Playdough Resistivity Lab

**Background**: The resistance of a current carrying cylinder (normally a wire) can be calculated by the following equation:

$$R=\frac{ρL}{A}$$

* R is the electrical resistance of the material measured in Ohms (Ω)
* Ρ is the resistivity of the material due to the electron affinity and density of the molecules measured in Ωm
* L is the length of the material measured in m
* A is the cross sectional area of the material measured in m2

Today you will calculate the resistivity of PlaydohTM

**Setup**: You will be rolling playdough into cylinders, varying the length and diameter of the cylinder and sending a voltage through it and measuring the resulting current through the circuit.

Draw the Circuit diagram of the lab below:

**Data**:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Trial | Voltage (V) | Current (A) | Length (cm) | Diameter (cm) |
| 1 |  |  |  |  |
| 2 |  |  |  |  |
| 3 |  |  |  |  |
| 4 |  |  |  |  |
| 5 |  |  |  |  |
| 6 |  |  |  |  |
| 7 |  |  |  |  |
| 8 |  |  |  |  |
| 9 |  |  |  |  |
| 10 |  |  |  |  |

**Analysis**:

With the variables measured: V, I, L and d, create an equation for the resistivity of the playdough:

I want you to determine the resistivity graphically. What looking above, what should go on your axes?

Hop onto Desmos or Excel and create the graph. Print it out for each group member and staple the graph to this paper.

What is your resistivity?

**Questions**:

1. A wire with length L and diameter d has a resistance of R. A new wire made of a material that has twice the resistivity of the first and a length of 4L and a diameter of 3d. What is the resistance of the new wire in terms of R?
2. Four different resistors are created from the same piece of carbon. The length and diameter of each resistor is shown. Rank the resistance of the four resistors.

