

M.Sc. FINAL (Physical Chemistry)

Dr. Ashok kumar Baswa

M.Sc. SEMESTER - III PHYSICAL CHEMISTRY SPECIALIZATION

CLASS NUMBER	LESSON PLAN UNIT PAPER – II CH (PC) 302T :PC-16:Lasers in Chemistry
1	General principles of laser action.
2	Stimulated emission. Rates of absorption and emission.
3	Characteristics of laser light. Laser pulses and their characteristics.
4	Pulse production, Q-switching.
5	Pulse modification, mode-locking. Practical lasers.
6	Solid-state lasers, gas lasers,
7	chemical and excimer lasers. Examples.
8	Applications of lasers in chemistry: Femtochemistry.
9	The pump-probe technique. Time-resolved spectroscopy.
10	Photodissociation of ICN. Formation and dissociation of CO-hemoglobin complex.
11	Conversion of ethylene to cyclobutane. Bond selectivity in chemical reactions – the reaction between hydrogen atoms and vibrationally excited HDO molecules.
12	Lasers and multiphoton spectroscopy
13	Principles.
14	Two-photon spectra of diphenyloctatetraene. Lasers in fluorescence spectroscopy
15	Lasers in Raman spectroscopy.

CLASS NUMBER	LESSON PLAN UNIT ELECTIVE 3A PAPER III CH(PC) 303T(CB1) PC(CB1)-3 : Types of materials, conducting organics and NLO materials
1	Introduction-Classification of materials
2	metals, ceramics, polymers, composites.
3	semiconductors and biomaterials
4	Glassy state – glass formers and glass modifiers, applications
5	Ceramics – criteria for determining the crystal structure of ceramic materials
6	Examples of ceramic crystal structures
7	Composites – particle reinforced and fibre reinforced composites.
8	Preparative methods of solid materials - Ceramic method (Solid State method),
9	co-precipitation as a precursor, solutions and gels (Zeolite synthesis),
10	crystallization from melts: Czochralski method, Kyropolous method
11	vapour phase transport method, ion-exchange and interaction reactions.
12	Techniques of single crystal growth – growth from solutions – growth from melts – growth from vapour.
13	Non-linear optical (NLO) behavior– basic concepts second and third harmonic generation
14	examples of organic , inorganic and polymer NLO materials.
15	Conducting organics – Fullerenes, doped fullerenes, fullerenes as superconductors

M.Sc. SEMESTER - IV PHYSICAL CHEMISTRY SPECIALIZATION

CLASS NUMBER	LESSON PLAN
	UNIT ELECTIVE –4B (ID PAPER) PAPER-IV CH(PC) 404T(CB4): Engineering Chemistry PC(CB4) -29: Water And Waste Water Treatment
1	Introduction to Engineering Chemistry
2	Review of Hardness
3	causes, measurement of hardness,
4	units- types of hardness
5	estimation of temporary and permanent hardness
6	numerical problems
7	Boiler troubles- scales and sludge formation, caustic Embrittlement, priming and foaming.
8	Soda-lime process, zeolite process
9	Ion exchange process. Treating saline water
10	distillation, electrodialysis, reverse osmosis
11	Municipal water supply: sedimentation, filtration, sterilization.
12	Waste water treatment: physical, chemical and biological treatment
13	Sewage water , COD and BOD
14	numerical problems
15	Lesson with Power point presentation

CLASS NUMBER	LESSON PLAN
	UNIT ELECTIVE –4B (ID PAPER) PAPER-IV CH(PC) 404T(CB4): Engineering Chemistry PC(CB4) -30: Corrosion And Its Control
1	Introduction to Corrosion
2	Problem and theories of corrosion
3	Chemical and electrochemical corrosion
4	corrosion reactions, factors affecting corrosion
5	nature of metal, purity of metal, electrochemical series, over voltage, nature of oxide film, nature of corrosion product,
6	of environment, effect of temperature, effect of pH, effect of oxidant, humidity
7	control methods, design and material selection, cathodic protection
8	sacrificial anode, impressed current cathode.
9	Surface coating methods: Surface preparation, metallic coatings
10	application of metal coatings: hot dipping, galvanizing
11	tinning, cladding, electroplating and electroless plating
12	chemical conversion coatings.
13	Organic surface coatings-paints, constituents of paints and their functions
14	methods of application of paints, failure of paint films, varnishes,
15	enamels, lacquers

CLASS NUMBER	LESSON PLAN UNIT ELECTIVE –4B (ID PAPER) PAPER-IV CH(PC) 404T(CB4): Engineering Chemistry PC(CB4) -31: Energy Sources
1	Introduction to Energy sources - Conventional energy resources
2	Chemical fuels, classification, (solids, liquids, gaseous)
3	Solid fuels: coal, analysis of coal, proximate and ultimate analysis and their significance.
4	Liquid fuels: petroleum, refining of petroleum
5	cracking, reforming of petrol
6	Synthetic petrol - Bergius and Fischer Tropsch's process
7	knocking, anti knocking agents, octane number
8	Diesel fuel: Cetane number. Other liquid fuels: LPG, biodiesel, kerosene, fuel oil, benzol, tar, power alcohol.
9	Gaseous fuels: natural gas, coal gas, producer gas, oil gas, water gas, biogas
10	Combustion: Calorific value and its determination, bomb calorimeter. HCV and LCV values of fuels
11	Numerical problems
12	analysis of flue gas by Orsats method. Rocket fuels, solid propellants, liquid propellants, monopropellants, bipropellants.
13	Non conventional energy resources: Nuclear fuels- nuclear reactor
14	nuclear fission, nuclear fusion, sources of nuclear fuels, disposal of radio active wastes, reprocessing of nuclear fuels.
15	solar, hydro, wind, tidal energies. Bio fuels, H ₂ as a non polluting fuel.