BE LAB TASK # 02

NAME: SHAHMEER KHAN.

STUDENT ID: 12113.

Topic: OHM'S LAW.

TASK:

Calculations/Observations:

Objectives:

1) Determine the Ohmic value and tolerance of resistors, using the color code.
2) Measure the resistance, using ohmmeter.
3) Calculate current flow through resistors using Ohm's Law.
4) Measure current flow through resistors and demonstrate the relationship of current to voltage and resistance.

1) Objective A:

Q, Determine the Ohmic value and tolerance of resistors, using the color code.

Given 4 Resistors are with different colors on each of them:

R1; Red, Green, Brown, Gold.

R2; Green, Black, Brown, Silver.

R3; Violet, Green, Brown, Silver.

R4; Brown, Black, Red, Gold.

****R1;***

Red, Green, Brown, Gold.

Red=2.

Green=5.

Brown=x10.

Gold= - + 5%.

Calculation:

=> 25x10=250.

=> 5% of 250=(5x250)/100=12.5.

=>250 OHMS - + 12.5 OHMS

OR;

=>Range (237.5-262.5 OHMS)

***R2;**

Green, Black, Brown, Silver.

Green=5.

Black=0.

Brown=10.

Silver= - + 10%.

Calculation:

=>50x10=500.

=>10% of 500=(10x500)/100=50.

=>500 OHMS - + 50 OHMS

OR;

=>RANGE(450-550 OHMS)

***R3;**

Violet, Green, Brown, Silver.

Violet=7.

Green=5.

Brown=10.

Silver=10%.

Calculation:

=>75x10=750.

=>10% of 750= (10x750)/100=75.

=>750 OHMS - + 75 OHMS

OR;

=>Range(675-825 OHMS).

***R4;**

Brown, Black, Red, Gold.

Brown=1.

Black=0.

Red=100.

Gold=5%.

Calculation:

=>10x100=1000.

=>5% of 1000= (5x1000)/100=50.

=>1000 OHMS - + 50 OHMS

OR;

=>Range(950-1050 OHMS).

2) Objective B:

Q, Measure the resistance, using ohmmeter.

Conditions Given By Sir;

R1<R2<R3<R4.

Value of the four resistors are:

R1=250 OHMS - + 12.5 OHMS (5% Tolerance).

R2=500 OHMS - + 50 OHMS (10% Tolerance).

R3=750 OHMS - + 75 OHMS (10% Tolerance).

R4=1000 OHMS - + 50 OHMS (5% Tolerance).

In the above table, the “indicated values” and “tolerance percentages” calculated in Objective A are written in blue color, while the ‘Measured Values’ in Objective B are written in brown color.

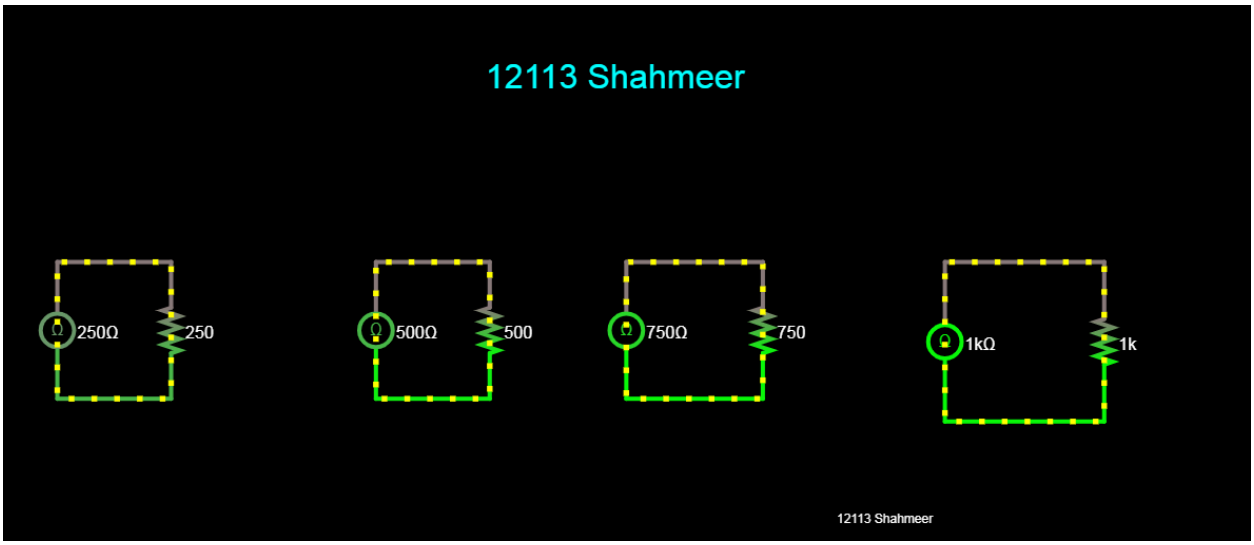
QUESTION;

Are your measured Resistance value the same as the indicated values?

Explain your answer.

Ans. Using the Online Simulator, yes, my measured values for resistance are same as the Indicated values above. This is because using the Online Simulator reduces the room for resistance tolerance percentage. While doing work in Circuits in Lab, the measured values may differ because of the tolerance percentage.

OBJECTIVE B SCREENSHOT;



3) Objective C:

Q, Calculating the current flowing through Resistor R1, using Ohm's law while keeping the Voltage constant to a value of 10 volts.

Ohm's Law;

V = IxR

or

I = V/R

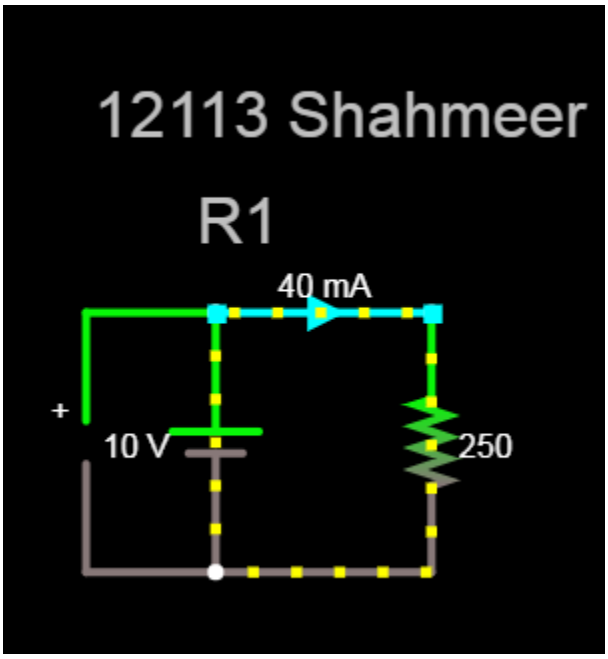
While V = 10.

I_{R1} = 10/250 = 0.04 A

0.04 is the value of current in Amperes. To change the output value to milli amperes. Multiply the output value to 1000.

0.04 amp x 1000 = 40 mAdc.

OBJECTIVE C SCREENSHOT;



RESISTOR	COLOR CODE (COLORS)	INDICATED VALUE (OHMS)	TOLERANCE (PERCENT)	MEASURED VALUE (OHMS)	CALCULATED VALUE (OHMS)
R1	RED, GREEN, BROWN, GOLD.	250	5	250	250
R2	GREEN, BLACK, BROWN, SILVER.	500	10	500	500
R3	VIOLET, GREEN, BROWN, SILVER.	750	10	750	750
R4	BROWN, BLACK, RED, GOLD.	1000	5	1000	1000

4) Objective D:

Q, Measure current flow through resistors and demonstrate the relationship of current to voltage and resistance.

Ans.

$I_{R2} = V/R_2$

Where V= 10

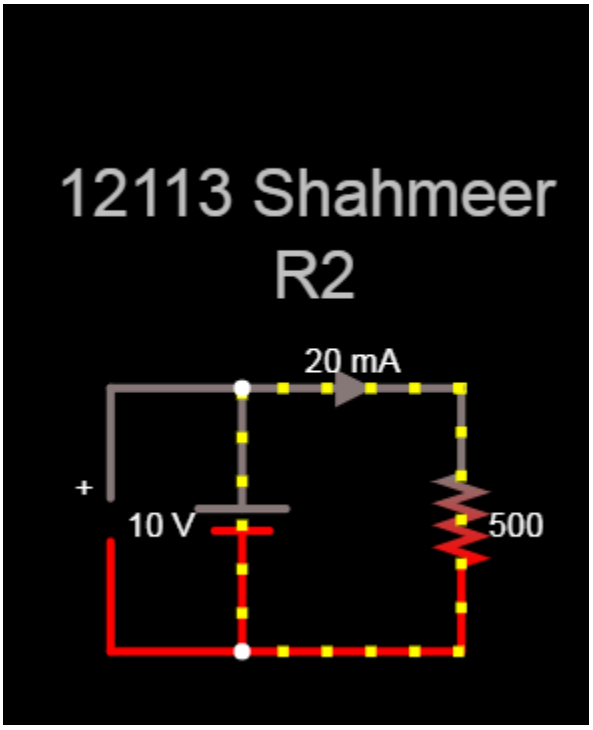
R2 as written above has a value of 500 ohm.

I_{R2} = 10/500 = 0.02 amperes.

To convert amperes to milli-amperes

0.02 x 1000 = 20 mADC.

OBJECTIVE D SCREENSHOT;



Q. Compare the two current values, Are they in agreement ?

Ans. Yes.

Q. Resistor R1 has less resistance than R2. Is the current flow through resistor R1 higher or lower than that measured through Resistor R2 ?

Ans. Using ohm's law I = V/R. We can see that the relation between current and resistance is inversely proportional. Hence whenever the resistance will rise, the current flow will decrease and vice versa.

Resistor R1 has less resistance compared to the Resistor R2 means that more current will flow through R1.

Remove resistor R1 and connect Resistor R3 in its place. Adjust power source to 10 Vdc and measure current flow.

$I_{R3} = V/R_3$

Where V= 10

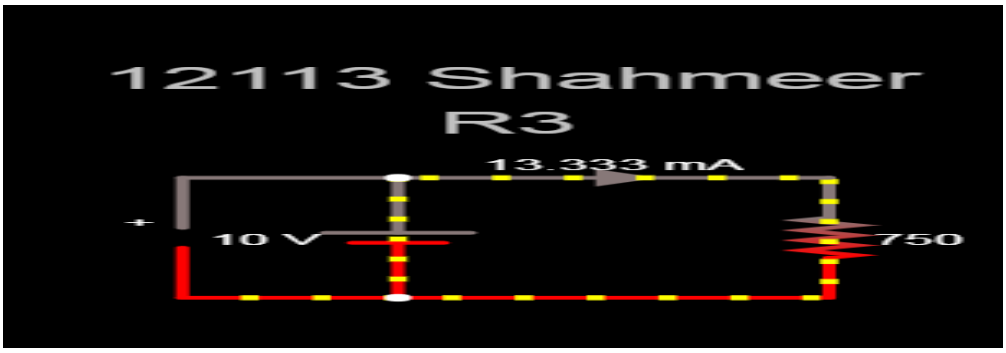
R3 = 750 ohm.

I_{R2} = 10/750 = 0.0133 amperes.

To convert amperes to milli-amperes;

0.0133 x 1000 = 13.3 mADC.

<u>Screenshot;</u>



Q, Does R3 have more or less resistance than Resistor R1 ?

Ans. More.

Q, Is more or less current flowing through resistor R3 than flowed through R1 ?

Ans. Less.

Substitute resistor R4 for Resistor R3 in the circuit. Adjust power source to 10 Vdc and measure current flow.

$I_{R4} = V/R_4$

Where V= 10

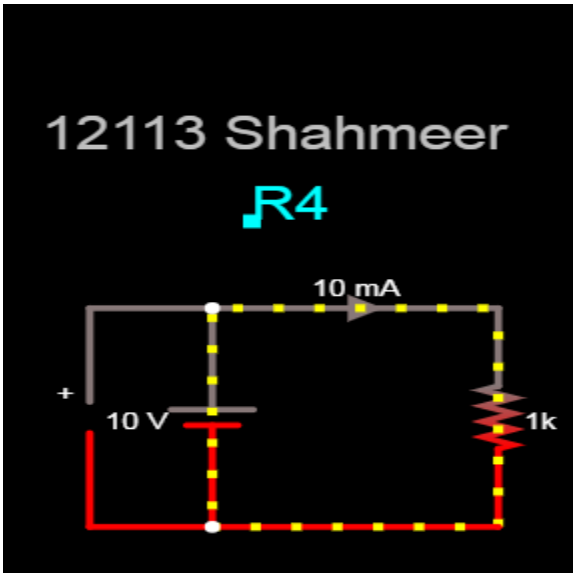
R3 = 1000 ohm.

I_{R2} = 10/1000 = 0.01 amperes.

To convert amperes to milli-amperes

0.01 x 1000 = 10 mAdc.

<u>Screenshot;</u>



Q, Is more or less current flowing through resistor R4 compared to R3?

Ans. Less.

Q, What conclusion regarding the relationship of current to resistance can you draw from Exercise Procedure above ?

Ans. After the current and resistance exercise above, we come to a conclusion that the relationship between current and resistance is always inversely proportional as stated by ohm's law and further verified by the exercise above.

Q, Calculate the resistance of resistor R1 through R4. Use the current values measured in Exercise Procedure above and a source voltage of 10Vdc.

Current through R1 => I_{R1} = 40mA or 0.04 Ampere

Using Ohm's Law i.e: V = IR or R = V/I

Where voltage value is fixed to V = 10 v.

$R_1 = V/I_1$

$R_1 = 10/0.04$

$R_1 = 250$ ohms

Current through R2 => I_{R2} = 20mA or 0.02 Ampere

Using Ohm's Law i.e: V = IR or R = V/I

Where voltage value is fixed to V = 10 v.

$R_2 = V/I_2$

$R_2 = 10/0.02$

$R_2 = 500$ ohms

Current through R3 => I_{R3} = 13.33 mA or 0.013 Ampere

Using Ohm's Law i.e: V = IR or R = V/I

Where voltage value is fixed to V = 10 v.

$R_3 = V/I_3$

$R_3 = 10/0.013$

$R_3 = 750$ ohms

Current through R4 => I_{R4} = 10mA or 0.01 Ampere

Using Ohm's Law i.e: V = IR or R = V/I

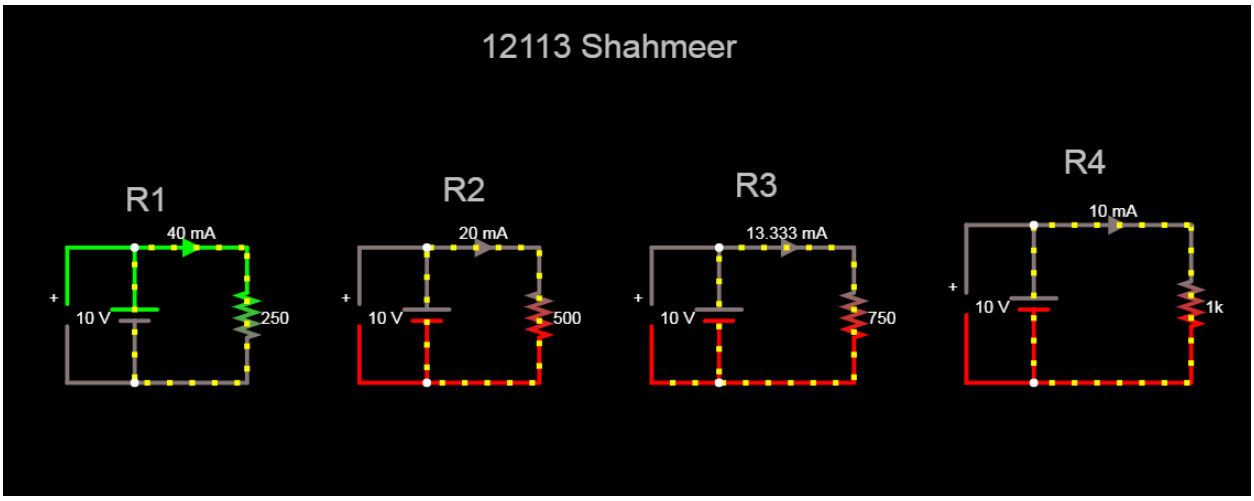
Where voltage value is fixed to V = 10 v.

$R_4 = V/I_4$

$R_4 = 10/0.01$

$R_4 = 1000$ ohms

Screenshot;



Q, How do you account for the variations among the three values ?

Ans. There can be several reasons for the distortions among these three values of resistance above i.e; Indicated, measured and calculated values.

While measuring the resistances, there are chances for instrument errors. The apparatus we use isn't always perfect and so it happens that there are chances for Scale or Zero Error on the Ammeter and Ohmmeter we use for measurement. Other reasons can be that the resistors we use are not completely upto their labelled values. The voltage provided by the power source (battery) can also differ and batteries wear down with time.

As for the errors in Calculated values, there can be Human Error or Calculation error. Recurring values such as 0.01333 can cause the results to be different than expected.

Remove resistor R4 and connect resistor R2 back into the circuit.

Adjust the power source to 20Vdc and measure current flow.

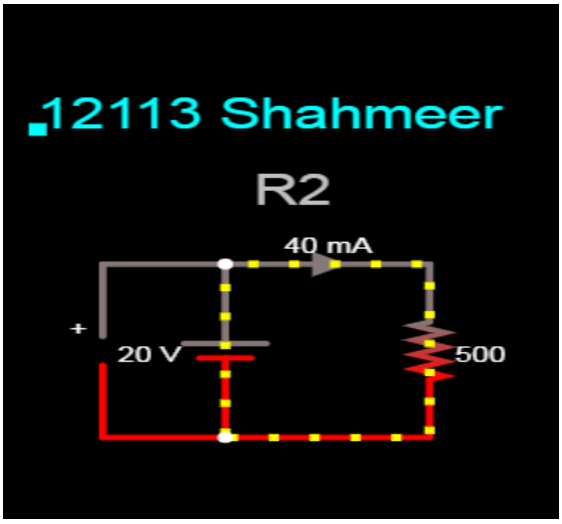
While V = 20 Vdc and R = 500 ohms.

I_{R2} = 20/500 = 0.04 A

To change the output value to milliamperes. We multiply the output value to 1000.

0.04 amp x 1000 = 40 mAdc.

<u>Screenshot;</u>



Q, Is current flow more or less than that measured through resistor R2 with a voltage source of 10 Vdc in above steps ?

Ans. More.

Reduce the voltage to 15Vdc and measure current flow.

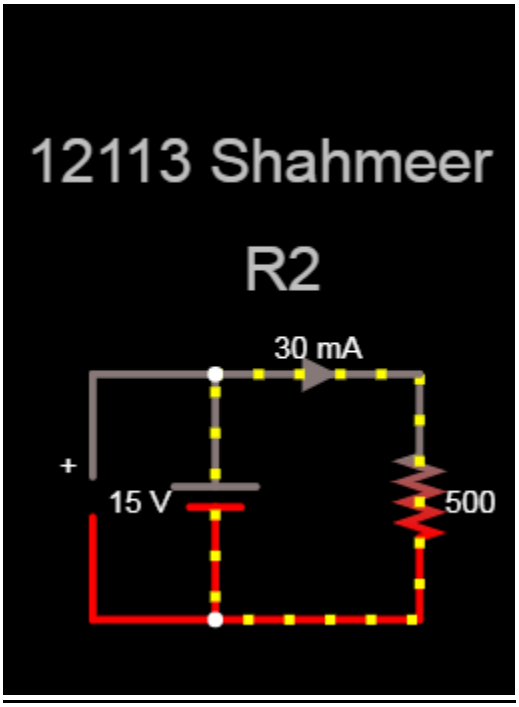
While V = 15 Vdc and R = 500 ohms

I_{R2} = 15/500 = 0.03 A

To change the output value to milliamperes. We multiply the output value to 1000.

0.03 amp x 1000 = 30 mAdc.

Screenshot;



Q, In this case the resistance remained same but the voltage was reduced.Did the current flow increase or decrease when the source voltage was reduced to 15Vdc?

Ans. Decrease.

Q, What conclusion regarding the relationship of current to voltage can you draw from the above procedure ?

Ans. From the above procedure we can draw to the conclusion that the relationship between Current and Voltage is always directly proportional. If the Voltage increases the Current also increases and vice versa. Considering that we're keeping the factor of resistance as a constant.

*) Link:

https://tinyurl.com/y26o37us