Assignment 2

Modern Physics(including Special Theory of Relativity)(PY251)

1. Derive the differential form of elliptical orbit and find the expression of energy for electron in elliptical orbit.

2. In a Stern-Gerlach experiment the magnetic field gradient is 5.0 $\mathrm{Vsm^{-2}mm^{-1}}$, with pole pieces 7 cm long. A narrow beam of silver atoms from an oven at 1250 K passes through the magnetic field. Calculate the separation of the beams as they emerge from the magnetic field.(Take μ=$9.27\times10^{-24}\mathrm{JT^{-1}}$).

3. Obtain an expression for the Bohr magneton.

4. An atomic transition line with wavelength 350 nm is observed to be split into three components, in a spectrum of light from a sun spot. Adjacent components are separated by 1.7 pm. Determine the strength of the magnetic field in the sun spot. μ_B=$9.17\times10^{-24}\mathrm{JT^{-1}}$.

5. Calculate the energy spacing between the components of the ground state energy level of hydrogen when split by a magnetic field of 1.0 T. What frequency of electromagnetic radiation could cause a transition between these levels? What is the specific name given to this effect.

6. To excite the mercury line 5461 Å an excitation potential of 7.69 V is required. If the deepest term in the mercury spectrum lies at 84181 $\mathrm{cm^{-1}}$, calculate the numerical values of the two energy levels involved in the emission of 5461 Å.