Smt Sindhutai Jadhao Arts and Science Mahavidyalaya, Mehkar

B.Sc. II SEMESTAR III

CHEMISTRY

Topic	Link for Material
CHE SEM III	
Unit I	
(A) Covalent Bonding: Limitations of valence bond theory. Molecular Orbital Theory. Postulates of MO theory. LCAO approximation. Formation of bonding and antibonding MOs. Rules for LCAO. MO energy level diagram. Concept of bond order. MO structure of homonuclear diatomic molecules of namely He2, H2, N2 and O2. Stability sequence of species of O2 i.e. O2, O2 +, O2 2+, O2 -and O2 2-. Paramagnetic nature of O2. Nonbonding MOs. MO structure of heteronuclear diatomic molecules viz. NO, HF and CO (Coulsons structure). Explanation of important properties of CO viz. - triple bond, almost nonpolar nature, electron donor and acceptor behaviour. Comparison of VB and MO theories	https://youtu.be/8B__xDUKqbM
Metallic Bonding: Free electron theory and properties of metals such as electrical and thermal conduction, malleability, ductility and metallic lusture. VB theory or Resonance theory of metals. Band theory to explain nature of conductors, insulators and semiconductors (both intrinsic and extrinsic).]	https://youtu.be/hb-LAZyFhes
VSEPR Theory: Various rules under VSEPR theory to explain molecular geometry (following examples may be taken to explain various rules- BeCl2, BF3, CH4 , NH4 + , PCl5 , SF6, IF7, SnCl2 , NH3, H2O, SF4, ClF3, ICl2 - , ICl4, BrF5, XeF6, SOF4, COF2, PCl3, PBr3, PI3, F2O, H2S). Limitations of VSEPR theory	https://youtu.be/1TWeEu_UGwQ
unit 2	
Volumetric Analysis: (a) Introduction:-Volumetric analysis, titrant, titrate, end point, equivalence point, indicator etc. Requirements of volumetric analysis. Definition of standard solution, primary standard substance. Requirements of primary standard substance. Terms to express concentrations namely- molarity, normality, molality, mole fraction and percentage. (Simple numericals expected	https://youtu.be/M0RjqSSuFBM
Acid-Base titrations:- Types of acid base titrations. pH variations during acid base titration. Acid base indicators. Modern theory (Quinoniod theory) of acid base indicators. Choice of suitable indicators for different acid base titrations	https://youtu.be/bsyBqVC_ldc

Redox Titrations:-General principles involved in redox titrations (redox reactions, redox potentials, oxidant, reductant, oxidation number). Brief idea about use of KMnO4,K2Cr2O7as oxidants in acidic medium in redox titrations. Use of I2 in iodometry and iodimetry. Redox indicators-external and internal indicators. Use of starch as an indicator. Iodometric estimation of Cu	https://youtu.be/RYmdkld6FfA
(B) Gravimetric Analysis: Definition. Theoretical principles underlying various steps involved in gravimetric analysis with reference to estimation of barium as barium sulphate. Coprecipitation and post precipitation. (Definition, types and factors affecting	https://youtu.be/LX-hrE31Kjo
unit 3	
Aldehydes and Ketones: Aliphatic and Aromatic aldehydes and ketones (Acetaldehyde, Benzaldehyde, Acetone, Acetophenone) Introduction, Structure of carbonyl group, acidity of -hydrogen in carbonyl compounds. Methods of preparation of aldehydes: From alcohols, Calcium salts of acids, Acid chlorides, Gatterman-Koch synthesis. Reactions of aldehydes: Cannizaros, Reformatsky, (Perkin with mechanism), Mannich reaction, (Benzoin and Aldol condensation with mechanism). Methods of preparation of ketones: oxidation, catalytic decomposition of acids, dry distillation of Ca salt, Friedel-Crafts reaction, hydration of alkynes. Reaction of ketones: MPV, Wolff-Kishner, LiAlH4 reductions	https://youtu.be/gKp1aM42VvI
Introduction, Structure and reactivity of carboxylic groups. Acidity of carboxylic acids, effects of substituents on acids strength. Methods of synthesis and chemical reactions of oxalic, lactic, benzoic and salicylic acid. Oxalic acid: Preparation from ethylene glycol and cyanogens. Chemical reactions: oxidation, reduction, esterification, reaction with ammonia, glycerol and action of heat.	https://youtu.be/nW6S4jbCVPw
Lactic acid: Preparation from acetaldehyde, pyruvic acid. Chemical reactions: Ester formation, action of PCl5, heat, oxidation and reduction. Benzoic acid: Preparation from benzene, toluene, benzyl alcohol, phenyl cyanide, benzamide. Chemical reactions : Reaction with PCl5, ammonia and ester formation. Salicylic acid: Preparation by Reimer-Tiemann reaction. Chemical reactions: acetylation and esterification. [	https://youtu.be/8XZuSuZKLGQ
unit 4	
Stereochemistry Introduction to different types of isomerism, Structural isomerism and Stereoisomerism, conformation, configuration and Geometrical isomerism.	https://youtu.be/Rt1cOELGR-g

Optical isomerism: Element of symmetry, chirality, Assymetric carbon atom, enantiomers, diastereoisomers, relative and absolute configurations, Fischer projection formula, RS nomenclature,Inversion and retension, racemisation and resolution of racemic mixture	https://youtu.be/tiej5AZ-yfQ
Geometrical isomerism: Cis-trans nomenclature, E-Z nomenclature, Methods of structure determination	https://youtu.be/1BMtAxD0x7U
Bayers Strain theory and its limitations. Stability of cycloalkanes, conformations and conformational isomers of ethane, n-butane and cyclohexane, their energy level diagrams. Newman, Sawhorse, Fischer and Flying wedge projection formulae.	https://youtu.be/RtOLnZM5kqo
unit 5	
Thermodynamics and Equilibrium: (i) Definition and physical significance of Helmholtz work function (A) and Gibbs free energy. Change in free energy (G) as a criteria of spontaneity and equilibrium. Variation of A with V & T. Change in G due to change inP and T. Gibbs-Helmholtz equation and its applications.	https://youtu.be/p73voaXw9aY
Chemical potential. Derivation of Gibbs-Duhem equation. Chemical potential of an ideal gas in a gaseous mixture. Derivation of Vant Hoff reaction of isotherm and its application to equilibrium state. Derivation of Vant Hoff equation and its applications.	https://youtu.be/fesNue-HhqE
Phase rule: Statement of Phase rule. Explaination of Phase, number of components and degrees of freedom. Application of phase rule to water and suphur systems	https://youtu.be/i07KnMEGjS8
unit 6	
A) Phase Equilibrium: (i) Raoults Law and its limitations. Ideal and non ideal solution. Classification of binary solutions of completely miscible liquids (I, II and III) on the basis of Raoults Law. (ii) Phase diagrams of Phenol-Water, Triethylamine-Water and Nocotine-Water system. (iii) Nerst distribution law and its applications to association and dissociation of solute in one of the immiscible solvents. Process of extraction. Derivation of the formula for the amounts of the solute left unextracted after nth extraction.	https://youtu.be/28LewgBtL4g

(B) Electrochemistry: [8] (i) Conductance of electrolyte solutions. Specific, equivalent and molar conductance. Determination of conductance of electrolyte solution. Variation of specific and equivalent conductance with dilution. Conductometric Migration of ions under the influence of electric field. Hittorfs theoretical device (Hittorfs rule). Transport number of ions. (iii) Kohlrauschs law of independent migration of ions. Determination of and the degree of dissociation of a week electrolyte. Determination of ionization (or dissociation) constant of week acid. Determination of solubility and solubility product of a sparingly	https://youtu.be/3ZpaTdCYFDo