f) Justify the trend of infrared stretching frequencies observed for the following compounds:

CO : 2143 cm^{-1}

 $[Mo(CO)_6]$: 2004 cm⁻¹

 $[Mo(CO)_3(PPh_3)_3]$: 1950 cm⁻¹

 $[Mo(CO)_3(NH_3)_3]$: 1855 cm⁻¹

2

- 10. a) Discuss the secondary and tertiary structures of proteins.
 Using one suitable example, mention its CD or ORD patterns upon changing its secondary and tertiary structures.
 - b) Prove that $[\psi]^{T}_{\lambda}$ (in degree) $\approx 3300 \Delta \epsilon$.
 - c) What will be the nature of cotton effect in case of diasteromers and enantiomers?
 - d) Define circular birefringence.
 - e) IR and Raman spectroscopic techniques are complementary-comment on.
 - f) What is LASER Raman spectroscopy? What are its advantages over classical Raman spectroscopy? $2\frac{1}{2}$

M. Sc. Chemistry Examination, 2019

(3rd Semester)

INORGANIC CHEMISTRY SPECIAL

PAPER - XII - I

Time: Two hours Full Marks: 50

(25 marks for each unit)

Use a separate answerscript for each unit.

UNIT - I - 3121

UNIT - I - 3121a

- a) Availing suitable Bloch equation establish the required relation between free induction decay signal and T₁, which can be employed in measuring the spin-lattice relaxation time.
 - b) Which difference would you expect in external magnetic field, RF field and magnetization in laboratory frame and rotatory frame of references of resonance condition $?1\frac{1}{2}$
- 2. How could you identify all possible isomers of the compound $[S_nF_4(pyridine)_2]$ form their NMR spectra?

[For
$$^{119}S_n$$
; $I = \frac{1}{2}$]

3. "J_{13C-H} largely depends on the s-charactor of C-H bond." Elaborate.

[3]

4. $A+B \rightleftharpoons AB$ is a rapid exchanging system.

How can the equilibrium constant (K) of the above reaction be determined from NMR measurement? (A, B and AB are all NMR active species)

OR

¹⁹F NMR of TiF₄ dissolved in EtOH affords a spectrum featuring two triplets with equal integration at dry ice temperature, which on warming to a temperature 0°C coalesce to a singlet. Upon addition of ethanolic solution of Na₂TiF₆ to the former mixture in equimolar proportion, NMR spectrum features a quintet and a doublet with an integration ratio of 1 : 4. Elucudate the structure of the Ti complex formed in different stages as stated above.

[For
48
Ti , I = O]

UNIT - I - 3121b

- 5. "PFCl₄ ratains its molecular symmetry in crystalline state where as PPhCl₄ does not." Explain the statement of the basis of NQR spectral study,
- 6. Enumerate the reasons for apperance of multiline Mössbauer spectrum. Why Mössbauer spectra can only be measured in the solid state? $3+1\frac{1}{2}$

7. Predict giving reason, the number of possible resonance line (s) be observed in NQR spectrum of CH₃ I molecule. Calculate the energy of each level generated due to quadrupole interation in the molecule as function of eQq.

[For
127
I; $I = \frac{5}{2}$] 2+3

8. What is Isomer Shift (IS)?

UNIT - I - 3122

- 9. a) What makes a molecule Raman active? using classical theory, explain the occurrence of Stokes and anti-stokes Raman scattering.
 - b) The equilibrium vibration frequency of I_2 is 215 cm⁻¹ and the anharmonicity constant is 0.003. Calculate the intensity of the 'hot band' relative to that of the fundamental at 300 K.
 - c) How will you prove the occurrence of linkage isomerism in $[Ru(dmso)_6]^{2+}$ (dmso = dimethylsulfoxide) with the help of IR spectroscopy?
 - d) The symmetrical stretching mode of CO₂ is infrared inactive but Raman active. Explain.2
 - e) Taking v_{CO} as a probe, how will you monitor the oxidative addition reaction in Vaska compound? $1\frac{1}{2}$

[Turn over