**Krishna University Pre-PhD Examination**
**Syllabus for Chemistry**
**PAPER-I**
**RESEARCH METHODOLOGY**

**UNIT-I:**

**Definition of Research:**Nature and importance of Research, Aims and Objectives of Research, Selection of area of research, Design of experimental program, Applications of research and types, Research process and steps in it,Deductive and inductive reasoning.

**Method Development and Validity**: Development of various methods, validation of methods developed, **Formulating a research problem**: Sources, Considerations, Steps in formulation of a problem, formulation of objectives.

**UNIT-II:**

**Literature :** Need, Procedure- Search for existing literature, Review the literature selected, Develop a theoretical and conceptual framework, writing up the review, Selection of literature, collection of literature, Manual collection from Library, usage of E-library, collection of literature from web, collection of literature from Scopus, Science direct, Scifinder etc., compiling of literature, software utilization in literature collection,

**UNIT-III:**

**Definition of variables:** Concepts, indicators and variables, Types of variables, Types of measurement scales.

**Research Modeling**: Types of Models, Model building and stages, Data consideration and testing, Data collection methods, Surveys-types and method selection.

**Design of Experiments:** Objectives, strategies, Factorial experimental design, Designingengineering experiments, basic principles- replication, randomization, blocking, Guidelines fordesign of experiments.

**UNIT-IV:**

Preamble, the problem, objectives, hypothesis to be tested, study design, setup, measurement procedures, analysis of data, organization of report; Displaying datatables, graphs and charts.

**UNIT-V:**

Developing an outline, Key elements-Objective, Introduction, Design or Rationale of work, Experimental Methods, Procedures,Measurements, Processing and Analysis of Data obtained, Results, Discussion, Conclusion, Referencing and various formats for referencewriting of books and research papers, Report Writing- Prewriting considerations, Thesis writing,Formats of report writing, Formats of publications in Research journals.Utility of research findings in fulfilling the needs of Society.

**REFERENCES:**


1. Research Methodology- Methods and Techniques by Kothari C.K.
2. Design and Analysis of Experiments by Montgomery, Douglas C.
3. Management Research Methodology; Integration of Principles, Methods and Techniques by Krishnaswamy, K.N., Sivakumar, Appalyer and Mathiranjan M.
4. Research Methodology- A Step-By-Step Guide for Beginners by Ranjit Kumar.
5. Research Methods by Trochim, William M.K.

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**PAPER-II**

**BROAD AREA OF RESEARCH**

**UNIT-I: UV-Visible Spectroscopy:** Brief review of electromagnetic spectrum, UV-Visible range, energy-wavelength-colour relationships, Interaction of electromagnetic radiation (UV-Vis) with matter and its effects, Chromophores,oxochromes, bathochromic, hypocromic, hipsochromic, hyperchromic shifts. Calculation of λmax.Woodword-Hofmann rules for conjugated dienes and α,β-Unsaturated carbonyl compounds.

**UNIT-II:** IR Spectroscopy, Identification of functional groups, confirming the molecules with IR, estimating the purity of compound, finger print region

**UNIT-III; Mass Spectrometry:** Basic principles and brief outline of instrumentation. Ion formation and types, molecular ion, meta stable ions, Fragmentation processes, Fragmentation patterns, nitrogen rule, identification of chloro and bromo compounds, Maclofferty rearrangement, Mass spectrum, its characteristics and representation.

**UNIT-IV; NMR** : Reference, Chemical shift, solvents used in NMR, $D_2O$ exchange, identification of nature of protons and number of protons on particular chemical environment.

**UNIT-V; Chromatography:** Introduction &classification of chromatographic techniques. Principle, instrumentation and applications of different chromatographic techniques - Paper Chromatography, TLC, Column Chromatography, Ion exchange chromatography.

**Validation:** Definition, Various parameters for validation– Accuracy, Precision, Robustness, Ruggedness, Limit of Detection (LOD), Limit of Quantification (LOQ) – as perI.C.H, USP and EP guidelines

**REFERENCES:**


1. Instrumental Methods of Chemical Analysis by B.K Sharma
2. Organic spectroscopy by Y.R Sharma
3. A Text book of Pharmaceutical Analysis by Kerrenth A. Connors
4. Vogel's Text book of Quantitative Chemical Analysis by A.I. Vogel
5. Practical Pharmaceutical Chemistry by A.H. Beckett and J.B. Stenlake
6. Organic spectroscopy by William Kemp
7. Quantitative Analysis of Drugs in Pharmaceutical Formulations by P. D. Sethi
8. Spectrophotometric identification of Organic Compounds by Silverstein
9. Pharmaceutical dosage forms byLiberman, HA &Lachman L Tablets vol I, II & III.
10. Physical Pharmacy by Alfred Martin.
11. Pharmaceutical Dosage forms by Howard. C. Ansel.
12. Modern Pharmaceutics by Gilbert S. Banker and Christopher T. Rhodes.

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**PAPER-III**

**RESEARCH SPECIALIZATION**

**UNIT-I: Purification and drying of chemicals and solvents**

Purification and drying of Benzene, hexane, toluene,xylene,methanol,ethanol, chlororform, carbonterachloride, dichloromethane, acetone, diethylether, tetradydrofuran, dioxane, DMSO, DMF, TFA. Distillation techniques, crystallization techniques, drying techniques.

**UNIT-II;** Preparation ofReagents:, Preparation of sodium wire, sodium granules, bases, sodium alkoxides, alkyllithium, aryl lithium, LDA, TMEDA, HMPA,organoboranes, organosilanes, Grignard reagents, organozinc reagents, organoplatinum reagents,organocupper reagents, organonickel reagents, organopalladium reagents.PPA.Sodiumamide.

**UNIT-III;** Types of organic reactions: substitution reactions, addition reactions, elimination reactions, rearrangements, molecular reactions.Retrosynthetic analysis, disconnection approach, FGI, reagent, synthon, linear and convergent synthesis.C-C single bond formation, C-C double bond formation, C-C triple bond formation, unactivated C-H bonds, Barton reaction.

**UNIT-IV; Organic Reactions;**Reaction intermediates, formation and stability of carbonium ions, carbanions, nitenes, free radicals, arynes, eloctrophiles, nuclophiles, aldol, benzoin, cannizaro, perkin, stobbe, dieckmann condensations, Claisen, Hofmann, Schmidt, lossen, curtius, Beckmann and fries rearrangements, Reimer-tiemann,reformatsky and Grignard reactions, Diels Alder reactions, friedeal crafts ,wittig,,mannich, vielsmayer reactions, Robinson annulations, routine functional group transformations, and interconversions of simple functionalities, hydroboration, sharpless asymmetric epoxidation, oxidations and reductions.

**UNIT-V;** Heterocylic Chemistry, Heterocyclics with single heteroatom, three, four , five and six membered heterocyclics. Heterocyclic with more than one hetero atoms.

**REFERENCES:**


1. Vogel's practical organic chemistry by A.I. Vogel
2. Organic synthesis by W.JH curruthers
3. Organic synthesis by H.O.House
4. Organic reactions and reagents by Jai jack lie
5. Heterocyclic chemistry by Jai jack Lie.

**Model Question paper**

(CHEMISTRY R130201)
PRE-M.PHIL./PRE-PH.D. EXAMINATION
Paper – 1: Research Methodology
(Regulation 2010-11, 2012-13&2014-15)

Time: 3 hours Maximum: 100 marks

Answer ALL questions. Each question carries equal marks. 5 x 20 = 100 marks

UNIT-I

1(A)

(Or)

(B)

UNIT-II

2(A)

(Or)

(B)

UNIT-III

3(A)

(Or)

(B)

UNIT-IV

4(A)

(Or)

(B)

UNIT-V

5(A)

(Or)

(B)

**Note: Each question may have sub-questions. Again the sub questions may have sub-sub-question).**

**Model Question paper**

(CHEMISTRY R130202)
PRE-M.PHIL./PRE-PH.D. EXAMINATION
Paper – II: BROAD AREA OF RESEARCH IN CHEMISTRY
(Regulation 2010-11, 2012-13&2014-15)

Time: 3 hours Maximum: 100 marks

Answer ALL questions. Each question carries equal marks. 5 x 20 = 100 marks

UNIT-I

1(A)

(Or)

(B)

UNIT-II

2(A)

(Or)

(B)

UNIT-III

3(A)

(Or)

(B)

UNIT-IV

4(A)

(Or)

(B)

UNIT-V

5(A)

(Or)

(B)

**Note: Each question may have sub-questions. Again the sub questions may have sub-sub-question).**