**Government College, Nalwa (Hisar)**

**LESSON PLAN (w.e.f. 01-05-2021)**

**Name: Dr. Sudesh Class: B.Sc. I (2nd sem)**

**Subject: Chemistry [CCL-204] Session: 2020-21**

**Paper: Physical Chemistry [Chemical energetics and Equilibria]**

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|  | Contents |
| Week 1 | **Unit-1:Chemical Energetics** Review of thermodynamics and the Laws of Thermodynamics. Important principles and definitions of thermochemistry.  |
| Week 2 | Concept of standard state and standard enthalpies of formations, integral and differential enthalpies of solution and dilution.  |
| Week 3 | Calculation of bond energy, bond dissociation energy and resonance energy from thermochemical data.  |
| Week 4 | Variation of enthalpy of a reaction with temperature – Kirchhoff’s equation. Statement of Third Law of thermodynamics and calculation of absolute entropies of substances. |
| Week 5 | **Unit-2: Chemical Equilibrium** Free energy change in a chemical reaction. Thermodynamic derivation of the law of chemical equilibrium.  |
| Week 6 | Distinction between ΔG and ΔGo, Le Chatelier’s principle.  |
| Week 7 | Relationships between Kp, Kc and Kx for reactions involving ideal gases. |
| Week 8 | **Unit-3: Ionic Equilibria-I** Strong, moderate and weak electrolytes, degree of ionization, |
| Week 9 | Factors affecting degree of ionization, ionization constant and ionic product of water. |
| Week 10 | Ionization of weak acids and bases, pH scale, common ion effect. |
| Week 11  | **Unit-4: Ionic Equilibria-II**Salt hydrolysis-calculation of hydrolysis constant,  |
| Week 12 | Degree of hydrolysis and pH for different salts. Buffer solutions. |
| Week 13 | Solubility and solubility product of sparingly soluble salts – applications of solubility product principle. |
| Week 14 | Revision |

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**LESSON PLAN (w.e.f. 01-05-2021)**

**Name: Dr. Sudesh Class: B.Sc. I (2nd sem)**

**Subject: Chemistry [CCL-205] Session: 2020-21**

**Paper: Organic Chemistry [Functional group Organic Chemistry]**

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| Dates | Contents |
| Week 1 | **Unit-1: Aromatic hydrocarbons** Preparation (Case benzene): from phenol, by decarboxylation, from acetylene, from benzene sulphonic acid.  |
| Week 2 | Reactions: (Case benzene): Electrophilic substitution: nitration, halogenation and sulphonation.  |
| Week 3 | Friedel-Craft’s reaction (alkylation and acylation) (upto 4 carbons on benzene). Side chain oxidation of alkyl benzenes (upto 4 carbons on benzene). |
| Week 4 | **Unit-2: Alkyl and Aryl Halides** Alkyl Halides (Upto 5 Carbons) Types of Nucleophilic Substitution (SN1, SN2 and SNi) reactions.  |
| Week 5 | Preparation: from alkenes and alcohols. Reactions: hydrolysis, nitrite & nitro formation, nitrile & isonitrile formation. Williamson’s ether synthesis: Elimination vs substitution.  |
| Week 6 | Aryl Halides Preparation: (Chloro, bromo and iodo-benzene case): from phenol, Sandmeyer & Gattermann reactions. Reactions (Chlorobenzene): Aromatic nucleophilic substitution (replacement by –OH group) and effect of nitro substituent. Benzyne Mechanism: KNH2/NH3 (or NaNH2/NH3).  |
| Week 7 | Reactivity and Relative strength of C-Halogen bond in alkyl, allyl, benzyl, vinyl and aryl halides.  |
| Week 8 | **Unit-3: Alcohols, Phenols and Ethers (Upto 5 Carbons)** Alcohols: Preparation: Preparation of 1о, 2о and 3о alcohols: using Grignard reagent, Ester hydrolysis, Reduction of aldehydes, ketones, carboxylic acid and esters.  |
| Week 9 | Reactions: With sodium, HX (Lucas test), esterification, oxidation (with PCC, alk. KMnO4, acidic dichromate, conc. HNO3). Oppeneauer oxidation Diols: (Upto 6 Carbons) oxidation of diols. Pinacol-Pinacolone rearrangement.  |
| Week 10 | Phenols: (Phenol case) Preparation: Cumene hydroperoxide method, from diazonium salts. Reactions: Electrophilic substitution: Nitration, halogenation and sulphonation. ReimerTiemann Reaction, Gattermann-Koch Reaction, Houben–Hoesch Condensation, Schotten – Baumann Reaction. Ethers (aliphatic and aromatic): Cleavage of ethers with HI.  |
| Week 11  | **Unit-4: Aldehydes and ketones (aliphatic and aromatic): (Formaldehye, acetaldehyde, acetone and benzaldehyde)** Preparation: from acid chlorides and from nitriles. |
| Week 12 | Reactions – Reaction with HCN, ROH, NaHSO3, NH2-G derivatives. Iodoform test. Aldol Condensation, Cannizzaro’s reaction, Wittig reaction,  |
| Week 13 | Benzoin condensation. Clemensen reduction and Wolff Kishner reduction. Meerwein-Pondorff Verley reduction. |
| Week 14 | Revision |

H.O.D.,Department of Chemistry

**Government College, Nalwa (Hisar)**

**LESSON PLAN (w.e.f. 01-05-2021)**

**Name: Dr. Sudesh Class: B.Sc. II (4th sem) Subject: Chemistry [CCL-405] Session: 2020-21**

**Paper: Physical Chemistry [States of Matter and Chemical Kinetics]**

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| Dates | Contents |
| Week 1 | **Unit-1: Kinetic Theory of Gases** Postulates of Kinetic Theory of Gases and derivation of the kinetic gas equation. Deviation of real gases from ideal behaviour, compressibility factor, causes of deviation.  |
| Week 2 | Van der Waals equation of state for real gases. Boyle temperature (derivation not required). Critical phenomena, critical constants and their calculation from van der Waals equation. Andrews isotherms of CO2.  |
| Week 3 | Maxwell Boltzmann distribution laws of molecular velocities and molecular energies (graphic representation – derivation not required) and their importance. Temperature dependence of these distributions. |
| Week 4 | Most probable, average and root mean square velocities (no derivation). Collision cross section, collision number, collision frequency, collision diameter and mean free path of molecules. |
| Week 5 | **Unit-2: Liquids** Surface tension and its determination using stalagmometer.  |
| Week 6 | Viscosity of a liquid and determination of coefficient of viscosity using Ostwald viscometer.  |
| Week 7 | Effect of temperature on surface tension and coefficient of viscosity of a liquid (qualitative treatment only). |
| Week 8 | **Unit-3: Solids** Forms of solids. Symmetry elements, unit cells, crystal systems, Bravais lattice types and identification of lattice planes |
| Week 9 |  Laws of Crystallography - Law of constancy of interfacial angles, Law of rational indices. Miller indices. X–Ray diffraction by crystals, Bragg’s law.  |
| Week 10 | Structures of NaCl, KCl and CsCl (qualitative treatment only). Defects in crystals. |
| Week 11  | **Unit-4: Chemical Kinetics** The concept of reaction rates. Effect of temperature, pressure, catalyst and other factors on reaction rates. Order and molecularity of a reaction. |
| Week 12 | Derivation of integrated rate equations for zero, first and second order reactions (both for equal and unequal concentrations of reactants). Half–life of a reaction. General methods for determination of order of a reaction. Concept of activation energy and its calculation from Arrhenius equation.  |
| Week 13 | Theories of Reaction Rates: Collision theory and Activated Complex theory of bimolecular reactions. Comparison of the two theories (qualitative treatment only). |
| Week 14 | Revision |

H.O.D.

Department of Chemistry

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**LESSON PLAN (w.e.f. 01-05-2021)**

**Name: Dr. Sudesh Class: B.Sc. II (4th sem) Subject: Chemistry [CCL-404] Session: 2020-21**

**Paper: Inorganic Chemistry [Transition metals and Coordination Chemistry]**

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| Dates | Contents |
| Week 1 | **Unit-1: Transition Elements (3d series)** General group trends with special reference to electronic configuration, variable valency |
| Week 2 | Colour, magnetic and catalytic properties, ability to form complexes  |
| Week 3 | Stability of various oxidation states (Latimer diagrams) for Mn, Fe and Cu. |
| Week 4 | **Unit-2: Lanthanoids and actinoids**Electronic configurations, oxidation states, colour |
| Week 5 | magnetic properties, lanthanide contraction |
| Week 6 | separation of lanthanides (ion exchange method only). |
| Week 7 | Revision |
| Week 8 | **Unit-3: Coordination Chemistry** Valence Bond Theory (VBT): Inner and outer orbital complexes of Cr, Fe, Co, Ni and Cu (coordination numbers 4 and 6).  |
| Week 9 | Structural and stereoisomerism in complexes with coordination numbers 4 and 6. Drawbacks of VBT.  |
| Week 10 | IUPAC system of nomenclature. |
| Week 11  | **Unit-4: Crystal Field Theory** Crystal field effect, octahedral symmetry. Crystal field stabilization energy (CFSE) |
| Week 12 | Crystal field effects for weak and strong fields. Tetrahedral symmetry. Factors affecting the magnitude of D. Spectrochemical series.  |
| Week 13 | Comparison of CFSE for Oh and Td complexes, Tetragonal distortion of octahedral geometry.Jahn-Teller distortion, Square planar coordination. |
| Week 14 | Revision |

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