UPES
End Semester Examination, May 2024

Course: Int. B.Sc/M.Sc Chemistry   Semester: VI
Program: Advanced Inorganic Chemistry   Time: 03 hrs.
Course Code: CHEM7017   Max. Marks: 100

Instructions:
- Read all questions carefully.
- There are internal choices in Question 9 and 11.

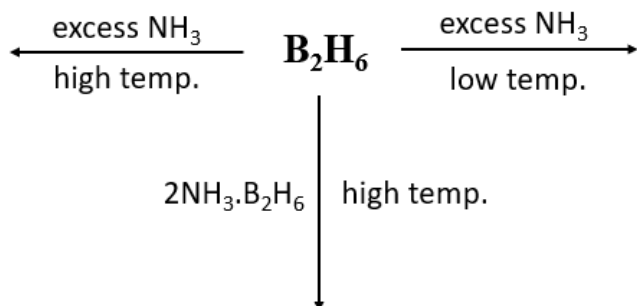| SECTION A (5Qx4M=20Marks)			
S. No.		Marks	CO
Q 1	What is spectrochemical series? Explain the difference between a weak field ligand and a strong field ligand.	4	CO1
Q 2	Sketch the changes in d-orbital energy levels for an octahedral transition complex undergoing a Jahn-Teller distortion.	4	CO1
Q 3	Draw and discuss ligand to metal charge transfer in tetrahedral complexes using MnO_4^-.	4	CO2
Q 4	Based on crystal field theory, write the electronic configuration of d^4 in in an octahedral field when $\Delta 0 < P$.	4	CO1
Q 5	Determine the point group for (a) NH_3 (b) CH_2CF_2.	4	CO3
SECTION B (4Qx10M= 40 Marks)			
Q 6	What will be CFSE for the d^6 high spin complex for both tetrahedral and octahedral complexes?	10	CO1
Q 7	Discuss *symmetry elements* and *symmetry operations* with suitable examples.	10	CO3
Q 8	What is the polyhedral skeletal electron pair theory Wade's rule?	10	CO4
Q 9	What is meant by the term hapticity? Give an example where the same ligand can show varying hapticity. Or Draw and discuss the geometry of pentacarbonyliron (0).	10	CO3
SECTION-C (2Qx20M=40 Marks)			
Q 10	Draw the molecular orbital energy level diagram for π-bonding square planar complexes. Explain ligand to metal charge transfer in brief.	20	CO1

Q11	The following is character table for C_{2v}, point group	20	CO4

C_{2v}	E	C_2	σ_v	σ_v
A_1	1	1	1	1
A_2	1	1	-1	-1
B_1	1	-1	1	-1
B_2	1	-1	-1	1

There are two functions f1 and f2 belonging to A2 and B1 representations, respectively. Explain and find the possible product of two functions f1 and f2 by using character table and the integral ∫f1 f2 dτ.

Or

What are the expected products for the following reactions:

$$\xleftarrow[\text{high temp.}]{\text{excess } NH_3} \quad \mathbf{B_2H_6} \quad \xrightarrow[\text{low temp.}]{\text{excess } NH_3}$$

$$2NH_3.B_2H_6 \downarrow \text{high temp.}$$