

AC-105

April-2016

B.Sc., Sem.-VI

CC-308 : Chemistry (Inorganic)

Seat No. : _____

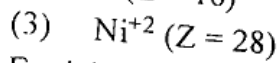
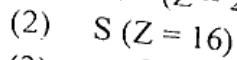
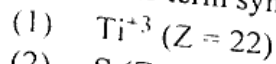
Time : 3 Hours].

[Max. Marks : 70

1. (a) Draw the pigeon hole diagram for d^2 configuration and derive all the term symbols for it. Arrange all the term symbols in the increasing order of energy giving reason.

OR

Derive the term symbol for the following :



- (b) Explain Orgel diagram of d^2-d^8 configuration.

OR

Explain spectrum of $[Cu(H_2O)_6]^{+2}$.

2. (a) What is Hermitian operator ? Prove that eigen values of Hermitian operators are always real.

OR

Obtain Normalized constant for following wave function :

(1) $\psi = Ne^{im\phi}$ where $0 \leq \phi \leq 2\pi$

(2) $\psi = N \sin \frac{n\pi x}{a}$ where $0 \leq x \leq a$

- (b) Explain Degeneracy for particle in three dimensional box.

OR

Construct following operators.

- (1) Linear momentum operator.
(2) Hamiltonian operator.

3. (a) Explain variation principle and prove that $\bar{E} \geq E_0$.

OR

Explain Huckel theory for allylic cation.

- (b) What is hybridization ? Give its types. Obtain the wave functions for SP hybrid orbitals.

OR

Explain the simple Huckel theory for ethylene molecule.

P.T.O.

4. (a) Discuss the structures of $\text{Ni}(\text{CO})_4$ and $\text{Fe}_3(\text{CO})_{12}$.

OR

Explain the application of IR Spectra in the study of structures of metal carbonyls.

- (b) What is organometallic compounds? Explain the classification of OMC. 7

OR

Discuss the structure of Ferrocene.

5. Answer the following in brief.

- (1) Why the colour of $[\text{Mn}(\text{H}_2\text{O})_6]^{2+}$ is light pink?
- (2) Why the d-d spectra is very weak and unsymmetrical?
- (3) Write spin multiplicity rule.
- (4) → What is zero point energy?
- (5) Define : Commute operator.
- (6) Write short form of Schrodinger equation.
- (7) The quantum number 'J' is known for HCl
- (8) Give the bond angle between SP^3 hybrid orbitals.
- (9) Write no of π -electron in allylic carb cation.
- (10) Write the use of variation theorem.
- (11) Write the ϕ equation.
- (12) Give the example of pentagonal bipyramidal structure of metal carbonyl hybride.
- (13) When the Nitrosil NO group behave as a ligand?
- (14) Write the no. of bridge and non bridge CO group in $\text{Co}_2(\text{CO})_8$.

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