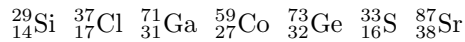


Physics 330, Spring 2009
HW#12 30 points
Due Friday, May 8.

1. **11-38 (5 points)** Use the shell model to predict the orbital and total angular momentum of these nuclei:



2. **11-59(5 points)** Compute the total energy released in the following set of fusion reactions. This is the proton-proton cycle, the primary source of the sun's energy:



3. **11-63(5 points)** A bone claimed to be 10,000 years old contains 15 g of Carbon. What should the decay rate of ${}^{14}\text{C}$ be?

4. **12-11(5 points)** Of the reactions below, which are allowed to proceed via the weak interaction and which are forbidden. Justify your answer.

(a) $K^+ \rightarrow \pi^0 + \mu^+ + \nu_\mu$

(b) $p + e^- + \nu_e \rightarrow e^- + \pi^+ + p$

(c) $\Lambda^0 \rightarrow \pi^+ + e^- + \bar{\nu}_e$

(d) $p + \nu_\mu \rightarrow \mu^+ + n$

5. **12-26(5 points)** Find the baryon number, charge, isospin, and strangeness for the following quark combinations and identify the corresponding hadron:

(a) $u\bar{d}$ (b) $d\bar{u}$ (c) $u\bar{s}$ (d) $s\bar{s}$ (e) $d\bar{s}$

6. **(5 points)** Briefly discuss the fundamental physics and experimental approach of any ongoing or planned experiment in particle physics. If you are not sure that your topic is appropriate, please ask. One additional point will be awarded if no other solutions discuss the same experiment.