

Resistance Lab

Vincent Edwards, Ali Mortada, Andrew Bringas

Mt. San Antonio College, Physics 4B, CRN 42240
April 26, 2023

1. Purpose

For part 1, the goal was to examine how material, cross-sectional area, and length impact resistance. For each coil of wire, resistance was determined in three ways: based on measurements of voltage and current; based on the resistance reading from the multimeter; and based on the dimensions of the wires and the resistivity of the material. In addition, the results of the three methods of determining resistance were compared.

2. Results

Table 1 contains the properties of the resistance coils used in part 1. ρ is the resistivity of the material. L is the length of the coil of wire. D is the diameter of the wire.

Table 1. Resistance Coils

Coil	Material	ρ (Ω m)	L (cm)	D (cm)
1	Nickel-Silver	44×10^{-8}	40	0.0254
2	Nickel-Silver	44×10^{-8}	80	0.0254
3	Nickel-Silver	44×10^{-8}	120	0.0254
4	Nickel-Silver	44×10^{-8}	160	0.0254
5	Nickel-Silver	44×10^{-8}	200	0.0254
6	Nickel-Silver	44×10^{-8}	200	0.0320
7	Copper	1.72×10^{-8}	2000	0.0254

Table 2 contains the measurements made during part 1. ΔV is the voltage across the resistance coil. I is the current through the resistance coil. $R_m + r$ is the resistance, measured using the multimeter, of the resistance coil and the wires connecting it to the multimeter. r is the resistance, measured using the multimeter, of just the wires used for connecting the multimeter to the resistance coil.

Table 2. Part 1 Measurements

Note: r , the resistance of the two wires connected to the multimeter, was measured to be $(0.1 \pm 0.1) \Omega$.

Trial	ΔV (V)	I (mA)	$R_m + r$ (Ω)
1	0.214 ± 0.001	55.07 ± 0.05	4.0 ± 0.1
2	0.400 ± 0.001	49.72 ± 0.01	8.3 ± 0.1
3	0.536 ± 0.001	44.53 ± 0.02	12.0 ± 0.1
4	0.662 ± 0.001	41.70 ± 0.01	15.9 ± 0.1
5	0.772 ± 0.001	38.19 ± 0.01	20.3 ± 0.1
6	0.538 ± 0.001	45.44 ± 0.01	11.7 ± 0.1
7	0.357 ± 0.001	51.31 ± 0.01	7.3 ± 0.1

3. Uncertainty

4. Conclusion

5. Citations

- [1] Karen Schnurbusch, *Physics 4B Lab Book*, Mt. San Antonio College, 2023, pp. 65-70.
- [2] Karen Schnurbusch, *Physics 4B Equations*, Mt. San Antonio College, 2023, pp. 4, 10.