Plan Academic Session: 2025-26
Department of Chemistry
Jagannath Barooah University, Jorhat

Name of the Teacher: GAUTAM KALITA
Semester: ODD

Class/ Sem	Title & Code of The Paper Allotted (Credit)	Method of Teaching	Teaching Material	Unit	Topic	Period/ Hours	Details of the Contents	Remarks / Books
Sem I, UG	GENERAL CHEMISTRY-I CHMMJ-011	Chalk and talk, PPT	Textbook, Diagrams	**V**	Gaseous State:	**15**	Kinetic molecular model of a gas; collision frequency; collision diameter; mean free path and viscosity of gases, relation between mean free path and coefficient of viscosity, calculation of σ from η; Maxwell distribution, kinetic energy, law of equipartition of energy, degrees of freedom and molecular basis of heat capacities. Behaviour of Real Gases: Causes of deviation from ideal	

							behaviour. Van der Waals equation of state, mention of other equations of state (Berthelot, Dietrici); virial equation of state; van der Waals equation expressed in virial form and calculation of Boyle temperature. Isotherms of real gases and their comparison with van der Waals isotherms, continuity of states, critical state, relation between critical constants and van der Waals constants, law of corresponding states.	
				VI	Liquid State:	**5**	Molecular forces and general properties of liquids. Surface Tension: surface tension, surface energy, effect of temperature on surface tension, shapes of liquid drops and soap bubbles, capillary action, determination of surface tension by capillary rise	

							method, drop weight and drop number methods using stalagmometer. Effect of temperature on surface tension. Parachor, Additive and constitutive properties: atomic and structural parachor. Elucidation of structure of benzene and benzoquinone. Viscosity: Definition, viscosity coefficient, fluidity, molecular viscosity, relative viscosity and absolute viscosity, determination of coefficient of viscosity using Ostwald viscometer. Effect of temperature, size, weight, shape of molecules and intermolecular forces.	
	GENERAL CHEMISTRY-I CHMMI-011	Chalk and talk, PPT	Textbook, Diagrams	UNIT-V	Gaseous State	15 Lectures;	Kinetic molecular model of a gas: postulates and derivation of the kinetic	

							gas equation; collision frequency; collision diameter; mean free path and viscosity of gases, including their temperature and pressure dependence, relation between mean free path and coefficient of viscosity, calculation of σ from η; variation of viscosity with temperature and pressure. Maxwell distribution and its use in evaluating molecular velocities (average, root mean square and most probable) and average kinetic energy, law of equipartition of energy, degrees of freedom and molecular basis of heat capacities. Behaviour of Real Gases: Deviations from ideal gas behaviour, compressibility factor, Z,	

							and its variation with pressure for different gases. Causes of deviation from ideal behaviour. Van der Waals equation of state, its derivation and application in explaining real gas behaviour, mention of other equations of state (Berthelot, Dietrici); virial equation of state; van der Waals equation expressed in virial form and calculation of Boyle temperature. Isotherms of real gases and their comparison with van der Waals isotherms, 6 Minor Syllabus of FYUGP in Chemistry Jagannath Barooah College continuity of states, critical state, relation between critical constants and van der Waals constants, law of	

							corresponding states.	
SEM III, UG	GENERAL CHEMISTRY-III CHMMI-031	Chalk and talk, PPT	Textbook, Diagrams	Unit-V	Ionic Equilibria	15 Lectures	Strong, moderate and weak electrolytes, degree of ionization, factors affecting degree of ionization, ionization constant and ionic product of water. Ionization of weak acids and bases, pH scale, common ion effect; dissociation constants of monoprotic acid (exact treatment). Salt hydrolysis-calculation of hydrolysis constant, degree of hydrolysis and pH for different salts. Buffer solutions; derivation of Henderson equation and its applications; buffer capacity, buffer range, buffer action and applications of buffers in analytical chemistry.	

							Solubility and solubility product of sparingly soluble salts – applications of solubility product principle. Theory of acid–base indicators; selection of indicators and their limitations. hydrolysis and hydrolysis constants.	
SEM V	PHYSICAL CHEMISTRY-II CHMMJ-053	Chalk and talk, PPT	Textbook, Diagrams	Unit I	Chemical Kinetics	16 Lectures	Order and molecularity of a reaction, rate laws in terms of the advancement of a reaction, differential and integrated form of rate expressions up to second order reactions, experimental methods of the determination of rate laws, kinetics of complex reactions (integrated rate expressions up to first order only): (i) Opposing reactions (ii) parallel reactions and (iii) consecutive reactions and	

							their differential rate equations (steady state approximation in reaction mechanisms) (iv) chain reactions. Temperature dependence of reaction rates; Arrhenius equation; activation energy. Collision theory of reaction rates, Lindemann mechanism, qualitative treatment of the theory of absolute reaction rates.	
				Unit III	Chemical Equilibrium	7 Lectures	Criteria of thermodynamic equilibrium, degree of advancement of reaction, chemical equilibria in ideal gases, concept of fugacity. Thermodynamic derivation of relation between Gibbs free energy of reaction and reaction quotient. Coupling of exoergic and endoergic reactions.	

							Equilibrium constants and their quantitative dependence on temperature, pressure and concentration. Free energy of mixing and spontaneity; thermodynamic derivation of relations between the various equilibrium 32 32 | P a g e Major Syllabus of FYUGP in Chemistry Jagannath Barooah College constants Kp, Kc and Kx. Le Chatelier principle (quantitative treatment); equilibrium between ideal gases and a pure condensed phase.	
SEM I, PG	**PHYSICAL CHEMISTRY I PCHMC - 103**	Chalk and talk, PPT	Textbook, Diagrams	Unit I	Equilibrium Thermodynamics	13 Lectures	• Fugacity, ideal/non-ideal solutions, activity and activity coefficient, excess functions. • Partial molar quantities (chemical potential,	

							partial molar volume), thermodynamics of mixing. • Third law of thermodynamics, experimental verification, absolute entropy determination.	
				Unit II:	Quantum Chemistry -I	12 Lectures	Review of Quantum Mechanics: Postulates, operators, commutation relation, theorems. • Model Systems: Free particle, particle in a box (1D, 3D), degeneracy. • Simple Harmonic Oscillator, two-particle rigid rotor, particle in a ring, quantum mechanical tunneling.	

Semester: EVEN

Class/	Title & Code	Method of	Teaching	Unit	Topic	Period/	Details of the Contents	Remarks

Sem	of The Paper Allotted (Credit)	Teaching	Material			Hours		/ Books
SEM II, UG	GENERAL CHEMISTRY-II CHMMJ-021	Chalk and talk, PPT	Textbook, Diagrams	UNIT-V	Chemical Thermodynamics	10 Lectures;	Second Law: Concept of entropy; thermodynamic scale of temperature, statement of the second law of thermodynamics; molecular and statistical interpretation of entropy. Calculation of entropy change for reversible and irreversible processes. Third Law: Statement of third law, concept of residual entropy, calculation of absolute entropy of molecules	
	GENERAL CHEMISTRY-II CHMMI-021	Chalk and talk, PPT	Textbook, Diagrams	UNIT-V	Chemical Thermodynamics	10 Lectures;	Second Law: Concept of entropy; thermodynamic scale of temperature, statement of the second law of thermodynamics; molecular and statistical interpretation of entropy. Calculation of entropy change for reversible and irreversible processes. Third Law: Statement of	

							third law, concept of residual entropy, calculation of absolute entropy of molecules	
SEM IV, UG	GENERAL CHEMISTRY-IV CHMMI-041	Chalk and talk, PPT	Textbook, Diagrams	Unit-V	Solid State	16 Lectures	Nature of the solid state, law of constancy of interfacial angles, law of rational indices, Miller indices, elementary ideas of symmetry, symmetry elements and symmetry operations, qualitative idea of point and space groups, seven crystal systems and fourteen Bravais lattices; X-ray diffraction, Bragg's law, a simple account of rotating crystal method and powder pattern method. Analysis of powder diffraction patterns of NaCl, CsCl and KCl. Defects in crystals. Glasses and	

							liquid crystals.	
SEM IV	PHYSICAL CHEMISTRY-I CHMMJ-043	Chalk and talk, PPT	Textbook, Diagrams	Unit IV	Free Energy Functions	10 Lectures	:: Gibbs and Helmholtz energy; variation of S, G, A with T, V, P; Free energy change and spontaneity. Relation between Joule-Thomson coefficient and other thermodynamic parameters; inversion temperature; Gibbs-Helmholtz equation; Maxwell relations; thermodynamic equation of state.	
				Unit-V	Systems of Variable Composition	10 Lectures	Partial molar quantities, dependence of thermodynamic parameters on composition; Gibbs-Duhem equation, chemical potential of ideal mixtures, change in thermodynamic functions in mixing of ideal gases.	

SEM VI, UG	PHYSICAL CHEMISTRY-III CHMMJ-063			UNIT II	Conductance	16 Lectures	Arrhenius theory of electrolytic dissociation. Conductivity, equivalent and molar conductivity and their variation with dilution for weak and strong electrolytes. Molar conductivity at infinite dilution. Kohlrausch law of independent migration of ions. Debye-Huckel-Onsager equation, Wien effect, Debye-Falkenhagen effect, Walden's rules. Ionic velocities, mobilities and their determinations, transference numbers and their relation to ionic mobilities, determination of transference numbers using Hittorf and Moving Boundary methods. Applications of conductance measurement: (i) degree of dissociation of weak	

							electrolytes, (ii) ionic product of water (iii) solubility and solubility product of sparingly soluble salts, (iv) conductometric titrations, and (v) hydrolysis constants of salts.	
				UNIT IV	Solutions and Colligative Properties	10 Lectures	Dilute solutions; lowering of vapour pressure, Raoult's and Henry's Laws and their applications. Thermodynamic derivation using chemical potential to derive relations between the four colligative properties [(i) relative lowering of vapour pressure, (ii) elevation of boiling point, (iii) Depression of freezing point, (iv) osmotic pressure] and amount of solute. Applications in	

							calculating molar masses of normal, dissociated and associated solutes in solution.	

*Faculty members may use ChatGPT by entering the following prompt to receive a quick and structured output.

Make a teaching plan for the session 2025-26 for even and odd semester. The table should include the following columns, class/semester, Title & Code of The Paper Allotted(credit), method of teaching, teaching material, unit, topic, period/hours required, details of the contents, remarks/books. The name of the teacher is Dr. Anirban Garg and he is from the department of Chemistry. The following course are being taught by him- CHMMJ-021(Unit III), CHMMI-021(Unit III), CHMSK-021(ALL), CHMMU-021(Unit III), CHMMJ-042(Unit I & Unit

II), CHMMJ-044(SECTION B), CHMVA-021(Unit II), CHMMJ-032(Unit IV), CHMMJ-033(SECTION B), CHMMI-031(Unit IV), CHMMU-031(Unit III), CHMMJ-052(Unit I, Unit VII & VIII), CHMMJ-054(Section B, Unit I). Compile as a formatted Word table.