Physics 200

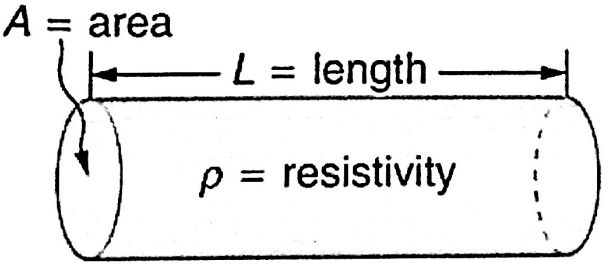
Name: _____

Notes: Chapter Sections 20.3, 20.4, and 21.1

Notes – 20.3 Resistance and Resistivity

1. The resistance of an object depends on its shape/size and the material of which it is composed.

2. $R = \frac{\rho L}{A}$ units Ωm



3. Resistivity ρ is an intrinsic property of the material, independent of its shape or size.

4. In home wiring, currents are limited and minimum wire thicknesses are specified because, as current and resistance increase, more heat (thermal energy) is produced in the wires,

4.5 Example Problem: What is the resistance of a 20.0-m-long piece of 12-gauge copper wire having a 2.053-mm diameter? ($\rho_{Cu} = 1.72 \times 10^{-8}\ \Omega \cdot m$)

$$R = \frac{1.72\times10^{-8}\ \Omega m\ (20m)}{\pi\left(\frac{2.053\times10^{-3}m}{2}\right)^2} = \boxed{0.104\Omega}$$

Notes – 20.4 Electric Power and Energy

5. Power (P) is the rate of energy use or energy conversion.

6. Voltage (electric potential) can be expressed as J/C and Current (Amperes) can be expressed as C/s Therefore, P= VI

7. The unit for power is Watt (W).

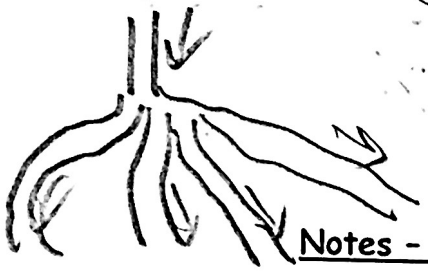
8. 1 W = 1 $\frac{J}{s}$

9. Given that V = IR, alternate expressions for power include:

$P = IV$ $\quad P = \frac{V^2}{R}$ $\quad P = I^2R$

(10)

10. Power companies do not charge for power, they charge for energy, which is sold to you in units called kilowatt-hours. 1kWh = 3.6×10^6 J.



$\left(1{,}000 \frac{J}{s}\right)(3{,}600 s) =$ 3.6 million J