**PHYS 633: Elementary Particle Physics Fall 2012**

**Homework #2 Due Date: 9/20/12**

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 JP = 1+.
	1. $π^{-}d\rightarrow π^{0}nn$
	2. $π^{-}d\rightarrow γnn$
2. Are the following decays forbidden by either P or C? Justify. The η (m=549 MeV) is a pseudoscalar meson (JPC=0-+).
	1. $η\rightarrow 3π^{0}$
	2. $η\rightarrow 3γ$
	3. $η\rightarrow 2π^{0}$
	4. $η\rightarrow 2γ$
	5. $η\rightarrow π^{0}γ$
3. The ρ is a vector meson (JPC=1--). Are the following decays allowed? Justify.
	1. $ρ\rightarrow π^{+}π^{-}$
	2. $ρ\rightarrow π^{0}π^{0}$
	3. $ρ\rightarrow e^{+}e^{-}$
4. **Problem 3.5**
5. **Problem 3.6**
6. **Problem 3.8**