A beam of deuterons ($^2\text{H}$) with kinetic energy 1.808 MeV is incident on a stationary target also made of deuterons. The collisions of the beam with the target produce both protons ($^1\text{H}$) and tritons ($^3\text{H}$). Protons emerging from the reaction perpendicular to the incident beam in the laboratory frame are measured to have a kinetic energy of 3.467 MeV. You may assume that the dynamics occurs in the $xy$-plane in the laboratory frame.

(1) We can compute the velocity of a particle from its kinetic energy by non-relativistic mechanics or by relativistic mechanics. Which is larger? Demonstrate the inequality between the two estimates analytically or geometrically.

(2) If the speed of the particle is 3% of the speed of light, calculate the relative error of the non-relativistic estimate.

(3) What is the speed of the proton produced in the above scattering experiment?

Now we wish to calculate the triton mass within an error of 0.01%.

(4) Write down the conservation laws for the collision of pointlike particles in the $xy$-plane.

(5) Find the triton mass, knowing the proton and deuteron masses are:

$m_p = 938.768 \text{ MeV/} c^2$,

$m_d = 1876.09 \text{ MeV/} c^2$,

where $c$ is the speed of light.