UNIVERSITY OF THE PUNJAB

B.S. 4 Years Program : Third Semester – Fall 2021

Roll No. .....

Paper: Concepts of Modern Physics **Course Code: PHY-201** **Time: 3 Hrs. Marks: 60**

Q.1. Answer the following short questions: (15x2=30)

i. If De Broglie wavelength of electron is 0.113pm. what is speed of electron?
ii. What is difference between stimulated and spontaneous emission.
iii. Why classical theory failed to explain photoelectric effect?
iv. How superconductivity is useful in daily life?
v. Why two-level laser is not possible?
vi. Explain the difference between donor and acceptor impurity.
vii. Briefly comment on energy time uncertainty relationship.
viii. Write down the general nuclear reaction showing how atomic and mass number of an atom is affected with the emission of gamma radiation.
ix. Write down Compton shift equation.
x. Briefly mention four characteristics of laser.
xi. What is nuclear reaction? Give the difference between fission and fusion reaction.
xii. Which are the experiments that support the wave theory of light and the particle theory of light?
xiii. What is blackbody radiation?
xiv. Define correspondence principle.
xv. Explain the difference between Rayleigh's law and Planck's Law.

Answer the following questions. (3x10=30)

Q2. (a) What is fission chain reaction? Discuss the three problems together with their solutions in working of nuclear reactor based on fission chain reaction. (7)
(b) Consider a ^{236}U nucleus is in its ground. How much energy is required to remove a neutron from it, leaving a ^{235}U nucleus behind? The needed atomic masses are n=1.008665 u; ^{235}U= 235.043924 u; ^{236}U= 236.045563 u; (3)

Q3. (a)Describe the arrangement of atoms in solids in terms of free electron gas theory. (8)
(b) Draw forward and reverse characteristics of PN junction (2)

Q4. (a) Consider a particle is trapped in an infinitely deep potential well. Determine the expression for the energy of particle. (7)
(b) An electron is confined to an infinite well (L=100 pm), which is roughly one atomic diameter. What is the energy of the second least allowed state? (3)