

**M.Sc. FINAL (Physical Chemistry)**

**2018-19**

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**M.Sc. SEMESTER - III PHYSICAL CHEMISTRY SPECIALIZATION**

| <b>CLASS NUMBER</b> | <b>LESSON PLAN</b>   |
|---------------------|--|
|                     | <b>UNIT PAPER – II CH (PC) 302T :PC-16:Lasers in Chemistry</b>   |
| 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.  |

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|                     | <b>UNIT ELECTIVE 3A PAPER III CH(PC) 303T(CB1) PC(CB1)-3 : Types of materials, conducting organics and NLO materials</b> |
| 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

| <b>CLASS NUMBER</b> | <b>LESSON PLAN</b>  |
|---------------------|---|
|                     | <b>UNIT</b> 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  |

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|---------------------|---|
|                     | <b>UNIT</b> 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<br>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 <sub>2</sub> as a non polluting fuel.                                      |