

## **MPT2: Technical Assistant Gr. III (1): Chemistry**

### **Syllabus for Paper III (Core)**

*(Taken from curriculum of first degree program –Chemistry (Kerala university -2017 onwards)*

**Analytical Methods in Chemistry:** Basic concepts -Molecular mass, mole concept, concepts on acids and bases, dissociation constants, degree of ionization, pH, Buffers-Henderson equation, mechanism of action and their preparation, Laboratory operations, use of common lab ware and equipment, heating methods, filtration techniques, weighing principles, Methods of analyses- general principle, standards, preparation of standard solutions, End point, acid-base, redox and complex metric titrations and indicators, gravimetric analyses, Separation and purification Techniques- recrystallization, drying, sublimation, principles of distillation and various distillation techniques. Evaluation and representation of Analytical data and use of spreadsheet, statistical treatment of analytical data.

**Basic Thermodynamics and Chemical Kinetics:** Basic concepts of thermodynamics, Laws of thermodynamics, concept of entropy, Gibbs and Helmholtz free energy concepts, Chemical and Ionic equilibria, Rate of reaction, rate equation, theories of chemical kinetics, effect of temperature on reaction rates, Arrhenius equation, concept of activation energy, collision theory, transition state theory, enthalpy and entropy of activation, Catalysis – homogenous and heterogeneous catalysis, surface catalysis.

**Organic Chemistry:** Fundamentals, Concepts and Assay of Natural products – Terpenoids, Alkaloids, Lipids, Vitamins, Steroids, Hormones, Amino acids, Peptides and Proteins, Nucleic Acids, Enzymes, general properties and assay. Dyes, Drugs and Polymers.

**Physical Chemistry:** Gaseous state – Theory of gases, general properties, collision properties, Liquid state – Intermolecular forces, surface tension, viscosity, determination of viscosity; Solid state- Basics, laws of crystallography, X-Ray diffraction theory and analyses of powder diffraction patterns, surface chemistry and colloidal state: adsorption, fundamentals, adsorption isotherms, BET theory and determination of surface area using BET equation. Types of solutions, purification of colloids.

**Concepts of Analytical Instrumentation:** Principles of instrumentation, Transducer concepts, Typical analytical instruments, Potentiometric and non-potentiometric instrumentation, temperature and pressure measurement, Surface analyses and microscopy, optical methods, thermo-gravimetric, differential thermal analyses, differential scanning calorimetry, electrophoretic techniques and their applications.

**Spectroscopy:** Rotation spectroscopy, Vibrational Spectroscopy, Raman spectroscopy, Electronic spectroscopy, UV-Visible Spectroscopy, Fluorescence Spectroscopy, IR Spectroscopy, Nuclear Magnetic resonance spectroscopy, Fluorescence spectrometer, Electron Spin resonance spectroscopy, Principles, and applications of the different spectroscopic techniques. Mass spectrometry – Basics, determination of molecular mass by MS

**Chromatography:** Basic principles- Differential migration, Different chromatographic techniques – Principles and Equipment, Concepts and use scenarios for LC, HPLC, GC, TLC, HPTLC.

**Unit Operations in Chemical Industry:** Distillation, Absorption, Adsorption, Evaporation, Crystallization – Concepts, Theory, Equipment and Operation Parameters.