MCH-011

### ASSIGNMENT BOOKLET

M.Sc. in Chemistry Programme (MSCCHEM)

## **INORGANIC CHEMISTRY 1**

Valid from 1<sup>st</sup> January, 2024 to 30<sup>th</sup> June, 2025

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 (2024-25) Dear Student,

format:

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**

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

Before attempting the assignment please read the following instructions carefully:

	ENROLMENT NO.:
	NAME:
	ADDRESS:
COURSE CODE:	
COURSE TITLE:	
ASSIGNMENT NO	<b>.:</b>
STUDY CENTRE:	<b>DATE:</b>
COURSE TITLE: ASSIGNMENT NO	

# 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 1<sup>st</sup> January, 2024 to 30<sup>th</sup> June, 2025**. If you have failed in this assignment or fail to submit it by June, 2025, then you need to get the assignment for the year 2025, 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 Maximum Marks: 100

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

1.	a)	Give the trends in metallic radii of alkali, alkaline earth and transition metals of fourth, fifth and sixth periods with proper illustration.	(5)
	b)	Explain periodic variation of electronegativity with atomic number for the first six rows of the periodic table.	(5)
2.	a)	What are the possible molecular structures of xenon hexafluoride? Explain with suitable figures. Explain the geometrical isomers of Ma <sub>2</sub> b <sub>2</sub> cd complex with suitable figures.	(5)
	b)	With suitable illustration explain the theory of Craig and Paddock for $\pi$ bonding in phosphazenes. Give some synthetic routes for polyphosphazenes.	(5)
3.	a)	Explain the concept of hapticity giving suitable examples.	(5)
	b)	What is $\beta$ -elimination in organometallic chemistry? What is the role of agnostic alkyls in $\beta$ -elimination?	(5)
4.	a)	With suitable examples explain fluxional organometallic compounds. What are the probable of symmetric and semibridging carbonyls. Give suitable examples.	(5)
	b)	Determine the number and symmetry designations of the infrared-active C-O modes in the following derivatives of Mo(CO) <sub>6</sub> .	(5)
		$Mo(CO)_5PR_3$ cis- $Mo(CO)_4(PR_3)_2$	
		trans-MO(CO) <sub>4</sub> (PR <sub>3</sub> ) <sub>2</sub> $fac$ -Mo(CO) <sub>3</sub> (PR <sub>3</sub> ) <sub>3</sub>	
5.	a)	With the help of molecular orbital theory explain the geometry of the nitrosyl ligand.	(5)
	b)	What are the polydentate phosphines? How do you prepare molybdenocene.	(5)
6.	a)	Give the structures of (a) $B_7H_7^{2-}$ (b) $B_5H_5^{4-}$ .	(5)
	b)	What are Wade's Rule? Apply them to any metalloborane.	(5)
7.	a)	Explain the different types of compounds having multiple metal-metal bonds.	(5)
	b)	If pairing energy $P$ for Fe <sup>3+</sup> ion is 29,875 cm <sup>-1</sup> and $\Delta_O$ for [Fe (H <sub>2</sub> O) <sub>6</sub> ] <sup>3+</sup> is 13,700 cm <sup>-1</sup> , find out (i) whether the complex is high spin or low spin (ii) the number of unpaired electrons (iii) whether the complex is coloured or not?	(5)
8.	a)	Give the octahedral as well as tetrahedral field electronic configuration for Cr <sup>3+</sup> and Co <sup>3+</sup> ions. Which site will be preferred by these ions, octahedral or tetrahedral? Justify your answer.	(5)

	b)	Explain the Curie Law and Curie-Weiss Law along with their plots.	(5)
9.	a)	With suitable illustration explain the super exchange mechanism in <i>d</i> -metal complexes.	(5)
	b)	Write the Russell-Saunders terms symbols for states with the angular momentum quantum numbers (L,S) (a) $(0,\frac{5}{2})$ , (b) $(3,\frac{3}{2})$ , (c) $(2,\frac{1}{2})$ , (d),(1,1)	(5)
10.	a)	$[FeF_6]^{3-}$ is almost colourless whereas $[CoF_6]^{3-}$ is coloured and exhibits only a single band in the visible region of the spectrum. Justify.	(5)
	b)	Explain charge transfer spectra with suitable examples. What is the reason for the deep purple colour of the permanganate ion?	(5)