所別：電機工程學系碩士班 乙組(一般生) 科目：近代物理
(學位在職生)

(1) What is the maximum wavelength of light that can eject photoelectrons from cesium? Note that the work function of cesium is 1.9 eV. (10%)

(2) Find the wavelength of the light emitted by the transition of electrons from the first excited state (n=2) to the ground state (n=1) of hydrogen. (10%)

(3) The position x of a 0.01-g pellet has been carefully measured and is known within $\pm 10nm$. What are the minimum uncertainties in its momentum?(10%)

(4) If $\varphi(x)$ satisfies the time-independent Schrodinger equation, verify that the wave function $\psi(x,t) = \varphi(x)e^{-iEt/\hbar}$ satisfies the time-dependent Schrodinger equation. (10%)

(5) What is the Zeeman effect?(10%).

(6) Describe the Pauli principle from certain symmetry properties of the two-particle wave function.(10%)

(7) Discuss the mechanism of spontaneous emission of radiation.(10%)

(8) A free particle has the initial wave function $\psi(x,0) = Ae^{-ax^2}$, where A and a are constant (a is real and positive). (a) Normalize $\psi(x,0)$. (5%) (b) Find $\psi(x,t)$. (10%).

(9) Find the expectation value of the potential energy in the nth state of the harmonic oscillator.(15%)