Details of the Test and Syllabus

Paper		No. of Questions	Max Marks
Section-I	Research Methodology	50	50 Marks
Section-II	UGC NET/CSIR Syllabus	50	50 Marks

Note: The topics of unit-I, unit-II and unit-III of RM will be excluded from syllabus of UGC NET/CSIR Syllabus. (Section-II)

PAPER -1 RESEARCH METHODOLOGY
Chemistry

UNIT – I: Characterization techniques (based on spectroscopy) used in Chemistry-I:

(i) UV-Visible

Principle, Type of transitions in UV, Woodward-Fieser Rules for Dienes and □-□□unsaturated Ketones, Brief introduction to Beer-Lambert law, Deviation fromBeer's law, Basic components of instrument, schematic diagram of single anddouble beam spectrophotometer and working of each component.

(ii) Infra-Red

Principle, Type of vibrations in IR, different important group frequencies, criteria for compound to be IR active, some simple examples of organic compounds, Basic components of instrument, schematic diagram of single anddouble beam spectrophotometer and working of each component.

UNIT – II: Characterization techniques (based on spectroscopy) used in Chemistry-II:

(i) Principle, instrumentation and applications of Nuclear Magnetic ResonanceSpectroscopy Principle, criteria for compound to be NMR active, basic components of instrument for NMR, schematic diagram of NMR spectrophotometer and working of each component, Relaxation process, shielding and de-shielding, Chemical shift. ^{1}H-NMR and ^{13}C-NMR techniques

(ii) Principle, instrumentation and applications of Mass spectroscopy basic components of instrument for Mass spectrometer, schematic diagram of Mass spectrometer, working of each component, molecular ion peak, base peak and their criteria.

UNIT – III: Purification and separation techniques used in Chemistry:

Crystallization, distillation, introduction to chromatographic techniques like paper, TLC and Ion-exchange chromatography, Gas Chromatography G C instrumentationUse of different columns in G C Applications of G C, Theory of Liquid Chromatography, High Performance Liquid Chromatographic Technique, Use of different columns in H P L C, Applications of H P L C, GC-MS and LC-MS techniques

UNIT-IV: Techniques and toolsused in Organic and InorganicChemical Experimentations:

(i) Organic qualitative analysis of single, binary and ternary component system.Determination of functional groups of organic compounds.

(ii) Preparation and mechanism of simple organic compounds with one-step and two-step preparations including bromination, nitration, acetylation, reduction, oxidation, etc.

(iii) Inorganic qualitative analysis of inorganic mixtures containing anions and cations (Including rare earths).

(iv) Preparation, estimation, purification of some inorganic complexes such as Tetrapyridino cupric persulphate, Bis-salicylaldehyde copper (II) complex, Trithioureacopper (I) Chloride, Trithioureacopper (II) Chloride, Tetra amine Copper (II) Sulphate, Chrome Red, Hexathiourea lead nitrate, Tetrapyridinio cupric persulphate, etc.

UNIT-V: Techniques and tools used in Physical and Analytical Chemical Experimentations:

(i) Determination ofsome physico-chemical constants like partial molar volume, heat of vaporization, entropy of vaporization, first, second order rate of reactions and partition coefficient.

(ii) Preparations of some polymeric compounds like polystyrene, polyacrylonitrile, polymethamethacralate (PMMA), polysulphide rubber, phenol formaledyde resin by using solution polymerization, emulsion polymerization, bulk polymerization techniques

(iii) Determination of some physico-chemical properties of solutions like, redox, complex formation, dissociation constants of mono and di-basic acids, precipitation by using analytical instruments like pH-metry, potentiometry and conductometry

(iv) Spectrophotometric determination of iron, nickel, nitrite, phosphate and separation of amino-acids and metal ions by ascending, circular paper chromatography and TLC.