PHY 491, Fall 2022 - Homework 4

DUE: Friday 09/27/24, 11:59pm

Problem 4.1 Oxygen is earth's most abundant element and makes up half of our planet's crust.

4.1.1 Find the electron configuration of atomic oxygen in its ground state. (2 Points)

4.1.2 Write down the corresponding spectroscopic notation of the atomic oxygen ground state. (1 Points)

4.1.3 Oxygen in our atmosphere is commonly found in the form of O_2 gas, a dioxygen molecule. Using the LCAO approach, sketch its molecular orbital diagram and argue why it is a stable molecule. (5 Points)

4.1.4 Interestingly, the dioxygen molecule has two excited states with the same number of electrons in all σ, σ^*, π, and π^* molecular orbitals. Using your knowledge of electron configurations, sketch the MO diagrams for both. (5 Points)

4.1.5 Find the molecular term symbols for all three states (3 points)

4.1.6 What type of magnetism is expected for atomic oxygen and the three configurations of molecular oxygen discussed above? (4 Points)