No. of Printed Pages : 4

RCHE-002

Ph.D. IN CHEMISTRY
(PHDCHEM)

Term-End Examination

00165

June, 2018

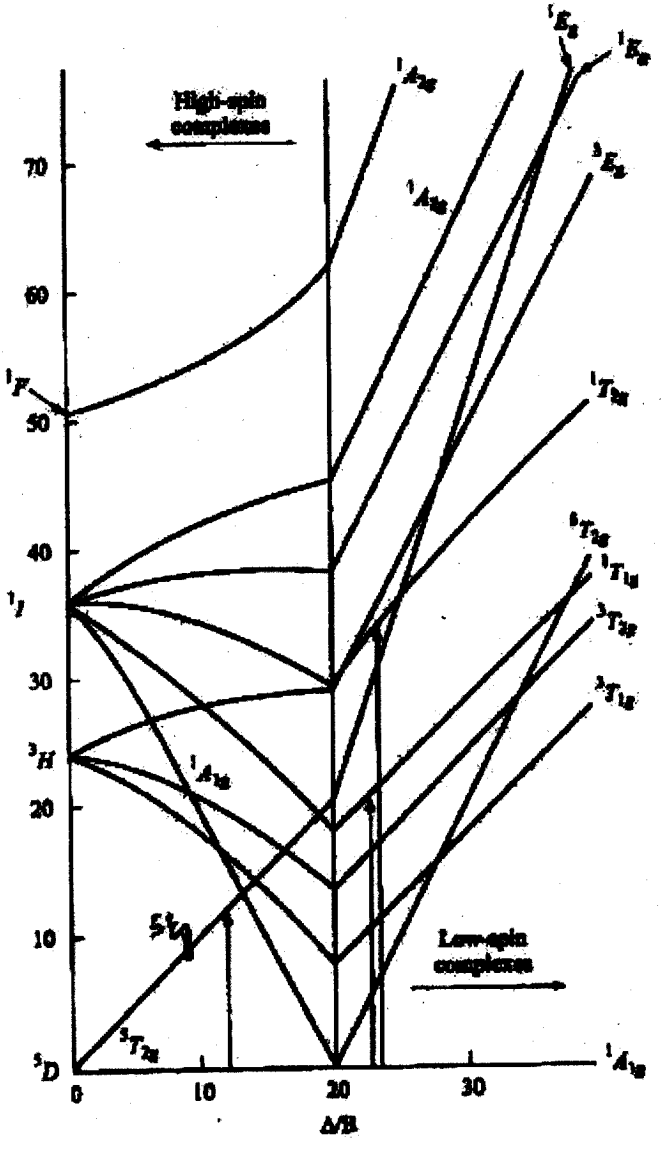
RCHE-002 : ADVANCES IN INORGANIC CHEMISTRY

Time : 3 hours *Maximum Marks : 100*

Note : *Answer* ***all*** *the questions.*

1. Explain how the nature of the metal ion, as well as the number and geometry of the ligands, affect the magnitude of Δ with reference to CFT. *10*

2. (a) What information can be obtained from the following Tanabe-Sugano diagram ? *10*



(b) What are the differences in the splitting of d orbitals in an octahedral field and in a tetrahedral field ? Explain the reasons for the labels applied to the two sets of orbitals in the two cases. *10*

3. (a) Account for the given magnetic moments of the following ions observed in their complexes.

V^{4+} 1·7 to 1·8 B.M.; V^{3+} 2·6 to 2·8 B.M.; Gd^{3+} 7·94 B.M. *5*

(b) A complex shows a magnetic moment of 7 B.M. How many unpaired electrons are there in it ? Assuming that there is no orbital contribution, what is the spin multiplicity ? *5*

(c) Hexaaquavanadium(II), $V(H_2O)_6^{2+}$ gives three bands at 810 mμ (12,300 cm^{-1}), 540 mμ (18,500 cm^{-1}) and 360 mμ (27,900 cm^{-1}). From the T/S diagrams assign them the transitions. Which one gives the 10 Dq value ? (T/S of all metal ions to be given). *10*

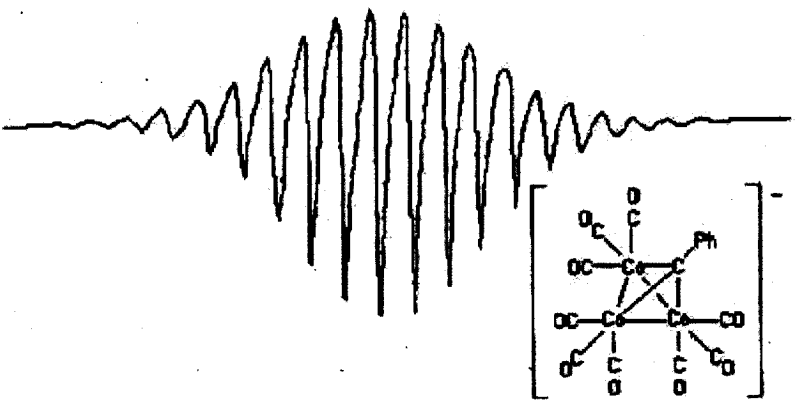
4. (a) What would be the pattern of the ^{19}F and ^{1}H NMR spectrum of HF_2^- ion ? *5*

(b) Give the ^{31}P NMR splitting pattern for the following compounds : *10*

PCl_3, $PFCl_2$, PF_2Cl, PF_3, PF_5

(c) (i) Predict the ESR spectrum of the cyclooctatetraene anion. 2

(ii) Explain the observed isotropic ESR spectrum of $[PhCCo_3(CO)_9]^-$ in THF solution at 40° C given below.
(For Co, I = 7/2) 3



5. (a) Explain the mechanism of O_2 transport and storage by haemoglobin and myoglobin. 5

(b) Explain the respiratory chain. 5

(c) Which electron transport systems are used in photosynthesis ? 5

6. (a) What are crown ethers ? Give examples. 5

(b) Explain how $\pi - \pi$ interactions and charge transfer occur in molecular host-guest complexes with suitable examples. 5

(c) Give the applications of 'urea inclusion' compounds. 5