

Energy conversion:

$$1 \text{ eV} = 1.6 \times 10^{-19} \text{ J}$$

For an electron, the rest energy is

$$m_e c^2 = 8.20 \times 10^{-14} \text{ J} = \underline{0.511 \text{ MeV}}$$

For a proton, the rest energy is

$$m_p c^2 = 1.5 \times 10^{-10} \text{ J} = \underline{938 \text{ MeV}}$$

The Law of conservation of mass-energy

If there is interaction between particles

$$E_{\text{before}} = E_{\text{after}}$$

where

$$E_i = \frac{m_i c^2}{\sqrt{1 - u_i^2/c^2}} = \gamma_i m_i c^2$$

↑
rest mass.

$$\left(\sum_{i=1}^n E_i \right)_{\text{before}} = \left(\sum_{j=1}^m E_j \right)_{\text{after}}$$