

(6 pages)

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M.Sc. (CBCS) DEGREE EXAMINATION,
APRIL 2018.

Second Semester

Chemistry

INORGANIC CHEMISTRY – II

(For those who joined in July 2017 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. When d orbital of central metal ion of an octahedral complex have t_{2g} orbital as unsymmetrical orbital leads to ————
- (a) distortion
(b) no distortion
(c) slight distortion
(d) none of these

2. Give the number of unpaired electron for $[\text{Fe}^{\text{III}}(\text{CN})_6]^{3-}$

(a) 1 (b) 2
(c) 0 (d) 4

3. The complex in which substitution takes place slowly are called ———— Complexes.

(a) labile (b) inert
(c) polarized (d) none of these

4. The reaction in which no electron transfer results in no net charge are called ———— processes.

(a) symbiosis (b) electron exchange
(c) anation (d) aquation

5. The term symbol of Mn^{3+} is

(a) $^5\text{D}_4$ (b) $^2\text{D}_{3/2}$
(c) $^5\text{D}_0$ (d) $^1\text{S}_0$

Page 2

Code No. : 7139



6. The selection rule for IR spectroscopy is
- (a) $\Delta V = \pm 1$ (b) $\Delta j = 0, \pm 1 \text{ \& } \pm 2$
- (c) $\Delta V = 0, \pm 1$ (d) none of these
7. The substances for which the magnetic permeability μ is less than one are called substances.
- (a) paramagnetic (b) diamagnetic
- (c) ferromagnetic (d) anti ferromagnetic
8. The outer orbital complexes are _____
- (a) paramagnetic (b) diamagnetic
- (c) ferromagnetic (d) antiferromagnetic
9. _____ described as inorganic benzene.
- (a) carborane (b) disulphur dinitride
- (c) boranes (d) borazines
10. Ortho silicate structure is _____
- (a) square planar (b) tetrahedral
- (c) octahedral (d) none of these

PART B — (5 × 5 = 25 marks)

Answer ALL questions choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) Give an account on the site selection of the cations in inverse spinels.
- Or
- (b) Explain the basic features of CFT.
12. (a) Describe the Bjerrums method of determination of stability constant.
- Or
- (b) Write notes on template effect.
13. (a) Explain how infrared spectroscopy is useful in the identification of coordination states.
- Or
- (b) How many d-d bands are expected for d^3 ion in an octahedral environment? Explain with suitable Orgel diagram.
14. (a) Describe how the magnetic susceptibility is measured by Guoy's balance.
- Or
- (b) What is meant by spin orbit coupling? Explain the effect of distortion and change in the magnetic properties of metal complexes.



15. (a) Give an account on the structure of hydride of boron with reference to diborane.

Or

- (b) Explain the structure and bonding of nido and closo carboranes.

PART C — (5 × 8 = 40 marks)

Answer ALL questions choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) State and explain Jahn -Teller theorem with the help of Cu^{2+} ion.

Or

- (b) Draw and explain the MOT of $[\text{Co}(\text{NH}_3)_6]^{3+}$ and $[\text{CoF}_6]^{3-}$

17. (a) Describe the ion exchange method for the determination of stability constants and composition of the complexes.

Or

- (b) Explain the theories of trans effect and uses of trans effect in the synthesis of complexes.

18. (a) Compare and contrast charge transfer and d-d transitions.

Or

- (b) Calculate the $10 Dq$, β , ν for $A_{2g} \rightarrow T_{1g}(F)$ band of a complex $\text{Ni}[(\text{DMSO})_6(\text{ClO}_4)_2]$.
Given $\nu_1 = 7728 \text{ cm}^{-1}$, $\nu_2 = 12970 \text{ cm}^{-1}$,
 $\nu_3 = 24038 \text{ cm}^{-1}$.

19. (a) Discuss various kinds of magnetism with suitable examples.

Or

- (b) Compare the magnetic properties of $\text{Fe}(\text{II})$, $\text{Co}(\text{II})$, $\text{Ni}(\text{II})$ and $\text{Cu}(\text{II})$ complexes to distinguish its various structure.

20. (a) Discuss in detail the different types of clusters.

Or

- (b) What are silicates? Draw the structure of four different types of silicates and give the name, formula of each type.

