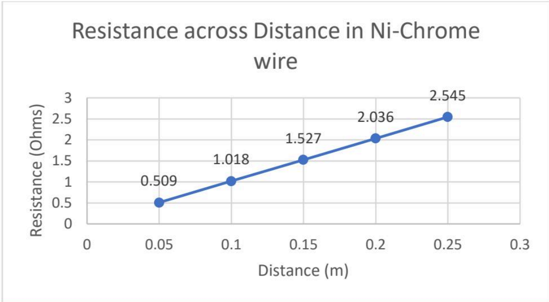

Figure 1: Resistance measured in 5 cm increments (error bars too small to be seen)

Commented [A2]: Axis is labelled and has units.

Commented [A3]: Date and time visible.

Commented [A4]: Horizontal and vertical scales visible

Question assigned to the following page: 2

Results - Experiment 2

Table 5: Voltage across the wheatstone bridge at various light levels

Light Level	Voltage
ambient	90mV
dark	-3.8V
light	2.56V

The voltage at different light levels is highest when it is light and lowest when it is dark. It is almost zero at ambient light. This means that when the light is high there is more a higher potential voltage in B than A since the voltage was measured with respect to A (V_b - V_a). This also means that at darker light levels the potential is higher in A than B. The voltages through A and B are about the same when the light level is not bright or dark. This makes a comparator since the circuit compares the voltages at A and B.

Question assigned to the following page: 3

Procedure – Bonus Experiment

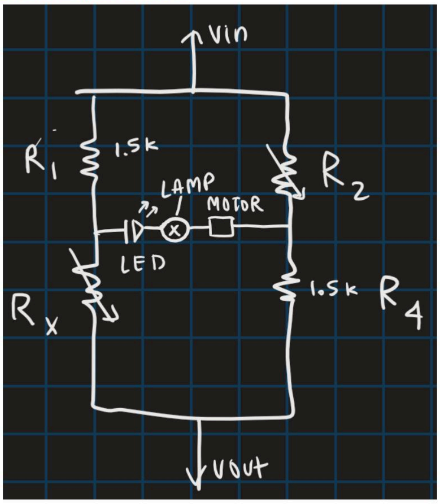

Figure 4: Using the same circuit as Experiment 2 and adding a motor, lamp, and LED; this circuit drives the load when there is light

The circuit was set up exactly like experiment 2 was, except an LED, lamp, and motor were added in series between A and B.

Table 6: Component values for circuit in Figure 1

Component	Figure 5
R_1	1.5k
R_2	LDR1
Rx	LDR2
R4	1.5
LED	Red LED
LAMP	Lamp
MOTOR	5v Wheel Motor

The results matched what I expected. The motor ran when it became light and did not run at any other time. I could improve it by letting the motor run backwards when it was dark, but I don't see a purpose for this right now. This circuit was useful because when it gets light the motor spins. Suppose you were in a zombie apocalypse where the zombies were motion sensitive and only moved at night. You would want your car to only drive during the times that zombies were not active so that it would not get hurt. The lights are indicators of your car running.