

## Homework 6, due 10-30

1. Consider Coulomb scattering of alpha particles off gold nuclei. Determine the alpha particle kinetic energy that corresponds to the two nuclei just touching at zero impact parameter.
2. The explosion of supernova 1987A released  $N \sim 10^{57}$  anti-neutrinos, some of which were detected by the Kamiokande detector. The star that exploded was located at a distance of  $R \simeq 140,000$  light years from the earth. The detector contained 2000 tons of water. The particles recorded were positrons produced in the reaction  $\bar{\nu}_e p \rightarrow n e^+$  of anti-neutrinos on the protons in  $H_2O$ . The cross section of this reaction at the mean anti-neutrino energy of 15 MeV is  $\sigma = 2 \cdot 10^{-45} m^2$ . How many events do you expect to be recorded?