Semester	**3**
Course	**Minor**
Paper Code	B2CH230312T
Paper Title	General Chemistry 3
No. of Credits	Theory: 3 + Practical: 1
Theory / Practical / Composite	Composite
Minimum No. of preparatory hours per week a student has to devote	7
Number of Modules	3
Syllabus	**Theory:** *Module 1: Carbonyl Compounds (12 Lectures)* Aldehydes and Ketones: General properties of aldehydes and ketones; Reactions: with HCN, ROH, $NaHSO_3$, NH_2-G derivatives and with Tollens' and Fehling's reagents; iodoform test; aldol condensation (with mechanism); Claisen-ester condensation, Cannizzaro reaction (with mechanism), Tischenko reaction (with mechanism), Perkin reaction, Wittig reaction, benzoin condensation; Clemmensen reduction, Wolff- Kishner reduction and Meerwein-Pondorff- Verley (MPV) reduction. Preparations and reactions of carboxylic acids, esters, amides, nitriles etc. *Module 2: Introduction to Spectroscopy (12 Lectures)* 1. Schrödinger equation as a proposal of Quantum Mechanics 2. Conditions of acceptable solutions 3. Particle in a one dimensional box problem: zero potential inside and infinite potential at boundary and beyond 4. General solution: appearance of quantum number as a requirement of mathematical solution 5. Pictorial representation of acceptable solution, ortho-normality criteria 6. Energy expression: energy quantization 7. Extension to three dimensional box 8. Transitions between different states

	9. Energy expression of rigid rotor and simple harmonic oscillator under Born-Oppenheimer limit, selection rules 10. Physical properties from as outcomes of spectrum 11. Breakdown of simple harmonic model: Morse potential 12. Energy expression and spectra under anhermonic oscillator model 13. Breakdown of Born-Oppenheimer approximation and introduction to vibronic spectra *Ionic Equilibrium (12 Lectures)* Acid-base equilibria in aqueous solution (Proton transfer equilibria in water), pH, buffer. Acid-base neutralisation curves; indicator, choice of indicators. Solubility product principle, common ion effect and their applications to the precipitation and separation of common metallic ions as hydroxides, sulfides, phosphates, carbonates, sulfates and halides. **Practical:** *Qualitative Analysis of Single Solid Organic Compounds* A. Detection of special elements (N, S, Cl) by Lassaigne's test B. Solubility and classification (solvents: H_2O, 5% HCl, 5% NaOH and 5% $NaHCO_3$) C. Melting point of the given compound. D. Detection of the following functional groups by systematic chemical tests: Nitrogenous functional groups:Aromatic amino ($-NH_2$), Aromatic nitro ($-NO_2$), Amido ($-CONH_2$, including imide). Non-nitrogenous functional groups: Carboxylic acid (-COOH), Phenolic -OH, Carbonyl (-CHO and >C=O).
Learning Outcomes	Theory: 1. The students are introduced to the reactivity, selectivity and various reactions occurring in carbonyl compounds. 2. The focus in spectroscopy will be on the excitation mechanism of the molecules, coupling between various motions and spectra. 3. The students are introduced to the various phenomena occurring in ionic solutions at the macroscopic level and their consequence in case of various experiments. Practical: The students will be able to identify elements and functional groups present in simple organic compounds.

<table>
<tr><td>Reading/Reference Lists</td><td colspan="2">1. Atkins' Physical Chemistry, James Keeler, Julio de Paula, Peter Atkins, 12th edition, OUP
2. Physical Chemistry, T. Engel, P. Reid, 3rd edition, Pearson Education India
3. General and Inorganic Chemistry, Volume 1, R. P. Sarkar, New Central Book Agency; 3rd Revised edition.
4. Physical Chemistry, P. C. Rakshit, 5th edition, Sarat Book House
5. Loudon, G. M. Organic Chemistry, Fourth edition, Oxford University Press, 2008.
6. Morrison, R. N. & Boyd, R. N. Organic Chemistry, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
Practical:
1. University Hand Book of Undergraduate Chemistry Experiments, edited by Mukherjee, G. N., University of Calcutta
2. Nad, Mahapatra, Ghosal-Practical Chemistry</td></tr>
<tr><td>Evaluation</td><td>Theory: 60
Internal: 15 (CIA: 10; Other form of Assessment: 2; Attendance: 3)
Semester Exam:45 (Gr. A: 15; Gr. B:30)</td><td>Practical: 40
CA:38; Attendance: 2</td></tr>
<tr><td>Paper Structure for Theory Semester Exam</td><td colspan="2">Gr. A: Attempt ONE out of TWO questions of 15 Marks each
Gr. B: Attempt TWO out of THREE questions of 15 marks each</td></tr>
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