

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
- Name the point symmetry group of BCl_3 molecule and arrange the symmetry operation according to the class.
 - Construct the group multiplication table for C_{2v} point symmetry group.
 - Test whether the C_{2v} point group is abelian or not.
 - What do you mean by reducible and irreducible representation?
 - Give two examples of Chiral catalyst.
 - In which reactions the atom economy is always 100%?
 - What do you mean by stereospecific reaction?
 - Name two green solvents.
 - Write down the equation which connects magnetic permeability and susceptibility.
 - What is ferrimagnetism?
 - α -Fe behave as paramagnetic above 1043 K. Justify.
 - 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 $[\text{Cu}(\text{CH}_3\text{COO})_2 \cdot \text{H}_2\text{O}]_2$. 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. Cast it in terms of character and hence show that $\sum_k (X^\mu C R)^\dagger = g$ (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_1 will occur only if $\Gamma^\mu = \Gamma^\gamma$. 4

P.T.O.

(2)

7. Consider the molecule *trans* N₂F₂ which belong to C_{2h} point symmetry group. Determine the irreducible representation in which the normal modes of vibration of N₂F₂ molecular belongs. Show the infrared and Raman activity of different normal modes of vibration of *trans*- N₂F₂ molecule. Finally comment on the results what you obtained.

The character table for C_{2h} point group is

10

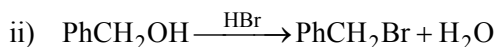
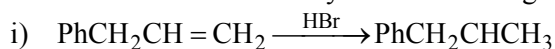
C _{2h}	E	C ₂	i	σ _n		
Ag	1	1	1	1	Ru	x ² , y ² , z ² , xy
Bg	1	-1	1	-1	R _{xj} R _y	xz, yz
Au	1	1	-1	-1	z _I	
Bu	1	-1	-1	1	x _j y	

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:



2+3

9. a) Normal addition of CH₃MgCl 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.
