C.U.SHAH UNIVERSITY
Summer Examination-2020

Subject Name: Elements of Modern Physics

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

Semester : 3   Date : 11/03/2020   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 Photoelectric Effect	01
	b)	Davisson- Germer Experiment was conducted to prove_____	01
	c)	Name the two hypotheses proposed for understanding the size and structure of the nucleus.	01
	d)	Give 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 energy and time.	01
	i)	Define Tunneling process in Quantum Mechanics.	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 Stopping Potential	01
	n)	Give the significance of $\left|\Psi\right|^2$ in Quantum Mechanics.	01

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

Q-2		**Attempt all questions**	**(14)**
	a)	Discuss Planck's Quantum theory in detail	06
	b)	Explain in detail the Photoelectric effect and hence deduce the expression for Stopping potential.	08
Q-3		**Attempt all questions**	**(14)**
	a)	Derive the expression for Compton Shift.	07
	b)	Enumerate on Davisson-Germer experimental setup and the conclusions derived from the same.	07
Q-4		**Attempt all questions**	**(14)**
	a)	Discuss Rutherford's scattering experiment to propose the model of an atom	07

b)	Taking Hydrogen as an example explain how one can understand Bohr's atomic model	07

Q-5	**Attempt all questions**	**(14)**
a)	Write a note on Wave-Particle duality.	07
b)	Explain in detail the concepts of Heizenberg's Gamma-Ray Microscope.	07

Q-6	**Attempt all questions**	**(14)**
a)	Give the importance of Heisenberg's uncertainty principle.	07
b)	Discuss in detail the two-slit Interference of macroscopic particles and photons.	07

Q-7	**Attempt all questions**	**(14)**
a)	Derive the Time-Dependent Schrödinger Equation.	07
b)	Taking a suitable example, explain the use of normalisation of wavefunction in Quantum Mechanics.	07

Q-8	**Attempt all questions**	**(14)**
a)	Deduce the expression for Energy of Particle in a rigid box.	08
b)	Give an account on Quantum Dots.	06