

This question paper contains 4 printed pages]

L—11—2019

FACULTY OF SCIENCE

M.Sc. (First Year) (First Semester) EXAMINATION

MARCH/APRIL, 2019

(CBCS Pattern)

CHEMISTRY

Paper I (CH-411)

(Inorganic Chemistry)

(Monday, 22-4-2019)

Time : 10.00 a.m. to 1.00 p.m.

Time—Three Hours

Maximum Marks—75

N.B. :— (i) Attempt All questions.

(ii) Log table and calculator is allowed.

(iii) Solve MCQ once only.

1. Solve any *three* out of five : 15

(a) Explain the inner sphere mechanism of electron transfer reactions with a suitable example.

(b) Explain lability and inertness of complexes on the basis of V.B.T.

(c) What is 18-electron rule ? Show that $\text{Ni}(\text{CO})_4$ obeys 18-electron rule.

(d) Give the characteristics of carbon monoxide as ligand.

(e) Calculate the number of microstates for p^6 and d^{10} configuration.

2. Solve any *three* out of five : 15

(a) Give the preparation and properties of ferrocene.

(b) Draw the structures of the following metal clusters :

(i) $\text{Mn}_2(\text{CO})_{10}$

(ii) $\text{Fe}_2(\text{CO})_9$.

P.T.O.

- (c) Determine the ground state term symbol for $(n-1)d$ orbital of Fe^{2+} .
- (d) What is $\text{S}_{\text{N}}2$ mechanism ? Give the characteristics of $\text{S}_{\text{N}}2$ mechanism in complexes.
- (e) Draw Tanabe-Sugano diagram for d^3 configuration.

3. Solve the following :

- (a) Explain metal-metal bonding in metal cluster with suitable examples. 8

Or

Explain oxidative addition and reductive elimination with suitable examples.

- (b) Draw and explain correlation diagram of d^1 and d^9 octahedral field. 7

Or

Calculate the magnetic moment of d^5 configuration in strong and weak octahedral ligand field.

4. Solve the following :

- (a) Distinguish between inner sphere and outer sphere electron transfer reaction in complexes. 8

Or

How will you prepare metal clusters by :

- (i) Thermal expulsion of CO from metal carbonyls.
- (ii) Condensation method.
- (b) Explain the charge transfer transitions in detail. 7

Or

Explain the structure and bonding in ferrocene.

5. (A) Select *correct* alternative from the following : 5

- (i) Number of microstates for p^4 configuration is
- (a) 10
 - (b) 20
 - (c) 18
 - (d) 15
- (ii) Mulliken spectroscopic term symbol for p in octahedral field is
- (a) A_{1g}
 - (b) T_{1g}
 - (c) T_{2g}
 - (d) eg
- (iii) $Ni(CO)_4$ is prepared by
- (a) Mond process
 - (b) Vilsmeier reaction
 - (c) Insertion reaction
 - (d) All of the above
- (iv) Complexes which do not allow exchange of ligand called
- (a) Labile complexes
 - (b) Inert complexes
 - (c) Both (a) and (b)
 - (d) None of the above

P.T.O.

- (v) Rate of electron transfer through outer sphere mechanism is increased if
- (a) Coordinated ligand is π -acceptor
 - (b) Electrons are present T_{2g} orbitals
 - (c) Coordinated ligand is π -donor
 - (d) None of the above
- (B) Write short notes on any *two* : 10
- (a) Anation reaction
 - (b) Spin cross over
 - (c) 16-electron rule.