

Elementary Particle Physics: Assignment # 4

Due Feb 22 10 am

- 1 Explain why the decay $\eta \rightarrow \pi^+\pi^-$ is forbidden both by strong and electromagnetic interactions while the decay $\eta \rightarrow \pi^+\pi^-\pi^0$ is forbidden by strong interactions but allowed as an electromagnetic decay.
- 2 For the following reactions write the quantum numbers Q, L, B, L_α ($\alpha = e, \mu, \tau$), S (strangeness), C (charm) for all the states and use the conservation of quantum numbers described in class to discuss which processes are forbidden and which are allowed by some of the three types of interactions: strong, electromagnetic or weak and why. For processes allowed by weak interactions discuss the dependence on the assumptions about the neutrinos
 - (a) $p \rightarrow e^+ \pi^0$
 - (b) $\tau^- \rightarrow e^- \mu^+ \mu^-$
 - (c) $\bar{p} p \rightarrow \bar{n} n \pi^+$
 - (d) $\mu^+ \mu^- \rightarrow \nu_\tau \bar{\nu}_\tau$
 - (e) $n n \rightarrow p p e^- e^-$
 - (f) $\Lambda_c^+ \rightarrow \Sigma^+ \pi^0$