# 1 Practice Nuclear Physics

**1. Rutherford scattering**

*Based on Q13M.2 from Unit Q 3rd Edition*

Estimate the minimum kinetic energy that an alpha particle must have to get stuck to a gold nucleus? Give your answer in both joules and electron volts.

(Note: The atomic number of gold is $Z = 79$, the mass number of gold is $A = 197$. An alpha particle consists of 2 protons and 2 neutrons. This question can be solved using knowledge of the Coulomb potential for a system of two point charges).

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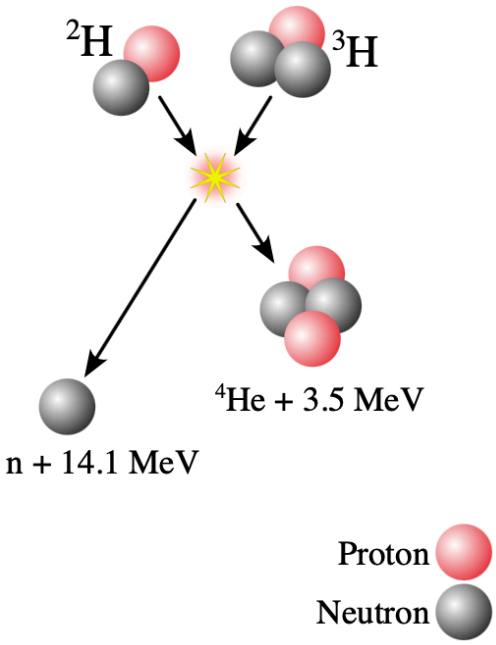
**2. Fusion**




(a) The figure shows the fusion reaction between tritium and deuterium. How much electrostatic potential energy will tritium and deuterium have just before the strong force overwhelms the electrostatic repulsion and sticks them together? You can assume that tritium and deuterium start to attract each other via the strong force when the center-to-center distance is about 10 fm.

(b) Fusion is happening in a gas of tritium and deuterium. Estimate the temperature of the gas. Give your answer in kelvin. (Use the equipartition theorem to help you solve this: the average kinetic energy of a gas atom is $(3/2)k_BT$, where $k_B$ is the Boltzmann constant).