

Roll No. _____
1900 /10/30/20

January 2018
M. Sc. 1st Semester Examination

CHEMISTRY

Paper IV - Group Theory and Spectroscopy - I (MCH-404)

Time 3 Hours]

[Max Marks Regular 85 / Private 100
[Min Marks Regular 28 / Private 33

Note : This question paper is meant for all Regular and Private students. Answer all five questions. All questions carry equal marks. The blind candidates will be given 60 minutes extra time.

1. (a) Taking suitable example discuss various symmetry elements and operations
(b) What is Group ? Discuss their types and postulates for a set of elements to form a group

OR

- (a) Explain Great Orthogonality Theorem and discuss its importance.
(b) Why a set of numbers cannot form a group by process of division ?
- 2 (a) Differentiate between Microwave Spectra and Infrared Spectra.
(b) How can the variation of rotational constant be determined ?

OR

— Explain Microwave Spectroscopy. How rotational energy of a diatomic molecule as a rigid rotator can be determined ? Discuss important applications of Microwave Spectroscopy.

3. (a) Why water cannot be used as a solvent in Infrared Spectroscopy ?
(b) How many normal vibrational molecules are possible in linear molecule ethane and in linear molecule benzene ?
(c) Why translational motion is not involved in Molecular Spectra ?

OR

Write notes on the following :

- (a) Zero Point Energy.
(b) Normal Modes of Molecular Vibrations.
(c) Anharmonic Oscillator

4. What is Raman Effect ? How Raman Spectra differs from IR Spectra ? Write application Raman Spectroscopy.

OR

Write notes on the following :

- (a) Quantum Mechanical Theory of Raman Effect.
(b) Classical Theory of Raman Effect.

5. Write notes on the following :

- (a) Molecular Orbitals.
(b) Franck-Condon Principle.

OR

Write notes on the following :

- (a) Principles of Photoelectron Spectroscopy.
(b) Photo Ionization Process.