

A3) A nucleus of rest mass M_1 moving at high speed with kinetic energy K_1 collides with a nucleus of rest mass M_2 at rest. A nuclear reaction occurs according to the scheme

nucleus 1 + nucleus 2 \rightarrow nucleus 3 + nucleus 4.

The rest masses of nuclei 3 and 4 are M_3 and M_4 .

The rest masses are related by

$$(M_3 + M_4)c^2 = (M_1 + M_2)c^2 + Q,$$

where $Q > 0$.

(10 points) Find the minimum value of K_1 required to make the reaction occur, in terms of M_1 , M_2 , and Q .