VPG (4) — Chem
(14) Gr. A

2016-18

Time : 3 hours

Full Marks : 70

Candidates are required to give their answers in

their own words as far as practicable.

The figures in the margin indicate full marks.

Answer **five** questions in which

Q. No. 1 is compulsory.

1. Answer **all** questions :   2×7 = 14

   (a) What are dinitrogen complexes ? Give an
   example.

   (b) Why water cann't be used as the solvent for
   infrared spectroscopy ?

   (c) What are different term-symbols of a d^2
   system ?

   (d) Define Racah Parameter.

   (e) Give the name of four Massbauer nucleides.

   (f) NO_2 Show esr spectrum but CO_2 doesnot.
   Explain.

   (g) What is g-values in esr spectra ?

2. (a) How IR spectroscopy is useful in the
   elucidation of structures of metal nitrosyls. 7

   (b) Explain, with suitable examples, where NO
   acts as terminal linear, bent and bridging
   ligands in different complexes.   7

3. (a) Explain the orbital and spin selection rules
   in transition metal complexes. What are
   forbidden transitions.   6+2 = 8

   (b) Discuss the factors determining the width of
   the transition metal complex electronic
   spectra.   6

4. (a) Explain the splitting of Russel-Saunders
   states S, P, D and F in octahedral and
   tetrahedral fields by Mulliken Symbol.   8

(b) Draw Orgel diagram for d^2 system and predict the different transition as per Orgel diagram. **6**

5. (a) Outline the basic Principles of esr spectrum. **6**

(b) Predict the number of spectral lines in esr spectrum of :

(i) $[Co(H_2O)_6]^{2+}$

(ii) $[Cr(H_2O)_6]^{2+}$

Indicate how zero field splitting and Krammmer's degeneracy applies in these compounds. http://www.vbuonline.com **8**

6. What is Massbauer spectroscopy ? Describe its application indetermining structure and bonding. **14**

7. (a) Explain the structure of B_2H_6 by NMR Spectroscopy. **6**

(b) Explain the use of ^{13}C and ^{31}P NMR in the determination of structure of Inorganic molecules. **8**

8. (a) What are the characteristics of Massbauer nucleides ? **6**

(b) Explain the structure of Prussian blue on the MB spectroscopy. **8**

9. Write short notes on any **two** of the following : **7×2 = 14**

(a) CHEMICAL shift in NMR spectroscopy

(b) Magnetically ordered compounds and their use.

(c) Zero-field splitting and Krammer's degeneracy

(d) Tanabe-Sugano diagram

———— ❖ ————