

PSG COLLEGE OF ARTS & SCIENCE  
(AUTONOMOUS)  
MSc DEGREE EXAMINATION MAY 2024  
(First Semester)

Branch - CHEMISTRY

TRANSITION METAL CHEMISTRY

Time: Three Hours

Maximum: 75 Marks

SECTION-A (10 Marks)

Answer ALL questions

ALL questions carry EQUAL marks

(10 × 1 = 10)

- Determine which of the following statements about VBT is incorrect.
  - It does not explain the color of coordination compound
  - It can distinguish between strong and weak ligands
  - It does not explain the kinetic stabilities of coordination compounds
  - It is unreliable in the prediction of geometries of 4-coordinate complexes
- The oxygen molecule is paramagnetic. It can be explained by---.
  - Resonance
  - Hybridisation
  - Valence bond theory
  - Molecular orbital theory
- The spin selection rule is----.
  - $\Delta S=0$
  - $\Delta l=0$
  - $\Delta S=\pm 1$
  - $\Delta l = \pm 1$
- The ground state configuration of  $Ni^{2+}$  in tetrahedral geometry is ----.
  - $^3F$
  - $^5D_0$
  - $^3F_4$
  - $^3D_{5/2}$
- How many ligands does a square planar complex have?
  - 4
  - 5
  - 6
  - 3.
- Which of the following is an example of photochemical reaction?
  - Photosynthesis
  - Decomposition of ammonia
  - Formation of NaOH
  - Decomposition of HCl
- If a compound has two chiral carbon. What is the number of optically active isomers?
  - Two
  - Three
  - Eight
  - Five
- A molecule is said to be chiral if it \_\_\_\_\_.
  - contains plane of symmetry
  - contains center of symmetry
  - cannot be superimposed on its mirror image
  - can be superimposed on its mirror image
- Which of the following is the oxygen binding site of the hemoglobin?
  - N-terminal of the beta subunit
  - Carboxy terminal of both alpha and beta subunits
  - Ferric ion ( $Fe^{+3}$ ) of the heme molecule
  - Ferrous ion ( $Fe^{+2}$ ) of the heme molecule
- Cytochromes are present in -----
  - lysosomes
  - mitochondrial matrix
  - cristae of mitochondria
  - outer membrane of mitochondria

SECTION - B (35 Marks)

Answer ALL questions

ALL questions carry EQUAL Marks

(5 × 7 = 35)

- a) What is CFT? How does it differ from VBT?  
OR  
b) Discuss the factors affecting magnitude of  $10Dq$ .
- a) Explain the difference between Orgel and Tanabe-Sugano diagrams.  
OR  
b) How do you measure magnetic susceptibility experiment by Guoy's method?

Cont...

13. a) Illustrate the inner sphere reaction mechanism.  
OR  
b) Describe the mechanism of substitution reactions in octahedral complexes.
14. a) Explain isomerism in coordination compounds with examples.  
OR  
b) Describe the Coordination compounds with the coordination number of 4 and 6.
15. a) Distinguish between Hemoglobin and Myoglobin  
OR  
b) Discuss the role of transport and storage of iron.

**SECTION -C (30 Marks)**

Answer ANY THREE questions

ALL questions carry EQUAL Marks

(3 × 10 = 30)

16. Explain the followings: i) Spectrochemical series ii) Spinels.
17. Calculate  $10Dq$  of  $V^{3+}$  and  $Ni^{2+}$  complexes.
18. Predict the theories of Trans effect.
19. Determine the geometrical and optical isomerism in octahedral complexes.
20. Illustrate the followings: i) Ferridoxin ii) Rubridoxin.

Z-Z-Z

END