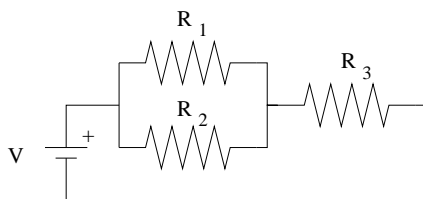


Practice Exam # 2 – Physics 152

March 4, 2009

Be sure to include pictures, coordinate systems, etc. where reasonable. Be explicit about what arguments you are using when determining a physical quantity, (e.g. \vec{E}).

1. In the first section of this course we dealt with charges at fixed locations, the forces on them and their potential energy (and by extension the electric fields and electric potentials that those charges experienced). In this second part of the course we have been interested in electric currents. Just what is an electric current? In answering this question please draw an example circuit and address the following:
 - (a) How does current relate to charge?
 - (b) Where can you find current?
 - (c) What causes a current to exist?
 - (d) What causes a current to stop existing?
2. Explain why the net change in voltage around a circuit loop is always zero.
3. In the following circuit $V = 10V$, $R_1 = 30\Omega$, $R_2 = 20k\Omega$, $R_3 = 100\Omega$.



Find

- (a) The equivalent resistance.
- (b) The current leaving the battery.
- (c) The current through R_2 .
- (d) Would removing R_2 from the circuit increase or decrease the current through R_3 ? Justify your answer using physical reasoning instead of a calculation.

4. Use Gauss' law to calculate the capacitance of a pair of concentric cylinders of radii a and b .
5. A circuit contains a capacitor, $C = 1\mu F$, and a resistor, $R = 1M\Omega$, in series. At time $t = 0$ the capacitor has a potential across it of $V_c(t) = 5Volts$.
 - (a) What is the charge on the capacitor at $t = 0$?
 - (b) What is $V_c(3s)$?
 - (c) What is the power dissipated by the resistor at $t = 3s$?
 - (d) What is the energy stored in the capacitor at $t = 3s$?