

PD-162-S.E.-CV-19
M.Sc. CHEMISTRY (1st Semester)
Examination, Dec.-2020
Paper-I
INORGANIC CHEMISTRY

Time : Three Hours]

[Maximum Marks : 80

[Minimum Pass Marks : 29

Note : Answer from both the Sections as directed. The figures in the right-hand margin indicate marks.

Section-A

1. Fill in the following questions:- **1x10=10**

(a) Which of the following molecules has irregular geometry-
 CO_2 , BCl_3 , SF_4 , SO_3

(b) What will be percentage of 'S' character in Sp^3d hybrid orbital?

(c) How many $d\pi - p\pi$ bond/s is/are found in P_4O_{10} molecule.

(d) Calculate the number of BMO_5 , Nonbonding AO_5 and $ABmO_5$ in $[Co(NH_3)_6]^{+3}$ complex ion.

(e) Which of the following orbital has minimum energy. 1s, 3p, 1d.

(f) Determine the number of microstates ratio (*Mj levels*) in p^3 configuration.

(g) Write the expression for Nephelauxatic ratio (β).

(h) The pink colour of permanganate ion is due to which type of excitation?

(i) Give an example of molecule having C_3v point group.

(j) Write the name of any two uses of character table.

2. Answer the following questions:- **2x5=10**

(a) Write the limitations of VSEPR theory.

(b) Which type of complexes form $d\pi - p\pi$ bonds, explain it with giving examples.

(c) Explain the origin of paramagnetism.

(d) Write the name of various symmetry elements with their symbols.

(e) Give one example of each of point group D_3h and Td .

Section-B

12x5=60

Answer all questions.

3. (a) What is Walsh diagram? Explain it with the help of triatomic molecule.
 (b) What is Bent rule? On the basis of Bent rule, explain the energetic of hybridization of $SnCl_2$ and SF_4 molecules.

OR

(a) Explain VSEPR theory, how this theory is useful to predict the geometry of molecules having lone pair of electrons.

(b) What is $d\pi - p\pi$ bonds? Explain its formation with giving suitable examples.

4. Explain the formation of sigma and pi bonding in $[Co(NH_3)_6]^{+3}$ complex using MOT.

OR

(a) Draw the M.O. diagram of $[Co(NH_3)_6]^{3+}$ ion and $[COF_6]^{-3}$ ion and explain their magnetic behavior.

(b) Explain the effect of π -bounding in the value of Δ_0

5. (a) Discuss the electronic spectrum of $[Ti(H_2O)_6]^{+3}$ ion.
 (b) What is Laport selection rule? Explain it with suitable example.

OR

(a) What do you understand by L-S coupling?
 (b) Explain orgel energy level diagram for d^4 and d^9 ions.

6. (a) Write notes on:-
(i) Spin crossover
(ii) Charge transfer spectra
(b) What do you mean by symmetry element and symmetry operations? Explain symmetry plane and centre of inversion with suitable examples.
OR

(a) Write notes on:-
(i) Magnetic exchange coupling
(ii) Anomalous magnetic moment
(b) Find out the molecular point group and schoenflies symbols of following molecules- H_2O , $B(OH)_3$, CH_4 , CO_2

7. (a) Define the term group and sub group.
(b) Construct the character table for C_2v point group.
OR

(a) Explain the relation between order of a finite group and its sub group.
(b) Write note on:-
(i) Reducible and irreducible representation
(ii) Conjugate relations and classes.