

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

Kaon: 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

## Baryon conservation

each quark has  $B = \frac{1}{3}$ , anti quarks  $B = -\frac{1}{3}$

$\sum B = \text{constant}$  for all interactions

### Examples

$$p \rightarrow \pi^+ + \pi^0$$

( $uud$ ) pions have  $q\bar{q}$  pairs so  $\sum B = 0$   
 $B = 1$

$1 \rightarrow 0 + 0$  not allowed

$$n \rightarrow p + e + \bar{\nu}_e \quad \text{allowed}$$

The least massive Baryon can't decay.

This is the proton.

# Lepton number conservation

each Lepton number is conserved

$$\sum L_e = \text{constant}$$

$$\sum L_\mu = \text{constant}$$

$$\sum L_\tau = \text{constant}$$

$$\tau^- \rightarrow \mu^- + \bar{\nu}_\mu + \nu_\tau$$

$\underbrace{\hspace{10em}}$   
 $\sum L_\mu = 0$

$$n \rightarrow p + e^- + \bar{\nu}_e$$

$\underbrace{\hspace{10em}}$   
 $\sum L_e = 0$