

Enrollment No: \_\_\_\_\_ Exam Seat No: \_\_\_\_\_

# C.U.SHAH UNIVERSITY

## Summer Examination-2018

**Subject Name: Elements of Modern Physics**

**Subject Code: 4SC03EMP1**

**Branch: B.Sc.(All)**

**Semester: 3**

**Date: 06/04/2018**

**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.
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<b>Q-1</b>	<b>Attempt the following questions:</b>	<b>(14)</b>
	a) Give the relation between energy (E) and frequency (f) of light.	01
	b) According to Planck's quantum theory, light is said to be a collection of -----	01
	c) The experimental proof of De-Broglies hypothesis was given by	01
	i) Davisson and Germer ii) Rutherford iii) Bohr	
	d) State the Heisenberg's uncertainty principle.	01
	e) Nuclear forces are charge -----	01
	i) Dependent ii) independent	
	f) Explain the term 'wave-particle duality'.	01
	g) Give the operator form of momentum(p) and energy (E) used in quantum mechanics.	01
	h) State the De-Broglie's hypothesis.	01
	i) Define Compton Shift.	01
	j) Define threshold frequency.	01
	k) Define Binding energy.	01
	l) Give the general formula for the radius of a nucleus.	01
	m) What are the constituent particles of an atom?	01
	n) Define normalization (of a wave function).	01

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

<b>Q-2</b>	<b>Attempt all questions</b>	<b>(14)</b>
	a) Explain the principle, construction and working of photoelectric effect; also	(08)



define the terms “Work Function” and “Stopping Potential”.

- b) An atom has energy levels (E) of 1eV, 2eV, 3eV. What are the frequencies (f) and wavelengths ( $\lambda$ ) of the line spectra emitted by the atom? (06)

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

- a) Explain the Bohr’s model of atom. (07)  
b) Explain the Davisson-Germer experiment with proper diagram. (07)

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

- a) Derive the formula for Heisenberg’s uncertainty principle. (03)  
b) Explain the characteristics of nuclear force. (07)  
c) Give two differences between proton-neutron hypothesis and proton-electron hypothesis of a nucleus. (04)

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

- a) Derive the time dependent Schrodinger equation. (07)  
b) Give the physical interpretation of wave function ( $\psi$ ). (07)

Determine the normalization constant (A) of a wave function  $\psi = A \cdot e^{im\phi}$ .

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

- a) Determine the energy (E) and wave function ( $\psi$ ) for a particle confined in a rigid box. (12)  
b) Define Tunneling (02)

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

- a) Explain the Rutherford’s experiment to understand the model of an atom. (07)  
b) Explain the Heisenberg’s gamma ray microscope. (07)

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

- a) Explain the concept of tunneling through a rectangular barrier. (07)  
b) Explain the Compton effect. (07)

