

This question paper contains 4 printed pages]

AG—11—2018

FACULTY OF SCIENCE

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

NOVEMBER/DECEMBER, 2018

(CBCS Pattern)

CHEMISTRY

Paper CH-411

(Inorganic Chemistry—I)

(Monday, 26-11-2018)

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

Time—3 Hours

Maximum Marks—75

N.B. :— (i) Attempt All questions.

(ii) Use of calculator is allowed.

(iii) Figures to the right indicate full marks.

(iv) Solve MCQ once only.

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

(a) Explain liability and inertness on the basis of C.F.T.

(b) What is acid hydrolysis ? Explain the effect of strength of metal-leaving group bond on the rate of acid hydrolysis.

(c) What is 18-electron rule ? Show that $\text{Fe}(\text{CO})_5$ obeys 18-electron rule.

(d) What are metal nitrosyl compounds ? How many ways nitric oxide forms metal nitrosyl compounds ?

(e) Determine the term symbol for ground state of nitrogen.

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

(a) Explain $\text{S}_{\text{N}}1$ CB mechanism with suitable examples.

P.T.O.

- (b) Draw and explain Orgel diagram for d^1 and d^9 complexes in octahedral and tetrahedral ligand field.
- (c) Distinguish between $d-d$ transitions and charge transfer spectra.
- (d) The rate of outer sphere electron transfer in $[\text{Fe}(\text{CN})_6]^{4-}$ to $[\text{Fe}(\text{CN})_6]^{3-}$ is much faster than that from $[\text{Co}(\text{NH}_3)_6]^{2+}$ to $[\text{Co}(\text{NH}_3)_6]^{3+}$. Explain.
- (e) What is S_N1 mechanism ? What type of intermediates and products would be formed during S_N1 reactions in octahedral complexes ?
3. (a) Explain oxidative addition and reductive elimination reactions with suitable examples. 8

Or

Explain the following properties of ferrocene :

- (i) Bromination
- (ii) Nitration
- (iii) Carboxylation
- (iv) Mannich condensation.
- (b) Explain the rules for determination of term symbol according to L-S coupling scheme. 7

Or

Calculate magnetic moment of the following ions in weak and strong octahedral ligand field :

- (i) Co^{2+}
- (ii) Fe^{3+} .
4. (a) Discuss the complementary and non-complementary two-electron transfer reactions with suitable examples. 8

Or

Explain mechanism of acid hydrolysis when inert ligand is π -donor.

- (b) Explain spectroscopic properties of carbonyl compounds. 7

Or

What are microstates ? Calculate the number of microstates for p^1 , p^4 and d^4 configurations.

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

- (i) For Laporte forbidden transitions :

- (a) $\Delta l = 0$
- (b) $\Delta s = 0$
- (c) $\Delta l = -1$
- (d) $\Delta l = \pm 1$

- (ii) Mulliken symbol for spectroscopic term P in octahedral field is :

- (a) A_{1g}
- (b) T_{1g}
- (c) T_{2g}
- (d) E_g

- (iii) Stable carbonyl complexes exist only for :

- (a) metals with filled d -orbitals
- (b) metals with vacant d -orbitals
- (c) metals with half filled d -orbitals
- (d) metals from s -block

- (iv) π -acceptor ligand(s) is/are :

- (a) CO
- (b) NO
- (c) CNR
- (d) All of the above

P.T.O.

- (v) Ferrocene is compound.
- (a) Aromatic
 - (b) Antiaromatic
 - (c) Paramagnetic
 - (d) Neutral
- (B) Write short notes on any *two* ; 10
- (a) Spin cross over
 - (b) Homoleptic carbonyls
 - (c) Racah repulsion parameters.