

ASSIGNMENT BOOKLET

Post Graduate Diploma in Analytical Chemistry (PGDAC)

Basic Analytical Chemistry	(MCH – 001)
Separation Methods	(MCH – 002)
Spectroscopic Methods	(MCH – 003)
Electroanalytical & Other Methods	(MCH – 004)

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

It is compulsory to submit the assignment before filling in the examination form.



School of Sciences
Indira Gandhi National Open University
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(2026)

Dear Learner,

This assignment booklet consists of the tutor marked assignments of MCH- 001, MCH- 002, MCH – 003 and MCH – 004 courses of the Post Graduate Diploma in Analytical Chemistry (PGDAC) programme. We hope, you are familiar with the system of evaluation to be followed for this Programme. You may probably like to re-read the section on assignments in the Programme Guide that was sent to you earlier. As you are aware, a weightage of 30 percent has been earmarked for continuous evaluation component. For this you have to submit the responses of the enclosed tutor marked assignments to the Study Centre Coordinator. The assignments are based on the content of all the blocks of all the courses.

Before attempting the assignment, please read the following instructions carefully.

- 1 On top of the first page of your assignment response, please write the details exactly in the following format; write your answers from second page onwards.

ENROLMENT NO. :

NAME :

ADDRESS :

.....

.....

COURSE CODE :

COURSE TITLE :

ASSIGNMENT NO. :

STUDY CENTRE :

DATE :

(NAME AND CODE)

PLEASE FOLLOW THE ABOVE FORMAT STRICTLY TO FACILITATE EVALUATION AND TO AVOID DELAY.

- 2 Use only foolscap size paper (but not of very thin variety) for writing your answers.
- 3 Leave about 4 cm margin on the left, top and bottom of your assignment response sheet.
- 4 Your answers should be precise.
- 5 While writing answers, clearly indicate the Question No. and part of the question being solved.
- 6 Though the validity of assignment is for one year, we advise you to submit the assignment response within 12 weeks after receiving it.
- 7 **We strongly suggest that you should retain a copy of your assignment responses.**

Wishing you good luck

TUTOR MARKED ASSIGNMENT
ELECTROANALYTICAL AND OTHER METHODS

Course Code: MCH-004
Assignment Code: MCH-004/TMA/2026
Maximum Marks: 100

Note: Answer all the questions given below.

- Q.1 a) What do you understand by cell potential? Calculate the potential of following electrodes:
(5)
- i) A copper electrode immersed in 0.022 M $\text{Cu}(\text{NO}_3)_2$
 - ii) A zinc electrode immersed in 0.030 M $\text{Zn}(\text{NO}_3)_2$
- b) Describe various factors that cause errors in pH measurement.
(5)
- Q.2 a) What is solid state membrane electrode? Draw a sketch and describe their applications.
(5)
- b) Define conductivity, cell constant and molar conductivity.
Resistance of a conductivity cell filled with 0.1M KCl solution is 100 Ω . If the resistance of the same cell when filled with 0.02 M KCl solution is 520 Ω , calculate the conductivity and molar conductivity of 0.02 M KCl solution. The conductivity of 0.1 M KCl solution is 1.29 Sm^{-1} . (5)
- Q.3 a) How will you analyse a binary alloy of copper and silver thermogravimetrically. (5)
- b) A solution of CuSO_4 is electrolysed for 10 minutes with a current of 1.5 amperes. What is the mass of copper deposited at the cathode? (5)
- Q.4 a) Explain how will you determine dissociation constant of a weak acid or base by conductometric method. (5)
- b) The conductivity of 0.001028 M acetic acid is $4.95 \times 10^{-5} \text{ S cm}^{-1}$. Calculate its dissociation constant if the limited molar conductivity for acetic acid is 390.5 $\text{Scm}^2 \text{ mol}^{-1}$.
(5)
- Q.5 a) Describe the design and principle of constant current coulometry. Write three main applications of coulometric titrations. (5)
- b) Enlist various voltammetric methods of analysis. Write briefly about anodic stripping voltammetry(ASV) and its usefulness for trace elemental analysis. (5)
- Q.6 a) Explain the terms limiting current, migration current, diffusion current, residual current and half wave potential. (5)
- b) What is dropping mercury electrode? Give its advantages. (5)

- Q.7 a) What are amperometric titrations? Draw common types of curves obtained in amperometric titrations. Briefly discuss their experimental set up. (5)
- b) List the factors affecting TG curve. Taking a suitable example, explain the effect of furnace atmosphere on TG curve. (5)
- Q.8 a) Draw a labelled diagram of the TG curve obtained by heating a mixture of 50 mg of calcium oxalate monohydrate and 50 mg of barium oxalate monohydrate to 1200°C. Calculate the amount of all mass losses. (5)
- b) Explain the basic principle of Differential Scanning Calorimetry (DSC). Draw a block diagram of DSC instrument. (5)
- Q.9 a) Describe various types of neutron sources available for NAA. Which one of these is most suitable for trace element analysis? (5)
- b) In what respects nuclear reactions are different from chemical reactions? Calculate Q value of the reaction ${}^{63}\text{Cu} = (n, \gamma){}^{64}\text{Cu}$. Give that ${}^{63}\text{Cu} = 62.929590$, ${}^{64}\text{Cu} = 63.929760$, $n = 1.008665$ amu. (5)
- Q.10 a) Explain why (n, γ) reaction is most suited for NAA. (5)
- b) Discuss the principle of isotope dilution technique. (5)