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RCHE-002

00132

Ph.D. IN CHEMISTRY (PHDCHEM)

Term-End Examination

December, 2018

RCHE-002 : ADVANCES IN INORGANIC CHEMISTRY

Time : 3 hours *Maximum Marks : 100*

Note : *Answer all the questions.*

1. Construct the MO Energy level diagram for BeH_2 along with the relevant explanation. **10**

2. (a) Give a suitable example to justify the statement "There are a number of circumstances that can lead to a symmetry that is less than octahedral in a six-coordinate complex". **5**

   (b) Calculate the spin-only moment and spin-plus orbital moment of Chromium (III) ion. **5**

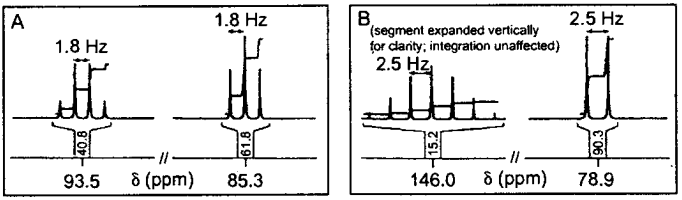
3. For a metal ion having d^6 configuration, what would be the CFSE in an octahedral field ? Will it be the same irrespective of the strength of the field ? Discuss. **10**

4. (a) The magnetic moment of a complex is 5.0 B.M. Find out the number of unpaired electrons and its spin multiplicity. (Assume there is no orbital contribution). **5**

   (b) Describe the ^1H-NMR spectra of BH_4^-, AlH_4^- and GaH_4^-. **5**

5. Explain in detail how you would derive the R – S symbol for Co(II) ion. 10

6. Match the ^{19}F NMR spectra below with the appropriate molecule giving reasons : 10



(a) $CF_3CF_2CF_2OClO_3$ (b) $(CF_3)_2CFOClO_3$

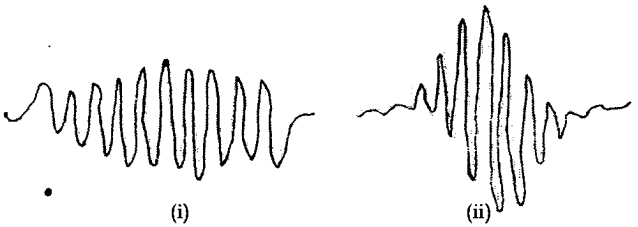
(c) $CF_3CF_2OClO_3$ (d) CF_3OClO_3

7. (a) The solution ESR spectra of 5

(i) [Nb (1, 3, 5 – C_6H_3 $Me_3)_2$] and

(ii) [Ti $(C_6H_6)_2]^-$ are shown below.

Account for the patterns that are observed in any one of these.



(b) Discuss briefly the function of cytochrome. 5

8. Explain the structure, function and site of oxygen binding of haemoglobin with the help of a diagram. 10

9. (a) Describe in brief electron transport systems used in photosynthesis. 5

(b) What are crown ethers ? Give examples from supramolecular chemistry. 5

10. With suitable examples, show that $\pi - \pi$ interactions and charge transfer occur in molecular host-guest complexes. 10