PHYS 733: Elementary Particle Physics **Spring 2018**

Homework #2 **Due Date: 2/22/18**

---

1. If a low-energy π^- stops in deuterium, it can be captured in an atomic orbit (s-wave) and then interact with the nucleus. Are the following reactions allowed? Justify your answers fully. The deuteron is $J^P = 1^+$.
   a. $\pi^- d \to \pi^0 nn$
   b. $\pi^- d \to \gamma nn$

2. Are the following decays forbidden by either P or C? Justify. The η (m=549 MeV) is a pseudoscalar meson ($J^{PC}=0^{-+}$).
   a. $\eta \to 3\pi^0$
   b. $\eta \to 3\gamma$
   c. $\eta \to 2\pi^0$
   d. $\eta \to 2\gamma$
   e. $\eta \to \pi^0\gamma$

3. The ρ is a vector meson ($J^{PC}=1^{--}$). Are the following decays allowed? Justify.
   a. $\rho \to \pi^+\pi^-$
   b. $\rho \to \pi^0\pi^0$
   c. $\rho \to e^+e^-$

4. **Problem 3.5**

5. **Problem 3.6**

6. **Problem 3.8**