

BCHET-147

ASSIGNMENT BOOKLET

**Bachelor's Degree Programme
(BSCG)**

**ORGANOMETALLICS, BIOINORGANIC CHEMISTRY, POLYNUCLEAR
HYDROCARBONS AND UV, IR SPECTROSCOPY**

Valid from 1st January, 2026 to 31st December, 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
(2026)**

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:

.....

.....

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, 2026 to 31st December, 2026.** If you have failed in this assignment or fail to submit it by December, 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

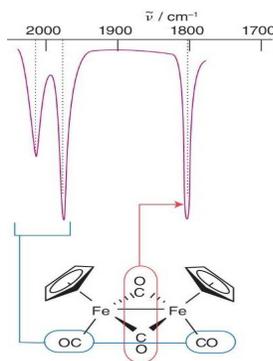
BCHET-147: ORGANOMETALLICS, BIOINORGANIC CHEMISTRY, POLYNUCLEAR HYDROCARBONS AND UV, IR SPECTROSCOPY

Course Code: BCHET-147
Assignment Code: BCHET-147/TMA/2026
Maximum Marks: 100

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

PART A: ORGANOMETALLICS, BIOINORGANIC CHEMISTRY

1. What is the chromyl chloride test? Give suitable equations. (5)
2. Give the structure of dimethyl beryllium. (5)
3. Explain the concept of hapticity with reference to allyl complexes, such as $[\text{Pd}(\eta^3\text{-C}_3\text{H}_5)\text{Cl}]$. How does η^3 -coordination differ from η^1 -coordination in terms of bonding and structure? (5)
4. Explain the structure of $\text{Fe}_2(\text{CO})_9$ based on valence bond approach. (5)
5. How can formation of nitrosyl complexes be formed from carbonyl complexes with the help of nitric oxide? Give three suitable equations to show this. (5)
6. The C – O stretching frequencies in the IR spectra of certain metal carbonyl species are as follows:
 $\text{Ni}(\text{CO})_4$ 2056 cm^{-1}
 $[\text{Fe}(\text{CO})_6]^{2+}$ 2200 cm^{-1}
The value for $\text{CO}(\text{g})$ is 2143 cm^{-1} . Discuss (5)
7. What information is obtained from the IR spectrum of $\text{Fe}_2(\text{Cp})_2(\text{CO})_4$ given below? (5)

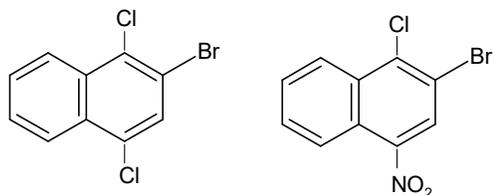


8. Which metal ion is essential for the process of blood coagulation? Explain the mechanism by which it facilitates clot formation? Give the different ways by which cadmium affects the human body. (5)
9. With the help of a suitable diagram explain the $\text{Na}^+\text{-K}^+$ pump. Show how the sodium-potassium pump moves toward an equilibrium state with the relative concentrations. (5)
10. With the help of a suitable diagram, explain the mechanism of oxygen binding in hemoglobin and discuss the structural changes that occur upon formation of oxyhemoglobin. (5)

PART B: POLYNUCLEAR HYDROCARBONS AND UV, IR SPECTROSCOPY

11. How will you prepare 5-hexen-2-one from ethyl 3-oxobutanoate. Give the reactions involved and the reagents used in the reaction. (5)

12. (a) Give IUPAC names of the following compounds. (2)



(b) Is naphthalene an aromatic compound? Explain. (3)

13. Give the reaction involved and the reagents used for the commercial preparation of pyrrole. (5)

14. Give the resonance structures for the intermediate in the reaction where electrophile E⁺ attacks on 2-position of pyridine. (5)

15. What are the differences between Bathochromic shift and Hypsochromic shift? (5)

16. Explain Woodward rules for predicting π - π^* absorption in dienes. (5)

17. What sort of shift may be observed in bromobenzene, (C₆H₅Br)? (5)

18. Explain the Feiser and Scott rules for predicting π - π^* absorption in α , β -unsaturated ketones (enones) and aldehydes. (5)

19. With the help of suitable diagrams explain how the IR spectrum is depicted in the absorption mode and the transmittance mode. (5)

20. The IR spectrum of a sample of cyclohexanol is recorded. Which major absorption bands you would be looking for in the spectrum? (5)