

# **GANPAT UNIVERSITY**

## **Syllabus for the Ph. D. Entrance Examination**

### **Instructions:**

1. The question paper of the Ph. D. Entrance Examination shall be of 100 marks, to be attempted in 2 hours duration.
2. The question paper will have 2 sections (Section-A and Section-B).
3. Section-A (From Research Methodology) will consist of 50 objective type questions (Multiple Choice), each carrying one mark. Section A shall be common for all the candidates appear in Entrance Examination.
4. Section-B shall be of 50 marks which is Subject specific depends on respective discipline/branch) will consist two parts.
  - Part - I shall be of 25 marks having 25 objective type of questions with multiple choice answers having only one correct answer.
  - Part - II shall be of 25 marks and having descriptive type of questions.
5. There is no negative marking.

## **SECTION – A**

**(Common for all candidates)**

### **RESEARCH METHODOLOGY**

Total Marks: 50

<b>Unit</b>	<b>Content</b>	<b>Marks</b>
1	Basics of Research: Research: Meaning, Objective, Characteristics, Steps of research, Methods of research, Types of research – Descriptive vs. Analytical, Applied vs. Fundamental, Quantitative vs. Qualitative, Conceptual vs. Empirical.	<b>[05]</b>
2	Research Problem and Research Design Introduction to Research Problem, Necessity of Defining the Problem, Selecting the Problem, Techniques Involved in Defining a Problem, Meaning and Types of Research Design, Important Concepts Relating to Research Design	<b>[10]</b>
3	Data Collection and Analysis Methods of Data Collection- Observation, Interview, Questionnaires, Schedules, Survey and Experimental. Selection of Appropriate Method for Data Collection, Different Techniques of Sampling such as Probability and Non-Probability, Basic Statistical Methods of Data Analysis such as Frequency distribution, Measures of central tendency, Measures of Dispersion, Coefficient of variation, correlation and regression.	<b>[20]</b>
4	Ethics in Research: Environmental impacts and Ethical issues, Commercialisation, Copy right, Royalty, Intellectual property rights and Patent law, Plagiarism, Citation, Referencing style and acknowledgement.	<b>[05]</b>

#### Reference Books

1. 'Research Methodology- A Step-By-Step Guide for Beginners', Ranjit Kumar, (Pearson Education, Delhi) ISBN: 81-317-0496-3.
2. 'Research Methodology- Methods and Techniques', Kothari, C.K., New Age International, New Delhi.
3. Research In Education, John V. Best, John V. Kahn 10<sup>th</sup> ed., Allyn & Bacon Publisher, 2005.
4. Practical Introduction of copyright by Gavin Mcfarlane, McGraw Hill Inc., USA.
5. Introduction to Scientology Ethics, Hubbard, L. Ron. New Era Publisher, Denmark.
6. Research Methodology by Deepak Chawala, Vikas Publications.
7. Statistics for Management, Levin & Rubin, Pearson Publication

# SECTION – B

## Faculty of Science

### [Chemistry]

Unit	Content	Marks
<b>1</b>	<b>Inorganic Chemistry</b>	<b>[12]</b>
	<ol style="list-style-type: none"><li>1. Chemical periodicity, Concepts of acids and bases, Hard-Soft acid base concept, Non-aqueous solvents.</li><li>2. Transition elements and coordination compounds: structure, bonding theories, spectral and magnetic properties, reaction mechanisms.</li><li>3. Organometallic compounds: synthesis, bonding and structure, and reactivity. Organometallics in homogeneous catalysis, Bioinorganic chemistry: photosystems, porphyrins, metalloenzymes, oxygen transport, electron- transfer reactions; nitrogen fixation, metal complexes in medicine.</li><li>4. Nuclear chemistry: nuclear reactions, fission and fusion, radio-analytical techniques and activation analysis, Cages and metal clusters.</li></ol>	
<b>2</b>	<b>Analytical chemistry</b>	<b>[12]</b>
	<ol style="list-style-type: none"><li>1. Separation, spectroscopic, electro- and thermo-analytical methods.</li><li>2. Principle and instrumentation of FTIR, Raman, NMR, UV-Vis, Mass Spectroscopy</li><li>3. Chromatography: Classification of stationary and mobile phase, Column Chromatography, Normal and Reverse Phase Chromatography, Paper Chromatography, Preparative TLC, Principle and examples of detection methods, Thin Layer Chromatography (TLC)</li><li>4. Principle and instrumentation of GC, HPLC, HPTLC, LCMS and UPLC</li></ol>	
<b>3</b>	<b>Physical Chemistry</b>	<b>[12]</b>
	<ol style="list-style-type: none"><li>1. Chemical bonding in diatomics; elementary concepts of MO and VB theories; Huckel theory for conjugated <math>\pi</math>-electron systems. Chemical applications of group theory; symmetry elements; point groups; character tables; selection rules.</li><li>2. Electrochemistry: Nernst equation, redox systems, electrochemical cells; DebyeHuckel theory; electrolytic conductance – Kohlrausch's law and its applications; ionic equilibria; conductometric and potentiometric titrations.</li><li>3. Polymer chemistry: Molar masses; kinetics of polymerization.</li><li>4. Thermodynamics: First and II laws of thermodynamics, Concept of entropy-entropy Entropy changes in various processes, Entropy as a function of V and T, P and T, Entropy change in isolated systems, Entropy changes on mixing of ideal gases, Clausius inequality, Entropy change as criterion for spontaneity and equilibrium, Third law of thermodynamics, Evaluation of absolute entropies, Standard entropies and entropy changes of chemical reactions, Helmholtz and Gibbs, Phase equilibrium.</li></ol>	
<b>4</b>	<b>Organic Chemistry</b>	<b>[12]</b>
	<ol style="list-style-type: none"><li>1. Principles of stereochemistry: Configurational and conformational isomerism in acyclic and cyclic compounds; stereogenicity, stereoselectivity, enantioselectivity, diastereoselectivity and asymmetric induction. Aromaticity: Benzenoid and non-benzenoid compounds – generation and reactions.</li><li>2. Organic reactive intermediates: Generation, stability and reactivity of carbocations, carbanions, free radicals, carbenes, benzynes and nitrenes. Common named reactions and rearrangements – applications in organic synthesis. Concepts in organic synthesis: Retrosynthesis, disconnection, synthons, linear and convergent synthesis, umpolung of reactivity and protecting groups.</li></ol>	

3. Pericyclic reactions – electrocyclisation, cycloaddition, sigmatropic rearrangements and other related concerted reactions. Principles and applications of photochemical reactions in organic chemistry. Synthesis and reactivity of common heterocyclic compounds containing one or two heteroatoms (O, N, S). Chemistry of natural products: Carbohydrates, proteins and peptides, fatty acids, nucleic acids, terpenes, steroids and alkaloids. Biogenesis of terpenoids and alkaloids.
4. Structure determination of organic compounds by IR, UV-Vis, <sup>1</sup>H & <sup>13</sup>C NMR and Mass spectroscopic techniques.

**5 Interdisciplinary topics**

**[2]**

Basic principles and applications of Nanotechnology, Green Chemistry, Phase transfer catalyst, Dyes, Medicinal Chemistry, Supramolecular Chemistry.