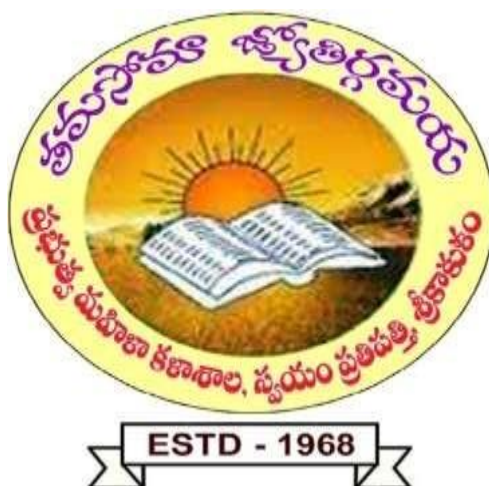


GOVERNMENT COLLEGE FOR WOMEN (A), SRIKAKULAM
B.ScBio-ChemistrySyllabus(w.e.f:2020-21 A.B)
GOVERNMENT COLLEGE FOR WOMEN (AUTONOMOUS)
SRIKAKULAM

DEPARTMENT OF BIO-CHEMISTRY



BOARD OF STUDIES
BIO-CHEMISTRY SYLLABUS
2024-25

B.Sc	Semester-V(Skill Enhancement Course-Elective)	Credits:4
Course:6B	Laboratory Techniques and Diagnostics	Hrs/Wk:4

Learning outcomes:

Students after successful completion of the course will be able to

1. Understand different types of diagnostic Laboratory Techniques
2. Identify various facilities required to set up a diagnostic lab.
3. Understand expertise related to various practices in diagnostic labs.
4. Acquires skills to get an employment or to become an entrepreneur.

Syllabus: (Total 90 hrs. (Including Teaching, Lab, Field Training and unit test etc.)) UNIT – I: Basic Medical Laboratory Principles and

Procedures: (10h)

Code of conduct for laboratory personnel – safety measures in the laboratory, chemical/reagents labeling, storage and usage.

First Aid in laboratory accidents – Precautions and first aid equipment's.

Sterilization, preparation of reagents.

General approach to quality control, quality control of quantitative data.

Reporting laboratory tests and keeping records.

UNIT-II: Laboratory equipment's: (10h)

Principle, Procedure & Applications of microscope – light microscope, Phase contrast, Fluorescence, Electron microscope.

Centrifuge-principle, types and applications

Colorimeter-Usage and care.

serological water bath and incubator, hot-air oven

UNIT-III: Urine Analysis: (10h)

Composition- abnormal and normal constituents of urine

Collection and preservation of urine

Physical examination

Chemical examination [abnormal and normal constituents of urine]

Microscopic examination of the urinary sediment.

Microbial culture of urine

UNIT-IV: Stool Examination: (10h)

Specimen collection- inspection of faeces- odour, pH

Interfering substance.

Test for occult blood, fecal fat

Microscopic examination of stool specimen.

UNIT-V: Clinical Hematology: (10h)

Collection of blood- Anticoagulants, preservation

Hemoglobin estimation by Sahli's method

RBC count, Packed cell volume [PCV]

Erythrocyte sedimentation rate [ESR]

Total and differential count of WBC, Platelet count

Blood grouping, ABO system, Rh System,

SUGGESTED REFERENCES:

- Park, K. (2007), Preventive and Social Medicine, B.B. Publishers
- Godkar P.B. and Godkar D.P. Textbook of Medical Laboratory Technology, II Edition, Bhalani Publishing House
- Cheesbrough M., A
Laboratory Manual for Rural Tropical Hospitals, A Basis for Training Courses
- Guyton A.C. and Hall J.E. Textbook of Medical Physiology.
- Robbins and Cortan, Pathologic Basis of Disease, VIII Edition.
- Prakash, G. (2012), Lab Manual on Blood Analysis and Medical Diagnostics, S. Chand and Co. Ltd.
- Medical laboratory technology by Mukaraje

GOVERNMENT COLLEGE FOR WOMEN (A), SRIKAKULAM
B.ScBio-ChemistrySyllabus(w.e.f:2020-21 A.B)

Skill

B.Sc	Semester–V(SkillEnhancementCourse-Elective)	Credits:1
Course:6B	LaboratoryTechniques and DiagnosticsLab	Hrs/Wk:2

outcomes:

On successful completion of the practical course, students shall be able to

1. List out different types of Blood Cells.
2. Identify the Laboratory tools
3. Develop skill on Collection and analysis of urine
4. Develop skill on Collection and analysis of fecal sample

Practicals syllabus:

1. Hemoglobin estimation by Shale's method
2. RBC count
3. ESR
4. Total and differential WBC count
5. Blood grouping [ABO system & Rh System]
6. Collection of urine and fecal samples
7. Fecal analysis to detect fats, undigested food and blood
8. Qualitative analysis of urine for normal and pathological conditions.

SUGGESTED REFERENCES FOR PRACTICALS:

1. Practical clinical Biochemistry-Harold Varley, CBS, New Delhi
2. Medical Laboratory Technology–
Kanai L. Mukherjee, Tata McGraw Hill Publication and co. ltd., Vol, I, II, III
3. Clinical chemistry–Ranjana Chawla
4. Laboratory Manual in Biochemistry–Jayaraman
5. Biochemical methods–S. Sadasivan And Manickam
6. Introduction to practical biochemistry–David T. Plummer.

Co-curricular activities:

- a) Mandatory: (Training of students by teacher on field related skills: 15 hrs)
- 1) For teachers: Training of students by teacher in laboratory and field for a total of 15 hrs on divisions in diagnostic center and infrastructure of diagnostic center.
- 2) For students; Visit to local diagnostic centers, observing the various analysis doing in lab. Submission of field work report of 10 pages in the prescribed format.
- 3) Maximum marks for field work report: 05
- 4) Suggested format for field work report: Title page, student details, content page, introduction, work done, findings, conclusion and acknowledgements.
- 5) Unit test (IE)

b) Suggested co-curricular activities:

1. Visit to diagnostic centers
2. Learning techniques of basic tools and instruments handling related to field work
3. Observe the sample collection, processing and preservation
4. Training of students by related subject experts
5. Attending special lectures, group discussions and seminar on related topics

GOVERNMENT COLLEGE FOR WOMEN (A), SRIKAKULAM
B.ScBio-Chemistry Syllabus(w.e.f:2020-21 A.B)

MODEL QUESTION PAPER
Semester V
(Skill Enhancement Course-Elective)
PAPER-6B: Laboratory Techniques and Diagnostics
(w.e.f.2024-25)

Time: 3 hours

Max. Marks: 60

SECTION-A

[5X8=40M]

(Answer all the questions. Each question carries 8 marks)

1. (a) Write an essay on Laboratory safety and hygiene.
(or)
(b) Write in detail note on sterilization and preparation of reagents.
2. (a) Write an essay on working principle of Electron microscope.
(or)
(b) Write the working principle and instrumentation of Laboratory centrifuge.
3. (a) Write a detailed note on collection and preservation of urine.
(or)
(b) Write an essay on microbial culture of urine.
4. (a) Write an essay on specimen collection and inspection of faeces.
(or)
(b) Write an essay on microscopic examination of stool specimen.
5. (a) How do you estimate Haemoglobin percentage by Sahli's method.
(or)
(b) Write an essay on total and differential count of WBC.

SECTION -B

[5X4=20M]

(Answer any five questions. Each question carries 4 marks)

6. First aid and precautions.
7. Quality control.
8. Incubator.
9. Normal and abnormal constituents of urine.
10. Physical examination of urine.
11. Test for fecal fat.
12. ESR.
13. ABO system.

GOVERNMENT COLLEGE FOR WOMEN (A), SRIKAKULAM
B.ScBio-Chemistry Syllabus(w.e.f:2020-21 A.B)

Suggested Question Paper Model For Practical Examination

Semester–V/Biochemistry Course–6A(Skill Enhancement Course)

BCP-

6B: LABORATORY TECHNIQUES AND DIAGNOSTICS

Max. Time: 3 Hrs.

Max. Marks: 50

1. Estimate the amount of Hemoglobin by Shale's method 20 M
2. Write the principle, procedure for Blood grouping 10 M
3. Write the principle/procedure for following Practicals 5 M
a) ESR b) Total count of RBC
4. Scientific Identification of spotters 5 x 1 = 5 M
 - A. Centrifuge
 - B. Colorimeter
 - C. light microscope
 - D. Neubauer chamber
 - E. RBC Pipette
5. Record + Viva-voce 5 + 5 = 10 M

GOVERNMENT COLLEGE FOR WOMEN (A), SRIKAKULAM
B.ScBio-ChemistrySyllabus(w.e.f:2020-21 A.B)

B.Sc	Semester-V(SkillEnhancementCourse-Elective)	Credits:4
Course:7B	BloodBanking&ClinicalScience	Hrs/Wk:4

Learningoutcomes:

Studentsaftersuccessfulcompletionof thecoursewillbeableto

1. UnderstanddifferenttypesofproceduresinBloodBank.
2. Identify various facilities required to set up a Blood Bank.Andclinicallab.
3. Understoodexpertiserelatedtovariouspracticesina BloodBank.Andclinicallab.
4. Acquireskillstogetanemploymentortobecomeanentrepreneur.

Syllabus: (Total 90 hrs. (Including Teaching, Lab, Field Training

and unit tests etc.)UNIT-I: BloodBanking

Bloodgrouping-ABOsystem,Rhtyping.

Coomb'stest.

Bloodtransfusion-Blooddonors,donorscreening,drawingofblood

Compatibilitytesting,crossmatching,

Bloodtransfusioncomplications.

UNIT-II:CSFand OtherBodyFluids

CompositionofCerebrospinalfluid&CSFanalysis

Compositionofsemen

Semenanalysis

sputumexamination

pregnancytests -Interpretation.

UNIT-III:EndocrineFunctionTestsanddiabetestests

thyroidhormonesand itsfunction,andClinicaldisorders

Thyroidfunctiontest- T3andT4,TSH,131IUptake.

cortisolandprolactintest

testosteroneandestrogentest

typesofdiabetes

Glucosetolerancetest,Glycatedhemoglobin

UNIT-IV:MedicalParasitology

Amoebiasis-lifecycleofcausativeorganism,pathogenesisanddiagnosis

Malaria-lifecycle,pathogenesisanddiagnosis

Acuteandchronicfilariasis-diagnosis.

Helminthiasis-lifecycle,pathogenesisanddiagnosis

UNIT-VMedicalMicrobiology

Safetyprocedureinmicrobiologicaltechniques.

Cultureoforganisms fromvariousspecimens.

Culturemedia

Antibioticsensitivitytests(pus,urine,stool,sputum, throatswab]

Gramstaining,Ziehl-Neilsonstaining(TB, Leprabacilli).

GOVERNMENT COLLEGE FOR WOMEN (A), SRIKAKULAM
B.ScBio-ChemistrySyllabus(w.e.f:2020-21 A.B)

B.Sc	Semester–V(SkillEnhancementCourse-Elective)	Credits:1
Course:7B	BloodBanking&ClinicalScience Lab	Hrs/Wk:2

Skilloutcomes:

Onsuccessfulcompletion ofthepracticalcourse, studentshallbeableto

1. ListoutdifferenttypesofBloodCells.
2. IdentifytheLaboratorytools
3. DevelopskillonCollectionAndAnalysisOfUrine
4. DevelopskillonCollectionAndAnalysis Offecalsample

Practicalsyllabus:

1. Bloodgrouping
2. RHTyping
3. Coomb'stest.
4. Cerebrospinalfluidanalysis
5. Semenanalysis
6. pregnancytest
7. Thyroidfunctiontest- T3and T4,TSH
8. Glucosetolerancetest
9. EstimationOfGlycatedhemoglobin
- 10Observe the permanent Slides;malarialparasites,Amoebiasis
- 11.Gramstaining, Ziehl–Neilsonstaining[demonstration]

SUGGESTEDREFERENCES:

1. PracticalclinicalBiochemistry-HaroldVarley,CBS,NewDelhi
2. MedicalLaboratoryTechnology–KanaiL.Mukherjee, TataMcGrawHillPublicationandco.ltd., Vol, I,II,III
3. ClinicalChemistry– RanjanaChawla
4. LaboratoryManualinBiochemistry–Jayaraman
5. Biochemicalmethods–S.SadasivanAndManickam
6. IntroductiontoPracticalbiochemistry–DavidT.Plummer.

Co-curricularactivities:

- a) Mandatory:(Trainingofstudents byteacheronfield relatedskills:15hrs)
 1. Forteachers:Trainingofstudents byteacherinlaboratoryand fieldforatotalof15hrsondivisionsindiagnosticcenterand infrastructureofdiagnosticcenter.
 2. Forstudents;Visittocaldiagnosticcenters ,observingthevariousanalysisdoinginlab.Submissionof fieldworkreportof10pagesinthe prescribedformat.
 3. Maximummarksforfieldworkreport:05
 4. Suggestedformatforfieldworkreport:Titlepage,studentdetails,contentpage,introduction,workdone, findings,conclusionand acknowledgements.
 5. Unittest(IE)
- b) Suggestedco-curricularactivities:
 1. Visittodiagnosticcenters
 2. Learningtechniquesofbasictoolsandinstrumentshandlingrelatedtofieldwork
 3. Observe the Samplecollection,processingandpreservation
 4. Trainingofstudents byrelatedsubjectexperts
 5. Attendingspeciallectures,groupdiscussions andseminarsonrelatedtopics

MODEL QUESTION PAPER
Semester V
(Skill Enhancement Course-Elective)
PAPER-7B: Blood Banking & Clinical Science
(w.e.f.2024-25)

Time: 3 hours

Max. Marks: 60

SECTION-A

[5X8=40M]

Answer All the questions. Each question carries 8 marks.

1. (a) Write an essay on ABO blood grouping. (or)
(b) Write in detail note on blood transfusion.
2. (a) Write an essay on composition of CSF and analysis.
(or)
(b) Write a detailed note on pregnancy test and interpretation.
3. (a) Write an essay on thyroid hormones and its clinical disorders.
(or)
(b) Write a detailed note on testosterone and estrogen test
4. (a) Write an essay on malarial parasites.
(or)
(b) Write an essay on Helminthiasis
5. (a) Write an essay on various culture media.
(or)
(b) Write a detailed note on antibiotic sensitivity tests.

SECTION- B

Answer any five questions. Each question carries 4 marks.

[5X4=20M]

6. Coomb's test.
7. Cross matching.
8. Composition of semen.
9. Semen analysis.
10. Types of diabetes.
11. GTT.
12. Amoebiasis.
13. Gram's staining.

Suggested Question Paper Model For Practical Examination

Semester–V/Biochemistry Course–6A(Skill Enhancement Course)

BCP-

7B:BLOOD BANKING & CLINICAL SCIENCE

Max. Time: 3 Hrs. Max. Marks: 50

1. Estimate the amount of Glycated hemoglobin present in given blood sample 20M
2. Write the principle, procedure for Blood grouping 10M
3. Write the principle/procedure for following Practicals 5 M
a) Coomb's test. b) GTT
4. Scientific Identification of spotters 5 x 1 = 5 M
 - A. Centrifuge
 - B. Coomb's test.
 - C. GTT
 - D. Neubauer chamber
 - E. RBC Pipette
5. Record + Viva-voce 5+5 = 10M
- 6.

MINOR
II-SEMESTER
BIOMOLECULES -(CourseNo-1)

COURSEOBJECTIVES

1. Provides information about classification, physico-chemical properties of amino acids and structural organization of proteins.
2. To understand the structure, properties and biological importance of carbohydrates and lipids.
3. Explore the composition and structure of nucleic acids.

UNIT-I

Fundamentals of Biochemistry: History, scope and avenues of Biochemistry. Water as a biological solvent. Measurement of pH, Buffers, Biological relevance of Buffers. Outlines of surface tension, adsorption and osmosis and their biological relevance.

UNIT-II

Carbohydrates: Classification, monosaccharides, D and L designation, open chain and cyclic structures, epimers and anomers, mutarotation. Reactions of carbohydrates (due to functional groups - hydroxyl, aldehyde and ketone). Amino sugars, Glycosides. Structure and biological importance of disaccharides (sucrose, lactose, maltose, isomaltose, trehalose), trisaccharides (raffinose, melzitose). Structural polysaccharides (cellulose, chitin, pectin) and storage polysaccharides (starch, inulin, glycogen). Glycosaminoglycans.

UNIT- III

Lipids Classification, saturated and unsaturated fatty acids, structure and properties of fats and oils (acid, saponification and iodine values, rancidity). General properties and structures of phospholipids. Prostaglandins- structure, types and biological role. Lipoproteins- types and functions.

UNIT-IV

Amino Acids and Proteins Classification, structure, stereochemistry, chemical reactions of amino acids due to carbonyl and amino groups. 2. Titration curve of glycine and pK values. Essential and non-essential amino acids, non-protein amino acids. 3. Peptide bond - nature and conformation. Naturally occurring peptides - glutathione, enkephalin. 4. Proteins: Classification based on solubility, shape, and function. Determination of amino acid composition of proteins. 5. General properties of proteins, denaturation, and renaturation of proteins. 6. Structural organization of proteins - primary, secondary, tertiary, and quaternary structures (Eg. Hemoglobin and Myoglobin).

UNIT-V

Nucleic acids and porphyrins, Types of RNA and DNA. Structure of purines and pyrimidines, nucleosides, nucleotides. Stability and formation of phosphodiester linkages. 2. Effect of acids, alkali and nucleases on DNA and RNA. 3. Structure of Nucleic acids- Watson-Crick DNA double helix structure, denaturation and renaturation of nucleic acids, T_m -values and their significance, cot curves and their significance. 4. Structure and properties of porphyrins: Heme, cytochromes and chlorophylls.

COURSE OUTCOMES

After successful completion of the practical course student should be able to

1. prepare buffers and apply the knowledge to calculate the pH values of charged biomolecules.
2. Identify various carbohydrates, amino acids and lipids present in the nature by performing qualitative analysis.

-SEMESTER

BIOMOLECULES -(Course No-1)

Credits-1

-
1. Preparation of buffers (acidic, neutral, and alkaline) and determination of pH.
 2. Qualitative identification of carbohydrates- glucose, fructose, ribose/xylose, maltose, sucrose, lactose, starch/glycogen.
 3. Qualitative identification of amino acids- histidine, tyrosine, tryptophan, cysteine, arginine.
 4. Qualitative identification of lipids- solubility, saponification, acrolein test, Salkowski test, Lieberman-Burchard test.
 5. Preparation of Osazones and their identification
 6. Estimation of proteins in biological samples:
 - a. Biuret method.
 - b. Folin-Lowry method.
 - c. UV method.
 - d. Bradford's dye binding method
 7. Estimation of amino acid by Ninhydrin method.
 8. Estimation of tyrosine by Million's reaction

Recommended Books

1. Fundamentals of Biochemistry—Jain, J.L., Jain, S., Jain, N. S. Chand & Co.
2. Biochemistry—Satyanarayana, U. and Chakrapani, U, Books & Allied Pvt. Lt
3. Nelson, D.L. and Cox, M.M -Lehninger's Principles of Biochemistry- Freeman & Co.- 7th Edition

III SEMESTERANALYTICALTECHNIQUES–(Course No2)

COURSEOBJECTIVES

1. To understand the basic concepts of analytical techniques.
2. To gain knowledge about the latest advances in analytical techniques.
3. To apply these techniques in research.

UNIT-I

Methods of tissue homogenization. Salt and organic solvent extraction and fractionation. Dialysis, Reversedialysis, ultrafiltration, lyophilization.

Chromatography: principle, procedure and application of partition chromatography, adsorption chromatography, ion exchange chromatography, gel chromatography, affinity chromatography, GLC and HPLC.

UNIT-II

Electrophoresis: Principle, procedure and application of free flow, zone electrophoresis (Paper electrophoresis, Gel electrophoresis, PAGE, SDS-PAGE and Disc PAGE). Isoelectric focusing, High voltage electrophoresis, Pulse field electrophoresis, Immunoelectrophoretic.

UNIT-III

Centrifugation: Principle of sedimentation technique. Different types of centrifuge and rotors. Principle, procedure and application of differential centrifugation, density gradient centrifugation, ultracentrifugation, rate zonal centrifugation, isopycnic centrifugation.

UNIT-IV

Colorimetry and spectrophotometry: Laws of light absorption - Beer - Lambert's law. UV and visible absorption spectra, molar extinction coefficient and quantitation. Principle and instrumentation of colorimetry and spectrophotometry. Principle of nephelometry, fluorometry, Atomic absorption and emission spectrophotometer

UNIT-V

Important stable radioisotopes used in biochemical research. P 32, I 125, I 131, Co 60. C 14 etc. Radiation hazards and precautions taken while handling radioisotopes. Principle and application of RIA. Measurement of radioactivity by GM counter and Scintillation counter.

III-SEMESTER

ANALYTICALTECHNIQUES–(Course No-2)

Credits-1

1. Estimationof ascorbicacid
2. Separationandestimationof totalcarotenoidsand β -carotene
3. Extractionandestimationof vitaminA, vitaminE, niacinandfreeamino
4. EstimationofphosphorusbyFiskeandSubbarowmethodCharacterizationoffats
—
estimationofsaponificationnumber, iodinenumber, acidnumberandR.M.
Number
5. ExtractionofPhytoconstitutentsbySoxhletandquantification

COURSEOUTCOMES

1. Aftercompletingthiscourse,thestudentwill
2. UnderstandthebasicconceptsandprinciplesofbiochemicaltechniquesnamelySpectrophotometry, Fluorimetry, Chromatography andCentrifugation.
3. AnalysebiochemicalcompoundssuchasCarotenoids, Vitamins, AlkaloidsandFlavonoids.
4. Identifythecompoundsbyvariousbiochemicaltechniquesandinterprettheresults
5. Applythelaboratoryskillsandconceptsincarryingoutexperimentsusingsophisticatedinstruments.

ReferenceBooks

1. Physical Biochemistry- Application to Biochemistry and Molecular Biology:FriefelderD.WHFreemanandCompany1.PrinciplesandTechniquesof BiochemistryandMolecularBiology:-
Ed.K.WilsonandJ.Walker,CambridgeUniverityPress.
2. TheToolsofBiochemistry:CooperT.G.,JohnWileyandSonsPublication.
3. Biophysicalchemistry.PrinciplesandTechniques:UpadhayayA,UpadhayayKandNath N.,Himalayapublishing house.
4. ExperimentalBiochemistry.CarkJrJ.M.andSwitzerR.L,W.H.FreemanandComp any.
5. ResearchMethodologyforBiologicalSciences:Gurumani.N.M.J.P.Publishers.,Che nnai,India.
6. Instrumental Methodsof ChemicalAnalysis:Chatwal.GandAnand.S.,HimalayaPublishingHouse, Mumbai, India.
7. ABiologist'sGuideto Principles andTechniquesof Practical Biochemistry:Williams. B.L.andWilson.K.(ed.)EdwardArnoldLtd.London
8. Jayaraman, J. (2011). Laboratory Manual in Biochemistry, New Age International (P)Ltd.
9. Sadasivam, S. and Manickam, A. (2005). Biochemical Methods, Second edition, NewAgeInternational (P) Ltd.

IV-SEMESTER

BIOENERGETICSANDMETABOLISMOFCARBOHYDRATES AND LIPIDS-
(CourseNo-3)

COURSEOBJECTIVES

1. To acquire knowledge related to the intermediary metabolism and the role of TCAcyclein central carbonmetabolism.
2. To learn basic concepts of Bioenergetics, the importance of high energy compounds,electron transport chain, synthesis of ATP, mechanisms of oxidative phosphorylationandphotophosphorylation.
3. To understandthefundamentals ofcellularmetabolism ofcarbohydratestheirassociation withvariousmetabolicdiseases.
4. To learnbiosynthesisanddegradation ofLipids,fattyacidsandcholesterol, Metabolism of lipoproteins and Ketone bodies.

UNIT-I

Principles of thermodynamics, free energy, enthalpy and entropy, Free energy changes inbiologicaltransformationsinlivingsystems.Redoxpotential,phosphategrouptransferpotential and ATP, High-energy compounds,oxidation and reduction reactions.

UNIT-II

Oxidativephosphorylation,Mitochondriaultrastructure,Energyharnessingcascadefromnutrients , Reducing equivalents, Electron transport and its carriers-Complex I, II, III, IV;Mitchell's Hypothesis—experimental verification, Determination of P:O ratio, ATP synthesisby F1-FO ATP synthase, E. Racker's experiment. Relation of proton movement and ATPsynthesis.Experimental demonstration ofthe movement ofATPsynthase.

Oxidationandreductionenzymes,utilization ofoxygenabyoxygenase's,superoxidedismutaseand catalase.respiratorycontrol,Mechanism,andtheories ofoxidative phosphorylation. Respiratory chain inhibitors and uncouplers of oxidative phosphorylation.Microsomelectron transportsystem. Bioluminescence.

UNIT-III

Approaches for studying intermediary metabolism. Glucose as fuel, glucose transporters,Glycolysis,anditsregulation.Substratecycling,TCAcycle— functionandregulation,Glyoxylatecycle,Gluconeogenesis,anditsregulation,HMPshuntanditssignificance,Uronicacidpathway,Glycogenmetabolismanditsregulationwithspecialreferencetophosphorylaseandglycogensynthase, Metabolism offructose,galactoseandlactose,Biosynthesis of amino sugars, peptidoglycans, glycosyl aminoglycans and glycoproteins. Inbornerrors ofcarbohydrate metabolism.

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UNIT-IV

Lipid metabolism – Oxidation of fatty acids, Biosynthesis of fatty acids and regulation;Metabolism of arachidonic acid; formation of prostaglandins, thromboxanes, leukotrienes,Biosynthesisof triglycerides.

UNIT-V

Metabolism of phospholipids, sphingolipids. Biosynthesis of cholesterol and its regulation,Formation of bile acids. Role of liver and adipose tissue in lipid metabolism. In born errors oflipid metabolism

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IV-SEMESTER

BIOENERGETICSANDMETABOLISMOFCARBOHYDRATESANDLIPIDS-
(CourseNo-3)

PRACTICALSYLLABUS

1. Isolationofcaseinfrommilk
2. Preparationoflactalbuminfrommilk
3. EstimationofreducingsugarbyDNSA(dinitrosalicylicacid)method
4. TitrationofglucosebyBenedict'smethod
5. EstimationofureabyDiacetylmonoximemethod
6. Estimationofcreatinineinserum
7. EstimationofcholesterolbyZAK'smethod

COURSEOUTCOMES

Afterthe completion ofthis course,the student willbeableto

1. Explainthebroadoutlinesofintermediarymetabolismandimportanceofcarbohydratemetabolismin life.
2. DescribetheimportanceofElectrontransportandATPproductionmechanism.
3. GaininknowledgeinCarbohydratemetabolismandtheirassociatedwithdisorders.
4. Describethedetailsof lipidmetabolism.

RECOMMENDED BOOKS

1. PrinciplesofBiochemistry, White.A, Handler, PandSmith.
2. Biochemistry, LehningerA.L.
3. Biochemistry, DavidE.Metzler.
4. Biochemistry, LubertStryer.
5. TextofBiochemistry, WestandTodd.

IV-SEMESTER
ClinicalBiochemistry-(CourseNo-4)

COURSEOBJECTIVES

1. To understand the basic concepts of laboratory techniques.
2. To understand the basic concepts of organ functions.
3. To gain knowledge about various investigations and their interpretations.

UNIT-I

Clinical Biochemistry Laboratory and Investigation of Homeostasis. The use of biochemical tests- Specimen collection and types, Automation and Computerization Water and electrolyte homeostasis - renin angiotensin – aldosterone system Pathological variations of water and electrolytes- diagnosis and Interpretations Self Study: Acid base balance and imbalance - Mechanism of regulations, Anion gap, Acidosis and Alkalosis.

UNIT-II

Abnormal Hemoglobin and Inherited Disorders 9hrs Inborn errors of Metabolism: Patterns of inheritance-

alkaptonuria, phenylketonuria, albinism, glycogen storage diseases and inherited disorders associated with urea cycle. Abnormal hemoglobin and hemoglobinopathies- Sickle cell anemia and thalassemias, porphyrias and porphyrinurias. Self-study: Plasma proteins in health and diseases

UNIT-III

Investigation of Renal and Gastric Functions. Renal function tests: Preliminary investigations, tests based on GFR, RPF and tubular function. Diseases related to kidney - nephritis, nephrosis, uremia, renal failure, renal calculi, renal hypertension, renal tubular acidosis, diabetes insipidus.. Dialysis - hemodialysis and peritoneal dialysis. Gastric function tests: Examination of resting content, Fractional gastric analysis, stimulation tests, Tubeless gastric analysis. Malabsorption syndrome, acidity, ulcers - gastric, duodenal and peptic, colon cancer, pancreatitis, gastric and pancreatic 'function tests. Self study: Gout, Lesch-Nyhan syndrome and orotic aciduria.

UNIT-IV

Liver Function Tests and Lipid Disorder Liver function tests: Tests based on abnormalities of bile pigment metabolism, detoxification and excretory functions. Diagnosis of different types of jaundice. Pancreatic function tests. Diseases relating to liver - jaundice, cirrhosis, hepatitis, cholestasis, cholelithiasis, hepatic coma, hepatic carcinoma, inherited diseases of bilirubin metabolism Lipid: Lipoproteins and atherosclerosis coronary heart diseases and hypertension. Self study: Biochemical changes in cancer-detection of tumor markers

UNIT-V

Blood Glucose Regulation and Enzymes of Diagnostic Importance 9hrs Carbohydrates: Blood glucose level - regulation and its clinical significance, Diabetes mellitus, Glycosuria and GTT. Enzymes and Isoenzymes of clinical importance - general principles of assay - Clinical significance of enzymes and isoenzymes (LDH, CK, phosphatase, 5' nucleosidase,

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amylase, lipase, acetylcholinesterase, transaminase and gamma glutamyl transferase) Self study: meningitis, encephalitis, epilepsy, Parkinson's, Alzheimer's, cerebral palsy.

IV-SEMESTER

Clinical Biochemistry-(Course No-4)

PRACTICALS SYLLABUS

1. Blood analysis:
Iron and Hemoglobin, Glucose, GTT. 10hrs
2. Serum and Urine analysis:
Creatinine, chloride, phosphorus, calcium. 10hrs
3. Lipid profiles (Serum) –
Total cholesterol, triglycerides, HDL, LDL 5hrs
4. Liver function tests –
Total Bilirubin, total protein, albumin, globulin, albumin/globulin ratio,
AST, ALT, ALP 10 hrs
5. Kidney function
tests Urea, creatinine, uric acid.

COURSE OUTCOMES

1. After completing this course, the student will:
2. Obtain basic knowledge about specimen collections, pathological variations of water, electrolytes
3. Interpret the results to diagnose the abnormal functions of organs.
4. Understand the antinutrient factors and its implication on other nutrients in food. Understand the patterns of inherited disorders and disorders of hemoglobin metabolism
5. Correlate the tests used for renal and gastric functions and their interpretations
6. Impart the diagnostic tests for liver function and lipoprotein metabolic disorders
7. Evaluate the alterations in blood glucose regulation and enzymes of clinical importance

REFERENCE BOOKS

1. Gowenlock, A.H. and Donald, J(2002). Varley's practical clinical Biochemistry, sixth edition, CBS publications and Distributors, New Delhi.
2. Sembulingam, K and Sembulingam, P(2010). Essentials of Medical Physiology, fifth edition. Jaypee Brothers (p) ltd, New Delhi.
3. Burtis and Ashwood (2007) Tietz Fundamentals of Clinical chemistry, 6th edition, WBSaunders Company, Oxford Science Publications USA.
4. Chatterjee and Shinde (2012). Textbook of medical biochemistry, 8th edition.
5. Devlin, T.M(2010). Textbook of Biochemistry with clinical correlations, 7th edition. New York.
6. Gans, G and Murphy, J.M.(2008). Clinical Biochemistry, fourth edition, Churchill Livingstone, Elsevier

V -
SEMESTERNUTRITIONALBIOCHEMISTRY-
(CourseNo-5)

Credits-3

CourseObjectives:

1. To compile various Nutrition and balanced diet, various dietary requirements of nutrients.
2. To acquire knowledge about protein calorie malnutrition
3. To revise the facts about Fat- and Water-soluble vitamins and their importance. 5. To extract facts about Obesity and various lifestyle associated diseases

UNIT-I

Animal and vegetative foods – chemical composition. Nutrients – Essential Nutrients and their classification. Digestibility, absorption and biochemical functions of macro nutrients, Carbohydrates – dietary requirements. Proteins – Nitrogen balance studies, Determination of Biological values of proteins, Specific Dynamic Action, improvement of protein quality by supplementation and fortification. Lipids– Dietary needs of lipids, essential fatty acids. Calorific values of foods, Basal metabolic rate and its determination, factors influencing BMR.

UNIT-II

Clinical nutrition – role of diet and nutrition in prevention of atherosclerosis and obesity, role of leptin in regulation of body mass. Starvation – Protein sparing treatment during fasting, Protein calorie malnutrition– Kwashiorkor and Marasmus, Nutritional requirements for pregnant and lactating women and aged people.

UNIT-III

Biological effects of non-nutrients, dietary fibre, physiological actions. Antinutrients–Protease inhibitors, hemagglutinins, hepatotoxin, goitrogens, cyanogenic glucosides, methylxanthines, oxalates. Toxins from mushrooms. Biological effects of food contaminants– Hexachlorobenzene, arsenic, DDT, cadmium, mercury, lead, aflatoxins, food additives-saccharin and sodium nitrite. Animal foods and seafoods. Food allergy – role of allergens, diagnosis and management of food allergy. Food processing and loss of nutrients during processing and cooking.

UNIT-IV

Vitamins – Fat soluble vitamins (A, D, E, K) and Water soluble vitamins (B complex and C) (Sources, biological functions and RDA), Disorders of vitamins A, D, E, K, Vitamin C and B-complex vitamins: Thiamin, Riboflavin, Niacin, Pantothenic acid, Lipoic acid, Pyridoxine, Biotin, folic acid and vitamin B12. Minerals- iron, calcium, iodine, selenium (Sources, biological functions and RDA). Deficiency disorders of minerals Nutritional requirements in infancy, childhood, pregnancy and lactation and old age.

UNIT-V

Obesity–Causes, Anthropometric measurements and Diet management. Dietary management in – Infection, Fever, Constipation, Diabetes mellitus, Peptic Ulcer, PCOS, Hypertension, Cardiovascular diseases, Pancreatitis, Cirrhosis and Cancer

V -
SEMESTERNUTRITIONALBIOCHEMISTRY-
(CourseNo-5)

Credits-1

PRACTICALS

1. Determination of reduced Ascorbic acid by DCPIP method
2. Determination of total Ascorbic acid by DNPH method
3. Determination of calcium in the food
4. Isolation of casein from milk and determination of its protein by any method
5. Determination of cholesterol of edible oil
6. Determination of ash content
7. Determination of moisture content of foods/food grains/powders
8. Determination of fructose from honey/fruit pulp
9. Determination of pyridoxine of fruits/leaves
10. Isolation of lactose from skimmed milk and the estimation of lactose
11. Determination of iodine value of edible oil by titrimetry
12. Determination of acid value by titrimetry

COURSE OUTCOME

1. Analyse the role of various nutrients, their dietary allowances and relate in day-to-day life.
2. Revise the Knowledge about the water- and fat-soluble vitamins and its significance and its functions
3. Outline the Knowledge about Obesity and obtaining better results

REFERENCE BOOKS:

1. Smith EL (1983) Principles of biochemistry: mammalian biochemistry: McGraw-Hill Companies.
2. Chatterjee CC (1951) Human physiology: Medical Allied Agency.
3. Murray R, Granner D, Mayes P, Rodwell V (2003) Harper's illustrated biochemistry (LANGE basic science): McGraw-Hill Medical.
4. Guyton Aurcher C, Hall John E (2006) Text book of Medical Physiology. Elsevier India Pvt. Ltd. New Delhi.
5. Dixon M, Webb E (1979) Enzyme inhibition and activation. Enzymes 3: 126-136.
6. Rao C (1973) University General Chemistry: An Introduction to Chemical Science: Mac Millan India.
7. Price NC, Frey PA (2001) Fundamentals of enzymology. Biochemistry and Molecular Biology Education 29: 34-35.
8. Palmer T, Bonner PL (2007) Enzymes: biochemistry, biotechnology, clinical chemistry: Elsevier

V -

SEMESTER ENZYMOLOGY -
(Course No 6)

COURSE OUTCOMES

1. To enlighten the students about enzyme kinetics.
2. To help the students to understand the mechanism of action of enzymes.
3. To help the students to learn the application of enzymes.

UNIT-I

Introduction to enzymes: Holoenzyme, apoenzyme, prosthetic group. Interaction between enzyme and substrate- lock and key model, induced fit model., enzyme specificity and types. IUB system of classification and nomenclature of enzymes (Class and subclass with one example) Ribozymes, Abzymes.

UNIT-II

Enzyme kinetics: Importance, order of reaction, study of the factors affecting the velocity of enzyme catalyzed reaction- enzyme concentration, temperature, pH, substrate concentration, inhibitors and Derivation of Michaelis -Menten equation and K_m value determination and its significance. Definition of V_{max} value of enzyme and its significance. Lineweaver- Burk plot (Only for single substrate enzyme catalyzed reaction).

UNIT-III

Methods of measurements and expression of enzyme activity. Unit of enzyme activity- definition and importance. Enzyme inhibition: Reversible and irreversible - examples. Reversible- competitive, noncompetitive and uncompetitive inhibition- explanation of double reciprocal plot with examples.

UNIT-IV

Enzyme regulation - covalently modulated enzymes with examples of adenylation and phosphorylation and allosteric regulation- example Aspartate trans carbamoylase. Isoenzymes- Lactate dehydrogenase and creatine phosphokinase. Zymogens

UNIT-V

Immobilization of enzymes, methods of immobilization. Industrial uses of enzymes: Detergent enzymes, thermo stable α amylase, papain, chymotrypsin

V -

SEMESTER ENZYMOLOGY-

(Course No-6)

Credits-1

PRACTICAL SYLLABUS

1. Assay of α -amylase activity in saliva
2. Determination of optimum pH of a plant/animal or microbial enzyme.
3. Studying the effect of different temperatures during enzyme activity measurements.
4. Studying the effect of different pH during enzyme activity measurements.
5. Substrate saturation and determination of K_m value from Michaelis-Menten curve.

After completing this course, the student will:

1. Acquire the knowledge of structure and organization of protein
2. Identify the different classes of enzymes, the methods used for purification of enzymes and describe enzyme kinetics for bi-substrate and multi-substrate reactions.
3. Do research in a contemporary action of enzyme and enzyme inhibition.
4. Explain the enzyme regulation and multi-enzyme complex.
5. Explore the applications of enzymes in clinical and various industrial sectors.

REFERENCE BOOKS

1. Enzymes: M. Dixon and E. C. Webb. Longman Publication.
2. Enzymology: Nicholas and Price
3. Biochemistry: D. Voet and J. G. Voet, John Wiley & Sons Inc. New York, Chichester, Brisbane, Toronto, Singapore ISBN 0-471-58651-X
4. Biochemistry: L. Stryer and Hall, J. E., Library of Congress Cataloguing in Publication Data, Bery, Jeremy Mark ISBN-0-7167-4684-0.
5. Enzymes: Trevor Palmer Affiliated East-West Press Pvt. Ltd, New Delhi ISBN 81-7671-04

GOVT. COLLEGEFORWOMEN(A)SRIKAKULAM

DEPT. OF BIOCHEMISTRY

B.ScSEMESTER–II,PAPER-II

BIOCHEMISTRY(MINOR)

MODELQUESTIONPAPER

Bio-Molecules

CODE:BCH-I

TIME:3hrs.

MARKS:60

SECTION-I

writeessayQuestionAnsweranyFiveofthefollowing

5x8=40

1) a)writeabouttheBiologicalBuffers?

(OR)

b)Writeabout thePH and Pkavalues ofwater?

2) a) WritetheClassificationofCarbohydrates?

(OR)

b) WritetheHomopolySaccarides?

3) a)Writethegeneral properties offats&Oils?

(OR)

b) Membranecompositionandorganization(fluidmosaicmodel)

4) a) WritetheTitrationcurveofglycogen?PH&pkaValey?

(OR)

b)StructuralOrganizationofProteins?

5) a)WriteaboutthestructureofNucleicacidwatsoncrickdoublebellivemodel.

(OR)

b)WritetheStructureofcytochrome?

Section-II

Short Questions Answer any five of the following

5x4=20

1. Electrical Conductivity?
2. Analysis of Drinking water & pond water?
3. Write about the disaccharides?
4. Bacterial cell wall of Polysaccharine?
5. Write the Phospholipids?
6. Write about the Lipo Proteins?
7. Naturally accruing Peptides?
8. Denaturation of Proteins?
9. Structure of t.RNA?
10. Structure of Chlorophyll?

GOVERNMENT COLLEGE FOR WOMEN (A), SRIKAKULAM
B.ScBio-ChemistrySyllabus(w.e.f:2024-25)

B.Sc. Choice Based Credit System (CBCS)
Subject: B I O C H E M I S T R Y
Model Question Paper (Theory)
Paper: III/IV

Time: 3 Hrs

Max. Marks: 60

SECTION - A

Answer ANY FIVE questions

Each question carries 10 marks 5 x 8M = 40 Marks

(Select two questions in each unit)

1. a) UNIT-I
OR
b) UNIT-I
2. a) UNIT-II
OR
b) UNIT-II
3. a) UNIT-III
OR
b) UNIT-III
4. a) UNIT-IV
OR
b) UNIT-IV
5. a) UNIT-V
OR
b) UNIT-V

SECTION - B

Answer ANY FIVE questions

Each question carries 5 marks 5 x 4 = 20 M

6. UNIT-I
7. UNIT-I
8. UNIT-II
9. UNIT-II
10. UNIT-III
11. UNIT-III
12. UNIT-IV
13. UNIT-IV
14. UNIT-V
15. UNIT-V
