Physics 224 **Fall 1999**

Phenomenology **due 11:00 am Thursday Oct. 26**

PROBLEM SET 4

Oct. 21 Colloquium: "Hot Topics in High Energy Astrophysics"

Dr. Danuta Kielczewska, UCI

3:30 pm, 101 Rowland Hall

1. Using the attached energy level diagrams for the formation of molecular orbitals, describe the bonding of H_2, He_2, Be_2, and B_2 by stating or diagraming which orbitals are occupied by electrons. In other words, draw spin up and spin down electrons in the energy levels for the molecular orbitals.

2. Eisberg and Resnick problem 15.20.

3. (a) Calculate the angular frequency of the Larmor precession of a classical symmetric top whose angular momentum is $\vec{I}$ and whose magnetic moment is $\vec{\mu} = g_N(e\hbar/2Mc)\vec{I}$ in a magnetic field whose induction is $\vec{B}$.

   (b) Calculate the energy levels of a nucleus whose spin quantum number is $\vec{I}$ and whose magnetic moment is $\mu = g_N(e\hbar/2Mc)\vec{I}$ in a magnetic field $\vec{B}$. Using the selection rule $\Delta_I = \pm 1$, evaluate the angular frequency of a photon which will induce the system to jump from one orientation to another.

4. Eisberg and Resnick problem 11.19.

5. Eisberg and Resnick problem 11.20.