Week 1 (Beginning Sept 6)

Prob2211: Antiparticles have the same mass as their counterpart particles but have an opposite charge. For example, the antiparticle of an electron, e^- is the positron, e^+. Most antiparticles are denoted by a bar over the particle, so $\overline{p}$ is the antiparticle of the proton, and it has a charge of -e. Which of the following reactions satisfy the conservation of charge:

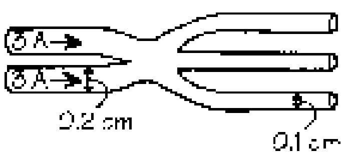
(a) $\overline{p} + p \rightarrow e^+ + e^- + e^+ + e^- + 2n$;

(b) $e^+ + e^- \rightarrow 2p + n + 2\gamma$;

(c) $e^+ + e^- \rightarrow e^+ + e^- + \overline{p} + p + 2\gamma$;

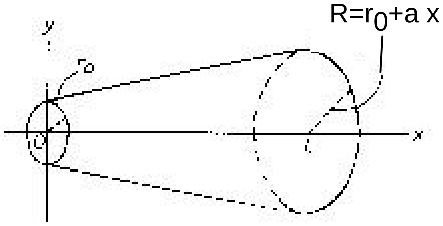
(d) $n + p \rightarrow$ e- + $\overline{p}$ + p

Prob2719. Two parallel metal wires of diameter 0.2 cm and a charge carrier density = ne = 7×10^{22} electrons/cm^3 carry a current of 3 A each. The wires join and then split into three identical but separate wires, each with a radius one-half that of the original wire (see fig. below). All the wires are made of the same material. What are the drift speeds in both the larger and smaller wires? Can you explain the difference in speeds in terms of the speeds of water flow in pipes?



Prob2740. What are the length and the radius of a copper wire (of circular cross section) whose resistance is 2 Ω and whose mass is 1.5 kg?

Prob2768. A piece of brass is machined into a long, tapering cylinder. Its radius is expressed by $r = r_0 + a x$, where a is a constant and x is measured from the narrow end of the tapering cylinder and runs from 0 to L (See fig.). Find an expression for the resistance of this piece.



Prob2761: Buildings have circuit breakers, devices that switch the current off when it exceeds a critical value, to protect the electrical system from damage. One circuit for a building's lights has a 15-A breaker. (a) What is the maximum power that can be delivered by a 110-V line to this circuit? (b) How many light bulbs, each requiring 75 W can this circuit handle?

Prob2766: A wire of resistance "r" is drawn to double its length. Assuming constant voltage and constant volume by how much does power dissipation change ?