

ASSIGNMENT BOOKLET

**M.Sc. in Chemistry Programme
(MSCCHEM)**

INORGANIC CHEMISTRY 1

Valid from 1st July, 2025 to 30th June, 2026

**It is Compulsory to submit the Assignment before filling in the Term-
End Examination Form.**



**School of Sciences
Indira Gandhi National Open University
Maidan Garhi, New Delhi-110068
(2025-26)**

Dear Student,

Please read the Section on assignments in the Programme Guide for M.Sc. in Chemistry that we sent you after your enrolment. A weightage of 30 per cent, as you are aware, has been earmarked for continuous evaluation, which would consist of one tutor-marked assignment for this course. The assignment is in this booklet, and covers all the four blocks of the course. The total marks of all the parts are 100, of which 40% are needed to pass it.

Instructions for Formatting Your Assignments

Before attempting the assignment please read the following instructions carefully:

- 1) On top of the first page of your answer sheet, please write the details exactly in the following format:

ENROLMENT NO.:

NAME:

ADDRESS:

.....

.....

COURSE CODE:

COURSE TITLE:

ASSIGNMENT NO.:

STUDY CENTRE: **DATE:**

PLEASE FOLLOW THE ABOVE FORMAT STRICTLY TO FACILITATE EVALUATION AND TO AVOID DELAY.

- 2) Use only foolscap size writing paper (but not of very thin variety) for writing your answers.
- 3) Leave 4 cm margin on the left, top and bottom of your answer sheet.
- 4) Your answers should be precise.
- 5) Solve Part (A) and Part (B) of this assignment, and **submit the complete assignment answer sheets within the due date.**
- 6) The assignment answer sheets are to be submitted to your Study Centre within the due date. **Answer sheets received after the due date shall not be accepted.**

We strongly suggest that you retain a copy of your answer sheets.

- 7) This assignment is **valid from 1st July, 2025 to 30th June, 2026**. If you have failed in this assignment or fail to submit it by June, 2026, then you need to get the assignment for the year 2026, and submit it as per the instructions given in the Programme Guide.
- 8) **You cannot fill the examination form for this course** until you have submitted this assignment.

We wish you good luck.

Tutor Marked Assignment

MCH-011: INORGANIC CHEMISTRY 1

Course Code: MCH-011

Assignment Code: MCH-011/TMA/2025-26

Maximum Marks: 100

Note: Attempt all questions. The marks for each question are indicated against it.

1.	a)	Explain the trends of ionization energy down the groups of the elements in the periodic table. How are the higher values of ionisation energies of the 5d transition elements justified?	(5)
	b)	What is the trend of the stability of the +6 state for Group 6 elements like tungsten, molybdenum and chromium? Which other group show a similar trend? Justify your answer.	(5)
2.	a)	Explain the structure of the pentafluorotellurate(IV) anion with the help of VSEPR theory. What is the point group of the symmetry in it?	(5)
	b)	With suitable illustration explain the theory of Dewar for π bonding in phosphazenes. What is phospham and how it is synthesized? Give suitable reaction.	(5)
3.	a)	Give the classification of nonclassically bonded organometallic compounds.	(5)
	b)	With any two suitable examples show how organometallic complexes of different classes may be stabilized by bulky ligands.	(5)
4.	a)	With suitable illustration explain the bent tin-tin double bond in $(\text{SnR}_2)_2$; where $\text{R} = (\text{Me}_3\text{Si})_2\text{CH}$.	(5)
	b)	With the help of suitable examples and structures, explain why some of the 16-electron organometallic complexes are stable. For a d^8 metal ion which form will be more stable, 16-electron square planar complex (d^8 and 8 ligand electrons) or a 18-electron complex (d^8 and 10 ligand electrons)? Justify your answer.	(5)
5.	a)	With suitable diagrams explain the electronic structure of NO and its binding to a metal fragment on the covalent model.	(5)
	b)	Compare the characteristics of electron-rich phosphines with those of electron poor phosphines regarding their σ donor and π acceptor capacities. What happens to these characteristics when the average electronegativity of the three groups attached to P increases?	(5)
6.	a)	Explain the π system of the allyl group with the help of molecular orbital theory. Illustrate your answer.	(5)
	b)	Give the structure of titanocene with its IUPAC nomenclature. How is the Hund's rule obeyed in manganocene?	(5)
7.	a)	Give the reactions for preparation of decaborane(14) from B_5H_8^- anion. Which is the only neutral dodecaborane and how is it prepared? Give suitable equation.	(5)
	b)	Explain the structure of $\text{Mo}_6\text{Cl}_8^{2-}$. Which are the two main classes of metal atom cluster	(5)

		compounds?	
8.	a)	Give the electronic configuration of d^n and d^7 complexes in both weak and strong fields. Also calculate their CFSE.	(5)
	b)	Explain the structure of normal spinels with a suitable example. Give suitable illustration.	(5)
9.	a)	Give suitable equations and explain the orbital and spin contributions towards paramagnetism in a complex.	(5)
	b)	What is the expected magnetic moment of the complex MnF_3 ? What sort of stereochemistry is seen in it? What is the electron configuration in it based on crystal field theory.	(5)
10.	a)	Write the Russell-Saunders terms symbols for states with the angular momentum quantum numbers (L,S) (a) (1, 1/2) (b) (2,1) (c) (0, 3/2) (d) (3, 0).	(5)
	b)	Explain how the <i>R</i> - and <i>S</i> - labels are used for enantiomers. Explain the λ and δ conformations of methyl axial and methyl equatorial respectively. Give suitable illustrations for all of these.	(5)