This question paper contains **3** printed pages]

NEPNY—65—2023

FACULTY OF SCIENCE AND TECHNOLOGY

M.Sc. (NEP) (First Year) (First Semester) EXAMINATION

NOVEMBER/DECEMBER, 2023

CHEMISTRY

Paper-SCHEE-401

(Physical Methods in Chemistry)

(Thursday, 28-12-2023)   **Time : 10.00 a.m. to 12.30 p.m.**

Time—2½ Hours   *Maximum Marks—60*

N.B. :— (*i*)   Question No. **1** is compulsory.

      (*ii*)   Attempt any *three* questions from Q. No. **2** to Q. No. **6**.

      (*iii*)   Use of logarithm table and simple non-programable calculator is allowed.

1.   Answer the following questions :   15

    (*a*)   Explain centre of symmetry and plane of symmetry with suitable example.

    (*b*)   Distinguish between accuracy and precision.

    (*c*)   Explain measurement technique of electron diffraction.

P.T.O.

2. Answer the following questions :

   (*a*)   (*i*)   Define the groups and give various postulates of the group.

            (*ii*)   Describe matrix representation for the symmetry elements–plane of symmetry and identity.   4+4=8

   (*b*)   Explain in detail student '*t*' test and student 'Q' test.   7

3. Solve the following questions :

   (*a*)   Derive Bragg's equation. Find the interplaner distance in a crystal in which a series of planes produces a second order reflection of wavelength 1.5 Å was observed at angle (2Q) equal to 21.975. (sin $10.895° = 0.189$).   8

   (*b*)   List symmetry elements, locate them diagrammatically and find point group of NH_3, HCN, BF_3 molecules.   7

4. Solve the following questions :

   (*a*)   What is significant figure ? Explain significant figure rule.

       "The percentage of constituent of 'A' in compound 'AB' were found to be 48.32, 48.36, 48.23, 48.11 and 48.38 percent. Calculate mean deviation and standard deviation.   8

   (*b*)   Explain the Debye-Scherrer method of X-ray structural analysis of crystal.   7

5. Attempt the following questions :

   (*a*) What is principle of neutron diffraction ? Explain scattering of neutrons by solids and liquids. 8

   (*b*) What is character table ? Construct a character table for C_{2v} group. 7

6. Write short notes on : 15

   (*a*) Mulliken symbols

   (*b*) Miller indices

   (*c*) Wierl equation.