

BCHET-141

ASSIGNMENT BOOKLET

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

ANALYTICAL METHODS IN CHEMISTRY

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-141: ANALYTICAL METHODS IN CHEMISTRY

Course Code: BCHET-141

Assignment Code: BCHET-147/TMA/2026

Maximum Marks: 100

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

Part A (50 marks)

- 1 Give the details of the preservation techniques used for water samples. (5)
- 2 A sample was analyzed for desired constituent having 3.67 g as the true value. The results of three measurements were 3.70 g, 3.74 g, and 3.77 g. Find the error of the mean (mean error), the percent relative error and the relative accuracy of the mean of the measurements. (5)
- 3 Give the differences between t-test and F-test with the help of suitable examples. (5)
- 4 With the help of suitable examples differentiate between the terms-distribution coefficient and distribution ratio. (5)
- 5 Give the mechanism of extraction by solvation. (5)
- 6 With the help of suitable equations explain the method solvent extraction with Diphenylthiocarbazone. (5)
- 7 Give the advantages of using continuous extraction? (5)
- 8 With the help of a suitable diagram explain development of chromatogram along with the use of standard samples. (5)
- 9 How does surface area of the stationary phase affect the separation in column chromatography? What should be the sample to absorbent ratio so that clear separations are obtained? (5)
- 10 What are the different types of ion exchangers? Give examples of a strong cation exchanger and a strong anion exchanger alongwith their specific functional groups. (5)

Part B (50 marks)

- 11 A mixture of CaO and CaCO₃ is analysed by TGA. The result indicates that mass of the sample decreases from 320.8 mg to 230.6 mg only between 650°C and 850°C. Calculate the percentage of calcium carbonate in the mixture. (5)
- 12 Explain the method of pH metric titrations. Draw the different types of pH titration curves and show how equivalence points can be found from them (5)
- 13 From the following data, calculate the molar conductivity of NaCl in aqueous solution: (5)
Conductivity of 4.0×10^{-4} mol dm⁻³ NaCl solution = 6.20×10^{-3} S m⁻¹
Conductivity of the water = 0.05×10^{-3} S m⁻¹.

- 14 With the help of suitable diagrams explain the typical conductometric titration curves for the following: (5)
- a) Strong acid with a strong base
 - b) Strong acid with a weak base
 - c) Precipitation titration
- 15 At 298 K, the limiting molar ionic conductivities of K^+ and Cl^- ions are 73.5 and 76.3 $S\ cm^2\ mol^{-1}$ respectively. Calculate: (5)
- (a) the transport number of K^+ ions, and
 - (b) the transport number of Cl^- ions.
- 16 An infrared radiation has a frequency of 8 gigahertz. (5)
- (a) Calculate the energy of a photon corresponding to this radiation.
 - (b) Determine the wavelength of the radiation.
- (Given $h = 6.626 \times 10^{-34}\ J\ s$ and 1 gigahertz = $10^9\ Hz$)
- 17 With the help of a suitable diagram explain the absorption of radiation causing (5)
- (a) transitions in rotational energy levels
 - (b) transitions in vibrational energy levels of the molecule.
- 18 (a) What is the role of absorbing species in UV-VIS spectra? What are its different types? (2)
- (b) The molar absorptivity of a substance is $1.5 \times 10^4\ cm^{-1}\ mol^{-1}\ dm^3$. Calculate the transmittance through a cuvette of path length 4.0 cm containing $3.0 \times 10^{-6}\ mol\ dm^{-3}$ solution of the substance. (3)
- 19 (a) What are the different types of IR spectrometers? Mention any one advantage of FT-IR spectrometer. (2)
- (b) What are the characteristic stretching frequencies for the following: (3)
- i) carboxylic acids
 - ii) amides
 - iii) nitroalkanes
- 20 Briefly compare the instrumentations for flame atomic absorption spectrophotometry and flame atomic emission spectrophotometry. (5)