Syllabus for Written Test -2020
Assistant Professor in
CHEMISTRY

UNIT – I:

Electrochemistry:

1.1 Electrodics: Conductance and its types, Transport number and its determination. Electrolytic cells & Galvanic cells, Electrode potentials SOP & SRP, Electro Chemical series & significance, Cell notation, Cell reaction, Reversible & irreversible cells. Nernst equation derivation & applications - Numericals

Types of electrodes A) Gas – electrode (Hydrogen Electrode) B) Metal - metal ion electrode C) Metal – metal insoluble salt electrodes (Calomel electrode) D) Redox electrodes (Quinhydrone electrode) Determination of PH, Ion selective electrode (glass electrode) & Determination of P^H

1.2 Electro Analytical Techniques: Conductometry – Principle, Acid - base titrations, Potentiometry – Principle, Acid – Base & Redox titrations, P^H metry - Acid - base titrations, Numericals

1.3 Battery Technology: Primary & Secondary batteries Zn – C batteries, Lithium batteries, Lead Acid Battery – Construction, charging & discharging reactions. Applications. Ni-cad & Lithium-ion batteries. Applications. Fuel cells – Concept, $CH_3OH – O_2$ fuel cell.

UNIT – II:

Water Technology and Corrosion:

2.1 Water Chemistry Hardness – types & its units. Determination of hardness by EDTA. Numericals. Alkalinity & its determination. Softening of water by Ion exchange method. Reverse Osmosis, specifications of potable water. Drinking water – Disinfection, Break point chlorination & ozonization. Boiler troubles, causes & effects.

2.2 Corrosion & its control: Introduction, definition, causes & effects. Types of Corrosion, Dry corrosion, Nature of metal oxide, passivity. Wet Corrosion – Mechanism. Differential aeration Corrosion - water line & pitting, Galvanic Corrosion. Factors affecting rate of Corrosion. Cathodic protection – sacrificial anode & impressed current methods.

2.3 Surface Coatings: Metallic coatings – Anodic & Cathodic coatings. Electroplating (Nickel plating) & Electroless plating (Copper plating) Paints – constituents & functions.

UNIT – III:

Chemistry of Engineering Materials:

3.1 Polymers Monomers, polymers, Homo, Hetero, Co Polymers. Tacticity, Types of Polymerization –

i) Addition ii) Condensation iii) Co – Polymerization – Examples

Thermoplastic & thermosetting resins – definitions of plastics, resins, fibers and elastomers.

Preparation, properties & uses of PVC (plasticized & unplasticised), Teflon, Bakelite

Kevlar and Polyurethane (Perlon – U). Rubbers, natural rubbers & its structure. Vulcanization & its Significance. Preparation, properties & uses of Buna-S, Butyl and Silicone Rubbers

3.2 Biodegradable Polymers Concept & Significance Polylactic acid

3.3 Conducting Polymers Definition, classification extrinsic & intrinsic polymers. Mechanism of conduction in polyacetylene, Structure of polyaniline & its doping. Applications of conducting polymers.

3.4 Nano Materials: Introduction, production methods & applications of Graphite, Fullerene & Carbon nanotubes

3.5 . Liquid Crystals: Introduction, classification of liquid crystals-Thermotropic and Lyotropic - Chemical constitution & liquid crystalline behavior. Molecular ordering in liquid crystals- Nematic, Smectic and Cholestric - Applications

UNIT – IV:

Fuels:

4.1 Fossil Fuels Definitions & Classification of fuels, requirements of a good fuel. Determination of calorific value by bomb calorimeter HCV, LCV. Theoretical calculation of calorific value by Dulong's formula – numericals. Combustion - Ignition temp of fuel, calculation of Oxygen & air required for the combustion of a fuel – numericals. Solid fuels - Coal & its composition, Proximate analysis – Significance. Ultimate analysis & Significance, petroleum & its compositions. Fractionation of petroleum – uses of gasoline, kerosene & diesel. Cracking & its significance – catalytic cracking by fixed bed method. Knocking, fuel rating and octane number. Unleaded petrol, composition & significance automobile exhausts – Catalytic converters. Gaseous fuels – LPG, CNG compositions & uses.

4.2 Bio Diesel: Sources, concept of Transesterification, properties & uses

4.3 Rocket Fuels: Principles of Propulsion, characteristics of a good propellant. Classification of Rocket fuels with examples

UNIT – V:
Organic Chemistry and Co-ordination chemistry:

5.1 Organic Chemistry:
Organic reactive intermediates: Generation, stability and reactivity of carbocations,carbanions, free radicals, carbenes, benzynes and nitrenes, Organic reaction mechanisms involving addition, elimination and substitution reactions with electrophilic, nucleophilic or radical species. Determination of reaction pathways.

5.2 Co-ordination chemistry
Werners theory, sidgwick's EAN rule, valence bond theory, crystal field theory, splitting of d-orbitals in linear trigonal planar, trigonal by piramydal, sqare planar, tetra hedral, octahedral and tetragonally distorted octahedral geometries. Crystal field stabilization energy.