



## Avinashilingam Institute for Home Science and Higher Education for Women

Deemed to be University Estd. u/s 3 of UGC Act 1956, Category A by MHRD (now MoE)

Re-accredited with A++ Grade by NAAC. CGPA 3.65/4, Category I by UGC

Coimbatore - 641 043, Tamil Nadu, India

### Master's Degree Examination – May 2025

#### II Semester

Class : I P.G.  
Major : Chemistry

Time: 3 Hours  
Max. Marks: 100

#### 23MCHC08 Inorganic Chemistry-II

##### Course Outcomes:

CO1 : Ability to classify molecules into point groups

CO2 : Knowledge of applications of group theory

CO3 : Understanding the chemistry of cage, chain complexes

CO4 : Familiarization of general characteristics of f-block elements and magnetic properties of their complexes

CO5 : Knowledge on nuclear reactions and applications

##### Part A

10 x 1 = 10

##### Choose the Correct Answer

- The geometry of  $\text{BrF}_3$  molecule is  
a. Trigonal planar    b. T-shape    c. V-shape    d. Linear    CO1K3
- Number of  $C_2$  axes present in  $D_{4h}$  point group is  
a. 2    b. 6    c. 4    d. 8    CO1K4
- Total symmetric irreducible representation among the following is  
a. E    b.  $B_1$     c.  $A_2$     d.  $A_1$     CO2K1
- Character value of reflection plane is  
a. 1    b. 3    c. -3    d. -1    CO2K3
- In \_\_\_\_\_ complexes, ligands from their coordination sphere are exchangeable?  
a. labile complexes    b. inert complexes    c. trans complexes    d. cis complexes    CO3K3
- Trans effect is mostly seen in \_\_\_\_\_ complexes.  
a. octahedral    b. tetrahedral    c. square planar    d. trigonal planar    CO3K4
- Spin-orbital interaction is maximum in  
a. La    b. Sm    c. Nd    d. Lu    CO4K4
- Neel's point is related to \_\_\_\_\_ magnetic substances.  
a. ferro    b. ferri    c. antiferro    d. antiferri    CO4K5
- Which of the following forms poly ions?  
a. Cr    b. Ni    c. Ni    d. Sc    CO5K1
- In carbon dating,  $^{14}\text{C}$  emits,  
a.  $\alpha$  particle    b.  $\beta$  particle    c. neutron    d. positron    CO5K1

##### Part B

5 x 6 = 30

##### Answer ALL questions

Each answer should not exceed 400 words or two pages

- a. Explain abelian and non-abelian groups with examples.    CO1K4  
(or)
- b.i. Write the group multiplication table for  $C_{2v}$  point group. (3)    CO1K4  
ii. Explain similarity transformation. (3)    CO1K1

- 12.a. List out the properties of irreducible representations. CO2K1  
(or)
- 12.b. Explain direct product method with suitable examples. CO2K4
- 13.a. What are labile and inert complexes? Give example for each. CO3K4  
(or)
- 13.b. Determine the rate of base hydrolysis reactions in octahedral complexes. CO3K5
- 14.a. Write a detailed note on quenching of orbital angular momentum. CO4K2  
(or)
- 14.b. Illustrate Neel point applicable to anti ferro magnetism. CO4K4
- 15.a. Explain the functioning of cyclotron and synchrotron. CO3K2  
(or)
- 15.b. Discuss the applications of radioactive isotopes in various fields. CO5K4

**Part C 5x 12 = 60**

**Answer ALL questions**

**Each answer should not exceed 800 words or four pages**

- 16.a. What are symmetry elements and symmetry operations? Explain various symmetry elements with suitable examples. CO1K4  
(or)
- 16.b. i. List out the properties of a group.(8) CO1K3  
ii. Assign point group for  $\text{BF}_3$ , H-CN,  $\text{CCl}_4$  and Phenol. (4) CO1K1
- 17.a. Derive the matrix representation for rotation and reflection operations. CO2K5  
(or)
- 17.b. State great orthogonality theorem. Construct character table for  $\text{C}_{2v}$  point group using orthogonality theorem. CO2K5
- 18.a. What are electron transfer reactions? Explain the inner and outer sphere mechanisms. CO3K3  
(or)
- 18.b. Define trans effect? Discuss the theories explaining the trans effect. CO3K2
- 19.a. Write a detailed note on dia, para, ferro and antiferro magnetic behaviours with suitable examples. CO4K4  
(or)
- 19.b. Explain the colour and complex formation properties of lanthanides and actinides. CO4K3
- 20.a. Discuss the preparation and structure of hexa chlorocyclotriphosphazene. CO3K3  
(or)
- 20.b.(i) With neat illustration explain the working of scintillation counter. (6) CO3K4  
(ii) Give a detailed note on isotope dilution analysis. (6) CO5K2

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