Soln 1-7

If by 'slowly drift,' we mean that there is essentially no kinetic energy, then

$$\begin{split} E &= m_{oP}c^{2} + m_{oAP}c^{2} = 2m_{oP}c^{2} = 2(1.67 \times 10^{-27})(3 \times 10^{8})^{2} = 3.006 \times 10^{-10} \text{ J} \\ \text{Energy required to light the bulb for one hour is} \\ E &= Pt = (100 \text{ J/s}) (3600 \text{ sec}) = 3.6 \times 10^{5} \text{ J} \\ N &= (3.6 \times 10^{5} \text{ J}) / (3.006 \times 10^{-10} \text{ J/collision}) = 1.2 \times 10^{15} \text{ collisions} \end{split}$$

This is turn corresponds to 2 picograms of protons and 2 picograms of antiprotons each hour.