Enrollment No: _____ Exam Seat No:_____

C.U.SHAH UNIVERSITY
Winter Examination-2021

Subject Name: Elements of Modern Physics

Subject Code: 4SC03EMP1 **Branch: B.Sc. (Chemistry, Mathematics)**

Semester: 3 **Date: 21/12/2021** **Time: 02:30 To 05:30** **Marks: 70**

Instructions:
(1) Use of Programmable calculator & any other electronic instrument is prohibited.
(2) Instructions written on main answer book are strictly to be obeyed.
(3) Draw neat diagrams and figures (if necessary) at right places.
(4) Assume suitable data if needed.

Q-1 **Attempt the following questions:** **(14)**

a) Define the Compton Effect 01
b) What result did the Davisson- Germer Experiment prove? 01
c) Define the term: Quantum Tunneling 01
d) Write the Semi-Empirical Mass Formula for Nucleus. 01
e) What do you mean by Threshold frequency? 01
f) What are Quantum Dots? 01
g) Write the proposal given by Bohr regarding the atomic model. 01
h) Give the Heizenberg's uncertainty principle in terms of position and momentum. 01
i) What are free particles? 01
j) Give the mathematical expression for Compton Shift 01
k) Write the expression for Tunneling Probability for particles in a box. 01
l) List two characteristics of nuclear forces. 01
m) Define Scintillation 01
n) What do you mean by Probability density? 01

Attempt any four questions from Q-2 to Q-8

Q-2 **Attempt all questions** **(14)**

a) Derive the expression for Compton Shift. 07
b) Discuss Planck's Quantum theory in detail 07

Q-3 **Attempt all questions** **(14)**

a) Explain in detail the Photoelectric effect and hence deduce the expression for Stopping potential. 07
b) Enumerate on Davisson-Germer experimental setup and the conclusions derived from the same. 07

Q-4 **Attempt all questions** **(14)**

a) How did Rutherford's scattering experiment help in proposing the model of an atom? 07

b) List the various characteristics of Nuclear Force 07

Q-5 **Attempt all questions** **(14)**

a) Discuss in detail the Bohr's atomic model 07

b) Explain in detail the concepts of Heizenberg's Gamma-Ray Microscope. 07

Q-6 **Attempt all questions** **(14)**

a) Write a note on Stationary states in Quantum mechanics 07

b) Discuss in detail the two-slit Interference of macroscopic particles and photons. 07

Q-7 **Attempt all questions** **(14)**

a) Derive the general expression for Time-Dependent Schrödinger Equation. 07

b) Normalize the given wave function: $\boldsymbol{\Psi = A\, e^{im\emptyset}}$ 07

Q-8 **Attempt all questions** **(14)**

a) Describe in detail the tunneling through a Rectangular Barrier 07

b) Write a note on Quantum Dots and their significance. 07