Phy114: Electromagnetism, Waves and Radiation for the Sports Science
Homework Problems
Set #4: Due Wednesday, February 28, 2011

Note: Students are encouraged to work together and discuss the problems. However, each student must arrive at her/his own final answers. Show all your work. Simply copied homework will result in zero.

1. (5 points) Sparks between charged objects, such as between hair and a comb on a dry day, can move a charge of about $2.5 \times 10^{-9}$ C. The spark may last only about 0.9 µs. What current in amperes flows under these circumstances?

2. (5 points) A heart defibrillator can sometimes restore a normal heartbeat to a heart attack victim. Suppose the defibrillator passes 9.0 A of current through the heart for 0.017 s. How much charge passes through the heart in this event?

3. (10 points) Suppose a battery used to power a clock wears out after moving 10,000 C of charge through the clock. How long did the clock run off the battery if it used 0.60 x $10^{-3}$ A of current?

4. (10 points) A 500-W halogen light bulb has an average lifetime of 2000 h. How many electrons move through the bulb in its life? The current that passes through the halogen bulb is 3.50 A.

5. (10 points) When starting a car engine, a 12-V battery supplies 220 A of current for 3 s. (a) Calculate the charge in coulomb moved in that time. (b) Calculate the energy in joules expended by the battery.