C. U. SHAH UNIVERSITY
Winter Examination - 2022

Subject Name : Elements of Modern Physics

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

Semester: 3   **Date: 29/11/2022**   **Time: 11:00 To 02:00**   **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)	Give the formula of Plank's Radiation Law.	**01**
b)	Define thermionic emission.	**01**
c)	What is the value of h?	**01**
d)	What do you mean by secondary emission?	**01**
e)	Define work function.	**01**
f)	Give the relation between time and energy uncertainty.	**01**
g)	Define fission and fusion.	**01**
h)	State the Heisenberg uncertainty principle.	**01**
i)	What is called eigen function?	**01**
j)	What is normalization condition?	**01**
k)	What is photoelectric effect?	**01**
l)	What is the total energy E of a free particle?	**01**
m)	What is continuity equation?	**01**
n)	What do you mean by quantum mechanical tunneling?	**01**

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

Q-2	**Attempt all questions**	**(14)**
a)	Explain briefly the photoelectric effect with necessary diagram and formulation.	**07**
b)	Write a note on Compton effect and derive the equation for scattered photon.	**07**
Q-3	**Attempt all questions**	**(14)**
a)	Explain the Rutherford's alpha particle scattering experiment in detail.	**07**
b)	Write a note on spectral series of hydrogen atom and draw the energy level diagram of hydrogen atom.	**07**
Q-4	**Attempt all questions**	**(14)**
a)	Write a note on nature of nuclear forces.	**07**

b)	Explain in detail the position and momentum and energy and time relation for the Heisenberg uncertainty.		**07**

Q-5   **Attempt all questions**   **(14)**
    a)   Write a note on Liquid drop model and derive SEMF.   **07**
    b)   Explain operator for momentum and kinetic energy.   **07**

Q-6   **(14)**

Describe particle in a one dimensional infinitely deep potential well and obtain solution of the wave equation.

Q-7   **(14)**

Derive one dimensional time independent schrodinger equation for free particle

Q-8   **(14)**

Explain physical interpretation of ψ and current density.