

# HALDIA INSTITUTE OF TECHNOLOGY

## LECTURE / LESSON PLAN

**Department:** Applied Science

**Semester:** 1<sup>st</sup> & 2<sup>nd</sup>

**Paper Name:** Chemistry-1

**Allotted Hour(s):** 33

**Name of the Teacher:** Dr. Suparna Rana

**Batch(s):**

**Session:**

**Paper Code:** CH101&CH201

**Actual Hour(s):** 40

Sl. No.	Date	Topics (As per University Syllabus)	Hours	Remarks/Books
<b>Module –1 Chemical Thermodynamics –I</b>				
1.		Introduction, Concept of thermodynamic system: Definition of system. Surroundings, universe. diathermal wall, adiabatic wall, Isolated system., closed system, open system, Extensive property, intensive property.	1	Physical Chemistry by P.C.Rakshit & S. Glasston
2.		Introduction to first law of thermodynamics (Different scientist's statements. mathematical form)	1	
3.		Internal energy, Enthalpy (definition, example, Characteristics), Physical significance, mathematical expression for change in internal energy [ideal gas and real gas obeying Vander Waals' eqn.]	1	
4.		$C_p$ & $C_v$ Definition $C_p - C_v$ relation for ideal gas Adiabatic changes (Adiabatic work., relation between thermodynamic parameters in adiabatic reversible process, Irreversible process. nature of P-V curve).	1	
5.		Application of first law of thermodynamics to chemical process: [Exothermic process, endothermic process. laws of thermochemistry (law of Lavoisier and Laplace) Hess's law of constant heat summation, (heat of formation, heat of combustion,) Kirchoff 's equations]	1	
6.		Statement, Mathematical form of 2 <sup>nd</sup> law of thermodynamics: Carnot's cycle, Entropy (Definition. characteristics, expression of entropy	1	
7.		Evaluation of entropy: characteristics and expression, Entropy Change in irreversible process, expression for change in entropy for irreversible isothermal process of an ideal gas,	1	

		irreversible cyclic process, entropy change of a mixture of gases.)		
8.		Work function & free energy (Introduction, characteristics, physical significance, mathematical expression for ideal gas and real gas obeying Vander Waals' eqn.) Gibbs Helmholtz Equation, Maxwell's Expression (only the derivation of 4 different forms),	1	
9.		Condition of spontaneity and equilibrium reaction	1	
10.		Joule Thomson and throttling processes (Introduction to first law of thermodynamics (Different scientist's statements. mathematical form) thermodynamic condition, expression of Joule Thomson coefficient. Inversion temperature.	1	
11.		Discussion and problem Solve	1	
<b><u>Module –2 Reaction Dynamics:</u></b>				
12.		Introduction, Rate laws: rate of reaction, order of reaction, molecularity	1	Physical Chemistry by P.C.Rakshit
13.		1st order of Kinetics, second order kinetics, pseudo unimolecular reaction	1	
14.		Mechanisms and theories of reaction rates (Transition state theory, Arrhenius equation)	1	
15.		Catalysis: Homogeneous catalysis (Definition, example, mechanism, kinetics). Problems Solve.	1	
<b><u>Module –2 Solid state Chemistry:</u></b>				
16.		Introduction to stoichiometric defects (Schottky & Frenkel) and non – stoichiometric defects (Metal excess and metal deficiency).	1	Inorganic Chemistry by J D Lee
17.		Role of silicon and germanium in the field of semiconductor. Problems Solve.	1	
<b><u>Module –3 Electrochemistry:</u></b>				
18.		Introduction, <b>Conductance:</b> Conductance of electrolytic solutions, specific conductance, equivalent conductance, molar conductance and ion conductance, effect of temperature and concentration (Strong and Weak electrolyte).	1	Physical Chemistry by P.C.Rakshit & Dr. S. Pahari & Atkins.
19.		Kohlrausch's law of independent migration of ions, transport numbers and hydration of ions. Conductometric titrations: SA vs SB & SA vs WB; precipitation titration KCl vs AgNO <sub>3</sub> .	1	

20.		<b>Electrochemical Cell:</b> Cell EMF and its Thermodynamic derivation of the EMF of a Galvanic cell (Nernst equation), single electrode potentials, hydrogen half cell, quinhydrone half cell and calomel half cell (construction, representation, cell reaction, expression of potential, Discussion, Application)	1	
21.		Storage cell, fuel cell (construction, representation, cell reaction, expression of potential, Discussion, Application).	1	
22.		Application of EMF measurement on a) Ascertain the change in thermodynamic function ( $\Delta G$ , $\Delta H$ , $\Delta S$ ) b) Ascertain the equilibrium constant of a reversible chemical reaction c) ascertain the valency of an ion. Problems Solve.	1	
<b>Module –4 Structure and reactivity of organic molecule:</b>				
23.		Introduction, Electro negativity, electron affinity, inductive effect, resonance, hyperconjugation, electrometric effect	1	Organic Chemistry by I L Finar & Reaction Mechanism by Peter Sykes Mukherjee Singh
24.		Hybridization, carbocation, carboanion & free radicals, examples & discussion.	1	
25.		Brief study of some substitution reaction	1	
26.		Brief study of some addition and elimination reaction. Problems Solve.	1	
<b>Module –4 Polymerization:</b>				
27.		Basic concepts, classifications and industrial applications, polymer, polymerization processes, degree polymerization (Addition and condensation polymerization).	1	P. Ghosh, Polymer Science and Technology of Plastics and Rubbers & Polymer chemistry by Gowarikar.
28.		Effect of polymer property on degree of polymerization) Polymer molecular weight (number avg. weight avg. viscosity avg.) (Theory and mathematical expression only), Poly dispersity index (PDI).	1	
29.		Preparation, structure and use of some common polymers: plastic (PE, PP, PVC, HDPE, LDPE, LLDPE, UHMWPE, bakelite)	1	
30.		Rubber natural rubber, Vulcanization, SBR, NBR, Fiber (nylon 6,6, polyesters)	1	
31.		Conducting and semi-conducting Polymers, stereo-regularity of polymer, crystallinity (concept of $T_m$ ) and amorphicity (Concept of $T_g$ ) of polymer. Problems Solve.	1	

**Module –5 Industrial Chemistry:**

32.		Introduction, classification, Choice of fuels, Calorific values of fuel, Solid Fuel: Coal, Classification of coal, constituents of coal, carbonization of coal (HTC and LTC),	1	Fuels & Combustion by S. Sarkar & R.K.Das
33.		Coal Analysis: Proximate and ultimate analysis.	1	
33.		Liquid fuel: Petroleum, classification of petroleum, Refining, Petroleum distillation, Thermal cracking,	1	
35.		Octane number, Cetane number, Aviation Fuel (Aviation Gasoline, Jet Gasoline), Bio-diesel.	1	
36.		Gaseous fuels: Natural gas, water gas, Coal gas, bio gas. Problems Solve.	1	
		<b>Total</b>	<b>36</b>	
<b>Topics (Beyond Syllabi)</b>				
		Joule-Thomson Co-efficient for Real gas in Chemical Thermodynamics	1	Physical Chemistry by P.C.Rakshit & S. Glasston
		Problems Solve. Assignment given	1	
		University problem discussion	1	
		University problem discussion	1	
		<b>Total</b>	<b>04</b>	
		<b>Grand Total</b>	<b>40</b>	

**(Signature of Teacher)**

**Sig. of Head of the Department**