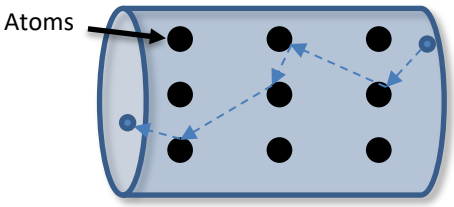
CONCEPT: RESISTANCE AND OHM'S LAW



- Electrons collide with atoms as they pass through a conductor
  - There is "internal friction" that **resists** current

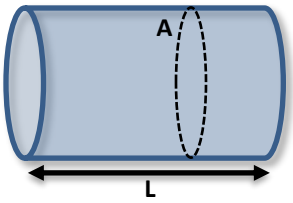
- For a conductor with a voltage V, the CURRENT through it is → $\boldsymbol{i} =$ _____
  - $\boldsymbol{R}$ is called the _____ → Units: OHMS, $\boldsymbol{\Omega}$
  - The larger the R, the **[LARGER | SMALLER]** the i

- OHM'S LAW states:

$\boldsymbol{V} =$ _____

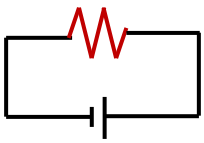
EXAMPLE: A conductor has a voltage of 10V across it, and 6μC of charge flows through it every 1.5 seconds. What is the resistance of this conductor?

CONCEPT: RESISTIVITY & RESISTORS IN CIRCUITS



- A material has an inherent resistance called the RESISTIVITY, **ρ** (UNITS = Ωm)
  - The RESISTANCE of a material is given by → $\boldsymbol{R} =$ _____
  - RESISTIVITY depends *ONLY* upon the material ($\boldsymbol{\rho_{lead}} = \mathbf{2.2\times10^{-7}\ \Omega \cdot m}$)

- A RESISTOR is a circuit element that has some resistance
  - In circuits, always consider wires to have _____ resistance



EXAMPLE: A wire 25.1m long and 6.00 mm in diameter has a resistance of 15.0$\mathrm{m}\Omega$. A potential difference of 23.0 V is applied between the ends. (a) Calculate the resistivity of the wire material. (b) What is the current in the wire?

PRACTICE: RESISTANCE OF AN UNKNOWN RESISTOR

A resistor has a current through it of 5A**.** If the EMF across the resistor is 10V, what is the resistance of this resistor?

EXAMPLE: CURRENT THROUGH UNKNOWN RESISTOR

A cylindrical resistor is made of lead, who's resistivity is 2.2×10^{-7} Ωm, with a radius of 5 mm and a length of 2 cm**.** If the EMF across this resistor is 5V, what is the current through the resistor?

PRACTICE: CURRENT THROUGH RESISTORS

Two resistors are made of the same material, one twice as long as the other**.** If the current through the shorter resistor is 5 A, what is the current through the longer resistor if they both have the same potential difference and cross-sectional area?