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NEPRT—65—2024

FACULTY OF SCIENCE AND TECHNOLOGY

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

APRIL/MAY, 2024

CHEMISTRY

(SCHEE-401)

(Physical Methods in Chemistry)

(Tuesday, 30-04-2024) **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. Nos. **2** to **6**.

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

1. Answer the following questions : 15

(*a*) Explain proper axis of rotation and center of symmetry with a suitable example.

(*b*) Distinguish between accuracy and precision.

(*c*) Explain the principle of electron diffraction.

P.T.O.

2. Answer the following questions :

(*a*) (*i*) Describe matrix representation for the symmetry elements, identity and inversion centre. 4

(*ii*) Write reducible representation for the C_{2v} and C_{3v} group based on 3N coordinates. 4

(*b*) What is sampling ? Explain the different types of sampling. 7

3. Solve the following questions :

(*a*) Explain Miller indices. When the diffraction of X-ray having wavelength 1.54 Å occur in X-ray diffractometer by the diffraction angle (2θ) equal to 21.97° and the interplanar distance is 4.04 Å, then calculate order of diffraction. (sin 10.98° = 0.1904). 8

(*b*) List the symmetry elements, show it diagrammatically and find the point groups for H_2O, C_6H_6 and $NiCl_4$. 7

4. Solve the following questions :

(*a*) Explain the terms, mean deviation and standard deviation.

The normality of solution is determined by four separate titrations, the results are being 0.2041, 0.2039, 0.2049, 0.2043. Calculate the mean deviation and standard deviation for these values. 8

(*b*) What is phase difference ? Explain the identification of unit cell from systematic absence in diffraction pattern. 7

5. Attempt the following questions :

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

(*b*) State and explain great orthogonality theorem (GOT) and give its consequences. 7

6. Write short notes on : 15

(*a*) Reducible and irreducible representation

(*b*) Ramchandran diagram

(*c*) Wierl equation.