

2. (12 points, suggested time 25 minutes)

A group of students prepare a large batch of conductive dough (a soft substance that can conduct electricity) and then mold the dough into several cylinders with various cross-sectional areas A and lengths ℓ . Each student applies a potential difference ΔV across the ends of a dough cylinder and determines the resistance R of the cylinder. The results of their experiments are shown in the table below.

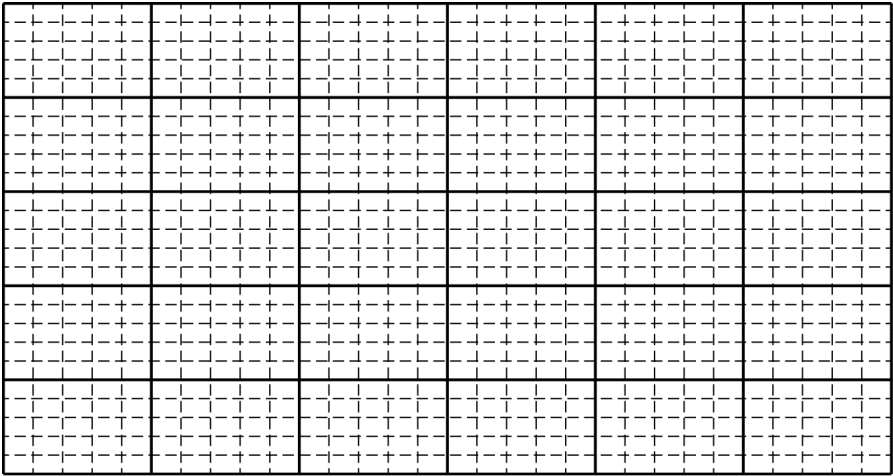
Dough Cylinder	$A \text{ (m}^2\text{)}$	$\ell \text{ (m)}$	$\Delta V \text{ (V)}$	$R \text{ (}\Omega\text{)}$		
1	0.00049	0.030	1.02	23.6		
2	0.00049	0.050	2.34	31.5		
3	0.00053	0.080	3.58	61.2		
4	0.00057	0.150	6.21	105		

(a) The students want to determine the resistivity of the dough cylinders.

i. Indicate below which quantities could be graphed to determine a value for the resistivity of the dough cylinders. You may use the remaining columns in the table above, as needed, to record any quantities (including units) that are not already in the table.

Vertical Axis: _____ Horizontal Axis: _____

ii. On the grid below, plot the appropriate quantities to determine the resistivity of the dough cylinders. Clearly scale and label all axes, including units as appropriate.



iii. Use the above graph to estimate a value for the resistivity of the dough cylinders.

(b) Another group of students perform the experiment described in part (a) but shape the dough into long rectangular shapes instead of cylinders. Will this change affect the value of the resistivity determined by the second group of students?

____ Yes ____ No

Briefly justify your reasoning.

(c) Describe an experimental procedure to determine whether or not the resistivity of the dough cylinders depends on the temperature of the dough. Give enough detail so that another student could replicate the experiment. As needed, include a diagram of the experimental setup. Assume equipment usually found in a school physics laboratory is available.