

**NATIONAL INSTITUTE OF TECHNOLOGY  
JAMSHEDPUR, JHARKHAND-831014  
DEPARTMENT OF CHEMISTRY**

**ENGINEERING CHEMISTRY**

**Thermodynamics:-**

Laws of thermodynamics, system, thermodynamic functions, state of a system, equilibrium, enthalpy, work done in different processes,  $C_p$ ,  $C_v$ , adiabatic PVT relations, Carnot cycle, concept of entropy, Clausius-Clapeyron equation & its applications, Maxwell relations, concept of free energy, chemical potential, Maxwell relations.

**Electrochemistry and corrosion:-**

Electrochemical cells, origin of electrode potential, standard potential, Nernst equation, EMF series, rechargeable batteries, Types of corrosion, galvanic series, Cathodic and anodic reactions, differential aeration cells, corrosion prevention methods.

**Kinetics & Solution Chemistry:**

Kinetics of chemical reaction, 1<sup>st</sup>, 2<sup>nd</sup> order reactions, reversible, consecutive and parallel reaction. Steady state approximations, Arrhenius equation, Chain reactions, photo chemical reactions, Solution chemistry and colligative properties, Real and ideal solutions, Diffusion, Osmosis, Osmotic pressure, Lowering of vapor pressure, Elevation in boiling point, Depression of freezing point, Abnormal molecular weight, Degree of association and dissociation.

**Chemical Bonding & Co-ordination chemistry:**

Bonding models in inorganic chemistry, Molecular orbital theory (MOT), Valence bond theory (VBT), and crystal field theory (CFT), Co-ordination chemistry: Co-ordination number, Chelate effect, EAN rule, splitting of 'd' orbital in octahedral, tetrahedral and square planar complex, Example of Bio-inorganic & metals in biological systems

**Industrial chemistry**

Polymers: types of polymer, polymerization, applications, important synthetic polymers. Refractory & ceramics material: Classification, manufacturing and Applications, Water treatment, Air pollution and Control techniques

**Text Books :**

1. A textbook of Engg. Chemistry-Shashi Chawla
2. A textbook of Physical Chemistry- S. Glasston
3. Physical Chemistry by Atkins
4. Engineering chemistry, Jain & Jain

**Reference Books:**

1. Environmental Engg. - Keiley
2. Selected topics in inorganic chemistry-MMT
3. I. A Levine, Physical chemistry, McGraw Hill

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**ENGINEERING CHEMISTRY LABORATORY**

List of experiments:

1. Determination of the surface tension of the given organic liquid by using Stalagometer.
2. Determination of the viscosity of the given organic liquid by Ostwald' Viscometer.
3. Finding the unknown concentration of a given Glycerol solution with the help of known Glycerol concentrated solutions by using Ostwald's Viscometer.
4. Determination of the total hardness of tap water sample by EDTA method.
5. Determination of dissolved oxygen (DO) in a given water sample by using Winkler's methods.
6. Estimating the percentage of available chlorine in the given sample of bleaching powder.
7. To find the concentration of NaOH solution in a strong acid (HCl) and strong base (NaOH) by using Conductrometric titration method.
8. Determination of the strength of unknown solution of HCl by titrating it with NaOH solution using pH-metric titration method.
9. Determination of the equivalent weight of a polybasic organic liquid.
10. Determination of the percentage composition of the supplied solution containing a mixture of NaOH & Na<sub>2</sub>CO<sub>3</sub> i.e., a mixture of hydroxide and carbonate alkalinity.
11. Determination of rate constant of hydrolysis of an ester catalysed by H<sup>+</sup> ions (HCl) at room temperature.
12. Determination of the distribution coefficient of iodine between water and carbon tetra chloride.
13. Determination of Ferrous Iron in Mohr's salt by KMnO<sub>4</sub>.
14. Determination of amount of sodium and potassium in a given water sample by flame spectrophotometer.
15. Determination of alkalinity of given water sample.