S.R. FATEPURIA COLLEGE

INTERNAL ASSESSMENT

PHYSICS (HONOURS)

4TH SEMESTER PAPER -PHY-H-CC-T-09

FULL MARKS: 10

Answer any ONE from the following questions: (10X1=10)

(1) (a) What is Ultraviolet Catastrophe?
(b) How does classical theory fail to explain the Photoelectric effect?
(c) Explain Compton Effect. Do you observe Compton Effect with visible light? Give reason for your answer.
(d) Show that a free electron at rest cannot absorb a photon.
(e) Calculate specific heat of silver at 20K for which Debye temperature is 210K. (2x5)

(2) (a) Explain Nuclear Shell Model. What is the basic point of difference between the liquid drop model and shell model?
(b) Explain Semi-empirical Mass Formula. Why are even-even nuclei most stable?
(c) A particle is enclosed in one-dimensional box. Find i. the energy eigen value, ii. Wave function and iii. Expectation value of the momentum operator. (3+3+4)

(3) (a) Derive relation between mean life and radioactive constant.
(b) Define activity of a radioactive decay. One gram of Ra^{266} has an activity of 1 curie. Calculate the mean life and half-life of Radium.
(c) Give the evidence of existence of Neutrinos. Why was their existence postulated?
(d) State the conditions of α-decay. Explain why in α-decay of a radioactive nuclide the kinetic energy of the emitted α-particle is a little less than the disintegration energy. (2+2+2+4)

(4) (a) Describe the energy level diagram for the phenomenon of spontaneous emission, stimulated emission and stimulated absorption. Define Optical pumping and Population inversion.
(b) Derive a relation between Einstein's A and B coefficients.
(c) Describe the formation and working principle of He-Ne Laser. (3+3+4)
