ASSIGNMENT BOOKLET

Bachelor's Degree Programme
(BSCM)

COORDINATION CHEMISTRY, STATES OF MATTER & CHEMICAL KINETICS

Valid from 1st January, 2024 to 31st December, 2024

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

Please Note

- **You can take electives (56 to 64 credits) from a minimum of TWO and a maximum of FOUR science disciplines, viz. Physics, Chemistry, Life Sciences and Mathematics.**

- **You can opt for elective courses worth a MINIMUM OF 8 CREDITS and a MAXIMUM OF 48 CREDITS from any of these four disciplines.**

- **At least 25% of the total credits that you register for in the elective courses from Life Sciences, Chemistry and Physics disciplines must be from the laboratory courses. For example, if you opt for a total of 64 credits of electives in these 3 disciplines, at least 16 credits should be from lab courses.**

- **You cannot appear in the Term-End Examination of any course without registering for the course. Otherwise, your result will not be declared and the onus will be on you.**

School of Sciences
Indira Gandhi National Open University
Maidan Garhi, New Delhi-110068
(2024)

Dear Student,

Please read the section on assignments in the Programme Guide for B. Sc. 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 it consists of two parts, Part A and B. It covers all blocks of the course. The total marks of all the parts are 100, of which 35% 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:

ROLL NO.: …………………………………………

NAME: …………………………………………

ADDRESS: …………………………………………

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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 January, 2024 to 31ˢᵗ December, 2024**. If you have failed in this assignment or fail to submit it by December, 2024, then you need to get the assignment for the year 2024, 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

BCHCT-137: COORDINATION CHEMISTRY, STATES OF MATTER & CHEMICAL KINETICS

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

PART A: COORDINATION CHEMISTRY

1. a) What is the ground state configuration of Sc^+ ion? Justify. (3)

    b) Why zinc and cadmium are soft metals? (2)

2. What is the composition of brass? Is it harder than pure copper? Give its uses. (5)

3. Why do lanthanoids mainly show ionic bonding? What is the nature of their melting and boiling points? (5)

4. What are the possible number of isomers for the octahedral complex ion $[Co(NH_3)Cl_2]^+$? (5)

5. What type of isomerism is exhibited in the complexes $[Co(NH_3)_5(SO_4)]$ Br and $[Co(NH_3)_5Br]SO_4$? (5)

6. Give the hybridized orbitals and the corresponding geometries of $[Ti(H_2O)_6]^{3+}$ and $[CoCl_4]^{2-}$. (5)

7. Explain the directional properties of the five d orbitals in a free transition metal ion with the help of suitable diagrams. (5)

8. Give the CFSE of an octahedral complex with seven electrons in the d orbitals. (5)

9   Give the possible electronic configurations for d^3 and d^6 systems in a tetrahedral crystal field. (5)

10. Which are the cases when tetrahedral geometry is favoured over octahedral geometry for metal complexes? Why are they so? (5)

PART B: STATES OF MATTER & CHEMICAL KINETICS

11. Calculate the i) average speed ii) root mean square speed and iii) most probable speed of oxygen molecules at 515 K. (Given $M_m(O_2) = 0.016$ kg mol^{-1}) (5)

12. State the Dalton's law of partial pressure and give its significance. (5)

13. Explain the pressure and volume correction terms to the ideal gas equation, and deduce van der Waals equation. (5)

14. What is meant by rate of a reaction? List and explain different types of rates used in chemical kinetics. (5)

15. With suitable example and figure explain the integrated rate law for first order reaction. (5)

16. For the reaction, $Cl_2(g) + 2NO(g) \rightarrow 2NOCl(g)$, the initial concentrations, $[Cl_2]_0$ and $[NO]_0$ are (5) given below along the corresponding with initial rates.

$[Cl_2]_0/M$	$[NO]_0/M$	Initial rate/Ms^{-1}
0.10	0.10	3.0×10^{-3}
0.20	0.10	6.0×10^{-3}
0.20	0.20	2.4×10^{-2}

Determine (i) the order of the reaction with respect to NO and Cl_2; (ii) the rate law; and (iii) the rate constant

17. Give the reasons for the striking contrast in the boiling points of ethanol (351 K) and (5) dimethyl ether (249 K). Give suitable diagrams to illustrate this.

18. What are the elements of symmetry? Give the suitable diagrams for any one of them. (5)

19. Explain close packing in two dimensions for a crystalline solid with the help of a suitable (5) diagram.

20. Give the consequences of Schottky and Frenkel defect. (5)