REVISED SYLLABUS OF B.Sc (Analytical Chemistry)
UNDER CBCS FRAMEWORK WITH EFFECT FROM 2020-2021

PROGRAMME: THREE-YEAR B.Sc. (B.Sc Analytical Chemistry)

(With Learning Outcomes, Unit-wise Syllabus, References, Co-curricular Activities & Model Q.P.)
For Five Courses of 1, 2, 3 & 4 Semesters)
(To be Implemented from 2020-21 Academic Year)

RecommendedCombinations– B.Sc.;
Chemistry& AnalyticalChemistry*or*Geology, Chemistry& AnalyticalChemistry*or*
Botany, Chemistry& AnalyticalChemistry*or*Zoology, Chemistry& AnalyticalChemistry

YEAR	SEMESTER	COURSE	TITLE	MARKS	CREDITS
I	I	I	Basic Principles&LaboratoryOperations	100	03
			Practical– I	50	02
	II	II	QuantitativeMethodsOf Analysis	100	03
			QuantitativeAnalysis	50	02
II	III	III	SeparationMethods–I	100	03
			Separation Techniques	50	02
	IV	IV	SeparationMethods–II	100	03
			Separation Techniques	50	02
		V (Open Course)	AnalyticalBiochemistry and Environmental Chemistry	100	03
			AnalysisofBio Products	50	02

ObjectivesandoutcomeoftheprogrammeAnalyticalChemistry

AnalyticalChemistryisanapplied,experimentalfieldofscienceandisbasednotonly on chemistry, but also on physics, biology, information theory and manyfields of technology.It isoffundamental importancenotonlytoallbranchesofchemistry butalso to all biological sciences, engineering sciences, health, medicine,pharmaceuticals, environment,industrialprocesses,quality controland implementationoflegislation.

TheobjectiveofB.ScAnalyticalchemistry courseistoprovidestudentsexposureto chemistry,physics,biologicalsciences,environmentalscience,computer application, instrumentationandanalyticaltechniques.Inthisthreeyearcourse spreadoversixsemesters, thereare10papersofAnalyticalchemistry7papersofchemistryand7Mathematics. Inthe lastsemester of thiscourse,thereisaprovisionforoneclusterelectivepapersoutoftwocluster electivepapers,viz.

After graduatingin Analytical Chemistry the students can pursue academics in Chemistry,bioinformatics,forensicscience,biochemistry andotherdisciplinesofinter-disciplinarysciences.Theycanalsouseitasasteppingstonetopharmaceuticalindustryand forResearchand Development in industry.

CourseStructure

Alltheory paperswillhave4hoursperweekandpracticalswillhave2hoursperweekuptoSemesterIV(Secondyear). Infinalyearalltheorypaperswillhave3hoursperweekand practicals will have2 hours perweek in SemesterV and VI(Finalyear).

EachTheoryPapershallbeof100marks andPracticalPapershallbe of50marks.

TotalNumberof Papers:21

Mathematics : 7 Papers
Chemistry : 7 Papers
Analytical Chemistry: 7Papers

SEMESTER– I

CourseI (ANALYTICALCHEMISTRY-1) **60hrs. (4h/w)**

Objectives

Theobjective ofthiscourse istomake students aware about theSIUnits, concentration terms,various analytical methods, typesoferrorsinchemical analysis, statistical testsof dataandsafeusageofchemicalsanditswaste.AndThermalGravimetry

CourseLearningOutcomes:

By theendofthecourse,thestudentswillbeableto:

UnderstandaboutSIunits
Learnuseofanalyticalequipment
Knowtypesoferrorsinchemicalanalysis
Handlestatisticaltestsofdata
Knowsafetywithchemicalsandwaste.

BASIC PRINCIPLES&LABORATORYOPERATIONS

UNIT– I

I.BasicConcepts: **12hrs**

A. SI Units

i)DefinitionsoftheSeven BasicUnits(Mass,Length, Time,Temperature,Amountofsubstance, Electricalcurrent andLuminousintensity),Derivedunits,Conversionbetween units,Significant figures.

B.Chemicalconcentrations

i) Mole,molarmass

ii)Calculationsingrams andmoles iii)Solutionsandtheirconcentrations:

a)Molarconcentrationb)Analytical molarityc)Equilibriummolarityofaparticularspeciesd) Percentconcentratione)Partspermillion/billion (ppm,ppb)f)Volumeratiosfordilution proceduresg)p-functions.

C. Preparation ofsolutions:standardsolutions,primarystandards,secondarystandards.

UNIT– II **12hrs**

IntroductiontoAnalyticalChemistryandAnalyticalMethods -I

i) Generalstepsinchemicalanalysis

ii)Introductiontomethodsofdetectinganalytes

Physical, Electromagneticradiations and Electriccharge

iii)Singlepananalyticalbalance:(operationandtheoryofthebalance,construction details, errorsinweighing,careofananalyticalbalance).

UNITIII **12hrs**

IntroductiontoAnalyticalChemistryandAnalyticalMethods -Ii

Descriptionanduseofcommonlaboratoryapparatus:Volumetricflasks,burettes,pipettes, meniscusreaders,weighingbottles,differenttypesof funnelschromatographiccolumns, chromatographic jars, desiccators, drying ovens, filter crucibles, rubber policeman. Calibration anduseofvolumetricglassware.

pHmeter:componentsofpHmeter,useofpHMeter,maintenanceofpHmeter,application ofdata.Laboratorynotebook

UNIT–IV **12hrs**

Errorsin ChemicalAnalysis

Typesoferrors,Accuracy andPrecision,Absoluteandrelativeuncertainty,propagationof uncertainty.TheGaussiandistribution,mean andstandarddeviation,confidenceintervals. Statisticaltestsofdata(theFtest,thettest,Qtestforbaddata,themethodofleastsquares). Calibrationcurve.Laboratorynotebook. Safetywithchemicalsandwaste.

UNIT– V **12hrs**

PrinciplesofThermogravimetry:

Thermometricmethods–PrinciplesofTGA,DTAandThermometrictitrations–application of$CaC_2O.H_2O$, $(CH_3COO)_2Ca$. H_2O and HCl VsNaOH Thermometric titrations.

TeachingLearningProcess:

Conventionalchalkandboardteaching,

Visitchemicalindustries/Drugindustriestogetinformationaboutthevarious instrumentsusedinindustries

ICT enabled classes.

Power point presentations. Interactive sessions

Togetrecentinformationthroughtheinternet.

AssessmentMethods:

PresentationsbyIndividualStudent

ClasstestsLaboratorytestwrittenassignment(s)

LABORATORY COURSE-I **30**hrs(2 h / w)

Practical-I (At the end ofSemester-I)

1. Useandcalibrationofvolumetricequipment(volumetricflasks,pipette's and burette's).
2. Preparationofstandardsolutionsofacids and bases.
3. Estimationofsodiumcarbonatebytitratingwithhydrochloricacid.
4. PreparationofstandardsolutionofEDTA.
5. EstimationofmagnesiumusingEDTA.
6. UseofpHmeter:determinationofpHofgivendilutesolutionsofshampoosandsoaps
7. Titrationofacid-baseusingpH meter.
8. Preparationofbuffers.

SUGGESTED BOOKS

1. SeamusP.J. Higson:AnalyticalChemistry.
2. DouglasA.Skoogand DonaldM..West:FundamentalsofAnalytical Chemistry.
3. AdionA.Gordus:Schaum'sOutlineofAnalyticalChemistry,Tata McGraw-Hill.
4. GaryD.Christian:AnalyticalChemistry.
5. FreifelderandKealy:AnalyticalChemistry.
6. DanielCHarris:ExploringChemicalAnalysis.
7. DanielCHarris:QuantitativeChemicalAnalysis.

MODEL PAPER

FIRST YEAR B.Sc., DEGREE EXAMINATION

SEMESTER-I

ANALYTICAL CHEMISTRY Course-I

Time: 3 hours Maximum Marks: 75

PART- A 5 X 5 = 25 Marks

Answer any **FIVE** of the following questions. Each carries**FIVE** marks

1. Explain the terms Mole and molarmass.
2. Explain in brief about the generalstepsinchemicalanalysis
3. Write short note on methodsofdetectinganalytes.
4. What is a Laboratorynote book?
5. Write account on typesoferrors,Accuracy andPrecision
6. Describe the safetywithchemicalsandwaste.
7. What are thermometricmethods
8. Explain how the calibration ofvolumetricglassware is done

PART- B 5 X 10 = 50 Marks

Answer **ALL** the questions. Each carries**TEN** marks

9 (a). Explain standardsolutions,primarystandards andsecondarystandards giving examples

(or)

(b). Explain the terms a) Molarconcentrationb)Analytical molarityc)Equilibrium molarityofaparticularspeciesd) Percentconcentratione)Partsper million and billion

10 (a). Write an essay on the operationandtheoryofthe Singlepananalyticalbalance

(or)

(b). Explain errorsinweighing,careofananalyticalbalance

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11 (a). Describe theuseof any fivecommonlaboratoryapparatus

(or)

(b). What is a pHmeter and describe the componentsofpHmeter and its use

12 (a). Explain theGaussiandistribution,mean andstandarddeviations

(or)

(b). Explain the statisticaltestsofdata. Write in detail about i)Ftest ii)ttest

13 (a). Explain the PrinciplesofTGA and DTA in detail

(or)

(b). What are thermometrictitrations and write its applications

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SEMESTER– II

CourseII-ANALYTICALCHEMISTRY-2 60hrs (4h/w)

QUANTITATIVEMETHODSOFANALYSIS

Objectives:

Theobjectiveofthiscourseisto makestudentsawareaboutthegravimetricandvolumetric methodsof analysis, various types of titrations, equilibria principles, various centrifugation methods, polorographyand environmental analysis.

CourseLearningOutcomes:

At thecompletion of this course, students should be able to understand:

VariousquantitativemethodsofanalysislikeGravimetricAnalysis VolumetricmethodsofanalysisVariousCentrifugationMethods, Polorography andEnvironmentalAnalysis

UNIT– I 12hrs

GravimetricAnalysis-I
A.Precipitationmethods. General principles
B.Volatilizationmethods. General principles - determination ofthesodiumhydrogencarbonatescontentofantacidtablets
C. Propertiesof precipitates andprecipitating reagents: Particle size, FilterabilityofPrecipitates- CrystallinePrecipitates-Co-precipitation-PrecipitationfromHomogeneous
D.DryingandIgnitionofprecipitates

UNIT–II 12hrs

VolumetricAnalysis
A. Definitions: Titrimetry, Volumetrictitrimetry, Gravimetrictitrimetry,Coulometric titrimetry.
B. Theequivalencepoint,theendpoint;Classificationofvolumetricmethods,theoryof indicators and buffers–EquilibriaPrinciples-Aqueousandnon-aqueousacid-base titration- Redoxtitrations-Complexometrictitrations - Precipitationtitrations
C. Typicalproblems involumetrictitrimetry:
D. SigmoidalTitrationCurves

UNIT–III 12hrs

CentrifugationMethods:
A.Introduction

B.Sedimentationandrelativecentrifugalforce
C.Differenttypesofrotors.
D.Densitygradient
E.Types ofcentrifugationtechniques.

UNIT–IV12hrs

Polarography

Basic principles – Dropping Mercury Electrode (DME) – Advantages and Disadvantages. Diffusion current – The Ilkovic equation (derivation not required). Half – Wave potential – Experimental set up – Applications. Determination of Copper and Zinc in Brass.

UNIT– V
12hrs

IntroductiontoEnvironmentalAnalysis:

A.Samplingmethod
B. Environmentalpollutionfromindustrialeffluentsand radiochemical waste.
C.Introductiontowaterandwaste analysis.

LABORATORY COURSE-II **30hrs(2 h / w)**

Practical-II Quantitative Analysis(At the end ofSemester-II)

1. DeterminationofthepKaandEquivalentWeightofaweakacidbypotentiometricpH titration.
2. Determinationofthestrength ofthegivenmagnesiumsulphatesolutionusing EDTAand Eriochromeblack–T as theindicator.
3. Determinationofthecapacityofananionic exchangeresin.
4. HomogeneousprecipitationoftheNickelasits Dimethylglyoxime.
5. Analysisofsoil
i)DeterminationofpHofsoil.
ii)Determinationoftotalsolublesalts.
iii)Determinationofcarbonateand bicarbonate.

SuggestedReadings:

1.AnalyticalChemistry-MethodsofSeparation(R.V. Dilts).
2.LaboratoryHandbookofChromatographicMethods(O.Mikes, R.A. Chalmers).
3.F.W.Fifieldand D.Kealy:AnalyticalChemistry.
4.Vogel'stextbookofquantitativechemicalanalysis,6th edition.
5.Vogel'stextbookofquantitativechemicalanalysis,7th edition.
6.KeithWilsonandJohnWalker:PracticalBiochemistry.

TeachingLearningProcess:

Conventionalchalkandboardteaching,
Visitchemical industries togetinformationaboutthetechnologies andenvironmental pollutionfromindustrialeffluents.
ICTenabledclasses.Power point presentations. Interactivesessions, Debate.

AssessmentMethods:

PresentationsbyIndividualStudent
ClassTests
Writtenassignment(s)
EndsemesterUniversitytheoryandpracticalexamination

MODEL PAPER

FIRST YEAR B.Sc., DEGREE EXAMINATION

SEMESTER-II

ANALYTICAL CHEMISTRY Course-II;QUANTITATIVEMETHODSOFANALYSIS

Time: 3 hours Maximum Marks: 75

PART- A 5 X 5 = 25 Marks

Answer any **FIVE** of the following questions. Each carries**FIVE** marks

1. Explain in brief about the co-precipitation of Gravimetry
2. Explain in brief about the generalpractical gravimetric procedures
3. Write short note on coulometric titrimetry.
4. Explain the theoryof indicators and buffers?
5. What are the different types of rotors used in centrifugation?
6. What is polarography write its applications
7. Write the Ilkovic equation and explain its significance
8. Explain the different types of sampling methods adopted in environmental analysis

PART- B 5 X 10 = 50 Marks

Answer **ALL** the questions. Each carries**TEN** marks

9 (a). Explain the general principles of precipitation methods of gravimetric analysis

(or)

(b). Explain the general principles of volatilization methods of gravimetric analysis 10 (a). Write an essay on the Aqueousandnon-aqueousacid-basetitration with examples

(or)

(b). Explain the redox titration, Complexometric titrations and precipitation titrations with examples

11 (a). Describe the determination of Copper and Zinc in brass using polarography

(or)

(b). Explain the experimental set up the instruments used in Polarography and write its applications

12 (a). Explain thesedimentation and relative centrifugal force in detail

(or)

(b). Explain the different types of centrifugation techniques with examples

13 (a). Explain the Environmentalpollutionfromindustrialeffluentsand radiochemical waste

(or)

(b). What are the water pollutants and explain the different methods of waste analysis

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SEMESTER– III

CourseIII-ANALYTICALCHEMISTRY-3 60hrs (4h/w)

SEPARATIONMETHODS-I

Objective:

Toacquirebasicknowledgeoftheanalyticalchemistryofimportanttechniquesthatwillprovidethebasisfortheirindustrialproduction methods.Toprovideanadequatemastery ofanalyticalmethodsusedforthedeterminationofcommercial/domesticrawmaterialsand finishedproductquality.

CourseLearningOutcomes:

Bytheendofthiscourse,studentswillbeableto:

Become familiar withfundamental concepts ofpartition coefficientsandtheir rolein achievingseparationsacrossdifferenttypesofchromatography.

Develop thecore skills to parse existing chromatographic protocols and identify the keyfactorsinfluencingachromatographyexperiment.

Understandtheunderlyingassumptionsof the mostcommonchromatographicseparation techniquesandapproachestomethodvalidation.

Understandtheconceptofsolubilityandtheirapplicationinseparationusingdistribution law.

Learnapplicationofdialysisandmembraneforvarioustechniques.

SEPARATIONMETHODS-I

UNIT– I 12hrs

Solvent Extraction:

Introduction, principle, techniques, factors affecting solvent extraction,Batch extraction, Continuousextractionandcountercurrentextraction.Synergism,ApplicationDetermination ofIron (III)

IonExchange:Introduction,actionofion exchangeresins,separation ofinorganic mixtures, applications, Solvent extraction: Principle and process,

UNIT– II 12hrs

Chromatography:

A.Classificationofchromatographicmethods: Principleofdifferentialmigration, descriptionofthechromatographic process,distributioncoefficients,modesof chromatography,performingcolumnchromatography.

B.Chromatography–theoryandpractice:Introduction, thechromatograph(elutiontime andvolume),capacityfactor,columnefficiencyandresolution, samplepreparation

UNIT– III **12hrs**

A.Techniquesofpaper chromatography:experimentalmodifications, variousmodesof development,natureofthepaper, detectionofspots, retardationfactors,factorsthataffect thereproducibility ofRfvalues(duetopaper,solventsystem,sample,development procedure),selectionofsolvent,quantitativeanalysis. Applications

B.Thin layerchromatography:stationaryphase,adsorbents,liquidphasesupports,plate preparation,mobilephase,sampleapplication,development, saturation ofchamber, detectionofspot, Rf values(effectofadsorbent,solvent,solute, developmentprocess), quantitativeanalysis,applications

UNIT– IV **12hrs**

ColumnChromatography.

A.General:columns, matrix materials,stationaryphase,columnpacking,applicationof sample,columndevelopmentandsampleelution,detectors andfractioncollectors, applications.

B. Highperformanceliquidchromatography: Principle,column,matricesandstationary phases,columnpacking,mobilephaseandpumps,application ofsample,detectors, applications.

C.Adsorptionchromatography: Principle,adsorbents,solvents,natureofsolute,operating parameters,retentionvolumesandtimes,applications.

UNIT– V **12hrs**

A. Liquid-liquidpartition,chromatography:Principle, normalphase chromatography, reversed- phaseliquidchromatography, reversedphaseliquidchromatography, applications.

B. Ion-exchangechromatography: Principle,ionexchangers,ion-exchange equilibria,ion-exchange resinselectivity,columnoperations(columndevelopment, detectionofsolute bands),factorsaffectingretention volumes,applications.

LABORATORY COURSE-III **30**hrs(2 h / w)

Practical-IIIPRACTICAL ANALYTICALCHEMISTRY(At the end ofSemester-III)

1.DeterminationofRfvalueofaminoacidsusingpaperchromatography.
2.Separationand identificationofmonosaccharidepresentinagivenmixturebypaper chromatography.
3.Determinationofequivalentconductanceofaweakelectrolyte(aceticacid)at different concentrations.
4.Determinationofadulterantinsomecommonfooditems:
i)Chicoryincoffeepowder, ii)Foreign resininasafetida iii)Chillipowder
iv) Turmeric powderv)Pulses

SuggestedReadings:

1.F.W.Fifieldand D.Kealy:AnalyticalChemistry.
2.DanielCHarris:Exploringchemicalanalysis.
3.DanielCHarris:Quantitativechemicalanalysis.
4.R.V. DiltsAnalyticalChemistry-MethodsofSeparation.
5.O.Mikes,R.A. Chalmers:LaboratoryHandbookofChromatographicMethods.

Teaching Learning Process:
Teaching LearningProcess forthe courseis visualized as largelystudent-focused. Transaction throughan intelligent mixof conventional and modern methods. Engagingstudents in cooperativelearning.
Learningthrough quizdesign.
Problem solvingto enhance comprehension.

Assessment Methods:
Assessment will be doneon the basisof regular class test, presentations and assignments asa part ofinternalassessment duringthe course as per the curriculum.
End semester universityexamination willbeheldforboth theoryandpractical.
In practical, assessmentwillbedonebased on continuous evaluation, performancein the experiment on thedate ofexamination and viva voce.

MODEL PAPER

FIRST YEAR B.Sc., DEGREE EXAMINATION

SEMESTER-III

ANALYTICAL CHEMISTRY Course-III;SEPARATIONMETHODS-I

Time: 3 hours Maximum Marks: 75

PART- A 5 X 5 = 25 Marks

Answer any **FIVE** of the following questions. Each carries**FIVE** marks

1. Explain in brief about the Batch extraction
2. Explain the principle of differential migration
3. Write a short note on modes of chromatography.
4. Explain the various modes of development of paper chromatography
5. Write a short notes on the adsorption chromatography
6. Write a short notes on different types of detectors used in HPLC
7. What is normal phase chromatography, give an example
8. Explain the reversed phase liquid chromatography

PART- B 5 X 10 = 50 Marks

Answer **ALL** the questions. Each carries**TEN** marks

9 (a). Explain the principle of solvent extraction in detail. ii) Explain the determination of Iron (III)

(or)

(b). Explain the actionofion exchangeresins and separation ofinorganic mixtures

10 (a). Write an essay on the general principles of chromatography in detail

(or)

(b). Explain the terms i) column efficiency and resolution ii) Sample preparation and iii) Chromatograph

11 (a). Describe the techniques of paper chromatography and its applications

(or)

(b). Explain the experimental set up of the thin layer chromatography with a detailed note of its applications in quantitative analysis

12 (a). Explain theprinciple of column chromatography and its applications

(or)

(b). Explain the principle and the parts involved in HPLC

13 (a). Explain the principle and ion exchangers of Ion exchange chromatography

(or)

(b). Write an essay on liquid-liquid partition chromatography

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SEMESTER – IV

CourseIV -ANALYTICALCHEMISTRY-4 60hrs (4h/w)

SEPARATIONMETHODS– II

Objective:

Objectiveof this courseis to learn theseparation techniques and its application

CourseLearning Outcomes:

At the end ofthe course,student should be able to understand:
Various types of separation techniques and their applications
Electrophoretictechniques and Centrifugation techniques

UNIT– I 12hrs

Gel, Affinity andGas Chromatography
A. Gelchromatography: Principle,typesofgels,separationbygelchromatography,applications.
B.Affinitychromatography: Principle, materials,selectionand attachmentof ligand, practical procedure,applications,
C.Gas-liquidchromatography: Apparatusandmaterials,preparationandapplicationof samples,separationconditions,detectors,applications.

UNIT–II 12hrs

Electrophoresis–I
Theoryandclassification, factors affectingmobility,macromolecular sizeandcharge interactions withsupporting electrolyte, pH and concentration discontinuities, factors affecting electrophoresis phenomena: electrolysis,

UNIT–III 12hrs

Electrophoresis–II
Electro-osmosis, temperature and supportingmedia; instrumentation, methodology, preparationofgel-stainingandde-staining,preparativezoneelectrophoresis, continuous electrophoresis,applications.

UNIT– IV 12hrs

DialysisandMembraneFiltration
A.Principle, apparatus, support media (paper, cellulose acetate membranes, gels)
B. Filters-nitrocellulose,fiberglass,polycarbonate
C.General Laboratorymethods.

UNIT– V **12hrs**

CentrifugationMethods:
Introduction,sedimentationandrelativecentrifugalforce, differenttypesof rotors,density gradients,typesofcentrifugationtechniques.

LABORATORY COURSE-IV

Practical-IVSeparation Techniques30hrs(2 h / w)

(At the end ofSemester-IV)

1. Determinationofthestrengthofthegiven HClsolutionbytitratingit against NaOH solution conductometrically.
2. Determinationofresidualchlorineincitywatersupplyusingcolorimetry.
3. Determinationofadsorptionisothermofaceticacidonactivatedcharcoal. Determinationof the adsorptionconstant(k)
4. Determinationofnicotinecontentincigarettetobacco.

SuggestedReadings:

1. R.V.Dilts:AnalyticalChemistry-MethodsofSeparation.
2. O.Mikes,R.A.Chalmers: LaboratoryHandbookofChromatographic Methods.
3. F.W.FifieldandD.Kealy:Principlesand practiceofanalytical chemistry.
4. Vogel'stextbookofquantitativechemicalanalysis,6th edition.
5. Vogel'stextbookofquantitativechemicalanalysis,7th edition.
6. KeithWilsonandJohnWalker:PracticalBiochemistry.
7. Chromatography: Basic Principles, Sample Preparations and RelatedMethods by Elsa Lundanes,LeonReubsaet,TygeGreibrokk,JohnWileyandSons,2013
8. IntroductiontoModernLiquidChromatographybyLloydR.Snyder,JosephJ.
9. KirklandandJohnW.Dolan,Wiley
10. PracticalHPLCMethodDevelopmentbyLloydR.Snyder,Wiley-Interscience
11. Principles&PracticesofChromatographybyR.P.W.Scott,LibraryforScience
12. Fundamentalsof Analytical Chemistry,VIII Edn., D. A. Skoog,D. M. West,F.J.
13. HollerandS.R.Crouch,ThomsonBrooks/ColePublishers,2004.
14. PrinciplesofInstrumental AnalysisbyD.A.Skoog,F.J.HollerandT.A.Nieman,5th
15. Edition(1998),HarcourtBrace&Company,Florida.
16. InstrumentalMethodsofChemicalAnalysis,B.K.Sharma,GoelPublishingHouse, Meerut.
17. 15. InstrumentalMethodsofChemicalAnalysis,ChatwalandAnand,HimalayaPublishing

Teaching Learning Process:

Lectures usingteachingaid (chalk/power point/videos),
Group discussion, • Presentations,

Adviseto students to preparereport.

Assessment Methods:

a. Presentation byindividual student b. Class test
c.Laboratorytest
d. Written assignments
e. End semesterUniversitytheoryand practicalexaminations

MODEL PAPER

FIRST YEAR B.Sc., DEGREE EXAMINATION

SEMESTER-IV

ANALYTICAL CHEMISTRY Course-IV;SEPARATIONMETHODS–II

Time: 3 hours Maximum Marks: 75

PART- A 5 X 5 = 25 Marks

Answer any **FIVE** of the following questions. Each carries**FIVE** marks

1. Write a short notes on selection and attachment of ligands in affinity chromatography
2. Explain the principle of electro - osmosis
3. Write a short note on the classification of electrophoresis
4. Explain the various applications of electrophoresis
5. Write a short notes on the Filters-nitrocellulose related to dialysis
6. Write a short notes on membrane filtration of fiberglass andpolycarbonate
7. Write a short notes on the support media used in membrane filration
8. Explain the density gradients of centrifugation

PART- B 5 X 10 = 50 Marks

Answer **ALL** the questions. Each carries**TEN** marks

9 (a). Explain the principle of gel chromatography and its applications

(or)

(b). Explain the gas – liquid chromatography and its applications

10 (a). Write an essay on the factors affectingmobility,macromolecular sizeandcharge interactions withsupporting electrolyte

(or)

(b). Explain in detail about the factors affecting electrophoresisphenomena

11 (a). Describe the instrumentation, methodology, preparationofgel-stainingandde-staining

(or)

(b). Explain the preparativezoneelectrophoresis andcontinuous electrophoresis

12 (a). Explain theprinciple of dialysis and membrane filtration

(or)

(b). Explain the general laboratory methods of membrane filtration

13(a). Explain the principle and types of centrifugation methods

(or)

(b). Write an essay on the sedimentationandrelativecentrifugalforce methods

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SEMESTER IV

Course– V ANALYTICALCHEMISTRY-5 60hrs (4h/w)

ANALYTICALBIOCHEMISTRYAND ENVIRONMENTAL CHEMISTRY

Objectives:

The Objective of the course is to learn about proteins, enzymes, nucleic acids and lipids, using suitable examples

Learning Outcomes:

By the end of the course, the students will be able to:
Learn how the structure of biomolecules determines their reactivity and biological uses.
Know biochemistry of diseases.

UNIT– I **12hrs**

BasicunderstandingoftheStructures,Properties andFunctionsofCarbohydrates, Lipids andProteins

1.Isolationandcharacterizationofpolysaccharides.
2.Classificationoflipids,properties,functionsand Biochemicalfunctionsofsteroid hormones.
3.Proteins-structure,classification,isolation, characterizationandfunctions.
4.Biochemistryofpeptidehormones.

UNIT– II **12hrs**

BiochemistryofDisease:A DiagnosticapproachClinicalchemistry:Adiagnostic approachbybloodanalysis.

1. Blood:Compositionandfunctionsofblood,bloodcoagulation.
2. Bloodcollectionand preservationofsamples.
3. Anemia
4. Regulation,estimationandinterpretationofdataforbloodsugar,urea,creatinine, cholesterolandbilirubin.

Unit-III: **12hrs**

MicrobiologicalTestsandAssays:

Microbiological assayof antibiotics, (Standardpreparationsand 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 soyabean casein digest agar medium only) and total microbial count only)

Unit-IV: **12hrs**

StandardizationandQualityControlofdifferentDosageForms:

Brief introductionto 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(bariumsulphate– limittestforimpurity),mouthwashes(Ointments(salicylic acid)

UNIT-V **12hrs**

Conceptandscopeof environmentalchemistry–Classification ofwaterpollutants– Characterization– Dissolved Oxygen–BOD – COD- Waste watertreatment(General).Disposal of radioactivewastes.Pollution dueto some typical industries like Textile, Pulp and Paper, Electroplating, Dairy, Canesugar

LaboratoryCourse-VAnalysisofBio Products30hrs(2 h / w)

Identificationand estimationofthefollowing:
1. Carbohydrates– qualitativeandquantitative.
2. Lipids–qualitative.
3. Determinationoftheiodinenumberofoil.
4. Determinationofthesaponificationnumberofoil.
5. DeterminationofcholesterolusingLiebermann-Burchardreaction.
6. Proteins– qualitative.
7. DeterminationofproteinbytheBiuretreaction.

SuggestedReadings:

1. T.G.Cooper:ToolofBiochemistry.
2. KeithWilsonandJohnWalker:PracticalBiochemistry.
3. AlanHGowenlock:Varley'sPracticalClinicalBiochemistry.
4. ThomasM.Devlin:TextbookofBiochemistry.
5. JeremyM.Berg, JohnLTymoczko,LubertStryer:Biochemistry.
6. G.P.Talwar andMSrivastava:TextbookofBiochemistryand
7. HumanBiology.
8. A.L.Lehninger:Biochemistry.
9. O.Mikes,R.A. Chalmers:LaboratoryHandbookofChromatographicMethods.
10. Environmental chemistrybyA.K.De
11. A text book of engineeringchemistrybyS.S.Dara
12. A text book ofIndustrialchemistrybyB.K.Sharma

Teaching Learning Process:

Lectures usingteachingaid (chalk/power point/videos),
Group discussion, • Presentations,
Adviseto students to preparereport.

Assessment Methods:

a. Presentation byindividual student b. Class test
c.Laboratorytest
d. Written assignments
e. End semesterUniversitytheoryand practicalexaminations

MODEL PAPER

FIRST YEAR B.Sc., DEGREE EXAMINATION

SEMESTER-IV

ANALYTICAL CHEMISTRY Course-V;

ANALYTICALBIOCHEMISTRYAND ENVIRONMENTAL CHEMISTRY

Time: 3 hours Maximum Marks: 75

PART- A 5 X 5 = 25 Marks

Answer any **FIVE** of the following questions. Each carries**FIVE** marks

1. Write a short notes on characterizationofpolysaccharides
2. What are lipids? Write their properties
3. Write a short note on the Bloodcollectionand preservationofsamples.
4. Explain the microbiallimit test
5. Write a short notes on the different dosageforms with the IP requirements
6. Write a short notes on the additives used intabletmanufacture
7. Explain the Classification ofwaterpollutants
8. Explain in brief about the Waste watertreatment

PART- B 5 X 10 = 50 Marks

Answer **ALL** the questions. Each carries**TEN** marks

9 (a). Explain the Biochemicalfunctionsofsteroid hormones

(or)

(b). Explain the characterizationandfunctions of proteins

10 (a). Write an essay on the Compositionandfunctionsofblood andblood coagulation.

(or)

(b). Explain in detail about regulation,estimationandinterpretationofdataforbloodsugar

11 (a). Describe the Microbiological assayof antibiotics in detail

(or)

(b). Explain the cupplatemethod andtwo levelfactorial assayof ampicillin

12 (a). Explain IP requirements and analytical methods fortheaspirin and Rifampicin

(or)

(b). Explain the standardizationandQualityControland dosageForms of mouthwashes and ointments

13 (a). Explain in detail about the disposal of radioactivewastes

(or)

(b). Describe the pollution dueto the industries of Pulp, Paper andTextile

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