

**M. SC. IN CHEMISTRY / M. SC. IN
ANALYTICAL CHEMISTRY
(MSCCHEM/MSCANCHEM)**

Term-End Examination

December, 2024

MCH-011 : INORGANIC CHEMISTRY-I

Time : 2 Hours

Maximum Marks : 50

Note : Attempt any **five** questions. All questions carry equal marks.

1. (a) Write the factors that affect the atomic radii and explain them. 5

- (b) Compare the variation in the values of Slater's effective nuclear charge for the elements of period 2 which have one valence electron with that in the elements of 3d series. 5

2. (a) What is the second postulate of VSEPR ?

On the basis of this postulate, predict the shape of sulphur tetrafluoride. 5

- (b) With suitable diagrams, compare the overlap of the orbitals in a p - p π system in benzene with the p - d π system in the phosphazene ring. 5

3. (a) (i) What are non-classical, multicentre bonded π -complexes ? Give any *one* example with suitable diagram. 3

- (ii) Explain with a suitable diagram the bridging and terminal methyls in trialkyl aluminium. 2

- (b) (i) What is the 18 electron rule ? Is it the same as EAN rule ? Explain. 3

- (ii) Use the 18 electron rule as a guide to find the value of n in $\text{Co}_2(\text{CO})_n$. 2

4. (a) Giving suitable illustrations, explain the different coordination modes of nitrosyl ligands. 5
- (b) What are metal pi complexes ? Give any *four* suitable examples of different types of such complexes. 5
5. (a) Give examples of any *two* methods (including reactions) of preparation of polyhedral borane anions. Give the structures of any *two* of them. 5
- (b) With suitable illustrations, explain when *closo*, *nido* and *arachno* prefixes are used for borane anions. 5
6. (a) Give the details of multiple metal-metal bonds in edge-sharing bioctahedral structures. 5

- (b) What would be the CFSE for an octahedral complex of a d^7 ion in a weak field and strong field ? 5
7. (a) Which site, octahedral or tetrahedral will be preferred by V^{2+} and Mn^{3+} ions ? Justify your answer. 5
- (b) Give the differences between diamagnetism and paramagnetism with suitable diagrams. 5
8. (a) Explain the mechanism of anti-ferromagnetic exchange. Illustrate your answer. 5
- (b) $[FeF_6]^{3-}$ is almost colourless whereas $[CoF_6]^{3-}$ is coloured and exhibits only a single band in the visible region of the spectrum. Justify. 3

- (c) What are the *two* types of Optical Rotatory Dispersion (ORD) curves ? Give suitable illustration. 2

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