**MCH-014**

**ASSIGNMENT BOOKLET**

**M.Sc. in Chemistry/Analytical Chemistry Programme**
**(MSCCHEM/MSCACHEM)**

# MATHEMATICS FOR CHEMISTS

(Valid from 1st January 2025 to 30th June 2025)

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

**School of Sciences**
**Indira Gandhi National Open University**
**Maidan Garhi, New Delhi-110068**
(2025)

Dear Learner,

Please read the sec1on on assignments in the Programme Guide for M.Sc. in Chemistry 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 covers both the blocks of the course. The total marks of all the parts are 100, of which 40% 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:

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**ENROLMENT NO. :** ……...

**NAME** **:** ……

**ADDRESS** **:** ……...

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**COURSE CODE** **:** …….

**COURSE TITLE** **: ……..**

**ASSIGNMENT NO. : ……...**

**STUDY CENTRE : ……...…** **DATE : ……...**

**(NAME AND CODE)**

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**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) 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, 2024 to 31st December, 2024. If you have failed in this assignment or fail to submit it by December, 2024, then you need to get the assignment for the year 2025, 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 the assignment.

Wishing you good luck

# Tutor Marked Assignment
## MATHEMATICS FOR CHEMISTS (MCH-014)

**Course Code: MCH-014**
**Assignment Code: MCH-014/TMA/2025**
**Maximum Marks: 100**

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

1. State whether the following statement are TRUE or FALSE. Give reason in support of your answer.

   a) Derivative of $\frac{1}{x}$ with respect to x is 1. (3)

   b) If A is a matrix of order 2 by 3 and B is a matrix of order 3 by 2, then order of the matrix $A+B$ is 2 by 3. (3)

   c) If $\vec{a}=3\hat{i}-5\hat{j}+4\hat{k}$ and $\vec{b}=4\hat{i}+4\hat{j}+2\hat{k}$ they are perpendicular to each other. (3)

   d) If probability of an event E is 1/2 and probability of the event $E\cap F$ is 1/6, then probability of the event F is 1/3, where events E and F are independent. (3)

   e) If the first term of an AP is 5 and 101 term of the AP is 1005 then common difference of the AP will be 105. (3)

2. Solve the following system of equations using Cramer's rule. (10)

   $x + 3y + 2z = 6, -x + 4y + 5z = 8, 2x + 5y + 3z = 10$

3. a) Prove that $A=\begin{bmatrix}\cos 2\alpha & -\sin 2\alpha \\ \sin 2\alpha & \cos 2\alpha\end{bmatrix}$ is an orthogonal matrix. (10)

4. a) Evaluate $\int_{-5}^{5}\left(x^3+x\right)dx$. (10)

   b) Evaluate $\int\frac{\ln x}{x^2}dx$. (10)

5. a) Solve the differential equation $\sin x\frac{dy}{dx}+y\cos x=1$. (5)

   b) If $\vec{a}=2\hat{i}+3\hat{j}+4\hat{k}$ and $\vec{b}=3\hat{i}+5\hat{j}+2\hat{k}$ then find $\vec{a}\times\vec{b}$. (10)

   c) In an iron determination (taking 1 g sample every time) the following four replicate results were obtained: 24.8, 25.2, 23.6 and 24.7 mg iron. Calculate the coefficient of variation and relative standard deviation in ppm of the given data. (10)

6. a) In a factory there are three machines A, B, C which produce 10%, 40% and 50% items respectively. Past experience shows that percentage of defective items produced by machines A, B, C are 5%, 4%, 2% respectively. An item from the production of these machines is selected at random and it is found defective. What is the probability that it is produced by machine A? (6)

b) Assume that in a population each person is equally likely to have a particular disease and disease status of each individual is independent of each other, then find the probability that out of the 5 randomly selected individuals who are tested for this particular disease exactly 3 have this disease. (6)

c) A hospital specialising in heart surgery. In 2023 total of 1000 patients were admitted for treatment. The average payment made by a patient was Rs 1,00,000 with a standard deviation of Rs 20000. Under the assumption that payments follow a normal distribution, find the number of patients who paid between Rs 90,000 and Rs 1,10,000. (8)