

Physics 135b
Problem set number 10
Due Wednesday, March 17, 2004

- Please turn in to TA's mail box, or my mail box, by 12:00 noon on Wednesday, March 17.
49. Problem 10.14 in text. This is the key to the breaking of CP invariance according to the standard model.
50. Below are listed several processes. For each process, you are asked to determine whether it is a permitted process for each of the weak, electromagnetic, and strong interactions. If it is allowed for a given interaction, draw a simple Feynman graph (carefully label all of the external and internal lines by particle name, but don't worry about the other labels, such as vertex factors, spinors, and momenta). If it is forbidden for an interaction, give at least one compelling reason. If you need to make any assumptions, state them. Note – some of these have plenty of room for thought, so be careful.
- (a) $\tau^- \rightarrow \mu^- \nu_\tau \bar{\nu}_\mu$.
 - (b) $H^0 \rightarrow b\bar{b}$, where H^0 is the Higgs particle.
 - (c) $\rho^0 \rightarrow \pi^0 \pi^0$.
 - (d) $p \rightarrow \pi^0 e^+$.
 - (e) $D^0 \rightarrow \bar{D}^0$.
 - (f) $\pi^- p \rightarrow K^+ K^- n$.
51. Some W physics: Predict the branching fraction for $W \rightarrow$ hadrons, stating any assumptions you make. Compare with experiment.
52. (Worth two problems). In class made a list of all of the independent parameters in the “standard model” for the strong and electroweak interactions. Now give the current measured values of the parameters, with uncertainties. Describe very briefly how each parameter has been measured. You may decide to quote a slightly different (but equivalent) set of parameters, if you find it convenient. You are likely to find the following URL helpful:
<http://pdg.lbl.gov/>