Five Year Integrated M.Sc. Examination, 2017

Semester - VIII

Paper: CH-4-8-1

Time: Four Hours **Full Marks: 80**

Questions are of value as indicated in the margin.

Group-A

1. Answer ***any ten*** questions: 10x2
   a) Name the point symmetry group of BCl_3 molecule and arrange the symmetry operation according the the class.
   b) Construct the group multiplication table for C_{2v} point symmetry group.
   c) Test whether the C_{2v} point group is abellian or not.
   d) What do you mean by reducible and irreducible representation?
   e) Give two examples of Chiral catalyst.
   f) In which reactions the atom economy is always 100%?
   g) What do you mean by stereospecific reaction?
   h) Name two green solvents.
   i) Write down the equation which connects magnetic permeability and susceptibility.
   j) What is ferrimagnetism?
   k) α-Fe behave as paramagnetic above 1043 K. Justify.
   l) Effective magnetic moment of Co(II) octahedral compounds are higher than the spin only magnetic moment. Explain.

Group-B

Answer ***any two*** questions.

2. a) Explain the origin of differential magnetic behaviours of the following 3d metals: Fe, Co, Ni-ferromagnetism; Cr and Mn –antiferromagnetism; Cu-Paramagnetism. 6
   b) Describe with examples of magnetically dilute and concentrated system. 4

3. a) Discuss with example super-exchange behaviour in magnetic systems. 3
   b) Explain the magnetic behaviour of $[Cu(CH_3COO)_2.H_2O]_2$. 3
   c) Discuss about the metamagnetism and single molecule magnet (SMM). 2+2

4. a) The oxides of the early elements, TiO, VO and CrO are diamagnetic. Justify. 2
   b) Explain the terms: Coercivity and remanent magnetization. 4
   c) What is ferrite? Give example. 2
   d) Write down about the spin frustration behaviour. 2

Group-C

Answer ***any two*** questions.

5. a) If $R \cdot S = T$, show $D(R) \cdot D(S) = D(T)$ (Symbols have their usual meaning). 4
   b) Write down the Great orthogonality theorem. Caste it interm of character and hence show that $\sum_k \left(X^{\mu} CR \right)^2 = g$ (Symbols have their usual meaning). 4+2

6. a) Using the theorem of irreducible representation construct the character table for C_{3v} point group. 6
   b) Prove that in a direct product representation $\Gamma^{\mu \otimes \gamma}$ the totally symmetric representation A, will occur only of $\Gamma^{\mu} = \Gamma^{\gamma}$. 4

P.T.O.

7. Consider the molecule *trans* N_2F_2 which belong to C_{2h} point symmetry group. Determine the irreducive representation in which the normal modes of vibration of N_2F_2 molecular belongs. Show the infrared and Raman activity of different normal modes of vibration of *trans*- N_2F_2 molecule. Finally comment on the results what you obtained.
The character table for C_{2h} point group is 10

C_{2h}	E	C_2	i	σ_n		
Ag	1	1	1	1	Ru	x^2, y^2, z^2, xy
Bg	1	–1	1	–1	R_{xj} R_y	$xz,\ yz$
Au	1	1	–1	–1	z_1	
Bu	1	–1	–1	1	x_j y	

Group-D

Answer ***any two*** questions.

8. a) Compare the BOOTS and BHC company synthesis of Ibuprofen with respect to their green context. 2+2+1
   b) Calculate the atom economy of the following reaction:
      i) $PhCH_2CH=CH_2 \xrightarrow{HBr} PhCH_2\underset{\displaystyle Br}{\underset{|}{C}}HCH_3$
      ii) $PhCH_2OH \xrightarrow{HBr} PhCH_2Br + H_2O$ 2+3

9. a) Normal addition of CH_3MgCl to Benzaldehyde is not asymmetric synthesis. Justify the statement. 5
   b) Explain the term chiral catalyst and chiral reagent in asymmetric synthesis with proper example. 5

10. Write short notes on (***any two***): 5+5
    a) TON and TOF
    b) Stoichiometry to Catalyst
    c) Multi component reaction in organic synthesis.

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