SCHEME OF EXAMINATION
AND
COURSE OF STUDY
Pre-Ph.D. course (CHEMISTRY)

(w.e.f. 2018-2019)

DEPARTMENT OF CHEMISTRY
GURUKUL KANGRI VISHWAVIDYALAYA, HARIDWAR

01.Jan.2019

Pre-Ph.D. Course Work
Subject Code: PCH-101
w.e.f. the session 2018-19 and onwards

Max. Marks =100   **Continuous Assessment: 30**
Time: 3 hrs   **ESE: 70**
                                                                            Pass Marks: 40

Paper - I (RESEARCH METHODOGY-I)

NOTE FOR THE EXAMINER: Examiners are required to ask two questions from each unit. A student shall be required to attempt one question from each unit. In all, five questions are to be attempted. All questions carry equal marks.

Unit – I

Data Analysis: Different ways to express concentrations, Accuracy, Precision, Expressing accuracy & precision, Standard deviation, Types of errors, Elimination and Minimization of errors, Significant figures, Criterion for the rejection of data (Q test), "t" test, Method of least squares for drawing the best fit line/ calibration plots, correlation coefficient and coefficient of determination and their significance.

Unit- II

Elementary idea of signal to noise ratio, Sensitivity and detection limits, sources & types of noise (Thermal, shot, Flicker and Environmental noise). Elimination and Minimization of noise. Basic idea of Fourier transformation.

Unit- III

Spectroscopic Techniques: UV-VIS and I.R. spectroscopic methods of Analysis, Raman spectroscopy and Mass spectrometry (Basic concepts ONLY). Instrumentation, basic terms of H-NMR spectroscopy. Applications in structure elucidation.

Unit- IV

Chromatographic Techniques: Gas-solid, Gas- liquid and High-Performance Liquid Chromatography (excluding specific applications), Retention capacity, Relative column capacity factor, operation efficiency and Resolution.
Ion Exchange: Cation and Anion exchangers, their Stability, Selectivity and Characteristics, general applications including ion exchange chromatography.

Unit- V

Introduction to Computers: Block diagram of computers; Input and output devices-key board, mouse, scanner, VDU, plotter and printers; Primary & secondary memory - RAM, ROM, Secondary Memory devices-Hard Disk, CD and Flash Drive; Volatile and non-volatile memory; CPU - ALU and control unit; Hardware & software, Software - system software and application software. Operating system and its functions: Microsoft windows. Applications of Microsoft Office and Internet.

Pre-Ph.D. Course Work
Subject Code: PCH-102
w.e.f. the session 2018-19 and onwards

Max. Marks =100   **Continuous Assessment: 30**
Time: 3 hrs   **ESE: 70**
                                                                    Pass Marks: 40

Paper - II (RESEARCH METHODOLOGY -II)

NOTE FOR THE EXAMINER: Examiners are required to ask two questions from each unit. A student shall be required to attempt one question each from unit I & II and any three questions from unit III, IV & V. In all, five questions are to be attempted. All questions carry equal marks.

Unit - I
Principle, instrumentation and application of Atomic absorption spectroscopy and atomic emission spectroscopy, Inductively Coupled Plasma: Introduction, Instrumentation and applications.

Unit - II
T.G.A., D.T.A. and D.S.C.methods of analysis, Thermometric titrations. SEM and TEM, determination of particle size. Fundamental of X-ray diffraction technique and general applications.

Unit - III
Chemical Kinetics: Collision theory for uni, bi and termolecular reactions, Steric factor, Theory of absolute reaction rates, Entropy of activation. Reactions in solution, Factors affecting the rates in solutions. Double and Single sphere models, Effect of ionic strength, Bronsted-Bjerrum equation.

Linear Free energy Relationships: Effect of substituents on reaction rates, Basic idea of linear free energy relationships particularly Hammett, Taft, Brown - Okamoto Sekigawa and Van - Bakkum plots (Introductory treatment only). Basic concepts of nano materials.

Unit- IV
Types of Electroanalytical Techniques and their details like Voltammetry, AC, DC pulse polarography, Coulometry, Stripping Voltammetry (Anodic and Cathodic) and Cyclic Voltammetry. Fundamental studies of redox processes in various media. Determination of the formal reduction potential. Determination of reversibility and irreversibility of electrochemical reactions. Peak currents and coupled chemical reactions, common applications.

Magnetic measurements, Gauy's balance method, vibrating sample method of magnetic measurements at various temperature.

Macrocycles and Supramolecular Chemistry.

Unit- V
Solvent Extraction Methods for isolation of material from a natural product. Identification of components through GC/MS, overview and use of NIST/WILEY/OTHER Libraries. Column Chromatography and Concept of eluents of varied polarities. Applications of HPLC in organic chemistry. ^{13}C NMR spectroscopy. 2D NMR (COSY, HETCOR, DEPT, APT, NOESY, AND ROESY), simple structures problems.

Protection and Deprotection of functional groups, Interconversion of functional groups (IFG), Retrosynthesis, Synthons, Synthetic equivalents.