



RF-3457-58

M. Sc. (Part - I) Examination  
April / May - 2010  
Inorganic Chemistry : Paper - IV

Time : 3 Hours]

[Total Marks : 54

RF-3457

Instructions :

(1)

नीचे दशांशके निशानीवाणी विगतो उत्तरवही पर अवश्य लिखनी. Fillup strictly the details of signs on your answer book.	Seat No. :
Name of the Examination :	<input type="text"/>
☛ M. Sc. - 1	<input type="text"/>
Name of the Subject :	<input type="text"/>
☛ INORGANIC CHEMISTRY-4	<input type="text"/>
☛ Subject Code No. : <input type="text" value="3"/> <input type="text" value="4"/> <input type="text" value="5"/> <input type="text" value="7"/>	☛ Section No. (1, 2,.....) : <input type="text" value="1"/>
	Student's Signature

- (2) Answer to the two sections should be written in the separate answer books.
- (3) Figures to the right indicate full marks of the questions.

- 1 (a) Explain the interaction of electromagnetic radiation with matter with respect to reflection and refraction. 9
- (b) Discuss the features of non-rigid rotor model.
- (c) The first line ( $J=0$ ) in the rotational spectrum of HCl appeared at  $3.948576 \text{ cm}^{-1}$ . Calculate the bond length of HCl.

OR

- 1 (a) Distinguish between nuclear spin and electron spin interaction and their significance. 9
- (b) Explain the term transition probability with respect to microwave spectroscopy.
- (c) Discuss the salient features of Stark effect.
- 2 (a) Explain the term linear harmonic oscillator and anharmonicity. 9

- (b) Discuss the considerations of quantum theories of Raman spectroscopy.
- (c) Calculate the force constant of a Fe-S stretching vibration of iron complex which exhibits the absorption frequency at  $680\text{ cm}^{-1}$ .  
(Given At. Wt. Fe = 55.85 and S=32)

**OR**

- 2** (a) Explain the meaning of **9**  
(i) Overtone and  
(ii) Hot bands with respect to IR spectroscopy.
- (b) What are the advantages of coherent Antistokes Raman spectroscopy?
- (c) Discuss the importance of Morse potential energy diagram.
- 3** (a) Draw a spectrum of lithium and francium atom. **9**  
(b) Discuss the features of electronic spectra of Cobalt and Vanadium element.  
(c) Write a note on chemical information from ESCA.

**OR**

- 3** (a) State and explain Franck-Condon principle. **9**  
(b) Explain how geometry of the excited state of a molecule can be established.  
(c) Discuss the method of interpretation of Auger Electron spectroscopy?

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Name of the Examination : M. Sc. - 1	<div style="border: 1px solid black; border-radius: 15px; padding: 10px; text-align: center;">Student's Signature</div>
Name of the Subject : INORGANIC CHEMISTRY-4	
Subject Code No. : <input type="text" value="3"/> <input type="text" value="4"/> <input type="text" value="5"/> <input type="text" value="8"/> Section No. (1, 2,.....) : <input type="text" value="2"/>	

- (2) Answer to the two sections should be written in the separate answer books.
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- 4 (a) What are the advantages of FT NMR? 9
- (b) Sketch and explain the basic ideas about NMR instrument.
- (c) Calculate the 'g' value of the compound which exhibits peak at 3340 gauss while DPPH marker indicates same at 3560 gauss under identical conditions.

OR

- 4 (a) Explain the followings : 9
- (i) Shielding and deshielding
- (ii) Chemical shift
- (iii) Spin-spin coupling.
- (b) What is principle of ESR spectroscopy?
- (c) Discuss the applications of NQR spectroscopy?

- 5 (a) Discuss the importance of variation theorem. 9
- (b) Give any three applications of Perturbation method.
- (c) Explain the use of Slater rules.

OR

- 5 (a) State Pauli's exclusion principle and discuss its significance. 9
- (b) What are electron correlations? How it affects the chemistry of an element and its own ion?
- (c) How spin magnetic momentum is calculated? Give example.

- 6 (a) Draw Walsh diagram for  $\text{PCl}_3$  molecule. 9  
(b) Write any three characteristics of VSEPR theory.  
(c) Discuss the energy status of  $\text{sp}^2$  and  $\text{sp}^3\text{d}^2$  hybridization.

OR

- 6 (a) Illustrate few chemical reactions of covalently bonded iron compounds. 9  
(b) Explain the contribution of compounds with  $d\pi - p\pi$  bonds.  
(c) Discuss the structural aspects of any two Ni(II) compounds.
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