ED-608

M.Sc. 3rd Semester
Examination, March-April 2021

CHEMISTRY

Paper - I

Resonance Spectroscopy, Photochemistry and Organocatalysis

Time : Three Hours] [*Maximum Marks* : 80
[*Minimum Pass Marks* : 16

Note : Answer any **one** question from each Unit. The figures in the right-hand margin indicate marks.

Unit-I

1. (*a*) What is meant by g-tensor ? Discuss significance of g-tensor by taking suitable example. 12

(*b*) The ESR spectrum of a radical with a single magnetic nucleus is split into four lines of equal intensity. What is the spin of the nucleus ? 8

2. (*a*) Discuss the basic theory of NQR spectroscopy. Explain splitting pattern in NQR. 12

(*b*) Discuss advantages and disadvantages in the use of NQR to obtain quadrupole coupling constants. 8

Unit-II

3. (*a*) What is Photoelectron spectroscopy (PES) ? Discuss identification of an element based on its PES spectrum. 12

(*b*) The analysis of an unknown but homogeneous sample is carried out with photoelectrons collected at some off normal takeoff angle. On rotating the sample around its normal axis, reproducible periodic spikes are noted in various core-level photoelectron signals. Explain the following : 8

(*i*) What are these variations indicative of ?

(*ii*) How may they be useful ?

4. (*a*) Discuss the basic theory of Photoacoustic spectroscopy (PAS). Explain also modulated and pulsed PAS. 12

(*b*) Write notes on PES spectrum of lithium. 8

Unit-III

5. (*a*) Explain photochemical quenching. Discuss the coalitional quenching using Stern-Volmer equation. 12

(*b*) Give the mechanism of Photo-Fries rearrangement with example. 8

6. (*a*) What is Quantum yield ? Discuss the kinetic scheme for a simple system with a photoreactive singlet state. 12

(*b*) Explain photochemical formation of smog. 8

Unit-IV

7. (*a*) Discuss on Wacker process for oxidation of alkene. 10

(*b*) Explain insertion and de-insertion reactions with suitable example. 10

8. (*a*) Discuss on heterogeneous catalysis synthesis. Give advantages of heterogeneous catalysis by giving examples. 10

(*b*) Explain hydrogenation of alkene giving its catalytic cycle. 10

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