

Homework #11: Quarks and Interactions

1. Construct a Feynman diagram for the decay:

$$\Xi^- \rightarrow \Lambda^0 + \pi^-$$

Use this model to explain why this decay does not happen in 10^{-23} seconds.

2. Construct a Feynman diagram for the production reaction

$$p + p \rightarrow p + \Sigma^+ + K^0.$$

From this model, estimate the time that it takes to create the reaction products. Does this result make sense to you? Why or why not?

3. Look up the properties of the particle given the name Ω^- in the table of particles that has a link on the class web page.

a) Find the three most likely decay modes of this particle and the relative frequency at which they occur.

b) Construct Feynman diagrams for these three decay schemes.

4. Construct a Feynman diagram for the weak decay of the μ^+ into a positron. Be sure to explain your reasoning.

5. Draw Feynman diagrams for the following decays:

$$\Xi^0 \rightarrow \Lambda^0 + \pi^0 \tag{1}$$

$$\Sigma^- \rightarrow n + \pi^- \tag{2}$$

$$\Sigma^0 \rightarrow \Lambda^0 + \gamma \tag{3}$$

$$\Sigma^{*-} \rightarrow \Sigma^- + \pi^0 \tag{4}$$

$$\Omega^- \rightarrow \Sigma^0 + \pi^- \tag{5}$$

Compare and contrast these decays and explain their half-lives. If any of them can't happen, show that the Feynman Diagram doesn't work.

6. Ford, Q4.19, p. 86.

Due: Friday, November 20, 2:30 pm