

## CO 1 & CO 2

- Nernst equation- derivation, explanation, importance
- Measurement of EMF
- Primary and Secondary batteries differences.
- Advantages of using fuel cells over traditional batteries.
- Construction, working, and applications of SHE with suitable examples.
- Electrochemical series- definition, explanation and applications/ uses.
- Concentration cells- working principle.
- Hydrogen-oxygen fuel cell- working, applications.
- methanol-oxygen fuel cell- working, applications.
- Lead acid battery- working, reactions, applications.
- Nickel-Metal Hydride (NiMH) cells- working, reactions, applications.
- Working and applications of Li-ion batteries.
- Construction and working of calomel electrodes with an example.
- Determination of pH of a given unknown sample.
- Pitting corrosion- causes and mechanism.
- Factors influencing rate of corrosion.
- Wet theory of corrosion- mechanisms and effects on materials.
- Sacrificial anodic method
- Impressed current cathode method
- Theories of chemical and electrochemical corrosion
- Cathodic protection works and illustrate the impressed current method- reactions.
- Electroplating process.
- Differences between cathodic coatings and anodic coatings.
- Chemical theory of corrosion and its types with suitable examples.
- Galvanic corrosion and its mechanism
- Differential aeration corrosion mechanism with suitable examples.

## CO 3 & CO 4

- Hardness- definition, causes, disadvantages
- Numerical problems based on hardness calculation
- Numerical problems based on alkalinity calculation
- Determination of alkalinity
- Cold and Hot LIME-SODA process of water softening with neat diagrams and reactions
- Complexometric titration method or EDTA method - principle, procedure, uses.
- Boiler corrosion- reason, chemical reactions, disadvantages, treatment methods
- Boiler troubles- types- reason, chemical reactions, mechanism involved, treatment methods, disadvantages
- Differences between foaming and priming in boilers.
- Ion exchange process of water softening- chemical reactions, diagram.
- Classification of polymers based on their source of origin with examples.
- Differences between addition polymerization and condensation polymerization with examples.
- Polymerization process/ synthesis/ preparation, properties, disadvantages and applications of Teflon, PVC, Bakelite, polystyrene.
- Classification of polymers based on their thermal behaviour with examples or differences between thermosetting and thermoplastics.
- Free radical polymerization mechanism- chemical reactions and intermediates involved.
- Differences between intrinsic and extrinsic conductivity in conducting polymers.
- Classification of carbon nanotubes based on their structures.
- Differences between single-walled nanotubes (SWCNTs) and multi-walled nanotubes (MWCNTs)
- Coordination mechanism involved in the polymerization process- chemical reactions, mechanism, types of catalyst used etc.,
- Definitions in polymers introduction
- Tacticity- importance, polymer classification, examples, types, applications, chemical structures.
- Conducting polymers- mechanism, reactions, examples, role of doping.