

P. R. GOVERNMENT COLLEGE (A), KAKINADA

B. Sc. (Analytical Chemistry)

SEMESTER –V

Paper–V (ANALYTICAL CHEMISTRY-5) 45hrs (3h/w)

ANALYTICAL BIOCHEMISTRY AND ENVIRONMENTAL CHEMISTRY

UNIT-I

9 hrs.

BASIC UNDERSTANDING OF THE STRUCTURES, PROPERTIES AND FUNCTIONS OF CARBOHYDRATES, LIPIDS, AND PROTEINS

- ❖ Isolation and characterization of poly saccharides.
- ❖ Classification of lipids, properties, functions and Biochemical functions of steroid hormones.
- ❖ Proteins- structure, classification, isolation, characterization and functions.
- ❖ Biochemistry of peptide hormones.
- ❖ Enzymes- nomenclature, classification, effect of pH, temperature on enzyme activity, enzyme inhibition.
- ❖ Lipoproteins.

UNIT-II

9 hrs.

BIOCHEMISTRY OF DISEASE: A DIAGNOSTIC APPROACH

Clinical chemistry: a diagnostic approach by blood/urine analysis.

- ❖ Blood: Composition and functions of blood, blood coagulation.
- ❖ Blood collection and preservation of samples.
- ❖ Anemia
- ❖ Regulation, estimation and interpretation of data for blood sugar, urea, creatinine, cholesterol and bilirubin.
- ❖ Urine: Collection and preservation of samples.
- ❖ Formation of urine.
- ❖ Composition and estimation of constituents of normal and pathological urine.

Unit-III:

9hrs

Microbiological Tests and Assays:

Microbiological Assay of antibiotics, (std. preparations and units of activity, test organisms and inoculum, apparatus, methods: cylinder or cup plate method and two level factorial assay (ampicillin), microbial limit test (preliminary testing, medium soya bean casein digest agar medium only) and total microbial count only), test of sterility-membrane filtration method, determination of thiomersal.

Unit-IV:**9hrs****Standardization and Quality Control of different Dosage Forms:**

Brief introduction to different dosage forms with the IP requirements,
Analytical methods for the following:

Tablets (aspirin), additives used in tablet manufacture, capsules (Rifampicin),

Powders (Sodium benzoate), solutions (saline, NaCl) suspensions

(Barium sulphate—limit test for impurity), mouthwashes (Ointments - salicylic acid) and
creams dimethazone by IR), injections (Mannitol), ophthalmic preparations (sulphacteamine),
aerosols (salbutamol), blood products and reporting protocols.

UNIT-V**9 hrs.**

Concept and scope of environmental chemistry –nomenclature –environmental segments –
The natural cycles of the environment -the hydrological cycle –the oxygen cycle –the nitrogen
cycle.

Classification of water pollutants –Characterization –Dissolved Oxygen –BOD-COD- Waste
water treatment (General). Disposal of radioactive wastes. Pollution due to some typical
industries like Textile, Pulp and Paper, Electroplating, Dairy, Cane sugar

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SEMESTER –V

Laboratory Course - V

Practical-V Analysis of Bio Products

30 hrs. (2 h / w)

Identification and estimation of the following:

- i. Carbohydrates – qualitative and quantitative.
- ii. Lipids –qualitative.
- iii. Determination of the iodine number of oil.
- iv. Determination of the saponification number of oil.
- v. Determination of cholesterol using Liebermann-Burchard reaction.
- vi. Proteins –qualitative.
- vii. Isolation of protein.
- viii. Determination of protein by the Biuret reaction.
- ix. Determination of nucleic acids

Suggested Readings:

- i. T. G. Cooper: Tool of Biochemistry.
- ii. Keith Wilson and John Walker: Practical Biochemistry.
- iii. Alan H Gowenlock: Varley's Practical Clinical Biochemistry.
- iv. Thomas M. Devlin: Textbook of Biochemistry.
- v. Jeremy M. Berg, John L Tymoczko, Lubert Stryer: Biochemistry.
- vi. G. P. Talwar and M Srivastava: Textbook of Biochemistry and Human Biology.
- vii. A.L. Lehninger: Biochemistry.
- viii. O. Mikes, R.A. Chalmers: Laboratory Handbook of Chromatographic Methods.
- ix. Environmental chemistry by A.K. De
- x. A text book of Engineering chemistry by S.S. Dara
- xi. A text book of Industrial chemistry by B.K. Sharma

SCHEME OF VALUATION

Max. Marks: 50

- | | | |
|--------------------------|-------|----------|
| 1. Quantitative Analysis | | 15 Marks |
| 2. Qualitative Analysis | | 15 Marks |
| 3. Viva – Voice | | 10 Marks |
| 4. Record | | 10 Marks |

P. R. GOVERNMENT COLLEGE, KAKINADA
MODEL QUESTION PAPER
SEMESTER – V
Paper - V (ANALYTICAL CHEMISTRY-5)
ANALYTICAL BIOCHEMISTRY AND ENVIRONMENTAL CHEMISTRY
Duration: 2hrs. 30Min. **Max. Marks: 60**

SECTION – A

Answer any **FOUR** questions. Each question carries **10** marks.

4 X 10 = 40M

1. Question from Unit –I
2. Question from Unit –II
3. Question from Unit –III
4. Question from Unit - IV
5. Question from Unit – V
6. Question from Unit – I
7. Question from Unit – II
8. Question from Unit - V

SECTION – B

Answer any **four** questions. Each question carries **5** marks.

4 x 5 = 20M

9. Question from Unit - I
10. Question from Unit – II
11. Question from Unit – III
12. Question from Unit – IV
13. Question from Unit – V
14. Question from Unit – I
15. Question from Unit – II
16. Question from Unit - V

P. R. GOVERNMENT COLLEGE, KAKINADA
SEMESTER – V
Paper - V (ANALYTICAL CHEMISTRY-5)
ANALYTICAL BIOCHEMISTRY AND ENVIRONMENTAL CHEMISTRY
Duration: 2hrs. 30Min. Max. Marks: 60

Blue Print:

S. No.	Course Content	Essay Questions (10M)	Short Answer Questions (5M)	Total No. Of Questions from each Unit
1	Unit -I	2	2	4
2	Unit –II	2	2	4
3	Unit –III	1	1	2
4	Unit –IV	1	1	2
5	Unit -V	2	2	4
	TOTAL	8	8	16

Note: Questions should be given from Question bank.

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SEMESTER – V
Paper - V (ANALYTICAL CHEMISTRY-5)
ANALYTICAL BIOCHEMISTRY AND ENVIRONMENTAL CHEMISTRY
Duration: 2hrs. 30Min. **Max. Marks: 60**

Question Bank

Essay Questions:10 M

19. Write about the isolation and characterization of polysaccharides
20. Write about the classification and functions of lipids
21. Explain about the classification and isolation of proteins
22. Write about the classification of enzymes and explain the effect of pH & temperature on enzymes
23. Write about composition of blood and explain about coagulation of blood
24. Explain about the collection and preservation of urine samples
25. Explain about the estimation of constituents in pathological urine.
26. Write about the collection and preservation of blood samples
27. Explain about the estimation and interpretation of blood sugar and cholesterol
28. Write about the microbiological assay of antibiotics
29. Explain about the determination of thiomersal.
30. Explain about the analytical methods of Aspirin tablet
31. Write about the analytical methods of Rifampicin capsule
32. Explain about the Oxygen cycle
33. Write about the nitrogen cycle
34. Explain about waste water treatment
35. Explain the methods of determination of DO and COD
36. Write about the water pollutants released from various industries

Question Bank:

Short answer Questions: 05 M

1. Write the biochemical functions of steroid hormones
2. Explain about the structure of proteins
3. Write about peptide hormones
4. Explain about enzyme inhibition
5. Write about the functions of blood
6. Explain about anemia.
7. Write about the estimation of bilirubin
8. Explain about the estimation of creatinine
9. Write about the formation of urine
10. Explain about the total microbial count
11. Explain about the microbial limit test
12. Write about the preparation of saline solution
13. Explain about mouth washes.
14. Write briefly about environmental segments
15. Explain about the classification of water pollutants
16. Define DO and COD and write their significances.
17. Explain about the disposal of radiochemical wastes
18. Explain about hydrogen cycle

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SEMESTER –V

Paper–VI: ANALYTICAL CHEMISTRY-645hrs (3h/w)

INSTRUMENTAL METHODS OF ANALYSIS

AN INTRODUCTION TO SPECTROSCOPIC METHODS OF ANALYSIS:

UNIT-I

9 hrs.

A. UV - VISIBLE SPECTROPHOTOMETRY:

Principle, Lambert-Beer's law and its deviations, UV– Visible spectrophotometer
Instrumentation – sources, detectors, Single and double beam spectrophotometers and its applications

B. IR SPECTROSCOPY:

Principle, Instrumentation – Sources, detectors and applications

UNIT-II

9 hrs

ATOMIC EMISSION SPECTROSCOPY (Flame photometry):

Principle – Instrumentation – Interferences – Analytical techniques for Flame photometry – Calibration plots (Working curves). Applications - Determination of Alkali and Alkaline earth metals in natural water

UNIT-III:

9hrs

ATOMIC ABSORPTION SPECTROSCOPY: AAS

Principle – Instrumentation – Radiation sources (line sources) – Hollow cathode lamps and Discharge lamps. Interferences – Analytical techniques for AAS – Calibration plots. Applications – Determinations of Calcium and Magnesium in tap water.

UNIT-IV:

9hrs

POLOROGRAPHY AND COULOMETRY:

A. Polarography:

Basic Principles of Polarography, residual current, migration current, diffusion current, half wave potential, Ilkovic equation.

Instrumentation, Dropping mercury electrode (DME), advantages and disadvantages of DME, Qualitative and quantitative analysis of inorganic ions.

B. Coulometry: Types of coulometric methods: Potentiostatic and amperostatic; principles, instrumentation and applications.

UNIT-V:

9hrs

BASIC ELECTRO-ANALYTICAL CHEMISTRY:

A. Electrochemical cells, Electrode potentials, cell potentials, Nernst equation, Determination of EMF of cell, Applications of EMF measurements – Potentiometric titrations.

B. Ion selective electrodes: Reference electrodes – Hydrogen electrode, Calomel electrode, silver chloride electrode. Indicator electrodes –Hydrogen and glass electrodes, Metal –metal ion electrode, inert electrode, Applications of ion selective electrodes.

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SEMESTER –V

Practical - VI Instrumental methods of analysis

30 hrs. (2 h /w)

1. Determination of Fe (II) with Cr (VI) by using Potentiometric titration method.
2. Determination of Fe (II) with Mn (VII) by using Potentiometric titration method.
3. Determination of metals in given samples by AAS technique.
4. Preparation of standard calibration graphs of Pb, Cd, Zn and Fe by AAS
5. Determination of Fe(III) by Spectrophotometric method.

Suggested Readings:

1. P.W. Atkins: Physical Chemistry.
2. G.W. Castellan: Physical Chemistry.
3. C.N. Banwell: Fundamentals of Molecular Spectroscopy.
4. Brian Smith: Infra-red Spectral Interpretations: A Systematic Approach.
5. W.J. Moore: Physical Chemistry.

SCHEME OF VALUATION

Max. Marks: 50

I.	Procedure to be written in the first 15 minutes	10 Marks
II.	Recording of data and reporting the value upto 2% error.....		20 Marks
III.	Error up to 5%	10 Marks
	Error greater than 5%	5 Marks
IV.	Viva – Voice	10 Marks
V.	Record	10 Marks

P. R. GOVERNMENT COLLEGE, KAKINADA
MODEL QUESTION PAPER
SEMESTER – V
Paper - VI (ANALYTICAL CHEMISTRY-6)
INSTRUMENTAL METHODS OF ANALYSIS

Duration: 2hrs. 30Min.

Max. Marks: 60

SECTION – A

Answer any **FOUR** questions. Each question carries **10** marks.

4 X 10 = 40M

1. Question from Unit –I
2. Question from Unit –II
3. Question from Unit –III
4. Question from Unit - IV
5. Question from Unit – V
6. Question from Unit – I
7. Question from Unit – IV
8. Question from Unit - V

SECTION – B

Answer any **four** questions. Each question carries **5** marks.

4 x 5 = 20M

9. Question from Unit - I
10. Question from Unit – II
11. Question from Unit – III
12. Question from Unit – IV
13. Question from Unit – V
14. Question from Unit – I
15. Question from Unit – IV
16. Question from Unit - V

P. R. GOVERNMENT COLLEGE, KAKINADA
SEMESTER – V
Paper - VI (ANALYTICAL CHEMISTRY-6)
INSTRUMENTAL METHODS OF ANALYSIS

Duration: 2hrs. 30Min.

Max. Marks: 60

Blue Print:

S. No.	Course Content	Essay Questions (10M)	Short Answer Questions (5M)	Total No. Of Questions from each Unit
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2	Unit –II	1	1	2
3	Unit –III	1	1	2
4	Unit –IV	2	2	4
5	Unit -V	2	2	4
	TOTAL	8	8	16

Note: Questions should be given from Question bank

P. R. GOVERNMENT COLLEGE, KAKINADA
SEMESTER – V
Paper - VI (ANALYTICAL CHEMISTRY-6)
INSTRUMENTAL METHODS OF ANALYSIS

Duration: 2hrs. 30Min.

Max. Marks: 60

Question Bank:

Essay Questions: 10 M

1. State and Explain Beers –Lamberts law and explain the principle of UV – Visible spectroscopy.
2. Explain about the instrumentation and applications of UV –Visible spectrophotometer.
3. Write about the principle and instrumentation of IR Spectroscopy.
4. Explain about Single beam and double beam spectrophotometers.
5. Explain about the Principle and instrumentation of Flame photometry
6. Explain about the following,
 - i. Determination of alkali and alkaline earth metals in natural waters by flame photometry
 - ii. Calibration plots in Flame photometry
7. Explain about the principle and instrumentation of Atomic absorption spectroscopy (AAS)
8. Explain about the following,
 - i. Determination of Calcium and Magnesium in tap water by AAS
 - ii. Calibration plots in AASS
9. Explain about the principle and instrumentation of Polarography technique.
10. Explain about the following,
 - i. Ilkovic equation
 - ii. Dropping mercury electrode (DME)
11. Explain about the potentiostatic coulometry technique
12. Explain about the amperiostatic coulometry technique.
13. Explain about the Nernst equation and its applications
14. Write about potentiometric titrations
15. Explain about the following,
 - i. Reference electrodes
 - ii. Indicator electrodes
16. Explain about the ion selective electrodes and write its applications.

Question Bank:

Short Answer Questions: 05 M

1. State Beers – Lamberts law and write its deviations
2. Explain about the photo multiplier tube detector used in Spectrophotometer
3. Write the advantages and disadvantages of double beam spectrophotometer over single beam spectrophotometer
4. Write the applications of IR spectroscopy
5. Explain about the interferences and its eliminations in Flame photometry
6. Explain about the calibration plots in Flame photometry
7. Write about the applications of Flame photometry
8. Explain about the radiation sources used in AAS
9. Write about Hollow cathode lamp
10. Write about the applications of AAS
11. Write about qualitative and quantitative applications of Polarography
12. State and explain about Ilkovic equation
13. Explain about Diffusion current and half wave potentials.
14. Explain about residual current and migration current.
15. Write about DME
16. Explain the principles of coulometry
17. Write about the applications of coulometry
18. Write about electrochemical cells
19. Explain about electrode potentials
20. What is emf? write about cell potentials
21. Explain about Glass electrode
22. Explain about calomel electrode
23. Explain about Metal – metal ion electrode