

**SEMESTER-VI - Electives**  
**ELECTIVE Paper – VII-(A) : ANALYTICAL METHODS**  
**IN CHEMISTRY**

✓  
45hrs (3h / w)

**UNIT-I**

**Quantitative analysis:**

**10h**

- a) Importance in various fields of science, steps involved in chemical analysis. Principles of volumetric analysis ∴ Theories of acid-base, redox, complexometric, iodometric and precipitation titrations - choice of indicators for these titrations.
- b) Principles of gravimetric analysis: precipitation, coagulation, peptization, coprecipitation, post precipitation, digestion, filtration and washing of precipitate, drying and ignition.

**UNIT-II**

**Treatment of analytical data:**

**7h**

Types of errors, significant figures and its importance, accuracy - methods of expressing accuracy, error analysis and minimization of errors, precision - methods of expressing precision, standard deviation and confidence limit.

**UNIT-III**

**SEPARATION TECHNIQUES IN CHEMICAL ANALYSIS:**

**8h**

**SOLVENT EXTRACTION** : Introduction, principle, techniques, factors affecting solvent extraction, Batch extraction, continuous extraction and counter current extraction. Synergism., Application - Determination of Iron (III)

**ION EXCHANGE** : Introduction, action of ion exchange resins, separation of inorganic mixtures, applications, Solvent extraction: Principle and process,

**UNIT – IV**

**10h**

**Chromatography:** Classification of chromatography methods, principles of differential migration adsorption phenomenon, Nature of adsorbents, solvent systems,  $R_f$  values, factors effecting  $R_f$  values.

Paper Chromatography: Principles,  $R_f$  values, experimental procedures, choice of paper and solvent systems, developments of chromatogram - ascending, descending and radial. Two dimensional chromatography, applications.

**UNIT -V**

**10h**

Thin layer Chromatography (TLC): Advantages. Principles, factors effecting  $R_f$  values. Experimental procedures. Adsorbents and solvents. Preparation of plates. Development of the chromatogram. Detection of the spots. Applications.

Column Chromatography: Principles, experimental procedures, Stationary and mobile Phases, Separation technique. Applications

HPLC : Basic principles and applications.

**List of Reference Books**

1. Analytical Chemistry by Skoog and Miller
2. A textbook of qualitative inorganic analysis by A.I. Vogel
3. Nanochemistry by Geoffrey Ozin and Andre Arsenault
4. Stereochemistry by D. Nasipuri
5. Organic Chemistry by Clayden

Dr. Aruna  
(Dr. K. ARUNA)  
B.O.S

**LABORATORY COURSE – VI**  
**Practical Paper – VII-(A) (at the end of semester VI) 30hrs (2 h / W)**

**50M**

1. Identification of aminoacids by paper chromatography.
2. Determination of Zn using EDTA
3. Determination of Mg using EDTA

Q. Answer  
(BOS)

**CLUSTER ELECTIVES: Cluster Elective – I**  
**Analytical and Physical**  
**SEMESTER-VI**  
**PAPER – VIII-A-1: POLYMER CHEMISTRY**

**45 hrs (3 h / w)**

**UNIT-I**

**12h**

Introduction of polymers:

Basic definitions, degree of polymerization ,classification of polymers- Natural and Synthetic polymers, Organic and Inorganic polymers, Thermoplastic and Thermosetting polymers, Plastics, Elastomers , Fibers and Resins, Linear ,Branched and Cross Linked polymers, Addition polymers and Condensation Polymers, mechanism of polymerization. Free radical, ionic and Zeigler – Natta polymerization.

**UNIT-II**

**10h**

Techniques of Polymerization : Bulk polymerization , solution polymerization , suspension and Emulsion polymerization.

Molecular weights of polymers: Number average and weight average molecular weights  
Determination of molecular weight of polymers by Viscometry , Osmometry and light scattering methods.

**UNIT-III**

**6h**

Kinetics of Free radical polymerization, Glass Transition temperature(T<sub>g</sub>) and Determination of T<sub>g</sub>:

Free volume theory, WLF equation, factors affecting glass transition temperature (T<sub>g</sub>).

**UNIT-IV**

**9h**

Polymer additives:

Introduction to plastic additives – fillers, Plasticizers and Softeners , Lubricants and Flow Promoters, Anti aging additives , Flame Retardants , Colourants , Blowing agents , Cross linking agents ,Photo stabilizers , Nucleating agents.

**UNIT-V**

**8h**

Polymers and their applications:

Preparation and industrial applications of Polyethylene, Polyvinyl chloride, Teflon, Polyacrylonitrile, Terelene , Nylon6.6 silicones.

**Reference Books:**

1. Seymour, R.B. & Carraher, C.E. *Polymer Chemistry: An Introduction*, Marcel Dekker, Inc. New York, 1981.
2. Odian, G. *Principles of Polymerization*, 4th Ed. Wiley, 2004.
3. Billmeyer, F.W. *Textbook of Polymer Science*, 2nd Ed. Wiley Interscience, 1971.
4. Ghosh, P. *Polymer Science & Technology*, Tata McGraw-Hill Education, 1991.34
5. Lenz, R.W. *Organic Chemistry of Synthetic High Polymers*. Interscience Publishers, NewYork, 1967.

*R. Amey*  
(BOS)



## SEMESTER-VI

### PAPER – VIII-A-2: INSTRUMENTAL METHODS OF ANALYSIS

45 hrs (3 h / w)

#### UNIT – I

##### **Introduction to spectroscopic methods of analysis:**

4 h

Recap of the spectroscopic methods covered in detail in the core chemistry syllabus: Treatment of analytical data, including error analysis. Classification of analytical methods and the types of instrumental methods. Consideration of electromagnetic radiation.

#### UNIT – II

##### **Molecular spectroscopy:**

8h

##### *Infrared spectroscopy:*

Interactions with molecules: absorption and scattering. Means of excitation (light sources), separation of spectrum (wavelength dispersion, time resolution), detection of the signal (heat, differential detection), interpretation of spectrum (qualitative, mixtures, resolution), advantages of Fourier Transform (FTIR). Samples and results expected. Applications: Issues of quality assurance and quality control, Special problems for portable instrumentation and rapid detection.

#### UNIT – III

10h

*UV-Visible/ Near IR* – emission, absorption, fluorescence and photoacoustic. Excitation sources (lasers, time resolution), wavelength dispersion (gratings, prisms, interference filters, laser, placement of sample relative to dispersion, resolution), Detection of signal (photocells, photomultipliers, diode arrays, sensitivity and S/N), Single and Double Beam instruments, Interpretation (quantification, mixtures, absorption vs. fluorescence and the use of time, photoacoustic, fluorescent tags).

#### UNIT – IV

##### **Separation techniques**

**Chromatography:** Gas chromatography, liquid chromatography, supercritical fluids, Importance of column technology (packing, capillaries), Separation based on increasing number of factors (volatility, solubility, interactions with stationary phase, size, electrical field), Detection: simple vs. specific (gas and liquid), Detection as a means of further analysis (use of tags and coupling to IR and MS), Electrophoresis (plates and capillary) and use with DNA analysis. 46 *Immunoassays and DNA techniques*

8h

**Mass spectroscopy:** Making the gaseous molecule into an ion (electron impact, chemical ionization), Making liquids and solids into ions (electrospray, electrical discharge, laser desorption, fast atom bombardment), Separation of ions on basis of mass to charge ratio, Magnetic, Time of flight, Electric quadrupole. Resolution, time and multiple separations, Detection and interpretation (how this is linked to excitation).

8h

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(Dr. K. Aruna)

## UNIT – V

### Elemental analysis:

10h

### Mass spectrometry (electrical discharges).

Atomic spectroscopy: Atomic absorption, Atomic emission, and Atomic fluorescence. Excitation and getting sample into gas phase (flames, electrical discharges, plasmas), Wavelength separation and resolution (dependence on technique), Detection of radiation (simultaneous/scanning, signal noise), Interpretation (errors due to molecular and ionic species, matrix effects, other interferences).

**NMR spectroscopy:** Principle, Instrumentation, Factors affecting chemical shift, Spin coupling, Applications.

4h

**Electroanalytical Methods:** Potentiometry & Voltammetry

4h

### Radiochemical Methods

4h

### X-ray analysis and electron spectroscopy (surface analysis)

### Reference books:

1. Skoog, D.A. Holler F.J. & Nieman, T.A. *Principles of Instrumental Analysis*, Cengage Learning India Ed.
2. Willard, H.H., Merritt, L.L., Dean, J. & Settoe, F.A. *Instrumental Methods of Analysis*, 7th Ed. Wadsworth Publishing Company Ltd., Belmont, California, USA, 1988.
3. P.W. Atkins: *Physical Chemistry*.
4. G.W. Castellan: *Physical Chemistry*.
5. C.N. Banwell: *Fundamentals of Molecular Spectroscopy*.
6. Brian Smith: *Infrared Spectral Interpretations: A Systematic Approach*.
7. W.J. Moore: *Physical Chemistry*

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## SEMESTER-VI

### PAPER – VIII-A-3 : ANALYSIS OF DRUGS, FOODS , DAIRY PRODUCTS & BIO-CHEMICAL ANALYSIS

45 hrs (3 h / w)

#### UNIT- I

Analysis of the following drugs and pharmaceuticals preparations:

(Knowledge of molecular formula, structure and analysis)

Analysis of analgesics and antipyretics like aspirin and paracetamol

Analysis of antimalarials like chloroquine .

Analysis of drugs in the treatment of infections and infestations :Amoxycillin., chloramphenicol, metronidazole, penicillin, tetracycline, cephalexin(cefalexin).

Anti tuberculous drug- isoniazid.

#### UNIT - II

Analysis of the following drugs and pharmaceuticals preparations:

(Knowledge of molecular formula, structure and analysis)

Analysis of antihistamine drugs and sedatives like: allegra, zyrtec(citirizine), alprazolam, trazodone, lorazepam, ambien(zolpidem), diazepam,

#### UNIT - III

Analysis of anti epileptic and anti convulsant drugs like phenobarbital and phenacemide.

Analysis of drugs used in case of cardiovascular drugs:atenolol, norvasc(amlodipine),

Analysis of lipitor(atorvastatin) a drug for the prevention of production of cholesterol.

Analysis of diuretics like: furosemide (Lasix), triamterene

Analysis of prevacid(lansoprazole) a drug used for the prevention of production of acids in stomach.

#### UNIT - IV

Analysis of Milk and milk products: Acidity, total solids, fat, total nitrogen, protein, lactose, phosphate activity, casein, chloride. Analysis of food materials-

Preservatives: Sodium carbonate, sodium benzoate sorbic acid Coloring matters, - Brilliant blue FCF, fast green FCF, tartrazine, erythrosine , sunset yellow FCF.

Flavoring agents - Vanilla , diacetyl, isoamyl acetate, limonene, ethylpropionate , allyl hexanoate and Adulterants in rice and wheat, wheat flour, sago, coconut oil, coffee powder, tea powder, milk..

#### UNIT - V

Clinical analysis of blood:Composition of blood,clinical analysis,trace elements in the body.Estimation of blood cholesterol,glucose,enzymes,RBC & WBC ,Blood gas analyser.

#### REFERENCE BOOKS :

- 1.F.J.Welcher-Standard methods of analysis,
- 2.A.I.Vogel-A text book of quantitative Inorganic analysis-ELBS,
- 3.F.D.Snell & F.M.Biffen-Commercial methods of analysis-D.B.Taraporavala & sons,
- 4.J.J.Elving and I.M.Kolthoff- Chemical analysis - A series of monographs on analytical chemistry and its applications -- Inter Science- Vol I to VII.,

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5. Analytical Agricultural Chemistry by S.L. Chopra & J.S. Kanwar -- Kalyani Publishers

6. Quantitative analysis of drugs in pharmaceutical formulations by P.D. Sethi, CBS Publishers and Distributors, New Delhi
7. G. Ingram- Methods of organic elemental micro analysis- Chapman and Hall.,
8. H. Wincciam and Bobbles (Henry J)- Instrumental methods of analysis of food additives.,
9. H. Edward- The Chemical analysis of foods; practical treatise on the examination of food stuffs and the detection of adulterants,
10. The quantitative analysis of drugs- D.C. Garratt- Chapman & Hall.,
11. A text book of pharmaceutical analysis by K.A. Connors- Wiley- International.,
12. Comprehensive medicinal chemistry- Ed Corwin Hansch Vol 5, Pergamon Press.,

## **I. LABORATORY COURSE – VIII**

**Practical Paper – VIII-A-1: (at the end of semester VI)**

**30 hrs (2 h / W)**

1. Preparation of Aspirin
2. Preparation of Paracetamol
3. Preparation of Acetanilide
4. Preparation of Barbutiric Acid
5. Preparation of Phenyl Azo  $\beta$ -naphthol

## **II. LABORATORY COURSE – VIII**

**Practical Paper – VIII-A-2 (at the end of semester VI)**

**30 hrs (2 h / W)**

1. Green procedure for organic qualitative analysis: Detection of N, S and halogens
2. Acetylation of 1<sup>o</sup> amine by green method: Preparation of acetanilide
3. Rearrangement reaction in green conditions: Benzil-Benzilic acid rearrangement
4. Electrophilic aromatic substitution reaction: Nitration of phenol
5. Radical coupling reaction: Preparation of 1,1-bis -2-naphthol
6. Green oxidation reaction: Synthesis of adipic acid
7. Green procedure for Diels Alder reaction between furan and maleic anhydride

### **List of Reference Books**

1. Green Chemistry Theory and Practice. P.T. Anatas and J.C. Warner
2. Green Chemistry V.K. Ahluwalia Narosa, New Delhi.
3. Real world cases in Green Chemistry M.C. Cann and M.E. Connelly
4. Green Chemistry: Introductory Text M.Lancaster: Royal Society of Chemistry (London)
5. Green Chemistry: Introductory Text, M.Lancaster
6. Principles and practice of heterogeneous catalysis, Thomas J.M., Thomas M.J., John Wiley
7. Green Chemistry: Environmental friendly alternatives R S Sanghli and M.M Srivastava, Narosa Publications

**VII-A-3 Practical:- Project Work**

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**SRI VENKATESWARA UNIVERSITY**  
**CHEMISTRY - SEMESTER-VI**  
**ELECTIVE Paper- VII-(A): ANALYTICAL METHODS IN CHEMISTRY**  
**MODEL PAPER**

**SECTION-A**

**I)ANSWER ANY FIVE QUESTIONS** **5X5=25 Marks**

- 1) Explain Accuracy & Precision ?
- 2) Write about  $R_f$  factor?
- 3) Explain about Complexometric Titrations?
- 4) What are Significant Figures?
- 5) Write a short note on Synergism?
- 6) Explain about the types of Ion exchange Resins?
- 7) Write a short note on Redox Titrations ?
- 8) Write the applications of Thin Layer Chromatography and Paper Chromatography?

**SECTION-B**

**II)ANSWER ALL QUESTIONS** **5X10=50Marks**

9.(a) What are Acid-Base Titrations? Explain the choice of indicator in Acid-Base Titrations?

**(OR)**

(b) Write the principles involved in gravimetric analysis?

10.(a) What are Errors? Explain different types of errors?

**(OR)**

(b) Write a short note on Standard deviation and Confidence limit?

11.(a) Write the principle, technique used in Batch extraction and determine  $Fe^{3+}$  ion in a given mixture?

**(OR)**

(b) Write a short note on Counter and Counter current extraction?

12.(a) Write the Principle and explain different types of experimental procedures involved in Paper chromatography?

**(OR)**

(b) Write the principle and applications of column chromatography?

13.(a) Write the Principle and explain different experimental steps involved in TLC?

**(OR)**

(b) Write the principle and applications of HPLC?

**CHEMISTRY - MODEL PAPER**  
**THREE YEAR DEGREE B.SC EXAMINATION**  
**THIRD YEAR EXAMINATION**  
**SEMESTER –VI**  
**PAPER VIII-A-1: POLYMER CHEMISTRY**

TIME :3 hrs

Max.Marks :75

**PART –A**

Answer any FIVE from the following questions.

5x5=25 M

- 1 What are polymers and write a short note on natural and synthetic polymers.
- 2 Explain the technique of emulsion polymerization.
- 3 What are the factors affecting the glass transition temperature(T<sub>g</sub>)
- 4 Write short notes on a) Photo stabilizer b) Nucleating agents.
- 5 Write the preparation of polyethylene.
- 6 Explain briefly about the Zeigler-Natta Catalyst.
- 7 Write the technique of Bulk polymerization
- 8 Discuss the free volume theory of polymers.

**PART – B**

Answer the following questions.

5x10=50 M

- 9 Define degree of polymerization and write the mechanism of free radical polymerization.  
(Or)  
Explain the classification polymers.
- 10 Explain the types of molecular weight of polymers.  
(Or)  
Determine the molecular weight of polymer by Viscometry.
- 11 Write the kinetics of Ionic polymerisation  
(Or)  
Determine the glass transition temperature (T<sub>g</sub>) and write the WLF equation.
- 12 Define additives and write the different types of additives.  
(Or)  
Explain briefly addition polymerization and condensed polymerization.
- 13 Write the preparation and industrial application PVC  
(Or)  
Write the preparation and Industrial application of Nylon 66

**CHEMISTRY - MODEL PAPER**  
**THREE YEAR B.S<sub>C</sub> DEGREE EXAMINATION**  
**THIRD YEAR EXAMINATIONS**  
**SEMESTER -VI**

**Paper VIII A-2 INSTRUMENTAL METHODS OF ANALYSIS**

**Time : 3hrs**

**Max .Marks : 75**

**PART- A**

**Answer any five of the following .**  
**Each question carries FIVE marks** **5 X 5 =25 M**

1. Discuss any five types of analytical methods based on measurement property.
2. Write notes on the advantages of Fourier transform (FTR).
3. Discuss any three applications of absorption spectra.
4. Discuss the factors which affect column efficiency.
5. Write short notes on resolution.
6. Give the principle of liquid chromatography and explain its advantages.
7. Give a brief account of photomultipliers.
8. Write notes on Vibrational spectrum.

**PART- B**

**Answer ALL the questions**  
**Each question carries TEN marks** **10 x 5 =50 M**

9. Write the classification of instrumental methods of analysis.

**Or**

Define errors. Explain different types of errors .How to determine Expression for errors.

10. What are the different types of detectors used in the detection of signal?

**Or**

How the separation of spectrum occurs in IR based on wavelength dispersion?

11. Explain the construction and working of single and double beam spectrophotometers.

**Or**

What are the different hard ware techniques for the enhancement of signal to Noise ratio (S/N) ?



**12. What is the principle and working of Gas Chromatography . Explain diagrammatically.**

**Or**

**Explain briefly electrophoresis . How it is used in DNA analysis.**

**13. How a gaseous molecule is converted into Ion based on chemical ionization.**

**Or**

**Explain the separation of ions based on**

- a) Mass to charge ratio**
- b) Time of flight.**

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**CHEMISTRY - MODEL PAPER**

**THREE YEAR B.Sc, DEGREE EXAMINATION**

**3<sup>rd</sup> YEAR B.Sc EXAMINATIONS**

**SEMESTER – VI**

**PAPER – VIII–A-3: ANALYSIS OF DRUGS, FOODS, DAIRY PRODUCTS &  
BIO–CHEMICAL ANALYSIS**

**Time : 3 hours**

**Maximum Marks : 75**

**PART – A**

Answer any **FIVE** of the following questions

Each Question carries **FIVE** marks

**5 x 5 = 25 Marks**

1. Write the structure and molecular formula of Aspirin and paracetamol ?
2. Define what is meant by a drug ,infections and infestations?
3. Explain what is the role of antihistamine drugs and sedatives?
4. Explain the importance the drug Lansoprazole in prevention of production of acids in stomach?
5. Write a brief note on the drug Lipitor ( atorvastatin) which prevents the production of cholesterol ?
6. Define what is meant by preservatives give suitable examples?
7. How do you know the adulterants in rice, wheat and wheat flour?
8. Explain what is meant clinical analysis and discuss its role in blood analysis ?

**PART – B**

Answer **ALL** the questions

Each Question carries **TEN** marks

**5 x 10 = 50 Marks**

- 09.(a) Define antimalerials , write the structure and preparation of chloroquine?

**(OR)**

(b) Write the preparations of Amoxycillin and tetracycline?

- 10.(a) Write the formula and preparation of alprazolam and diazepam ?

**(OR)**

(b) Write the structure and analysis of allegra and lorazepam?

11. (a) Define what is meant by Epileptic and anti convulsant drugs ? write the analysis method of phenobarbital?

**(OR)**

(b) Write the preprative methods of atenolol and triamterene?

- 12.(a) How do you estimate acidity , fat content and Lactose in milk?

**(OR)**

(b) Describe the importance of flavoring agents namely vanilla, isoamyl acetate and ethyl propionate in milk and milk products ?

13. (a) Define what is meant by clinical analysis of blood and how do you estimate trace elements in the Blood?

**(OR)**

(b) Write the composition of blood, how the glucose, cholesterol and enzymes in blood is estimated?