

Atomic Physics Assignment 5

10 marks

1. Hydrogen Energy Levels

- a) What effects contribute to the energy separating the $n=1$ and $n=2$ energy levels? What is the difference in eV between the $n=1$ and $n=2$ energy levels?
- b) What effects contribute to fine structure? What is the shift or splitting in eV it causes of the $n=1$ and $n=2$ energy levels.
- c) What contributes to the Lamb Shift? What is the Lamb Shift splitting in eV of the $n=2$ levels?
- d) What contributes to the hyperfine interaction? What is the hyperfine splitting in eV of the hydrogen ground state?
- e) Numerically estimate the shift of the H ground state due to the Earth's magnetic field?
- f) Numerically estimate the shift of the hydrogen ground state due to a DC electric field of 1 kV/cm.