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NEPWT—318—2024

FACULTY OF SCIENCE AND TECHNOLOGY

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

NOVEMBER/DECEMBER, 2024

CHEMISTRY

Paper SCHEE-401

(Physical Methods in Chemistry)

(Thursday, 19-12-2024) **Time : 10.00 a.m. to 1.00 p.m.**

Time—3 *Hours* *Maximum Marks*—60

Note :— (*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-programmable calculator is allowed.

1. Answer the following questions : 15

(*a*) Explain plane of symmetry and improper axis of rotation with suitable example.

(*b*) What is error ? Explain different types of errors.

(*c*) Explain the scattering of neutrons by solids and liquids.

P.T.O.

2. Answer the following questions : 4+4=8

(*a*) (*i*) Distinguish between reducible and irreducible representation.

(*ii*) Define the group and give various postulates of the group.

(*b*) Explain what is meant by deviation and standard deviation with suitable example. 7

3. Solve the following questions :

(*a*) Explain Ramachandran diagram. Diffraction angle (2θ) equal to 16.8° for crystal having interplanar distance in crystal 0.400 nm, second order diffraction was observed for X-ray. Calculate wavelength of X-ray used (sin 8.4° = 0.146). 8

(*b*) What is character table ? Construct character table for C_{3v} point group. 7

4. Solve the following questions :

(*a*) Distinguish between accuracy and precision.

"Suppose an object is weighted five times and the following values obtained are as

0.1010, 0.1020, 0.1005, 0.1030, 0.1015,

then calculate mean deviation and standard deviation for these values. 8

(*b*) Explain the Laue's method of X-ray structural analysis of crystal. 7

5. Attempt the following questions :

(*a*) Derive equation for the relation between scattering intensity and scattering angle in electron diffraction. 8

(*b*) List symmetry elements, show it diagrammatically and find the point groups for PCl_5, HOCl and XeF_4 molecules. 7

6. Write short notes : 15

(*a*) Abelian and non-abelian point groups

(*b*) Miller indices

(*c*) Principle of neutron diffraction.