BCHCT-137

ASSIGNMENT BOOKLET

Bachelor's Degree Programme
(BSCG)

COORDINATION CHEMISTRY, STATES OF MATTER & CHEMICAL KINETICS

Valid from 1st January, 2023 to 31st December, 2023

School of Sciences
Indira Gandhi National Open University
Maidan Garhi
New Delhi-110068
(2023)

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, 2023 to 31st December, 2023**. If you have failed in this assignment or fail to submit it by December, 2023, 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.

ASSIGNMENT

COORDINATION CHEMISTRY, STATES OF MATTER & CHEMICAL KINETICS

Course Code: BCHCT-137
Assignment Code: BCHCT-137/TMA/2023
Maximum Marks: 100

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

PART A: COORDINATION CHEMISTRY

1 a) In potassium which of the two orbitals 3*d* and 4*s* has higher energy? Give reasons. (3)

b) Why are high oxidation states stable when we move from the second to the third row of the transition series? (2)

2 In $[Ni(H_2O)_6]^{2+}$ the observed magnetic moment is higher than the spin-only value explain the reason. (5)

3 Why do the colours arise in lanthanoid ions and why are the colours pale? (5)

4 What is the definition of a complex? Determine the coordination number and the oxidation state of the transition metal ion in the $[Co(NH_3)_6]^{3+}$ complex. (5)

5 What will be the names of the following ligands when they are present in a complex entity: (5)

CN^-, O^{2-}, Me_2As^-, $(CH_3COCHCOCH_3)_2$ and H_2O.

6 What are the different types of structural isomerism? Give example of any one of them. (5)

7 Explain the structure of $[MnCl_4]^{2-}$ with the help of valence bond theory. (5)

8 Predict the geometry of the $Ni(CO)_4$ complex showing their hybridized orbitals. (5)

9 Calculate the crystal field stabilization energy (CFSE) of an octahedral complex with four electrons in the *d* orbitals. (5)

10 Calculate the spin-only magnetic moment for low-spin octahedral complex of d^5 and d^6 ions. (5)

PART B: STATES OF MATTER & CHEMICAL KINETICS

11 State postulates of kinetic theory of gases and derive the equation: $pV = \frac{1}{3}mN\bar{u}^2$. (5)

12 Define mean free path of a molecule. Calculate the mean free path of oxygen molecule at 300 K and 1.013×10^5 Pa. The collision diameter for the molecule is 1.20×10^{-10} m. (5)

13 What are critical constants? Derive the relationships between the critical constants and van der Waals constants. (5)

14 a) List different factors affecting the rates of chemical reactions. (2)

b) Derive the integrated rate equation for a second order reaction in which a single reactant forms the product and the reaction rate depends on the second power of the reactant concentration. (3)

15 a) What are clock reactions? What type of rate of reaction is determined by these reactions? (2)

b) Derive an expression relating the activation energy with the rate constants at two different temperatures. (3)

16 The first-order decomposition of N_2O_5 is studied at 340 K starting with 2.50 g of N_2O_5. If its amount decreases to 1.50 g in 100 s, then calculate: (5)

a) the rate constant

b) the half life of reaction

c) the time required for the amount of N_2O_5 to reduce to 0.5 g.

17 What are the various intermolecular forces that are responsible for the conversion of gases into liquids and solids? (5)

18 Explain with suitable diagrams the planes of symmetry and the axes of symmetry in the cubic system. (5)

19 Explain the parameters of a unit cell with the help of a suitable diagram. (5)

20 Tungsten form *bcc* crystals. Its cell-edge length is 2.18×10^{-10}. Find the density of tungsten. (Given: Molar mass of tungsten = 183.84 g per mol). (5)