C.U.SHAH UNIVERSITY Summer Examination-2016

Subject Name : Atomic and Molecular Physics

Subject Code :5SC02PHC2Branch : M. Sc. (Physics)

Semester : 2 Date : 06/05/2016 Time : 10:30To 01:30 Marks :70

Instructions:

- (1) Use of Programmable calculator and 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.

SECTION – I

Q-1		Attempt the Following questions	(07)
	a.	Give the radial wave equation for hydrogen atom.	01
	b.	On what factors does the energy level E_0 of a hydrogen atom depend?	01
	c.	Why do we use spherical polar coordinates to solve the Schrödinger equation for Hydrogen atom?	01
	d.	Which all quantum numbers are introduced in the solution of Hydrogen atom?	01
	e.	Give the angular part of the wave equation for Hydrogen atom.	01
	f.	What is Paschen Back effect?	01
	g.	What is Anomalous Zeeman effect?	01
Q-2		Attempt all questions	(14)
	a.	Explain L-S coupling briefly	05
	b.	Write a note on different series in alkali spectra.	05
	c.	Give the physical interpretation of the result of Schrödinger equation.	04
		OR	
Q-2		Attempt all questions	(14)
	a.	Explain j-j coupling briefly.	05
	b.	What is Stark Effect? Differentiate between Zeeman and Stark effect.	05
	c.	Define: (1) fine structure and (2) hyperfine structure.	04
Q-3		Attempt all questions	(14)
	a.	Derive the radial part of the wave function for Hydrogen atom using Schrödinger equation.	07
	b.	State and prove Pauli's Exclusion principle.	07
		OR	
Q-3	a.	Deduce the expression for interaction energy in coupling schemes.	07
	b.	Explain different line broadening mechanisms.	07

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SECTION – II

Q-4		Attempt the Following questions	(07)
	a.	What is linear molecules?	01
	b.	Write specific condition for prolate symmetric top and oblate symmetric top.	01
	c.	Which types of information are derived from rotational spectra?	01
	d.	What Morse curve represents?	01
	e.	Divide the region wise IR spectroscopy.	01
	f.	Write the principle of microwave detectors.	01
	g.	Write the expression for fundamental frequency of vibration.	01
Q-5		Attempt all questions	(14)
	a.	Explain rotational spectra of rigid diatomic molecules.	05
	b.	Explain rotational spectra of non-rigid rotator.	05
	c.	What is isotope effect in rotational spectra? Explain.	04
		OR	
Q-5		Attempt all questions	(14)
	a.	Explain vibrating diatomic molecule.	05
	b.	Discuss normal vibrations of Co ₂ and H ₂ O molecules.	05
	c.	Explain linear polyatomic molecules.	04
Q-6		Attempt all questions	(14)
-	a.	Explain Stark effect.	07
	b.	Discuss Microwave spectrometer with schematic diagram.	07
		OR	
Q-6		Attempt all Questions	(14)
	a.	Discuss diatomic vibrating rotator with spectrum analysis.	07
	b.	Explain IR spectrometer with schematic diagram.	07

