

Jannayak Chandrasekhar University, Ballia

Ph. D. Course work, Faculty of Science (Department of Chemistry)

COURSE WORK SYSTEM

COURSE STRUCTURE, SYLLABUS/ Ph.D. COURSE WORK

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| 1. PAPER-1-Research Methodology and Computer Application- | Credits-4, MM-100 |
| 2. PAPER-2-Research and Publication Ethics | Credits-2, M.M.-100 |
| 3. PAPER-3- Chemistry Paper I | Credits-4, M.M.-100 |
| 4. PAPER-4- Chemistry Paper-II | Credits-4, M.M.- 100 |

Total-14 Credits and Maximum Marks-400

After the completion of course work

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| 1. Synopsis Seminar | Satisfactory |
| 2. Oral Comprehensive | Satisfactory |
| 3. Course Seminar | Satisfactory |
| 4. Thesis Pre-submission Seminar | Satisfactory |
| 5. Thesis (Doctoral Research Work) | Satisfactory |
| 6. Thesis Viva-Voce | Satisfactory |

Note:

- 1-The research work may be initiated as per Ph.D. ordinance.
2. The evaluation of seminar presentation and oral comprehensive examination shall be done by the departmental committee which shall be constituted by the Head of Department / Principal of College.
3. The minimum passing marks of every paper according the UGC rules.

COURSE STRUCTURE, SYLLABUS/ Ph.D. COURSE WORK

Paper- I RESEARCH METHODOLOGY AND COMPUTER APPLICATION 4 Credit, MM;100

COMMON SYLLABUS FOR ALL Ph.D. SUBJECTS

Paper- II Research and Publication Ethics 2 credits , MM:100

COMMON SYLLABUS FOR ALL Ph.D. SUBJECTS

Paper III: Chemistry Paper-I

Unit - I

INORGANIC CHEMISTRY

Max. Mark- 100

- (I) Electronic spectra and magnetic properties of transition metal - Spectroscopic ground state, Orgel energy diagram for transition metal complexes(d^1-d^9), charge transfer spectra, electronic spectra of octahedral and tetrahedral of Cu(II) and Ni(II) complexes and calculation of the ligand field parameters.
- (II) Environmental Chemistry- Composition of atmosphere, vertical temperature, analytical method for measuring COD, BOD, Fats, oils, metals(As, Cd, Cr, Hg,Pb, Se etc) , purification and treatment of water, soil composition, micro and macro nutrients, analytical methods for measuring air pollution, thermal power plants, nuclear power plants, disposal of waste and their management.

Unit-II

ORGANIC CHEMISTRY

- (I) Application of spectroscopy in structural identification- IR, UV-Vis, NMR(^1H and ^{13}C), Mass spectroscopy. Occurrence, isolation, nomenclature and general methods of structure and identification of following compounds(alkaloids, terpenoids, catenoids, steroids etc).
- (II) Heterocyclic Chemistry- Aromatic heterocyclics, general behavior of aromatic heterocyclic, classification, criteria of aromaticity, heteroatomic reactivity and tautomerism in aromatic heterocycle, drug design.

Unit-III Practical

(Any one of the following)

- (I) Preparation of selected inorganic compounds and structural elucidation on the basis of given spectra (IR, ESR and MS) Selection can be made from the following.

Sodium amide

Dichlorophenyl borane PhBCl_2

Sn(IV) Iodide, Tin (IV) chloride and Tin (II) iodide

Ammonium hexachlorostannate $\text{CNH}_4\text{SnCl}_6$,

Trichlorodiphenyl antimony (V) hydrate

Sodium Tetrathionate, $\text{Na}_2\text{S}_4\text{O}_6$

Metal Complexes of dimethyl Sulfoxide, CuCl_2 , 2DMSO.

Metal acetylacetonate.

Ion exchange separation of oxidation state of V.

Preparation of Fe(II) Chloride.

Phosphine Ph_3P and its transition metal complexes.

Ferrocene

Copper glycine Complex

(II) Chromatographic Separations:

Thin layer chromatographic separation of Nickel, Manganese Cobalt and Zinc. Determination of R_f values.

Cadmium and Zinc

Zinc and Magnesium

ORGANIC CHEMISTRY

Qualitative Analysis

Separation and identification of components of a mixture of three organic compounds (three solids or two liquids and one solid, two solids and one liquid). Suitable derivatives to be prepared where possible. Purity of the separated components should also be checked on TLC plates, Chemical analysis.

Isolation of the following

Caffeine from tea leaves.

Casein from milk

Lactose from milk

Nicotine dipicrate from tobacco

Lycopene from tomatoes.

Unit-IV Practicals(Any one of the following)

Organic Synthesis

i. Adipic acid by chromic acid oxidation of cyclohexanol.

- ii. Triphenyl methanol from Benzoic acid.
- iii. Dibenzal acetone from Benzaldehyde.
- iv. p-chlorotoluene from p-toluidine
- v. Synthesis of p-nitroaniline and p-bromoaniline.

Physical Chemistry (Any one)

1. Show that the order of reaction between acetone and Iodine is zero with respect to Iodine
2. Determination of glass transition temperature of a given salt (e.g., CaCl_2) conductometrically.
3. Determination of the velocity constant of hydrolysis of an ester / ionic reaction in micellar media.
4. Determination of the velocity Constant of decomposition of Benzene diazonium chloride.

PAPER IV –Chemistry paper - 2

Unit-I

Chemical Kinetics.

Max. Mark- 100

Rate of reaction, order of reaction, characteristics of simple chemical reactions, zero order, first order, second order reactions. Methods of determination of order of reactions. Effect of temperature on the rate of reaction., Arrhenius equation, concept of activation energy, Steady state approximation, hydrogen bromine reaction, pyrolysis of acetaldehyde, hydrogen chlorine photochemical reaction.

Unit-II

ANALYTICAL CHEMISTRY

Solvent extraction, Steam Distillation, Paper and Column Chromatography, NMR (^1H and ^{13}C), IR, UV-Visible, Mass Spectroscopy and their application in structural determination.

Unit-III Practical (Any one of the following)

II. Preparation of selective inorganic compounds (any one)

(a) $\text{VO}(\text{acac})_2$

(b) $\text{Na}[\text{Cr}(\text{NH}_3)_2(\text{SCN})_4]$

(c) $\text{K}_3[\text{Fe}(\text{C}_2\text{O}_4)_3]$

(d) Prussian Blue

(e) $[\text{Co}(\text{Py})_2\text{Cl}_2]$

(f) $[\text{Cu}(\text{NH}_3)_4]\text{SO}_4 \cdot \text{H}_2\text{O}$

Organic Chemistry

III. Determination of iodine and saponification values of an oil sample.

IV. Determination of DO, COD and BOD of water sample.

Physical Chemistry

III. Determination of the velocity constant, order of the reaction and energy of activation for saponification of ethyl acetate by sodium hydroxide conductometrically.

Unit -IV Practical (Any one of the following)

Organic Chemistry

(A) Multistep synthesis of organic compound

Preparation of organic compound involving not more than three stages.

i) Benzanilide from benzene

ii) Benzilic acid from benzoin

iii) Quinoline from aniline

iv) 2-Phenylindole from phenylhydrazine

v) Alkylation of dimethylmalonate with an alkylhalide

(B) Paper Chromatography

Separation and identification of the sugars present in the given mixture of glucose, fructose and sucrose by paper chromatography and determination of R_f values. Identification of organic compounds on the basis of given spectral data (UV, IR, PMR, CMR and MS).

Physical Chemistry

i- Determination of dissolved oxygen in aqueous solution of organic solvent.

ii- Determination of ionic product of water.

Books suggested

1. F. A. Cotton and G. Wilkinson advanced inorganic chemistry, 6th Edn. (199). Symmetry and group theory, Vishal publication.
2. Organic Spectroscopy by Y. R. Sharma.
3. Bio-inorganic, Bio organic and Supra molecular chemistry by P. S. Kalsi.
4. Environmental chemistry, S. E. Manahan, Lewis publishers.
5. Environmental chemistry, Sharma and Kaur, Krishna publishers.
6. Designing organic synthesis, S. Warren, Wiley.
7. Advanced organic chemistry, J. March, Wiley.
8. Organic synthesis II, L.D.S. Yadav and Jagdamba Singh.
9. Natural Products: Chemistry and biological significance, Mann R.S. Davidson, J.B. Hobbs, D.V. Banthorpe and I.B. Harborne, Longman, Essex.
10. The Chemistry of Heterocycles, T. Eicher and S. Hauptmann, Thieme.
11. Physical Chemistry, P. W. Atkins, ELBS.
12. Quantum chemistry, Ira N. Levine. Prentice Hall.