# IIPM SCHOOL OF ENGINEERING & TECHNOLOGY

**LESSON PLAN: 2023-24**

# Sub: Th.2b- Engineering Chemistry

## Branch : Common

**Faculty name : Soumya Ranjan Dash**

## Duration : 60 hours

**SYLLABUS:**

## Semester : 1st/2nd

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| **UNIT-I** | 1. ***Atomic structure***    * **Fundamental particles ( electron, proton & neutron Definition, mass and charge ).Rutherford’s Atomic model ( postulates and failure), Atomic mass and mass number, Definition, examples and properties of Isotopes, isobars and isotones. Bohr’s Atomic model ( Postulates only), Bohr-Bury scheme, Aufbau’s principle, Hund’s rule, Electronic configuration (up to atomic no 30).** |
| **UNIT-II** | 1. ***Chemical Bonding***     * **Definition , types ( Electrovalent, Covalent and Coordinate bond with examples ( formation of NaCl, MgCl2, H2,Cl2, O2, N2, H2O, CH4, NH3, NH4 +, SO2 ).** |
| **UNIT-III** | 1. ***Acid base theory***    * **Concept of Arrhenius, Lowry Bronsted and Lewis theory for acid and base with examples ( Postulates and limitations only). Neutralization of acid & base.**    * **Definition of Salt, Types of salts ( Normal, acidic, basic, double, complex and mixed salts, definitions with 2 examples from each).** |
| **UNIT-IV** | 1. ***Solutions***     * **Definitions of atomic weight, molecular weight, Equivalent weight. Determination of equivalent weight of Acid, Base and Salt.**    * **Modes of expression of the concentrations ( Molarity , Normality & Molality) with Simple Problems. pH of solution ( definition with simple numericals )**    * **Importance of pH in industry ( sugar, textile, paper industries only)** |
| **UNIT-V** | 1. ***Electrochemistry***    * **Definition and types ( Strong & weak) of Electrolytes with example. Electrolysis ( Principle & process) with example of NaCl (fused and aqueous solution).**    * **Faraday’s 1st and 2nd law of Electrolysis ( Statement, mathematical expression and Simple numerical) Industrial application of Electrolysis- Electroplating ( Zinc only).** |
| **UNIT-VI** | 1. ***Corrosion***   ***Definition of Corrosion, Types of Corrosion- Atmospheric Corrosion, Waterline corrosion. Mechanism of rusting of Iron only. Protection from Corrosion by (i) Alloying and (ii) Galvanization.*** |
| **UNIT-VII** | 1. ***Metallurgy***   ***Definition of Mineral, ores , gangue with example. Distinction between Ores And Minerals. General methods of extraction of metals,***  ***i) Ore Dressing***  ***ii) Concentration ( Gravity separation, magnetic separation, Froth floatation & leaching)***  ***iii) Oxidation (Calcinations, Roasting )***  ***iv) Reduction (Smelting, Definition & examples of flux, slag)***  ***v) Refining of the metal ( Electro refining, & Distillation only)*** |
| **UNIT-VIII** | 1. ***Alloys***   ***Definition of alloy. Types of alloys ( Ferro, Non Ferro & Amalgam) with example. Composition and uses of Brass, Bronze, Alnico, Duralumin*** |
| **UNIT-IX** | 1. ***Hydrocarbons***   ***Saturated and Unsaturated Hydrocarbons ( Definition with example)***  ***Aliphatic and Aromatic Hydrocarbons ( Huckle’s rule only). Difference between Aliphatic and aromatic hydrocarbons***  ***IUPAC system of nomenclature of Alkane, Alkene, Alkyne, alkyl halide and alcohol ( up to 6 carbons ) with bond line notation.***  ***Uses of some common aromatic compounds ( Benzene, Toluene, BHC, Phenol, Naphthalene, Anthracene and Benzoic acid) in daily life.*** |
| **UNIT-X** | 1. ***Water Treatment***   ***Sources of water, Soft water, Hard water, hardness, types of Hardness (temporary or carbonate and permanent or non-carbonate), Removal of hardness by lime soda method ( hot lime & cold lime—Principle, process & advantages ) , Advantages of Hot lime over cold lime process.***  ***Organic Ion exchange method ( principle, process, and regeneration of exhausted resins)*** |
| **UNIT-XI** | 1. ***Lubricants***   ***Definition of lubricant, Types ( solid, liquid and semisolid with examples only ) and specific uses of lubricants ( Graphite, Oils, Grease), Purpose of lubrication*** |
| **UNIT-XII** | 1. ***Fuel***   ***Definition and classification of fuel, Definition of calorific value of fuel, Choice of good fuel.***  ***Liquid: Diesel, Petrol, and Kerosene --- Composition and uses.***  ***Gaseous: Producer gas and Water gas (Composition and uses). Elementary idea about LPG, CNG and coal gas (Composition and uses only).*** |
| **UNIT-XIII** | 1. ***Polymer***   ***Definition of Monomer, Polymer, Homo-polymer, Co-polymer and Degree of polymerization. Difference between Thermosetting and Thermoplastic, Composition and uses of Polythene, & Poly-Vinyl Chloride and Bakelite.***  ***Definition of Elastomer ( Rubber). Natural Rubber (it’s draw backs ). Vulcanisation of Rubber. Advantages of Vulcanised rubber over raw rubber.*** |
| **UNIT-XIV** | 1. ***Chemicals in Agriculture***   ***Pesticides: Insecticides, herbicides, fungicides- Examples and uses.***  ***Bio Fertilizers: Definition, examples and uses*** |

**BOOKS SUGGESTED:**

* **Engineering Chemistry by Y.R. Sharma and P. Mitra, Kalyani Publishers**
* **Engineering Chemistry for Diploma – Dr. R K Mohapatra, PHI Publication, New Delhi.**
* **Engineering Chemistry- Jain & Jain, Dhanpat Roy and Sons.**

## Objective :

## Engineering Chemistry is concerned with the changes of matters with its environment and an ever-growing subject. So, the aim of teaching Engineering Chemistry in Diploma Courses is to acquaint the students with the basic Chemistry of different materials used in industry and to equip the students with the basic principles of chemical changes taking place in different aspects connected to engineering fields. They also develop the right attitude to cope up with the continuous flow of new technology.

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| **Sl. No** | **Chapter** | **Proposed Week for Teaching** | **Lecture No.** | **Sub. Topic** | **Important Teaching Points** | **Content Source** |
| 01 | **I** | 1ST | 01 | Atomic structure | Fundamental particles (electron, proton & neutron Definition, mass and charge ). |  |
| 02 | 02 | Atomic structure | Rutherford’s Atomic model (postulates and failure) |  |
| 03 | 03 | Atomic structure | Atomic mass and mass number |  |
| 04 | 04 | Atomic structure | Definition, examples and properties of Isotopes, isobars and isotones |  |
| 05 | 2ND | 01 | Atomic structure | Bohr’s Atomic model (Postulates only)  Bohr-Bury scheme |  |
| 06 | 02 | Atomic structure | Aufbau’s principle, Hund’s rule |  |
| 07 | 03 | Atomic structure | Electronic configuration (up to atomic no 30) |  |
| 08 | **II** | 04 | Chemical Bonding | Electrovalent, Covalent and Coordinate bond |  |
| 09 | 3RD | 01 | Chemical Bonding | formation of NaCl, MgCl2, H2, Cl2, O2 |  |
| 10 | 02 | Chemical Bonding | formation of N2, H2O, CH4, NH3, NH4 +, SO2 |  |
| 11 | **III** | 03 | Acid base theory | Concept of Arrhenius |  |
| 12 | 04 | Acid base theory | Lowry Bronsted and Lewis theory for acid and base with examples (Postulates and limitations only) |  |
| 13 | 4TH | 01 | Acid base theory | Neutralization of acid & base |  |
| 14 | 02 | Acid base theory | Definition of Salt, Types of salts (Normal, acidic, basic, double, complex and mixed salts, definitions with 2 examples from each) |  |
| 15 | **IV** | 03 | Solutions | Definitions of atomic weight, molecular weight, Equivalent weight. Determination of equivalent weight of Acid, Base and Salt. |  |
| 16 | 04 | Solutions | Modes of expression of the concentrations (Molarity, Normality & Molality) with Simple Problems. |  |
| 17 | 5TH | 01 | Solutions | pH of solution (definition with simple numerical) |  |
| 18 | 02 | Solutions | Importance of pH in industry (sugar, textile, paper industries only) |  |
| 19 | **V** | 03 | Electrochemistry | Definition and types (Strong & weak) of Electrolytes with example. Electrolysis (Principle & process) with example of NaCl (fused and aqueous solution). |  |
| 20 | 04 | Electrochemistry | Faraday’s 1st and 2nd law of Electrolysis (Statement, mathematical expression and Simple numerical) Industrial application of Electrolysis-Electroplating (Zinc only). |  |
| 21 | **VI** | 6TH | 01 | Corrosion | Definition of Corrosion, Types of Corrosion- Atmospheric Corrosion, Waterline corrosion |  |
| 22 | 02 | Corrosion | Mechanism of rusting of Iron only. Protection from Corrosion by (i) Alloying and (ii) Galvanization. |  |
| 23 |  | 03 |  | Doubt Clearing Class (Physical Chemistry) |  |
| 24 | 04 |  | Unit Test (Physical Chemistry) |  |
| 25 | **VII** | 7TH | 01 | Metallurgy | Definition of Mineral, ores, gangue with example. Distinction between Ores and Minerals. |  |
| 26 | 02 | Metallurgy | Ore Dressing |  |
| 27 | 03 | Metallurgy | Concentration (Gravity separation, magnetic separation, Froth floatation & leaching) |  |
| 28 | 04 | Metallurgy | Oxidation (Calcinations, Roasting) |  |
| 29 | 8TH | 01 | Metallurgy | Reduction (Smelting, Definition & examples of flux, slag) |  |
| 30 | 02 | Metallurgy | Refining of the metal (Electro refining, & Distillation only) |  |
| 31 | **VIII** | 03 | Alloys | Definition of alloy. Types of alloys (Ferro, Non-Ferro & Amalgam) with example. Composition and uses of Brass, Bronze, Alnico, Duralumin |  |
| 32 |  | 04 |  | Doubt Clearing Class (Inorganic Chemistry) |  |
| 33 | 9TH | 01 |  | Unit Test (Inorganic Chemistry) |  |
| 34 | **IX** | 02 | Hydrocarbons | Saturated and Unsaturated Hydrocarbons (Definition with example) |  |
| 35 | 03 | Hydrocarbons | Aliphatic and Aromatic Hydrocarbons (Huckle’s rule only). Difference between Aliphatic and aromatic hydrocarbons |  |
| 36 | 04 | Hydrocarbons | IUPAC system of nomenclature of Alkane, Alkene, Alkyne, alkyl halide and alcohol (up to 6 carbons) with bond line notation. |  |
| 37 | 10TH | 01 | Hydrocarbons | IUPAC system of nomenclature of Alkane, Alkene, Alkyne, alkyl halide and alcohol (up to 6 carbons) with bond line notation. |  |
| 38 | 02 | Hydrocarbons | Uses of some common aromatic compounds (Benzene, Toluene, BHC, Phenol, Naphthalene, Anthracene and Benzoic acid) in daily life |  |
| 39 | 03 | Hydrocarbons | Doubt Clearing Class (Organic Chemistry) |  |
| 40 | 04 | Hydrocarbons | Unit Test (Organic Chemistry) |  |
| 41 | **X** | 11TH | 01 | Water Treatment | Sources of water, Soft water, Hard water |  |
| 42 | 02 | Water Treatment | hardness, types of Hardness (temporary or carbonate and permanent or non-carbonate) |  |
| 43 | 03 | Water Treatment | Removal of hardness by lime soda method |  |
| 44 | 04 | Water Treatment | (Hot lime & cold lime—Principle, process & advantages |  |
| 45 | 12TH | 01 | Water Treatment | Advantages of Hot lime over cold lime process. |  |
| 46 | 02 | Water Treatment | Organic Ion exchange method (principle, process, and regeneration of exhausted resins) |  |
| 47 | **XI** | 03 | Lubricants | Definition of lubricant, Types (solid, liquid and semisolid with examples) |  |
| 48 | 04 | Lubricants | specific uses of lubricants (Graphite, Oils, Grease), Purpose of lubrication |  |
| 49 | **XII** | 13TH | 01 | Fuel | Definition and classification of fuel, Definition of calorific value of fuel, Choice of good fuel. |  |
| 50 | 02 | Fuel | Liquid: Diesel, Petrol, and Kerosene --- Composition and uses |  |
| 51 | 03 | Fuel | Gaseous: Producer gas and Water gas (Composition and uses) |  |
| 52 | 04 | Fuel | Elementary idea about LPG, CNG and coal gas (Composition and uses only). |  |
| 53 | **XIII** | 14TH | 01 | Polymer | Definition of Monomer, Polymer, Homo-polymer, Co-polymer and Degree of polymerization |  |
| 54 | 02 | Polymer | Difference between Thermosetting and Thermoplastic, Composition and uses of Polythene, & Poly-Vinyl Chloride and Bakelite |  |
| 55 | 03 | Polymer | Definition of Elastomer (Rubber). Natural Rubber (it’s draw backs). Vulcanisation of Rubber. Advantages of Vulcanised rubber over raw rubber. |  |
| 56 | **XIV** | 04 | Chemicals in Agriculture | Pesticides: Insecticides, herbicides, fungicides- Examples and uses. |  |
| 57 | 15TH | 01 | Chemicals in Agriculture | Bio Fertilizers: Definition, examples and uses. |  |
| 58 |  | 02 |  | Doubt Clearing Class (Industrial Chemistry) |  |
| 59 | 03 |  | Unit Test (Industrial Chemistry) |  |
| 60 |  | 04 |  | Class Test |  |