**LESSON PLAN (EVEN SEMESTER 2023-24 )**

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**GOVERNMENT COLLEGE MOHNA**

**B.Sc. 1st Year (Physical Chemistry)**

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| **Month/Week** | **First week**  | **Second week** | **Third week** | **Fourth week** |
| **January** | Practical exams  | Kinetics-I Rate of reaction, rate equation, factors influencing the rate of a reaction | Order of a reaction, integrated rate expression for zero order, first orde, second and third order reaction | Methods of determination of order of reaction. |
| **February** | Effect of temperature on the rate of reaction – Arrhenius equation | Transition state theory of Bimolecular reactions. | Electrochemistry-I Electrolytic conduction, factors affecting electrolytic conduction, specific, conductance, molar conductance, equivalent conductance | Arrhenius theory of ionization, Ostwald’s Dilution Law |
| **March** | Debye- Huckel – Onsager’s equation for strong electrolytes (elementary treatment only) Transport number | Hittorfs methods, (numerical included) | Kohlarausch’s Law, calculation of molar ionic conductance and effect of viscosity temperature & pressure on it and its Applications | **Holi Break** |
| **April** | Applications of conductivity measurements | Conductometric titrations. Definition of pH and pKa, Buffer solution, Buffer action. | Buffer mechanism of buffer action | Revision |

**B.Sc. III Year (Physical Chemistry)**

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| **Month/Week** | **First week**  | **Second week** | **Third week** | **Fourth week** |
| **January** | Practical exams  | Quantum Mechanic s-I Black-body radiation, Plank’s radiation law, photoelectric effect, heat capacity of solids, Compton effect, | Postulates of quantum mechanics , commutation relations, Hamiltonial & Hermitian operator | Determination of wave function & energy of a particle in one dimensional box, Pictorial representation, its significance. |
| **February** | Physical Properties and Molecular Structure Optica-l activity, polarization – (clausius – Mossotti equation)., dipole moment and structure of molecules. | dipole moment, included dipole moment, measurement of dipole moment-temperature method and refractivity method | Magnetic permeability, susceptibility and its determination. Applica tion of magnetic properties – paramagnetism, diamagnetism and ferromagnetics. | Spectroscopy –Introduction  |
| **March** | Rotational Spectrum Diatomic molecules. Energy levels of rigid rotator (semi-classical principles), selection rules,  | spectral intensity distribution using population distribution (Maxwell-Boltzmann distribution), determination of bond length,  | qualitative description of non-rigid rotor, isotope effect | **-Holi break** |
| **April** | Vibrational spectrum: Energy levels of simple harmonic oscillator, selection rules, intensity, determination of force constant and qualitative relation of force constant and bond energies, effects of anharmonic motion ,isotopic effect  | idea of vibrational frequencies of different functional groups | Raman Spectrum: Concept of polarizibility, pure rotational and pure vibrational Raman spectra of diatomic molecules, selection rules, Quantum theory of Raman spectra. | Revision |

**B.Sc. IInd Year (Physical Chemistry)**

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| **Month/Week** | **First week**  | **Second week** | **Third week** | **Fourth week** |
| **January** |  2nd law of thermodynamics, different statements | Carnot’s cycles and its efficiency, Carnot’s theorm, Thermodynamics scale of temperature | Concept of entropy – entropy as a state function, entropy as a function of V & T, entropy as a function of P & T, entropy change in physica l change, entropy as a criteria of spontaneity and equilibrium. | Entropy change in ideal gases and mixing of gases |
| **February** | Third law of thermodynamics: Nernst heat theorem, statement of  | concept of residual entropy, evaluation of absolute entropy from heat capacity data. |  Gibbs function (G) and Helmholtz function (A) as thermodynamic quantities, A & G as criteria for thermodynamic equilibrium and spontaneity, their advantage over entropy change |  Variation of G and A with P, V and T. |
| **March** | Electrolytic and Galvanic cells – reversible & Irreversible cells. salt- anion and redox electrodes. Electrode reactions, Nernst equations, derivation of cell EMF and single electrode potential. | EMF of cell and its measurement, Wes ton standard cell, activity and activity coefficients. Calculation of thermodynamic quantities of cell reaction (G, H & K). Types of reversible electrodes. | Standard Hydrogen electrode, reference electrodes, standard electrodes potential, sign conventions, electrochemical series and its applications | **-** |
| **April** | Concentration cells with and without transference, liquid junction potential, application of EMF. | Determination of pH using Hydrogen electrode, Quinhydrone electrode and glass electrode by potentiometric methods  | Revision | Revision |

**B.Sc. IInd Year (Organic Chemistry)**

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| **Month/Week** | **First week**  | **Second week** | **Third week** | **Fourth week** |
| **January** |  Practical exams  | Infrared (IR) absorption spectroscopy Molecular vibrations, Hooke's law, selection rules, intensity and position of IR bands, measurement of IR spectrum | characteristic absorptions of various functional groups and interpretation of IR spectra of simple organic compounds. Applications of IR spectroscopy in structure elucidation | Amines Structure and nomenclatu re of amines, phys ical properties. Separation of a mixture of amines. features affecting basicity of amines.  |
| **February** | Preparation of alkyl and aryl amines and Chemical reactions  | Diazonium Salts Mechanism of diazotisation, structure of benzene diazonium chloride,  |  Replacement of diazo group by H, OH, F, Cl, Br, I, NO2 and CN groups, reduction of diazonium salts to hyrazines, coupling reaction and its application. |  Revision and test  |
| **March** | Nitro Compounds Preparation of nitro alkanes and nitro arenes and their chemical reactions. Mechanism of electrophilic substitution reactions in nitro arenes and their reductions in acidic, neutral and alkaline medium. |  Mechanism of electrophilic substitution reactions in nitro arenes and their reductions in acidic, neutral and alkaline medium. | Aldehydes and Ketone – Preparation and Physical Properties | **-** |
| **April** | Chemical Properties |  Mechanism of benzoin, aldol, Perkin and Knoevenagel condensations. Condensation with ammonia and its derivatives. Wittig reaction.  | Mannich reaction.Oxidation of aldehydes, Baeyer–Villiger oxidation of ketones, Cannizzaro reaction. MPV, Clemmensen, Wolff-Kishner, LiAlH4 and NaBH4 reductions | Revision |

**B.Sc. II Year (Inorganic Chemistry)**

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| **Month/Week** | **First week**  | **Second week** | **Third week** | **Fourth week** |
| **March** | Lanthanides Electronic structure,  | oxidation states and ionic radii and lanthanide contraction, complex formation, occurrence and isolation, lanthanide compounds. | Revision | Holi Break |
| **April** | General features and chemistry of actinides,  | chemistry of separation of Np, Pu and Am from U,  | Comparison of properties of Lanthanides and Actinides and with trans ition elements . | Revision |