In addition to the standard Model, commonly produced particles have their own names.

Meson: Bound state of quark-antiquark (Boson)

Baryon: Bound state of three quarks

Pion: Meson made from u, d quarks

Koan: Meson containing an s quark

Hadron: made from strongly interacting particles

Some conserved quantities:

Charge

Baryon number

Lepton number + neutrino oscillations!

Some rules:

no free quarks

no fractional charges
But for conservation

Each quark has \( B = \frac{1}{3} \), antiquarks \( B = -\frac{1}{3} \)

\( \Sigma B = \) constant for all interactions

Examples

\( p \rightarrow \pi^+ + \pi^0 \)

(Uud) pions have \( q \bar{q} \) pairs so \( \Sigma B = 0 \)

\( B = 1 \)

\( 1 \rightarrow 0 + 0 \) not allowed

\( n \rightarrow p + e^- + \nu_e \) allowed

The least massive baryon can't decay.

This is the proton.
Lepton number conservation

Each lepton number is conserved

\[ \Sigma L_e = \text{constant} \]
\[ \Sigma L_u = \text{constant} \]
\[ \Sigma L_\gamma = \text{constant} \]

\[ \pi^- \rightarrow M^- + \bar{\nu}_u + \nu_\gamma \]
\[ \Sigma L_u = 0 \]

\[ \nu \rightarrow \mu + e^- + \bar{\nu}_e \]
\[ \Sigma L_e = 0 \]