

SCHEME OF EXAMINATION

AND

COURSE OF STUDY

Pre-Ph.D. course (CHEMISTRY)

(w.e.f. 2022-2023)



**DEPARTMENT OF CHEMISTRY
GURUKUL KANGRI DEEMED TO BE UNIVERSITY,
HARIDWAR**

27 May, 2022

Pre-Ph.D. Course Work (Chemistry)

Subject Code: PCH-101

w.e.f. the session 2022-23 and onwards

Max. Marks =100

Time: 3 hrs

Credit:06

Continuous Assessment: 30

ESE: 70

Pass Marks: 40

Paper - I (RESEARCH METHODOLOGY)

NOTE: The question paper shall consist of Two sections (Sec.-A and Sec.-B). Sec.-A shall contain 10 short answer (about 150 words) type questions of SIX marks each and student shall be required to attempt any five questions. Sec.-B shall contain 08 descriptive type questions of TEN marks each and student shall be required to attempt any four questions. Both sections shall have questions from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

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 (Chemistry)

Subject Code: PCH-102

w.e.f. the session 2022-23 and onwards

Max. Marks =100

Time: 3 hrs

Credit:02

Continuous Assessment: 30

ESE: 70

Pass Marks: 40

Paper - II (RESEARCH PUBLICATION ETHICS)

NOTE: The question paper shall consist of Two sections (Sec.-A and Sec.-B). Sec.-A shall contain 10 short answer (about 150 words) type questions of SIX marks each and student shall be required to attempt any five questions. Sec.-B shall contain 08 descriptive type questions of TEN marks each and student shall be required to attempt any four questions. Both sections shall have questions from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

I Theory:

RPE 01: Philosophy and Ethics (3 hours)

1. Introduction to philosophy: definition, nature and scope, concept, branches
2. Ethics: definition, moral philosophy, nature of moral judgements and reactions

RPE 02: Scientific Conduct (5 hours)

1. Ethics with respect to science and research
2. Intellectual honesty and research integrity
3. Scientific misconducts: Falsification, Fabrication, and Plagiarism (FFP)
4. Redundant publications: duplicate and overlapping publications, salami slicing
5. Selective reporting and misrepresentation of data

RPE 03: Publication Ethics (7 hours)

1. Publication ethics: definition, introduction and importance
2. Best practices / standards setting initiatives and guidelines: COPE, WAME, etc.
3. Conflicts of interest
4. Publication misconduct: definition, concept, problems that lead to unethical behaviour and vice versa, types
5. Violation of publication ethics, authorship and contributorship
6. Identification of publication misconduct, complaints and appeals
7. Predatory publishers and journals

II. Practice

RPE 04: Open Access Publishing (4 hours)

1. Open access publications and initiatives
2. SHERPA/RoMEO online resource to check publisher copyright & self-archiving policies
3. Software tool to identify predatory publications developed by SPPU
4. Journal finder / journal suggestion tools viz. JANE, Elsevier Journal Finder, Springer Journal Suggested, etc.

RPE 05: Publication Misconduct (4 hours)

- A. Group Discussions (2 hours)**
1. Subject specific ethical issues, FFP, authorship
 2. Conflicts of interest
 3. Complaints and appeals: examples and fraud from India and abroad

B. Software Tools (2 hours) 1. Use of plagiarism software like Turnitin, Urkund and other open source software tools

RPE 06: Databases and Research Metrics (7 hours)

- A. Databases (4 hours)**
1. Indexing databases
 2. Citation databases: Web of Science, Scopus, etc.

B. Research Metrics (3 hours) 1. Impact Factor of journal as per Journal Citation Report, SNIP, SIR, IPP, Cite Score

2. Metrics: h-index, g index, i10 index, altmetrics

Pre-Ph.D. Course Work (Chemistry)

Subject Code: PCH-103

w.e.f. the session 2022-23 and onwards

Max. Marks =100

Time: 3 hrs

Credit:06

Continuous Assessment: 30

ESE: 70

Pass Marks: 40

Paper - III (RESEARCH CONCEPTS IN CHEMISTRY)

NOTE: The question paper shall consist of Two sections (Sec.-A and Sec.-B). Sec.-A shall contain 10 short answer (about 150 words) type questions of SIX marks each and student shall be required to attempt any five questions. Sec.-B shall contain 08 descriptive type questions of TEN marks each and student shall be required to attempt any four questions. Both sections shall have questions from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

Unit - I

Principle, instrumentation and application of Atomic absorption spectroscopy and atomic emission spectroscopy

Inductively Coupled Plasma: Introduction, Instrumentation and applications.

T.G.A., D.T.A. and D.S.C. methods of analysis. Thermometric titrations.

SEM and TEM, determination of particle size.

Unit - II

Adsorption: Importance of adsorption, General definitions and terminology associated with adsorption, Physiorption and chemisorption, type of Adsorption isotherms, Adsorption Models, Adsorbents, Activated carbons, Carbonization and activation, Uses of activated carbons.

Synthesis and Analysis of polymers: Isolation and purification of polymers, polymerization technique, synthesis of polymer and their characteristics i.e. Determination of glass transition temperature and Molecular weight, Determination of viscosity, pH, electrolytic stability, Hardness, tensile strength, percentage elongation of polymers

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

- i) Classification and Constituents of Crude Drugs: Brief and introductory idea of drug constituents and their Morphological, Chemical and Pharmacological classification.
- ii) Plant Analysis : Methods of extraction, Isolation, separation and identification of various constituents (Introductory description).
- iii) Pharmacodynamics of Ayurvedic drugs: Brief description of Rasa, Guna, Vipaka, Virya, and Prabhava