

Eng.

[70]



Seat No.: \_\_\_\_\_

No. of printed pages **2**

**SARDAR PATEL UNIVERSITY**  
**B.Sc. EXAMINATION (SEMESTER-V) NC**  
**INORGANIC CHEMISTRY (US05CCHE52)**

Date: 06-10-2025

Time: 10.00 AM to 1.00 PM

Day : Monday

Total Marks: 70

Note: (i) All questions are to be attempted.  
(ii) Figures to the right indicate marks.

**Q:1 GIVE THE ANSWER OF FOLLOWING MULTIPLE CHOICE QUESTION: [10]**

1. Which is the principal axis of rotation present in benzene molecule ?  
(a)  $C_6$  (b)  $C_4$  (c)  $C_3$  (d)  $C_2$
2. How many two-fold axis of rotation present in cyclobutene molecule ?  
(a) 1 (b) 2 (c) 3 (d) 4
3.  $CN^-$  is a \_\_\_\_\_ field ligand.  
(a) strong (b) weak (c) bidentate (d) octahedral
4. The number of unpaired electrons present in  $[Co(NH_3)_6]^{3+}$  is \_\_\_\_\_.  
(a) 0 (b) 2 (c) 3 (d) 4
5. Which orbital is very important in CFT ?  
(a)  $s$  (b)  $p$  (c)  $d$  (d)  $f$
6.  $S_N1$  is known as \_\_\_\_\_ mechanism.  
(a) dissociation (b) association (c) both (a) & (b) (d) none of these
7. The high charge and ..... size of a ligand leads to the formation of stable complexes.  
(a) small (b) large (c) same (d) very large
8. The complexes in which the ligand substitution is fast are called ..... complexes.  
(a) inert (b) parallel (c) labile (d) octahedral
9.  $S_4N_4$  is insoluble in \_\_\_\_\_.  
(a)  $CCl_4$  (b) ether (c) benzene (d)  $H_2O$
10. How many isomers of  $S_6(NH)_2$  is possible?  
(a) 2 (b) 3 (c) 4 (d) 5

**Q:2 ANSWER THE SHORT QUESTIONS (ANY TEN):**

[20]

1. Define: (a) Improper rotation (b) Identity operation
2. Identify symmetry elements of Pyridine molecule and detect the point group.
3. Give the multiplication table for  $C_{2v}$  point group.
4. What is mean pairing energy ?
5. How the geometry of complex ion affected in the magnitude of  $\Delta_o$  ?
6. Define trans effect.
7. What is acid hydrolysis.
8. What is chelate effect?
9. Explain macrocyclic effect.
10. What is nitride of sulphur?
11. Give the uses of silicones.
12. Give the general properties of inorganic polymers.



**Q:3 ANSWER THE FOLLOWING QUESTIONS:**

- (a) Prove with proper examples:  
(i)  $S_n^{2n} = E$ , for  $n = \text{odd numbers}$  [05]  
(ii)  $S_n^n = E$ , for  $n = \text{even numbers}$   
(b) Give multiplication table for  $C_{3v}$  point group and also prove that it is non-abelian group. [05]

**OR**

**Q:3 ANSWER THE FOLLOWING QUESTIONS:**

- (a) Give the symmetry elements and point group present in following molecules: [05]  
(a) Methane (b)  $SF_6$  (c)  $HCl$  (d)  $SO_2$   
(b) Write a note on  $D_n$  and  $D_{nh}$  point group. [05]

**Q:4 ANSWER THE FOLLOWING QUESTIONS:**

- (a) Discuss the distribution of  $d^n$  electrons in high spin and low spin octahedral complexes. [05]  
(b) Discuss energy level molecular orbital diagram of  $[CoF_6]^{3-}$  ion. [05]

**OR**

**Q:4 ANSWER THE FOLLOWING QUESTIONS:**

- (a) Discuss crystal field splitting of  $d$ -orbital in octahedral complexes, with proper diagram. [05]  
(b) Discuss Kurnakov's test. [05]

**Q:5 ANSWER THE FOLLOWING QUESTIONS:**

- (a) Determine the stability constant and composition of a complex experimentally using Job's method. [05]  
(b) What is  $S_N1$  mechanism? Discuss its mechanism in detail. [05]

**OR**

**Q:5 ANSWER THE FOLLOWING QUESTIONS:**

- (a) Discuss the factors affecting the stability of complexes depends on properties of ligand. [05]  
(b) Explain the mechanism of acid hydrolysis of octahedral complexes in which the inert ligand is a  $\pi$ - acceptor. [05]

**Q:6 ANSWER THE FOLLOWING QUESTIONS:**

- (a) What are inorganic polymers? Classify them on the basis of type of reactions by which they are produced. [05]  
(b) Give the preparation, properties and structure of  $S_4N_4$ . [05]

**OR**

**Q:6 ANSWER THE FOLLOWING:**

- (a) Give the preparation and structure of Borazine,  $B_3N_3H_6$ . [05]  
(b) Write notes on imides of sulphur. [05]