Nuclear reactions: introduction

$$A + a \rightarrow B + b$$

Conservation laws: linear momentum, angular momentum, total charge, baryon number, parity, total energy

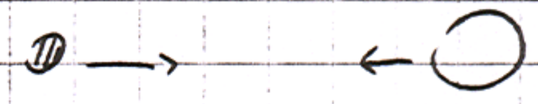
$$Q\text{-value} \equiv (M_A + M_a - M_B - M_b)c^2 = \sum T_f - \sum T_i$$

Reference systems: lab, cm

lab

$$x_{cm} = \frac{M_A x_A + M_a x_a}{M_A + M_a} \qquad v_{cm} = \frac{1}{M_A + M_a} M_a v_a$$

cm



$$v_a^{(cm)} = v_a - v_{cm} = v_a \times \left(1 - \frac{M_a}{M_a + M_A}\right) = v_a \frac{M_A}{M_A + M_a}$$

$$v_A^{(cm)} = -v_{cm} = -\frac{M_a}{M_A + M_a} v_a$$

$$\sum T_i = \frac{1}{2} M_a \frac{M_A^2}{(M_A + M_a)^2} v_a^2 + \frac{1}{2} M_A \frac{M_a^2}{(M_A + M_a)^2} v_a^2 =$$

$$= \frac{1}{2} \frac{M_a M_A^2 + M_A M_a^2}{(M_a + M_A)^2} v_a^2 = \frac{1}{2} \frac{M_a M_A}{M_A + M_a} v_a^2 = \frac{M_A}{M_A + M_a} T_{lab}$$

μ

"

$$\frac{A}{A + a}$$

Def σ $\equiv$ $\frac{\#\ \text{events per unit } t}{\#\ \text{incident particles per unit Surface } t}$