ASSIGNMENT BOOKLET

M.Sc. in Analytical Chemistry Programme (MSCANCHEM)

ELECTROANALYTICAL AND OTHER ANALYTICAL METHODS

(Valid from 1st July, 2025 to 30th June, 2026)

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

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THE PEOPLE'S
UNIVERSITY

School of Sciences
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(2026)

Dear Learner,

We hope, you are familiar with the system of evaluation to be followed for the M.Sc. in Analytical Chemistry (MSCANCHEM) 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 response to the enclosed tutor marked assignment to the coordinator of the study centre allotted to you. The assignment is based on the content of all the 5 blocks of the Electroanalytical and Other Methods (MCH-004) course. The total marks of all the parts are 100, of which 40% are needed to pass it.

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: …………………………...

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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 within 12 weeks after receiving it.

7   We strongly suggest that you should retain a copy of your assignment responses.

Wishing you good luck

Electroanalytical and Other Analytical Methods (MCH-004)

Note: Answer all the questions given below.

1. **a)** Derive an expression for the determination of an equilibrium constant using electrode potential measurement. **(5)**

    b) Calculate the potential of the cell given below

$$Cu \mid Cu^{2+} (0.010 \text{ M}) \parallel Ag^+ \mid Ag (0.10 \text{ M})$$ **(5)**

    Hint: use Appendix I for the standard electrode potential values.

2. **a)** How is the conductance varied with concentration? Explain with the help of suitable examples. **(5)**

    b) At 298 K, the limited molar conductivities at infinite dilution of sodium benzoate, hydrochloric acid and sodium chloride are 8.24×10^{-3} S m^2 mol^{-1}, 4.26×10^{-2} S m^2 mol^{-1} and 1.26×10^{-2} S m^2 mol^{-1}, respectively. Calculate the limiting molar conductivity of aqueous benzoic acid. **(5)**

3. **a)** Discuss the factors which limit the accuracy of pH measurements. **(5)**

    b) Give two applications of ion selective electrodes. **(5)**

4. **a)** Describe concentration polarization. Give the importance of overvoltage. **(5)**

    b) A solution of Zn is electrolyzed for 30 s using a current of 1.0 mA. Calculate the mass of Zn plated on the electrode for the electrochemical reaction:

$$Zn^{2+} + 2e \rightarrow Zn$$ **(5)**

5. **a)** Write the advantages of coulometric titrations. **(5)**

    b) Calculate the amount of Co (II) deposited on the surface of a cathode, if a constant current of 0.96 A for 28.4 minutes is passed through solution of Co (II). Assume that current efficiency is 90%. **(5)**

6. **a)** Conductivity of 1.6×10^{-2} mol dm^3 acetic acid is 0.0215 S m^{-1}. Calculate the degrees of dissociation and the dissociation constant of acetic acid. You may consult Table 4.2 for the limiting ionic conductivities of the hydrogen and acetate ion. **(5)**

    b) How would you analyze a mixture of Ca, Sr, and Ba oxalates using thermogravimetry? Draw a thermogram for the decomposition of Ca, Sr and Ba oxalates. **(5)**

7. **a)** List the advantages of DTA and DSC over TGA. **(5)**

    b) An impure sample of $CaC_2O_4.H_2O$ is analyzed using TGA technique. TG Cure of the sample indicates the total mass change from 85 mg to 30.7 mg when this sample was healed upto 900° C. Calculate the % purity of the sample. **(5)**

8. **a)** Draw a DTA Curve for $CaC_2O_4.H_2O$. Give the interpretations of different peaks exist in the thermogram. **(5)**

b) At 291 K, the conductivity of pure water is 4.3×10^{-6} S m^{-1}. Calculate the ionic product of pure water at 291 K. **(5)**
Hint: consult Table 4.2 for the limiting ionic conductivity of H$^+$ and OH$^-$ ions.

9. **a)** Give advantages and limitations of NAA technique. **(5)**

b) Discuss the working of a Scintillation Detector. **(5)**

10. **a)** Draw and label the three-electrode cell for hydrodynamic voltammetry. **(5)**

b) Write the Ilkovic equation and mention the meaning of each of the terms used in it. **(5)**