

With effect from the academic year 2015-2016

BS 203 CH

ENGINEERING CHEMISTRY-II
(Common to all branches)

Credits: 3

Instruction: (3L) hrs per week

CIE: 30 marks

Duration of SEE: 3 hours

SEE: 70 marks

Objective:

- To study the various types of electrodes, cells and batteries & their applications.
- To study the various types of corrosion, the factors that influencing the corrosion & various corrosion controlling methods.
- To study the various types of chemical fuels, composites & liquid crystals.

Outcomes:

- Gain knowledge in the concept and applications of various types of batteries.
- Enrich knowledge in the causes, effects of corrosion and its prevention methods.
- The student able to assess the quality of various types of Fuels.
- Obtain the knowledge in the advantages and applications of engineering materials like Composites, Liquid crystals etc.

Unit- I :ELECTROCHEMISTRY: Electrolytic conductors-conductance, specific conductance, equivalent conductance and molar conductance. Cell constant, measurement of electrolytic conductance. Effect of dilution on various conductivities. Kohlrausch law and its applications – determination of Λ^∞ of weak electrolytes, solubility product and degree of dissociation. Principle and applications of conductometric titrations. Numerical problems.

Electrolytic and galvanic cells, cell notation, concept of electrode potential, single electrode potential and its determination. Electrochemical series and emf calculations. Types of electrodes- Hydrogen, Calomel, Quinhydrone and Glass electrode. Nernst equation and its applications. Determination of pH by using Quinhydrone and Glass electrodes. Principle and applications of Potentiometric titrations. Numerical problems.

Unit-II: CHEMISTRY OF BATTERIES: Chemical Cells: Primary batteries: Zin-Carbon battery. Secondary batteries: Lead-acid battery, Nickel-Cadmium battery-charging and discharging reactions and its applications. Modern Lithium batteries, advantages and applications.

Solar Cells: Concept of Solar energy conversion, Photovoltaic cells.

Fuel Cells: Concept of fuel cells and their advantages. H₂-O₂ alkaline fuel cell and methanol-Oxygen fuel cell.

Unit-III: CORROSION AND ITS CONTROL: Introduction, causes and effects of corrosion-Dry or chemical corrosion and wet or electro chemical corrosion and their mechanism. Pilling-Bedworth Rule and its significance. Types of electrochemical corrosion-Differential aeration, Galvanic, Waterline and Pitting corrosion. Factors effecting rate of corrosion: a) Nature of metal –galvanic series, over voltage, relative areas of anode and cathode, purity of metal,

nature of surface oxide film b) Nature of environment-effect of temperature, effect of humidity and effect of P^H .

Corrosion control methods: Cathodic protection –Sacrificial anode and impressed current cathode methods. Corrosion inhibitors-anodic and cathodic inhibitors.

Surface Coatings: Types of metallic coatings-anodic and cathodic coatings methods of application of metallic coatings: Hot-dipping, galvanizing, tinning and electroplating. Paints-constituents and their functions.

Unit–IV: CHEMICAL FUELS:DefinitionandClassification. Requirement of a good fuel, advantages, disadvantages of solid, liquid and gaseous fuels.

Combustion: Ignition temperature of a fuel. Calculation of air quantities by weight and volume required for the combustion of the fuels. Calorific value of the fuel-lower calorific value (LCV) Higher calorific value (HCV)-theoretical calculations of calorific value by Dulong's formula – Numerical problems.

Solid Fuels: Coal-Proximate and Ultimate analysis and its significance.

Liquid fuels: Source- fractional distillation of petroleum, important fractions, and their uses. Cracking and its significance.Catalytic cracking by moving bed method.Knocking, fuel rating-Octane and Cetane numbers.

Gaseous fuels: LPG, CNG composition and uses.

Unit–V: ENGINEERING MATERIALS-II:Composites: Introduction, constituents of composites. Types of composites-Fibre-reinforced,Particulate and Layered composites. Advantages and applications of Composites.

Liquid Crystals:Introduction, classification of liquid crystals, Thermotropic, Lyotropic liquid crystals. Chemical constitution and liquid crystalline behavior.Molecular ordering in liquid crystals.Nematic, Smectic and Cholestric liquid crystals and their applications.

Insulators: Thermal and Electrical- their Characteristics and applications.

Suggested Readings:

1. Puri, Sharma and Pathania, *Principles of Physical Chemistry*, Vishal Publishing Co., 47th Edition (2015).
2. P.C Jain & Monica Jain, *Engineering Chemistry*, Dhanapathi Rai publishing Co. 16th Edition (2015)
3. Shashi Chawla, *Text book of Engineering Chemistry*, Dhanapathi Rai publishing Co. 3rd Edition (2003).
4. Shikha Agarwal, *Engineering Chemistry*, Cambridge University Press, 2015.
5. O.G. Palanna, *Engineering Chemistry*, TMH Edition(2009).
6. C. Parameshwara Murthy, CV Agarwal, Andhra Naidu, *Engineering Chemistry*, BS Publications(2006).

With effect from the academic year 2015-2016

BS 252 CH

ENGINEERING CHEMISTRY LAB -II
(Common to all branches)

Credits: 1

Instruction: 2 hrs per week

CIE: 25 marks

Duration of SEE: 2 hours

SEE: 50 marks

INSTRUMENTAL ANALYSIS

CONDUCTOMETRY:

1. Conductometric titration of strong acid vs. strong base.
2. Conductometric titration of weak acid vs. strong base.
3. Conductometric titration of mixture of acids vs. strong base.
4. Conductometric titration of Barium chloride against Sodium sulphate.

POTENTIOMETRY:

1. Potentiometric titration of strong acid vs. strong base.
2. Potentiometric redox titration-KMnO₄ vs Fe⁺².

P^H METRY:

1. P^H metric titration of strong acid vs. strong base.
2. P^H metric titration of weak acid vs. strong base.

COLORIMETRY:

1. Verification of Beer's Law by using Potassium permanganate.
2. Estimation of KMnO₄(Mn) in the given solution.
3. Estimation of iron in cement.

KINETICS:

1. First order reaction-hydrolysis of methyl acetate
2. Second order reaction-potassium iodide and persulphate

Suggested Readings:

1. BD Khosla, A.Ghulati, VC.Garg., *Senior practical Physical Chemistry*, S.Chand and Co., New Delhi 10th ed. 2001.
2. B.Vishwanathan, P.S Raghavan *Practical Physical Chemistry*, Viva Books Private Limited.
