S.R.R. & CVR Government Degree College

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NAAC accredited Institution with grade B+ with C.G.P.A 2.6 during March 2017

Machavaram, Vijayawada, Krishna District, AP-520 004

(3)

Board of Studies - AY:2021-22

313: B.Sc., MBC
309: B.Sc., M.B.F.

Department of Biochemistry

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Department of Biochemistry

Report on 6th Board of Studies Meeting for U.G. Programmes of the Department for AY-2021-22

Composition of the BoS of Biochemistry as Per U.G.C. Guidelines

S.No	Name of the Faculty	Designation	Signature
1	Smt. Syed Vaziha Tahaseen, Lecturer Department of Biochemistry S.R.R. & CVR Government Degree College, Vijayawada Mobile: 9948740949, Email: vazeehatahaseensuraj@gmail.com	Chairperson	Syed V Tahaseen
2	Dr.L.Suseela Assistant professor Department of Biotechnology & Biosciences Krishna University Machilipatnam	University Nominee	L Suseela 24/11/2021
3	Dr. P.Kiranmayi Assistant professor Department of Biochemistry Acharya Nagarjuna University, Nagarjuna Nagar, Guntur	Subject Expert	Dr. P. KIRANMAYI, M.Phil.,Ph.D. Assistant Professor Department of Bio Chemistry Acharya Nagarjuna University Nagarjuna Nagar - 522 510, A.P.
4	Mrs. D. Vijayasree, Lecturer Department of Biochemistry GDC for Women, Guntur.	Subject Expert	
5.	Dr. Kisore Babu Govada Laila Nutraceuticals, Vijayawada Mobile:9908630910, Email: kishorempharm@gmail.com	Industrial Expert	24/11/2021
6.	M. Ratna Kumari Studying P.G. in Biochemistry Acharya Nagarjuna University Nagarjuna Nagar, Guntur	Postgraduate student	M. Ratna kumari
7.	E. Sarojini Devi Lecturer in Biochemistry SRR&CVR GDC, Vijayawada.	Member	E. Sarojini Devi

Principal 24.11.2021

PRINCIPAL
SRR & CVR GOVT. DEGREE COLLEGE
(Autonomus)
Machavaram, VIJAYAWADA - 520 004.

PREFACE

S.R.R. & CVR Govt. Degree College (Autonomous), Vijayawada, is one of the prestigious educational institutions located in a historically significant place like Vijayawada in Krishna District, Andhra Pradesh. Vijayawada is a place of historical and cultural significance and importance. In the same way, S.R.R. & CVR Govt. Degree College has also acquired its reputation and prominence in and around Vijayawada by molding the lives of many students to become great personalities. This college is named after late Sri Raja Rangayyappa Rao and late Sri Chunduru Venkata Reddy, who have been great and noble donors of the city Vijayawada, by whose generosity the college has reached and attained such and this elevated status by way of shaping the lives of many generations of students making them worthy citizens of the country. This college has acquired excellent standards academically by the contributions of great teachers because, in the history of any educational institution, its teachers play a vital role. The college was established in 1937. It offers 27 undergraduate and ten postgraduate academic programmers with 86 regular faculty members. The college has a total strength of around 2,800 students, including 1550 boys and 650 girl students. The Institution was accredited with grade B+ with C.G.P.A 2.6 during March 2017 by NAAC and got ISO 9001: 2015 certificate during 2019. The college was ranked by NIRF in 101-150 band at NIRF-2020 & 151-200 band at NIRF 2019.

. The department of biochemistry in S.R.R. and CVR Government Degree College, Machavaram, Vijayawada established as restructure course in the year 1998. The B.Sc. course in Biochemistry with the combination of Microbiology, Chemistry/Food technology is of 03/04 years duration. According to the Semester System, the choice-based credit system (CBCS) has been implemented since 2017. The department has also offered UGC COP MLT certificate courses since 2005. The department has sufficient infrastructure necessary for undergraduate practical and research, constitutes an electronic pH meter, electronic balance, laboratory incubator, autoclave, light microscopes, water distillation unit, hot air oven, microtome, colorimeter, etc. spectrophotometer. In addition to the central library of the college, the departmental library is well maintained with reference books, including international editions and entrance exam practice books. The department is also provided with a projector with a screen to deliver ICT-based lectures. The department's objectives are to achieve excellence in teaching through periodic class tests, seminars, group discussions, preparing the students to participate in various competitions, organizing seminars, workshops, conferences, and field trips.

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Department of Biochemistry

BOARD OF STUDIES MEETING FOR BIOCHEMISTRY COURSE
AGENDA
ACADEMIC YEAR: 2021-22

The 6th meeting of the Board of Studies in Biochemistry course was convened on 24th November 2021 at 01.00 p.m. in the Department of Biochemistry, Science block, under Chairmanship of Syed Vaziha Tahaseen, the In-Charge of the department, with the following agenda:

Agenda:

1. To consider and approve course Structure of Biochemistry with course codes BCN-1325 and BCN-2325 for the admitted batch - 2021-22.
2. To consider and approve BC-N-3325, BCN-4325, and BCN-5325 Syllabi for Courses in Semester III & IV under CBCS with Learning Outcomes-based Curriculum Framework (LOCF) for the academic year 2021-22 onwards.
3. To consider and approve BC-5325-5, B-5325-6 , BC-7325A, BC-7325B ,BC-8325B1, BC-8325B2, BC-8325B3 Syllabi for Courses in Semester V and Semester VI under CBCS
4. To consider and approve UGC COP Medical Lab Technology as an add-on course for Undergraduate students of all programs.
5. To approve the syllabus for life skill course Environmental education
6. To consider and approve the Student Evaluation Policy and Procedure and split-up of C.I.A. & SEE.
7. To consider and approve the list of Question paper setters and examiners.
8. To consider and approve the Departmental Activities Calendar.
9. To consider and approve the Students Centered Pedagogy Policy to enrich the curriculum.
10. Any other with the permission of the chair.

Members present

S.No	Name of the Faculty	Designation	Signature
1	Smt. Syed Vaziha Tahaseen Department of Biochemistry S.R.R. & CVR Government Degree College, Vijayawada Mobile: 9948740949, Email: vazeehatahaseensuraj@gmail.com	Chairperson	
2	Dr.L.Suseela Assistant professor Department of biotechnology & biosciences Krishna University Machilipatnam	University Nominee	24/11/2024
3	Dr. P.Kiranmayi Assistant professor Department of Biochemistry Acharya Nagarjuna University, Nagarjuna Nagar, Guntur	Subject Expert	Dr. P. KIRANMAYI, M.Phil.,Ph.D. Assistant Professor Department of Bio Chemistry Acharya Nagarjuna University Nagarjuna Nagar - 522 510 A.P.
4	Mrs. D. Vijayasree Lecturer Department of Biochmistry GDC for Women, Guntur.	Subject Expert	
5.	Dr. Kisore Babu govada Laila Nutraceuticals, Vijayawada Mobile:9908630910, Email: kishorempharm@gmail.com	Industrial Expert	24/11/2024
6.	M. Ratna Kumari Studying P.G. in Biochemistry Second Year Acharya Nagarjuna University Nagarjuna Nagar, Guntur	Postgraduate student	M. Ratna Kumari
7.	E.Sarojini Devi Lecturer in Biochemistry SRR&CVR GDC, Vijayawada.	Member	E. Sarojini

Structure of BIOCHEMISTRY Syllabus

(Under CBCS for 3-year B.Sc. Programme)

(With domain subject covered during the first 4 Semesters with 5 Courses)

Year	*Semester*	*Courses*	*Title of the Course*	*Marks*	*No.ofHrs/Week*	*No.ofCredits*
I	I	I	BCH-1 Biomolecules	100	4	04
			Practical – BCP-101 Qualitative Analysis	50	2	01
	II	II	BCH-II Analytical techniques	100	4	04
			Practical – BCP-201 Biochemical Techniques	50	2	01
II	III	III	BCH-III Enzymology, Bioenergetics, and Intermediary Metabolism	100	4	04
			Practical – BCP-301 Quantitative analysis	50	2	01
	IV	IV	BCH-1V Physiology, Nutritional and Clinical Biochemistry	100	4	04
			Practical – BCP-401 Nutritional and Clinical Biochemistry	50	2	01
		IV	BCH-V Microbiology and Immunology	100	4	04
			Practical – BCP-501 Microbiology and Immunology	50	2	01
Total No. of Courses: 05 (Five)						

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Department of Biochemistry

6 th BOARD OF STUDIES MEETING FOR BIOCHEMISTRY
COURSE CONDUCTED ON 24th NOVEMBER 2021
MINUTES
ACADEMIC YEAR: 2021-22

The Minutes of the 6th Board of Studies meeting in Biochemistry was convened on 24th November 2021 at 01.00 p.m. under the Chairmanship of Syed Vaziha Tahaseen; the In-Charge of the department is as follows:

Minutes and Resolutions of Board of Studies Meeting

Agenda 1: To discuss about the outline of the course.

Proposal: The Chairperson, Syed Vaziha Tahaseen, the In-Charge of the department, welcomed BoS members and initiated discussion on agenda points.

Discussion: The Chairman B.O.S. Syed Vaziha Tahaseen explained about the programs existing in the academic year 2020-21, conveyed about the 2020-2021 academic year introduced M.B.F. course, admissions. And explained the acievement of the out went batch students as two of them were selected for P.G. courses at Central universities.

The outline of course structure, theory, practical course, credits, and allotted lecture hours are discussed with the members. University Nominee Dr. Suseela enquired about the titles of the papers. E Sarojini madam conveyed that the semester IV, paper V title has been changed as Microbiology and Immunology.

Agenda 2: To consider and approve the course Structure of Biochemistry with course codes BCN-1325 and BCN-2325 for the admitted batch - 2021-22.

Discussion: Dr. Kisore, industrial expert suggested to include the concept soil analysis as additional input in unit 1 of semester 1.

Resolution 1: It is resolved to approve the biochemistry course structure for the semester I and II. The soil analysis, micelles, and porphobilinogen concepts are kept as additional inputs for units I, III, and V respectively.

Resolution 2: The Woodward Fieser rule was introduced in Spectrophotometry.

Agenda 3: To consider and approve BC-N-3325, BCN-4325, and BCN-5325 Syllabi for Semester III & IV courses for the academic year 2021-22 onwards.

Discussions: The board members were agreed with the change in title for semester IV paper V, as the molecular biology unit is replaced with the in-depth concepts of immunology. The chairperson conveyed that the molecular biology paper will be introduced as a separate course in semester V for the academic year 2022-23.

Proposal: The chairperson, Sd V Tahaseen, proposed to delete photosynthesis from the carbohydrate unit and introduce it in paper V.

Discussion: Dr. Kiranmayi, subject expert, appreciated this change, and other members accepted.

Resolution 3: The photosynthesis topic was introduced in paper V chapter 2.

Proposal: Dr. Suseela, the university nominee, proposed introducing the mechanism of nerve impulse transmission in paper IV UNIT 3.

Discussion: As students understood the structure of neuron in course IV, the members recognized the importance of introducing nerve impulse transmission and accepted it.

Resolution 4: The concept of nerve impulse transmission was introduced in unit 2, paper IV

Proposal: It was proposed by Dr. Kishore, an industrial expert, to introduce Sars CoV2 as an example of an animal virus. And to introduce Cystatin C as a marker for kidney function tests in addition to G.F.R. and creatinine, and to introduce the monoclonal antibodies role as a cocktail injection for Covid 19 treatment.

Discussion: The members of BoS had a fruitful discussion on the introduction of Sars CoV2 (Severe acute respiratory syndrome-related coronavirus) as an example for animal virus and marker Cystatin C and the cocktail therapy.

Resolution 5: As an example for an animal virus, Sars virus was taken, and Cystatin C significance as a marker, cocktail monoclonal antibody treatment was included as additional input in the syllabus with the acceptance of all the members.

Proposal: Mrs.Vijayasree, the subject expert, proposed to take the example of adrinalin hormone to explain the signaling pathway for hormone action instead of insulin.

Resolution 6 : The above-suggested proposal was accepted.

Agenda 4 : To consider and approve BC-5325-5, B-5325-6 , BC-7325A, BC-7325B ,BC-8325B1,BC-8325B2, BC-8325B3 Syllabi for Courses in Semester V and Semester VI under CBCS .

Proposal: The chairperson BoS proposed to accept the syllabus for the courses mentioned

Resolution 7: It is resolved to continue the same syllabi proposed in the 5 th BoS meeting for the courses mentioned above.

Agenda 5 : To consider and approve syllabus for UGC COP Medical Lab Technology as an add-on course for Undergraduate students of all programs.

Proposal: To discuss the syllabus for add-on course, "COP in Medical Lab Technology" i.e Certificate course in MLT , Diploma in MLT, Advanced diploma in MLT, approval for issue of notification by the COE, SRR&CVR GDC, conduct of the final examination by the COE autonomous cell SRR&CVR GDC, and issue of certification by Krishna University.

Discussion: BoS university nominee, Dr. Suseela Madam and other members of BoS appreciated for succesfully conducting the UGC sponsered MLT course since 2005 in biochemistry department.

Resolution 8 : The syllabus was approved by the BoS committee, It is resolved to conduct the course under autonomy for issue of notification and conduct of examination.

Agenda 5 : To approve the syllabus for life skill course Environmental education.

Resolution: It is resolved to implement the syllabus prescribed by APSHE without any changes for academic year 2021-22.

Agenda 6: To consider and approve the Student Evaluation Policy and Procedure and split up of C.I.A. & SEE.

Proposal: The chairman proposed that the evaluation system in each course be 40: 60 for Internal Continuous Internal Evaluation (C.I.A.) and Semester **End Evaluation (SEE).**

Discussion: Faculty members of the department expressed their willingness to frame question papers based on the active verbs used to prepare question paper patterns on Bloom's Taxonomy.

Resolution 9: It is resolved to approve the Student Evaluation Policy and Procedure and split-up of C.I.A. & SEE.

Agenda 7: To consider and approve the list of Question paper setters and examiners.

Resolution 10 : The list of Question paper setters and examiners was approved.

Agenda 8: To consider and approve the Departmental Activities Calendar.

Resolution 11: The departmental activity calender was appreciated by board members.

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Department of Biochemistry

Programme-313 and 309

w.e.f Academic Year - 2021-22

Program Specific Outcomes (PSOs) for 313 and 309

PO1 **Critical Thinking**: The Student acquires in-depth knowledge about experimental strategies and scientific approaches used to address questions about biological processes at the molecular level. Analyze scientific information by identifying components, relationships, and patterns, both in experimental data and ideas

PO2 **Effective Communication:** The Student will read, understand, design, and critically interpret the biological literature in their area of interest. The student will explain and apply scientific information to solve problems in familiar and unfamiliar situations. Elicit views of others, mediate disagreements, and help research conclusions in group settings.

PO3 **Modern tool usage:** The Student can function successfully within laboratory and field settings, including using basic and advanced tools and equipment (microscopes, measurement devices, and computer technologies) and utilizing appropriate safety protocols.

PO4 **Conduct investigations of complex problems:** The Student will be able to conduct background research on life science topics to make informed decisions, including understanding basic concepts and processes necessary to investigate issues, applying skills for information, drawing on personal observations, and formulating decisions on topics that can be put into practice in home and community settings.

PO5 **Ethics:** The Student will recognize and be able to apply basic ethical principles to basic and applied biological/biomedical practice and understand the role of biological/biomedical science, scientists, and practitioners in society.

P06 **Skills:** The Student will be able to utilize various learning skills, including critical thinking and decision-making skills, and communication skills for analyzing learning and sharing

information with others. The student will design, conduct, research, and communicate (in writing and orally).

PO7 **Lifelong learning:** Acquire the ability to engage in independent and lifelong learning in the broadest context of socio-technological skills. Enable students to discuss how science and technology are interdependent and assist each other in developing knowledge and technological applications throughout life.

Members present

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1	Smt. Syed Vaziha Tahaseen Department of Biochemistry S.R.R. & CVR Government Degree College, Vijayawada Mobile: 9948740949, Email: vazeehatahaseensuraj@gmail.com	Chairperson	Sd/ V Tahaseen
2	Dr.L.Suseela Assistant professor Department of biotechnology & biosciences Krishna University Machilipatnam	University Nominee	L. Suseela 24/11/2024
3	Dr. P.Kiranmayi Assistant professor Department of Biochemistry Acharya Nagarjuna University, Nagarjuna Nagar, Guntur	Subject Expert	Dr. P. KIRANMAYI, M.Phil.,Ph.D. Assistant Professor Department of Bio Chemistry Acharya Nagarjuna University Nagarjuna Nagar - 522 510, A P
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Department of Biochemistry

Syllabi for Courses in Semesters I, II, III&IV are under CBCS with Learning Outcomes-based Curriculum Framework (LOCF)

Title of the Course: **Biomolecules -BCN-1325**

Common for BCN-1325 : BSc MBC & MBF

Course Code :	BCN-1325	Continuous Internal Assessment (C.I.A.)	40
No. of Lecture Hours / Week	04	Semester End Evaluation (SEE)	60
Total Number of Lecture Hours	60	Total Marks	100
Practical Component	02 Hour/Week	Exam Hours	03

Course Outcomes (Cos) : Biomolecules

CO1: Students will gain knowledge in the chemistry of biomolecules such as carbohydrates, lipids, proteins, nucleic acids, and porphyrins which make up all the living organisms, including humans.

CO2: Students will be able to understand the classification and properties of biomolecules and their biochemical functions

CO3: This will enable the student to understand the importance of these biomolecules in living organisms and the effects of their alterations in diseases occurring in plants, animals, and humans.

CO4: The students will be able to correlate the reactions of carbohydrates, amino acids, and lipids for identification tests and biochemical pathways.

C.O5:The Students will be able to understand the characterization of biomolecules in research.

CO6: The practicals will give the expertise to the student for analysis of any biological or non-biological sample to identify its chemical composition.

BIOMOLECULES-BCN-1325

Unit - I:

1. Biophysical Concepts **12 hours**

Water as a biological solvent, analysis of drinking water and pond water, Introduction to Different types of waters such as Potable water, Purified Water, Distilled Water, Deionized Water, R.O. Water, Water for Injection, Different Types of Waters used in the pharmaceutical industry, water for Vaccines. Total dissolved salts (T.D.S.), B.O.D., C.O.D. Buffers, measurement of pH, and biological buffers.

Additional input: Soil analysis.

Unit - II:

2. Carbohydrates **12 hours**

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), structural polysaccharides (cellulose, chitin, pectin), and storage polysaccharides (starch, inulin, glycogen). Bacterial cell wall polysaccharides and Blood group substances. Galactomannans and their applications in modern foods.

Unit – III:

3. Lipids **12 hours**

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, Bio Membranes-Membrane composition and organization - Fluid mosaic model.

Additional input: Micelles

Unit-IV:

4. Amino Acids and Proteins **12 hours**

Amino Acids: Classification, structure, stereochemistry, chemical reactions of amino acids due to carbonyl and amino groups. Titration curve of glycine and pk values. Essential and nonessential amino acids, non-protein amino acids. Peptide bond - nature and conformation. Naturally occurring peptides - glutathione, enkephalin.

Proteins: Classification based on solubility, shape, and function. General properties of proteins, denaturation, and renaturation of proteins. Structural organization of proteins- primary, secondary, tertiary, and quaternary structures (E.g., Hemoglobin and Myoglobin). Ramachandran plot.

Unit-V:

5. Nucleic acids and porphyrins **12 hours**

Types of R.N.A. and D.N.A. Structure of purines and pyrimidines, nucleosides, nucleotides. Stability and formation of phosphodiester linkages. Effect of acids, alkali, and nucleases on D.N.A. and R.N.A. Structure of Nucleic acids- Watson-Crick D.N.A. double helix structure, denaturation and renaturation kinetics of nucleic acids-, *T*m-values and their significance, cot curves and their significance.

Structure of porphyrins: Identification of Porphyrins, Structure of metalloporphyrin's–Heme, cytochromes, and chlorophylls.

Additional input: Porphobilinogen

BCN-1325P

List of experiments:

1. Preparation of buffers (acidic, neutral, and alkaline) and determination of pH.
2. Qualitative identification of carbohydrates- glucose, fructose, ribose, 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. Absorption maxima of colored substances-p-Nitrophenol, Methyl orange.
7. Absorption spectra of protein-BSA, nucleic acids-Calf thymus D.N.A.

Recommended books:

1. Soil Testing Manual by Dr. G. S. Wagh.
2. Soil Testing and Plant Analysis: Part I Soil Testing, Volume 2, SSSA Special publications by Glenn W. Hardy.
3. Soil Analysis: An interpretation manual by K. I. Peverill, L. A. Sparrow, D. J. Reuter
4. The biochemistry of Nucleic acids; Adams et al., Chapman and Hall, 1986.
5. Proteins: A guide to study by physical & chemical methods Haschemeyer and Haschemeyer,
6. Proteins: Structure, function, and evolution. Dickerson & Geis, 2nd Edn, Benjamin/Cummings.
7. Biochemistry - Zubay C, Addison – Wesley, 1986.

8. Biochemistry, A problem Approach, 2nd Edn. Wood, W.B. Addison Wesley 1981.
9. Biochemistry, Lehninger A.H.
10. Textbook of Biochemistry West, E.S., Todd, Mason & Vanbruggen, Macmillian &Co.
11. Principles of Biochemistry White-A, Handler, Pand Smith E.L. Mc Grew Hill.
12. Organic chemistry, I.L. Finar, ELBS. (1985).
13. Organic Chemistry by Morrison and Boyd (2000) Prentice Hall.
14. Fundamentals of Biochemistry by Donald Voet (1999).
15. Indian Pharmacopeia available in the pharmacy department

BLUEPRINT
BIOMOLECULES- BCN-1325

S.NO	TYPE OF QUESTIONS / UNITS	SA 4 marks	S.A. 4 marks	S.A. 4 marks	LA 8 marks	LA 8 marks	Total 60 marks
		Questions given	Questions To attempt	Total marks	Questions To attempt	Total marks	Total 60 marks
1	**UNIT-1 Biophysical concept**	2Q	STUDENT CHOICE	4M	1Q	8M	12M
2	**UNIT-II Carbohydrates**	2Q		4M	1Q	8M	12M
3	**UNIT-III Lipids**	2Q		4M	1Q	8M	12M
4	**UNIT-IV Aminoacids and proteins**	2Q		4M	1Q	8M	12M
5	**UNIT-V Nucleic acids and Porphyrins**	2Q		4M	1Q	8M	12M
	Total questions to attempt	5Q		20M	5Q	40M	60M

BIOCHEMISTRY- MODEL QUESTION PAPER
SEMESTER-1
BIOMOLECULES-BCN-1325

Time : 3 hrs **Max. Marks: 60**

Part-A

I Answer any FIVE of the following: **5×4 =20M**

Each question carries **FOUR** marks

1. Total dissolved solids
2.. Structure and biological importance of disaccharides
3. Blood group substances.
5. Structure and biological role of prostaglandins
6. Types and functions of lipoproteins
7. Titration curve of glycine
8. Forces stabilizing the structure of the protein
9. Ramachandran plot
9. Denaturation and renaturation of nucleic acids
10. Types of R.N.A.

Part-B

II Answer **ALL THE** following questions. **5×8=40 M**

Each question carries **EIGHT** marks

11. Explain different types of waters and analysis of drinking water

OR

Discuss the biological buffers

12. List the chemical reactions of carbohydrates with relevant equations

OR

List the bacterial cell wall polysaccharides discuss their structural organization in the bacterial cell wall

13. Discuss the structure and classification of lipids

OR

Write in detail about the fluid mosaic model of plasma membrane

14. Discuss and detail the structure of proteins

OR

Discuss the chemical properties of amino acids due to amino group

15. Discuss about the structure of D.N.A. in detail

OR

Give a detailed account of metalloporphyrins

BIOCHEMISTRY-QUESTION BANK
SEMESTER-1
BIOMOLECULES-BCN-1325

UNIT-1

Short answer questions:

1. Biological relevance of Ph, Pka values.
2. Analysis of drinking water and pond water.
3. total dissolved salts (T.D.S.)
4. (B.O.D.),(C.O.D.).

Essay questions:

1. Explain the role of water as a biological solvent in living system.
2. Write about Different types of water.

UNIT-2

Short answer questions:

1. Mutarotation& epimers
2. Any four chemical reactions of carbohydrates.
3. Structure and examples of any three monosaccharides.
4. Bacterial cell wall polysaccharides.
5. Structure and biological importance of any two disaccharides.
6. Blood group substances.
7. Biological importance of lactose.

Essay questions:

1. Write any five chemical reactions of carbohydrates.
2. Describe the structure and function of polysaccharides.
3. Define carbohydrates. Classify them with examples.
4. Structural polysaccharides.
5. Storage polysaccharides.

UNIT-3

Short answer questions:

1. Fluid mosaic model.
2. Biological role of prostaglandins.
3. phospholipids.
4. fats & oils.
5. Sphingolipids.
6. Simple lipids.

Essay questions:

1. Explain the structure and functions of phospholipids and sphingolipids.
2. Explain the structure and functions of compound lipids.
3. Give an account of the classification of lipids.
4. Discuss the fluid mosaic model of the plasma membrane in detail.
5. Structural & biological importance of prostaglandins.

UNIT-4

Short answer questions:

1. Nature and confirmation of peptide bond.
2. Naturally occurring peptide-glutathione.
3. Essential and nonessential amino acids.
4. Titration curve of Glycine.
5. Nonprotein Amino acids.
6. Denaturation & Renaturation of proteins.
7. General properties of proteins.
8. Hemoglobin & Myoglobin.

Essay questions:

1. Write any four chemical reactions of amino acids due to amino group.
2. Discuss the structure and classification of amino acids.
3. Write any five chemical reactions of amino acids.
4. Discuss about a.) Peptide bond

b.) Naturally occurring peptide.

5. Discuss about the classification of proteins based on their function.
6. Discuss about Structural organization of proteins.

UNIT-5

Short answer questions:

1. Structural components of Nucleic acids.
2. Circular D.N.A.
3. D.N.A. supercoiling.
4. Chargaff's rule.
5. Denaturation and Renaturation of DNA.
6. Cot curve analysis.
7. D.N.A. reassociation curve.
8. Protoporphyrins.
9. Chlorophylls.

Essay questions:

1. Watson-Crick D.N.A. double helix structure.
2. D.N.A. Reassociation kinetics, cot curves, and their significance.
3. Discuss about different types of RNA'S.
4. Discuss about the Structure of chlorophyll a and chlorophyll b
5. Structure of Metalloporphyrins haem, Cytochromes & Chlorophylls.

S.R.R. & CVR Government Degree College

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NAAC accredited Institution with grade B+ with C.G.P.A 2.6 during March 2017

Machavaram, Vijayawada, Krishna District, AP-520 004

Department of Biochemistry

Syllabi for Courses in Semesters I, II, III&IV are under CBCS with Learning Outcomes-based Curriculum Framework (LOCF)

Title of the Course: Analytical Techniques- BCN-2325

Common for BCN-2325 : BSc MBC & MBF

Course Code :	BCN-2325	Continuous Internal Assessment (C.I.A.)	40
No. of Lecture Hours / Week	04	Semester End Evaluation (SEE)	60
Total Number of Lecture Hours	60	Total Marks	100
Practical Component	02 Hour/Week	Exam Hours	03

Course Outcomes (Cos): Analytical Techniques

CO 1: The student will learn the various analytical techniques and applications in separating and isolating cells and tissues.

CO2: Will enable the student for isolation, purification, and chemical characterization of compounds having medical and commercial importance.

CO3: Students will be familiarized with the theory of the chromatographic separation process, and they will be able to apply theoretical knowledge in the optimization of chromatographic separation.

CO4: At the end of this course, students must illustrate the working principles underlying electrophoresis, centrifugation techniques, and their applications in biochemistry.

CO5:Students will learn about autoradiography and understand the principle and the instrumentation of a spectrophotometer, relevant UV-visible spectroscopy, and outline of U.V. spectroscopy devices.

CO6: The practicals will provide expertise to the students in isolating bacteria. The expertise gained by the student in this course can be helpful in food industries, pharma industries, clinical and microbiological labs.

ANALYTICAL TECHNIQUES- BCN-2325

Unit-I: Cell homogenization and centrifugation 12 hours

Introduction to types of Cells & Cell Lysis, methods of tissue homogenization:(Potter-Elvejham, mechanical blender, sonicator and enzymatic). Centrifugation techniques, principles, and applications- differential, density gradient. Ultra-centrifugation- preparative and analytical.

Unit-II: Chromatographic techniques 12 hours

Types of chromatographic techniques, Principle and applications - Paper chromatography- solvents, Rf value, applications; Thin layer chromatography- principle, choice of adsorbent and solvent, Rf value, applications; Gel filtration, Ion- exchange- principle, resins, the action of resins, experimental techniques, applications, separation of metal ions; Affinity chromatography. Introduction to HPLC.

Unit-III: Spectroscopy and tracer techniques 12 hours

Electromagnetic radiation, Beer-Lambert's law. Introduction to Absorption & Emission spectroscopy, Woodward Fieser rule.

Colorimetry and Spectrophotometry, Tracer techniques: Radioisotopes, units of radioactivity, half-life, β, and γ- emitters, use of radioactive isotopes in biology.

Unit-IV: Electrophoresis 12 hours

Electrophoresis- principles and applications of paper, polyacrylamide (native and S.D.S.) and agarose gel electrophoresis, isoelectric focusing, immune-electrophoresis-types, and applications.

Unit-V: Microbial techniques: 12 hours

Microscopy: Basic principles of light microscopy, phase contrast, electron microscope, and fluorescent microscope and their applications.

Preparation of different growth media, isolation and culturing and preservation of microbes, Gram's staining- Gram-positive and Gram-negative bacteria, motility and sporulation, Sterilization Techniques-Physical methods, chemical methods, radiation methods, ultrasonic and. Antibiotic resistance.

BCN-2325P

List of Experiments:

1. Isolation of R.N.A. and D.N.A. from tissue/culture.
2. Qualitative Identification of D.N.A., R.N.A. and Nitrogen Bases
3. Isolation of egg albumin from egg white.
4. Isolation of cholesterol from egg yolk.
5. Isolation of starch from potatoes.
6. Isolation of casein from milk.
7. Separation of amino acids by paper chromatography.
8. Separation of serum proteins by paper electrophoresis.

Recommended books:

1. Principles and Techniques of Practical Biochemistry. Eds. Williams and Wilson.
2. Techniques in Molecular biology Ed. Walker &Gastra, Croom Helm, 1983.
3. Principles of instrumental analysis, 2nd Ed, Holt-Sanders, 1980.
4. An introduction to spectroscopy for Biochemistry. Ed. Brown S.N., Academic press
5. Analytical Biochemistry, Holmes and Hazel peck, Longman, 1983.
6. An introduction to practical biochemistry. David T. Plummer, Tata Mac Grew-Hill.
7. Biophysical chemistry, Edshall& Wyman, Academic press Vol. II & I.
8. A textbook of quantitative inorganic analysis, including elementary instrumental analysis, Vogel ELBS.
9. Biochemical calculations Seigel, IH, 2nd Edit, John Wiley & Sons Inc., 1983.
10. Analytical Biochemistry by Friefelder David

BLUEPRINT
ANALYTICAL TECHNIQUES- BCN-2325

S.NO	TYPE OF QUESTIONS / UNITS	SA 4 marks	S.A. 4 marks	S.A. 4 marks	LA 8 marks	LA 8 marks	Total 60 marks
		Questions given	Questions To attempt	Total marks	Questions To attempt	Total marks	Total 60 marks
1	**UNIT-1 Cell homogenization and centrifugation**	2Q	STUDENT CHOICE	4M	1Q	8M	12M
2	**UNIT-II Chromatographic techniques**	2Q		4M	1Q	8M	12M
3	**UNIT-III Spectroscopy and tracer techniques**	2Q		4M	1Q	8M	12M
4	**UNIT-IV Electrophoresis**	2Q		4M	1Q	8M	12M
5	**UNIT-V Microbial techniques**	2Q		4M	1Q	8M	12M
	Total questions to attempt	5Q		20M	5Q	40M	60M

BIOCHEMISTRY- MODEL QUESTION PAPER
SEMESTER-II
ANALYTICAL TECHNIQUES- BCN-2325

Time : 3 hrs **Max. Marks: 60**

Part-A

Answer any FIVE of the following: 5×4 M=20 M

Each question carries **FOUR** marks.

1. Differential centrifugation
2. Affinity chromatography
3. T.L.C.
4. Beer-Lambert law.
5. Absorption &Emission spectroscopy
6. Gel filtration.
7. Tracer techniques
8. Isoelectric focusing
9. R.I.A.
10. Gram +ve & Gram –ve bacteria

Part-B

Answer ALL THE following questions. 5 X 8=40M

Each question carries 8marks

11. Discuss about different methods used for tissue homogenization.

(or)

Principles and applications of Ultracentrifugation

12. Principles and applications of HPLC chromatography

(or)

Principles and applications of Ion exchange chromatography

13. Principles and applications of Spectrophotometry

(or)

Discuss applications of radioisotopes in biology

14. Principles and applications of Polyacrylamide electrophoresis

(or)

Define types and applications of immune electrophoresis.

15. Principles and applications of electron microscope

(or)

Discuss about sterilization techniques in detail.

BIOCHEMISTRY-QUESTION BANK
SEMESTER-II
ANALYTICAL TECHNIQUES- BCN-2325

Short answer questions:

1. Types of Cells
2. Methods of tissue homogenization
3. Centrifugation technique principle
4. Differential centrifugation
5. Density gradient ultra-centrifugation
6. Analytical ultra-centrifugation
7. Paper chromatography
8. Thin-layer chromatography
9. Gel filtration chromatography principle
10. Ion-exchange chromatography principle
11. Affinity chromatography principle
12. HPLC Principle
13. Beer-Lambert's law
14. Tracer techniques
15. Use of radioactive isotopes in biology
16. SDS PAGE
17. Isoelectric focusing
18. Immune-electrophoresis-types and applications.
19. The basic principle of light microscopy
20. Phase-contrast microscope
21. Electron microscope applications
22. Fluorescent microscope principle
23. Preparation of different growth media
24. Gram's staining
25. Sterilization Techniques-Physical methods.
26. Sterilization techniques chemical methods

Essay questions:

1. Discuss about different methods used for tissue homogenization
2. Principles and applications of Ultracentrifugation
3. Principles and applications of HPLC
4. Principles and applications of Ion exchange chromatography
5. Principles and applications of Gel filtration chromatography
6. Principles and applications of Affinity chromatography
7. Explain about the principle and types of ELISA
8. Principles and applications of Spectrophotometry
9. Discuss applications of radioisotopes in biology
10. Principles and applications of Polyacrylamide electrophoresis
11. Define types and applications of immune electrophoresis.
12. Principles and applications of a light microscope
13. Principles and applications of a fluorescent microscope
14. Principles and applications of electron microscope
15. Discuss about sterilization techniques in detail

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Department of Biochemistry

Syllabi for Courses in Semesters I, II, III&IV are under CBCS with Learning Outcomes-based Curriculum Framework (LOCF)

Title of the Course: Enzymology, Bioenergetics, and Intermediary Metabolism - BCN-3325

Common for BCN-3325 : BSc MBC & MBF

Course Code :	BCN-3325	Continuous Internal Assessment (C.I.A.)	40
No. of Lecture Hours / Week	04	Semester End Evaluation (SEE)	60
Total Number of Lecture Hours	60	Total Marks	100
Practical Component	02 Hour/Week	Exam Hours	03

Course Outcomes (Cos) :

Enzymology, Bioenergetics, and Intermediary Metabolism

CO1: Students will learn the basics of enzymology and will be familiar with the kinetics of enzyme action

CO2: Students will understand the basics of enzyme action and control their activity by using inhibitors.

CO3: Understand the use of inhibitors in designing drugs.

CO4: Understanding the steps in metabolic pathways helps interpret inborn errors of metabolism.

CO5: Can relate the thermodynamic principles to energy transformation in living systems

Enzymology, Bioenergetics, and Intermediary Metabolism- BCN-3325

Unit-I: Enzymology **12 hours**

Introduction to Biocatalysts, differences between chemical and biological catalysis. Nomenclature and classification of enzymes. Definition of holo-enzyme, apo-enzyme, coenzyme, cofactor. The active site, Enzyme specificity. Principles of the energy of activation, transition state. Interaction between enzyme and substrate-lock and key, induced fit models. Michaelis - Menten equation for the uni-substrate reaction (derivation not necessary), Significance of Km and Vmax. Enzyme inhibition –competitive and non-competitive. Factors affecting enzyme activity.

Unit-II: Carbohydrate Metabolism. **12 hours**

Concept of anabolism and catabolism. Glycolytic pathway, energy yield. The fate of pyruvate-formation of lactate and ethanol, Citric acid cycle, regulation, energy yield, amphipathic role. Glycogenolysis and glycogenesis. Pentose phosphate pathway. Gluconeogenesis. Inborn errors in glycogen metabolism.

Unit-III: Lipid Metabolism **12 hours**

Catabolism of fatty acids (β- oxidation) with an odd number of carbon atoms, Ketogenesis, synthesis of fatty acids, biosynthesis, and triacylglycerol degradation. Biosynthesis of cholesterol, Gaucher's and Niemann-pick diseases.

Unit-IV: Metabolism of Amino acids **12 hours**

General reactions of amino acid metabolism- transamination, decarboxylation and deamination, Urea cycle and regulation, metabolism of aromatic amino acid-phenylalanine. Inborn errors of Albinism, Alkaptonuria. Biosynthesis and regulation of purine and pyrimidine nucleotides. (De novo and salvage pathways) Catabolism of purines and pyrimidines. Biosynthesis of deoxyribonucleotides- ribonucleotide reductase and thymidylate synthase and their significance. Disorders of nucleotide metabolism- Gout, Lesch- Nyhan syndrome

Unit-IV: Bioenergetics and Biological oxidation **12 hours**

Bioenergetics: Thermodynamic principles – Chemical equilibria; free energy, enthalpy (H), entropy (S). Free energy change in biological transformations in living systems; High energy compounds. Oxidation-reduction reactions.

Organization of components of electron transport chain in mitochondria. Mechanism of oxidative phosphorylation. Uncouplers and inhibitors of oxidative phosphorylation.

Practical

List of experiments

1. Assay of amylase.
2. Assay of urease.
3. Effect of pH, temperature, and substrate concentration on enzyme activity.
4. Estimation of glucose by DNS method
5. Estimation of total carbohydrates by Anthrone method.
6. Estimation of amino acid by Ninhydrin method.
7. Estimation of protein by Biuret method.

Recommended books:

1. Understanding enzymes: Palmer T., Ellis Harwood ltd., 2001.
2. Enzyme structure and mechanism. Alan Fersht, Freeman & Co. 1997
3. Principles of enzymology for food sciences: Whitaker Marc Dekker 1972.
4. Principles of Biochemistry, White. A Handler, P, and Smith.
5. Biochemistry, Lehninger A.L.
6. Biochemistry, Lubert Stryer.
7. Review of physiological chemistry, Harold A. Harper.
8. Text of Biochemistry, West, and Todd.
9. Metabolic pathways – Greenberg.
10. Mitochondria, Munn.
11. Biochemistry, 2nd Edition, G. Zubay.

BLUEPRINT

ENZYMOLOGY, BIOENERGETICS, AND INTERMEDIARY METABOLISM-BCN-3325

S.NO	TYPE OF QUESTIONS / UNITS	SA 4 marks	S.A. 4 marks	S.A. 4 marks	LA 4 marks	LA 4 marks	Total 60 marks
		Questions given	Questions To attempt	Total marks	Questions To attempt	Total marks	Total 60 marks
1	**UNIT-1 Enzymology**	2Q	STUDENT CHOICE	4M	1Q	8M	12M
2	**UNIT-II Carbohydrate Metabolism**	2Q		4M	1Q	8M	12M
3	**UNIT-III Lipid Metabolism**	2Q		4M	1Q	8M	12M
4	**UNIT-IV Metabolism of Amino acids**	2Q		4M	1Q	8M	12M
5	**UNIT-V Bioenergetics and Biological oxidation**	2Q		4M	1Q	8M	12M
	Total questions to attempt	5Q		20M	5Q	40M	60M

BIOCHEMISTRY MODEL QUESTION PAPER

SEMESTER-III

ENZYMOLOGY, BIOENERGETICS, AND INTERMEDIARY METABOLISM

Time: 3 hrs **Max. Marks: 60**

Part-A

Answer **any FIVE of the following** questions 5×4 M=20 M

Each question carries **FOUR** marks

1. Effect of temperature and pH on enzyme activity.
2. Define enzyme inhibition. write about competitive inhibition.
3. Anaplerotic reactions
4. Urea synthesis.
5. Gout
6. Inborn errors of glycogen metabolism
7. Disorders of lipid metabolism
8. Uncouplers
9. Enthalpy and entropy
10. Inhibitors of oxidative phosphorylation

Part-B

Answer ALL THE following questions. 5 ×8M=40M

Each question carries 8 marks

9. (a) Discuss about the nomenclature & classification of Enzymes.

(or)

(b) Write in detail about Michaelis Menton equation for Unisubstrate reaction and give the significance of Km &Vmax.

10. (a) Discuss about glycogenesis and glycogenolysis in detail.

(or)

(b) Discuss about the reactions of the T.C.A. cycle

11. (a) Discuss about the Denovo synthesis of fatty acids.

(or)

(b) Write about β-oxidation reactions and energy yield of fatty acids with an even number of carbon atoms.

12. (a) Discuss about the general reaction of amino acid metabolism.

(or)

(b) Explain the biosynthesis of purine nitrogen bases.

13. (a) Write about the organization of the electron transport chain components in the Mitochondrial inner membrane.

(or)

(b) Give notes on Mechanism of Oxidative Phosphorylation

BIOCHEMISTRY-QUESTION BANK
SEMESTER-III

ENZYMOLOGY, BIOENERGETICS, AND INTERMEDIARY METABOLISM-BCN-3325

UNIT-1

Short answers

1. Enzyme specificity
2. Any five features of the active site
3. Define activation energy, transition state
4. Define holoenzyme, apoenzyme, co-enzyme, and co-factor
5. Irreversible and reversible enzyme inhibitions
6. Competetive inhibition

Essay questions

1. Write about the nomenclature and classification of enzymes
2. Explain about enzyme-substrate binding theories by lock and key model and induced fit theory
4. Write Michaelis-Menten equation. Write about the significance of Km and Vmax

Unit-2

Short questions

1. Fate of pyruvate.
2. H.M.P. shunt.
3. Diabetes mellitus.
4. Amphipathic role.
5. Gluconeogenesis.

Essay questions

1. Discuss about glycogenesis and glycogenolysis in detail.
2. Write about the reactions of the Calvin cycle in detail.
3. Photosynthesis- Light reaction and dark reaction
5. Citric acid cycle
6. Write about the reactions of glycolysis
7. Discuss in detail about the reactions T.C.A. cycle

Unit-3

Short questions

1. Biosynthesis of Triacylglycerol
2. Disorders of lipid metabolism

3. Ketogenesis

4.Gauchers and Niemann-pick diseases

Essay questions

1. Discuss about the Denovo synthesis of fatty acids.

2. Write about β-oxidation reactions and energy yield of fatty acids with an even number of carbon atoms.

3. Write in detail about the steps involved in the Biosynthesis of cholesterol.

Chapter 4

Short questions

1. Urea cycle.

2. Gout

3. Lesch-Nyhan syndrome

4. Ribonucleotide reductase complex

5. Thymidylate synthase

6. Disorders of nucleic acid metabolism

Essay questions

1. Discuss about the general reaction of amino acid metabolism.

2. Write about the synthesis and degradation of aromatic amino acid- Phenylalanine and give a note on inborn errors of aromatic amino acids metabolism

3. Biosynthesis and regulation of purine and pyrimidines

Chapter 5

Short questions

1. Oxidation-reduction reactions

2. Inhibitors of oxidative phosphorylation

3. Enthalpy and Entropy

4. uncouplers

Essay questions

1. Write about the organization of the electron transport chain components in the mitochondrial inner membrane.

2. Give notes on Mechanism of Oxidative Phosphorylation

3. High energy compounds

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Machavaram, Vijayawada, Krishna District, AP-520004

Department of Biochemistry

Syllabi for Courses in Semesters I, II, III&IV are under CBCS with Learning Outcomes-based Curriculum Framework (LOCF)

Title of the Course: Physiology, Nutritional and Clinical Biochemistry- BCN-4325

Common for BCN-4325 : BSc MBC & MBF

Course Code :	BCN-4325	Continuous Internal Assessment (C.I.A.)	40
No. of Lecture Hours / Week	04	Semester End Evaluation (SEE)	60
Total Number of Lecture Hours	60	Total Marks	100
Practical Component	02 Hour/Week	Exam Hours	03

Course Outcomes (C.O.s): Physiology, Nutritional and Clinical Biochemistry

CO1: The student will get knowledge of the different physiological systems and their functions in the human body. By studying blood, its composition, and its functions, the student will understand the importance of blood.

CO2: This course will also provide knowledge in hormones, their functions, and the diseases occurring due to alterations in the levels of hormones.

CO3: Students can understand the functioning of organ and organ systems and apply the knowledge in disease conditions.

CO4: By studying this course, the student will know the nutritional importance of proteins, carbohydrates, lipids, vitamins, and minerals. And will also come to know the R.D.A. for vitamins and minerals.

CO5: Clinical biochemistry unit and practical will enable the student to do diagnostic tests, making them capable of working in clinical laboratories.

CO6: For liver diseases, Gastrointestinal diseases, renal diseases, and nutritional deficiencies, students can diagnose the reason and assist physicians.

Physiology, Nutritional and Clinical Biochemistry- BCN-4325

Unit-I: Digestion and Absorption **12hours**

Digestion and absorption of carbohydrates, lipids, and proteins. Role of enzymes and Gastrointestinal hormones indigestion. Liver functions. Transportation mechanisms such as Passive transportation, Active transportation, Facilitated Diffusion, Phagocytosis & Pinocytosis, Ionic transportation.

Unit-II: Nervous system and excretory system **12hours**

Introduction to the nervous system, Neurons-structure, types, properties, and functions; Neurotransmitters. Mechanism of nerve impulse transmission. Cerebrospinal fluid composition and functions.

Introduction to the excretory system. Organization of kidney, Structure, and functions of the nephron, Urine formation, Normal and abnormal constituents of the urine. Renal function tests-urea, creatinine, Cystatin C, G.F.R.

Unit III: Endocrinology **12 hours**

Endocrinology- organization of the endocrine system. Classification of hormones. Outlines of chemistry, physiological role, and disorders of hormones of thyroid, parathyroid, adrenalin glands. Reproductive hormones estrogen and testosterone. Pituitary and hypothalamus hormones. Mechanism of hormonal action- signal transduction pathway for insulin.

Unit- IV: Nutritional Biochemistry **12hours**

Balanced diet. Calorific values of foods and their determination by bomb calorimeter. B.M.R. and factors affecting it. The specific dynamic action of foods. Energy requirements and recommended dietary allowance (R.D.A.) for children, adults, pregnant and lactating women. Sources of complete and incomplete proteins. The biological value of proteins. Malnutrition- Kwashiorkor, Marasmus, and P.E.M. Vitamins- sources, structure, biochemical roles, deficiency disorders of water- and fat-soluble vitamins. Introduction to nutraceutical and functional foods. Bulk and trace elements-Ca, Mg, Fe, I, Cu, Mo, Zn, Se, and F.

Unit- V: Clinical Biochemistry **12hours**

Composition of the blood, Blood groups, coagulation of blood, and disorders of blood coagulation (hemophilia). Hemoglobin and transport of gases in the blood (oxygen and CO_2). Types of anemias, hemoglobinopathies-sickle cell anemia. Plasma proteins in health and disease. Liver diseases-jaundice. Liver function tests- conjugated and total bilirubin in serum, albumin: globulin ratio, Serum enzymes in liver diseases-SGOT, SGPT, G.G.T., C.P.K., Acid, and alkaline phosphatases.

Physiology, Nutritional and Clinical Biochemistry- BCN-4325P

List of experiments

1. Estimation of vitamin C by 2, 6 -dichlorophenol indophenol method.
2. Determination of acid value of oil.
3. Estimation of hemoglobin in the blood.
4. Total count - R.B.C. and WBC. Differential count.
5. Determination of blood group and Rh typing.
6. Urine analysis for albumin, sugars, and ketone bodies.
7. Estimation of urinary creatinine.
8. Estimation of Blood Glucose.
9. Estimation of serum total cholesterol.

Recommended books:

1. Essentials of Food and Nutrition, Vol. I & II, M.S. Swaminathan.
2. Textbook of Biochemistry with clinical correlations. Thomas M. Devlin (John Wily).
3. Harper's Review of Biochemistry, Murray, et al. (Longman).
4. Biochemical aspects of human disease – R.S. Elkeles and A.S. Tavil. (Blackwell Scientific Publications).
5. Clinical chemistry in diagnosis and treatment–Joan F.Zilva and P.R.Pannall (Lloyd-Luke Medical Books, 1988).
6. Varley's Practical Clinical Biochemistry – Ed. Alan W. Gowenlock (Heinemann Medical Books, London, 1988).
7. Clinical diagnosis and management by Lab methods (John Bernard Henry, W.B. Saunders Company, 1984).
8. Clinical Biochemistry – S.Ramakrishnan and Rajiswami.
9. Chemical Biochemistry (Metabolic and clinical aspects) by W.J.Marshall&S.K.Bangert.
10. Textbook of clinical Biochemistry by Tietz et al.

BLUEPRINT

Physiology, Nutritional and Clinical Biochemistry- BCN-4325

S.NO	TYPE OF QUESTIONS / UNITS	SA 4 marks	S.A. 4 marks	S.A. 4 marks	LA 4 marks	LA 4 marks	Total 60 marks
		Questions given	Questions To attempt	Total marks	Questions To attempt	Total marks	Total 60 marks
1	**UNIT-1 Digestion and absorption**	2Q	STUDENT CHOICE	4M	1Q	8M	12M
2	**UNIT-II Nervous system and excretory system**	2Q		4M	1Q	8M	12M
3	**UNIT-III Endocrinology**	2Q		4M	1Q	8M	12M
4	**UNIT-IV Nutritional Biochemistry**	2Q		4M	1Q	8M	12M
5	**UNIT-V Clinical Biochemistry**	2Q		4M	1Q	8M	12M
	Total questions to attempt	5Q		20M	5Q	40M	60M

BIOCHEMISTRY MODEL QUESTION PAPER

SEMESTER-IV

Physiology, Nutritional and Clinical Biochemistry- BCN-4325

Time: 3 hrs **Max. Marks: 60**

Part-A

Answer **any FIVE of the following** questions 5×4 M=20 M

Each question carries **FOUR** marks

1. Gastrointestinal hormones.
2. Phagocytosis.
3. Neuron structure.
4. kidney-Structure.
5. Physiological role of epinephrin
6. Physiological role of growth hormones.
7. Kwashiorkor.
8. S.D.A.
9. Sickle cell anemia.
10. Serum lipoproteins.

Part-B

Answer **ALL** the following questions. 5 X 8M=40M

Each question carries **EIGHT** marks

1(a). Discuss transportation mechanisms with one example

(i)Passive Diffusion (2)Active transportation (3)Facilitated diffusion.

Or

(b). Write an essay on digestion and absorption of proteins.

2(a). Write about the composition and functions of Cerebrospinal fluid.

Or

(b). Describe in detail the structure of the nephron and mechanism of nerve impulse transmission

3(a). Write in detail about the mechanism of hormonal action

Or

(b) Discuss about the physiological role and deficiency disorders of thyroid hormone.

4(a). Write in detail about B.M.R. and the factors affecting it.

Or

(b). Define the bulk and trace elements and explain about the physiological role and deficiency

disorder of calcium

5(a). Discuss about the mechanism of coagulation of blood.

Or

(b). Explain about the Liver function tests- conjugated and total bilirubin in serum, albumin: globulin ratio, Serum enzymes in liver diseases-SGOT, SGPT.

BLUEPRINT

Physiology, Nutritional and Clinical Biochemistry- BCN-4325

UNIT -1

Short answer questions

2. Active transport
3. Passive transport
4. Facilitated diffusion
5. Phago &Pinocytosis.
6. Ion transportation

Long answer questions

1. Digestion and absorption of carbohydrates
2. Digestion and absorption of lipids
3. Digestion and absorption of proteins
4. Discuss about the liver function tests.

UNIT -2

Short answer questions

1. Structure and types of neurons
2. Mechanism of nerve impulse transmission
3. Neurotransmitters
4. Acid-base balance and electrolyte balance
5. Renal function tests (anyone)
6. Markers used for kidney function

Long answer questions

1. Cerebrospinal fluid composition and its functions
2. Mechanism of urine formation
3. Normal and abnormal constituents of urine
4. Renal function tests

Unit -3

Short answer questions

1. Out lines for classification of hormones
2. Hormonal Deficiency disorders (anyone)
3. Mechanism of signal transduction
4. Glucocorticoids.
5. Mineralo corticoids
5. Gastrointestinal hormones
6. Growth hormone

Long answer questions

1. Discuss about the physiological role and disorders of hormones (anyhormone)
2. Give an account of the mechanism of hormonal action (any hormone)
3. Write a note on the signal transduction mechanism for glucocorticoids
4. Discuss the physiological role of pituitary hormones

Unit -4

Short answer questions

1. Define a balanced diet and give an example
2. Define B.M.R. and write about the factors affecting B.M.R.
3. Define S.D.A. give its significance
5. Brief introduction to water-soluble vitamins
6. Physiological role of trace element (anyone)
6. Physiological role of bulk element (anyone)
7. Biological value of proteins
8. Protein-energy malnutrition

Long answer questions

1. Determination of colorific value using bomb calorimeter with diagram

2. Define R.D.A discuss about R.D.A. for women and add extra requirements for pregnant, lactating women

3. Discuss about the physiological role and deficiency disorders of any one water-soluble vitamin (vitamin should be specified)

4. Discuss about the physiological role and deficiency disorders of any one fat-soluble vitamin (vitamin should be specified)

Unit -5

Short answer questions

1. Plasma proteins
2. Blood groups
3. Disorders of blood coagulation
4. Hemoglobinopathies
5. Serum lipids and lipoproteins
4. Hemoglobin

Long answer questions

1. Composition and coagulation of blood
2. Hemoglobin and transport of gases
3. Liver function tests
4. Serum enzymes in liver diseases
5. Transport of gases in the blood (oxygen and CO_2)

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Department of Biochemistry

Syllabi for Courses in Semesters I, II, III&IV are under CBCS with Learning Outcomes-based Curriculum Framework (LOCF)

Title of the Course: Microbiology & Immunology- BCN-5325

Common for BCN-5325 : BSc MBC & MBF

Course Code :	BCN-5325	Continuous Internal Assessment (C.I.A.)	40
No. of Lecture Hours / Week	04	Semester End Evaluation (SEE)	60
Total Number of Lecture Hours	60	Total Marks	100
Practical Component	02 Hour/Week	Exam Hours	03

Course Outcomes (C.O.s) : Microbiology & Immunology

CO1: The understanding of immunology concepts involves in-depth knowledge of tissues, cells, and molecules involved in host defense mechanisms.

CO2: It helps understand types of immunity, antigens-antibodies, and their properties, complement system, MHCs, and immune responses.

CO3: Understanding of pathology of diseases caused by various microorganisms such as bacteria, virus, parasites, and fungus, immune mechanisms in disease control, vaccination, the process of immune interactions in clinical science.

CO5: Provides basic knowledge about the immune system and allows the student to create insight as to how to improve their immune system and good health

CO6: Understanding of types of hypersensitivity reactions and autoimmune diseases can be used to interpret the diseased conditions in the laboratory. Students will enhance their ability to understand tumor immunology and transplantation immunology concepts.

Microbiology & Immunology- BCN-5325

Unit-I: Microbiology **12 hours**

Introduction to microbiology and microbial diversity. Classification of microorganisms- prokaryotic and eukaryotic microorganisms. Bacterial structure, growth curve, and kinetics of growth. Introduction to viruses, cultivation of viruses, structure and life cycle of -plant virus (ex: TMV Virus) and animal virus (ex: SARS CoV2).

Unit-II: Photosynthesis and Nitrogen Fixation

12hours

Photosynthesis- Light and Dark reactions, Calvin cycle, C4 cycle, Nitrogen cycle, non-biological and biological nitrogen fixation, Nitrogenase system. Utilization of nitrate ion, Ammonia incorporation into organic compounds. Synthesis of glutamine and regulatory mechanism of glutamine synthase.

Unit-III: Applied Biochemistry **12 hours**

Fermentation Technology: Batch, continuous culture techniques, principle, types of fermenters. Pasteur effect. Industrial production of chemicals- alcohol, acids (citric acid), solvents (acetone), antibiotics (penicillin), Enzyme Technology: Immobilization of enzymes and cells, industrial applications, enzymes in Bioremediation.

Unit-IV: Immunology-1 **12hours**

Organs and cells of the immune system. Innate and acquired immunity, Cell-mediated and humoral immunity (T-cells and B-cells). Classification of immunoglobulins, the structure of IgG. Epitopes / antigenic determinants. Concept of haptens. Adjuvants. Monoclonal antibodies

Additional input: Cocktile monoclonal antibody therapy for Covid 19

Unit V: Immunology-2

Antigen-antibody reactions- agglutination, precipitation, immunodiffusion, and complement fixation reactions. Blood group antigens. Immunodiagnostics- ELISA and R.I.A. Vaccines and their classification. Traditional vaccines live and attenuated Modern vaccines- recombinant and peptide vaccines: hypersensitivity reactions and types of Autoimmune diseases.

Microbiology & Immunology- BCN-5325P

List of experiments

1. Biosafety and good laboratory practices (G.L.P.) of Microbiology.
2. Sterilization of microbial media by autoclave.
3. Antibiotic sensitivity test
4. Isolation of pure cultures: (i) Streak plate method. (ii) Serial dilution method.
5. Demonstration of alcohol fermentation.
6. Antibiotic sensitivity by paper disc method.
7. Effect of nitrogen sources on growth of E. coli

Recommended books:

1. Willey MJ, Sherwood, LM & Woolverton C J (2013) Prescott, Harley and Klein's Microbiology by. 9th Ed., McGraw-Hill.
2. Atlas RM. (1997). Principles of Microbiology. 2nd edition. WM.T.Brown Publishers.
3. Pelczar MJ, Chan ECS and Krieg NR. (1993).

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Microbiology & Immunology- BCN-5325P

S.NO	TYPE OF QUESTIONS / UNITS	SA 4 marks	S.A. 4 marks	S.A. 4 marks	LA 4 marks	LA 4 marks	Total 60 marks
		Questions given	Questions To attempt	Total marks	Questions To attempt	Total marks	Total 60 marks
1	**UNIT-1 Microbiology**	2Q	STUDENT CHOICE	4M	1Q	8M	12M
2	**UNIT-II Nitrogen Fixation**	2Q		4M	1Q	8M	12M
3	**UNIT-III Applied Biochemistry**	2Q		4M	1Q	8M	12M
4	**UNIT-IV Immunology-1**	2Q		4M	1Q	8M	12M
5	**UNIT-V Immunology 2**	2Q		4M	1Q	8M	12M
	Total questions to attempt	5Q		20M	5Q	40M	60M

BIOCHEMISTRY MODEL QUESTION PAPER

SEMESTER-IV

Microbiology & Immunology- BCN-5325P

Time: 3 hrs **Max. Marks: 60**

Part-A

Answer **any FIVE of the following** questions 5×4 M=20 M

Each question carries **FOUR** marks

1. Structure of prokaryotic cell
2. Bacterial growth curve
3. C4 Cycle
4. Nitrogen cycle
5. Pasteur effect.
6. Immobilization of enzymes
7. Live and attenuated vaccines
8. Innate immunity
9. Define complement fixation
10. Blood group antigens

Part-B

Answer **ALL** the following questions. 5 X 8M=40M

Each question carries **EIGHT** marks

1(a). Discuss transportation mechanisms with one example

(i)Passive Diffusion (2)Active transportation (3)Facilitated diffusion.

Or

(b). Write an essay on digestion and absorption of proteins.

2(a). Write about the composition and functions of Cerebrospinal fluid.

Or

(b). Describe in detail the structure of the nephron and mechanism of nerve impulse transmission

3(a). Write in detail about the mechanism of hormonal action

Or

(b) Discuss about the physiological role and deficiency disorders of thyroid hormone.

4(a). Write in detail about B.M.R. and the factors affecting it.

Or

(b). Define the bulk and trace elements and explain about the physiological role and deficiency disorder of calcium

5(a). Discuss about the mechanism of coagulation of blood.

Or

(b). Explain about the Liver function tests- conjugated and total bilirubin in serum, albumin: globulin ratio, Serum enzymes in liver diseases-SGOT, SGPT.

Microbiology & Immunology- BCN-5325P

QUESTION BANK

UNIT-1

Short answer questions:

1. Introduction to microbial diversity
2. Structure of prokaryotic cell
3. Bacterial growth curve
4. Bacterial growth curve kinetics
5. Basic structure of eukaryotic cell structure
6. Differences between pro and eukaryotes

Essay questions:

1. Discuss about the classification of microorganisms
2. Discuss in detail about the structure o
3. Structure and life cycle of TMV virus
4. Structure and life cycle of SARS CoV2 virus

UNIT-2

Short answer questions:

1. Nitrogen cycle
2. Nitrogenase system.
3. Ammonia incorporation into organic compounds
4. C4 Cycle
5. Cyclic and non-cyclic photophosphorylation

Essay questions:

1. Essay on biological nitrogen fixation
2. Synthesis of glutamine and regulatory mechanism of glutamine synthase.
3. Write about the reactions of the Calvin cycle in detail

UNIT-3

Short answer questions:

1. Enzymes used in Bioremediation
2. Pasteur effect.
3. Immobilization of enzymes
4. Immobilization of cells

Essay questions

1. Batch and continuous culture techniques
2. Explain the principle, design, and types of fermenters.
3. Industrial production of ethyl alcohol
4. Industrial production of citric acid
5. Industrial production of solvent acetone
6. Industrial production of the antibiotic penicillin
7. Discuss the industrial applications of immobilized enzymes.

UNIT-4

Short answer questions:

1. Epitopes / antigenic determinants
2. Haptens and Adjuvants
3. Live and attenuated vaccines
4. Modern vaccines
5. Blood group antigens.
6. Lymphocytes
7. Innate immunity

Essay questions:

1. Discuss in detail the organs of the immune system
2. Write in detail about the types of immunity
3. Discuss in detail the classification and structure of immunoglobulins
4. Monoclonal antibody production and applications.

UNIT-V

1. Define agglutination
2. Define precipitation,
3. Define immunodiffusion

4. Define complement fixation
5. Blood group antigens

Essay questions:

1. Discuss about the antigen-antibody reactions
2. Write about the principle and applications of ELISA
3. Write about the principle and applications of R.I.A.
4. Discuss about the classification of vaccine
5. Define hypersensitivity and write about the types of hypersensitivity reactions
6. Define autoimmunity discuss about the types of autoimmunity

SRR & CVR GOVERNMENT DEGREE COLLEGE (AUTONOMOUS)
Vijayawada 520004
BIOCHEMISTRY SYLLABUS FOR V SEMESTER
PAPER – V
IMMUNOLOGY & ENDOCRYNOLOGY

Periods: 60 **Max. Marks: 60**

Programme Objective :

- Understanding of the overview of immune system of including cells, organs and receptors
- To learn structure and functions of different classes of immunoglobulins, mechanisms involved in different types of hypersensitivity and the importance of conventional vs. Recombinant vaccines
- To get acquainted with the importance of antigen –antibody interaction in disease diagnosis, autoimmunity
- To understand the structure, properties and physiological functions and effects of each of the endocrine glands and their hormones
- To understand the causes, Clinical manifestations, management and nursing, investigation of hormones

Course Outcome:

- Will be able to known about endocrine glands, their secretions and functions
- Will be able to know the role of hormones in body metabolic functions
- Will be able to establish a Diagnostic and research Laboratory
- Will be able to get knowledge on various disorders caused by the imbalance of endocrine secretions.

UNIT – I Overview of Immune system
1.1 Introduction to basic concepts in Immunology.
1.2 Innate immunity-mechanism and types of acquired immunity.
1.3 Cells of immune system.
1.4 Organs of immune system, immune response
UNIT – II Antigens and Antibodies &Immune system in Health and Disease
2.1 Basic properties of antigens, factors influencing immunogenicity.
2.2 Haptens and adjuvants.
2.3 Structure of antibody, classes and functions of antibodies.
2.4 Classification and brief description of various types of hyper sensitivities.
2.5 Types of autoimmunity.
Unit – III Immunological techniques
3.1Major histo compatibility complexes.
3.2 Monoclonal antibodies.
3.3 General introduction to Vaccines, Types of vaccines.

3.4 Antigen-antibody reactions-Agglutination, Precipitation, ELISA, RIA.

Unit – IV Endocrinology I

4.1 Organization of endocrine system.
4.2 Classification of hormones.
4.3 Mechanism of hormonal action, signal transduction pathways.
4.4 Pituitary hormones - GH, TSH, LH, FSH, oxytocin and vasopressin (physiological role).

Unit –V Endocrinology II

Structure, physiological role and disorders of:

5.1 Hormones of pancreas- insulin, glucagon.
5.2 Thyroid, parathyroid hormones.
5.3 Hormones of Adrenal glands.
5.4 Introduction to gastrointestinal hormones.
5.5 Reproductive hormones-Estrogen,progesterone.

BIOCHEMISTRY PRACTICAL SYLLABUS FOR V SEMESTER
BIOCHEMISTRY - PAPER – V
IMMUNOLOGY& ENDOCRINOLOGY

List of Experiments:

1. Collection of serum from blood.
2. Determination of blood group and Rh typing.
3. HCG based pregnancy test.
4. Glucose tolerance test.
5. Indirect ELISA
6. Sandwich ELISA
7. Direct ELISA
8. Purification of IgG Antibodies with Ammonium Sulphate
9. Ouchterlony Double Diffusion –Titration
10. Ouchterlony Double Diffusion - Patterns

BC 5325-5

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BIOCHEMISTRY SYLLABUS FOR V SEMESTER
BIOCHEMISTRY - PAPER – V
IMMUNOLOGY & ENDOCRYNOLOGY
BLUE PRINT FOR QUESTION PAPER

S.No	Type of Questions→ / Units ↓	SA 4 marks	SA 4 marks	SA 4 marks	LA 8 marks	LA 8 marks	Total 60 Marks
		Questions given	Questions to attempt	Total marks	Questions to attempt	Total marks	Total 60 Marks
1	UNIT- I: Overview of Immune system	2Q	Student choice	8 M	1 Q	8 M	16M
2	UNIT-II: Antigens and Antibodies &Immune system in Health and Disease	2Q		8 M	1Q	8M	16M
3	UNIT-III : Immunological techniques	2 Q		8M	1Q	8 M	16M
4	UNIT-IV Endocrinology I	2Q		8 M	1 Q	8 M	16M
5	UNIT- V Endocrinology II	2Q		8M	1 Q	8 M	16M
	Total Questions to attempt	5 Q		20 M	5 Q	40 M	60 M

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Vijayawada 520004
BIOCHEMISTRY SEMISTER V
MODEL QUESTION PAPER (THEORY)
IMMUNOLOGY

Time: 2 1/2hrs **Max. Marks: 60 M**

Part-A

Answer **any FIVE of the following** questions 5×4 M=20 M
Each question carries **FOUR** marks

1. Lymphocytes.
2. Passive immunity.
3. Adjuvents.
4. Characteristics of antigen.
5. ELISA.
6. Vaccines.
7. Signal transcription.
8. Hormones of placenta.
9. GI Hormones.
10. Parathyroid hormone.

Part-B

Answer ALL THE following questions. 5 X 8M=40M
Each question carries 8marks

11.(a)Discuss in detail about the mechanism of innate immunity
Or
(b) Write about the organs of immune system.
12.(a)Explain about the classes & functions of antibodies.
Or
(b) Define hypersensitivity discuss about the types of hypersensitivity reactions.
13 (a) discuss about the synthesis & applications of monoclonal antibodies.
Or
(b) Write a note on MHC complex
14.(a) Write about the mechanism of hormonal action.
Or
(b) Discuss about the pituitary hormones.
15.(a) Write about the structure physiological role and disorders of thyroid hormones.
Or
(b) Write about the structure, physiological role & disorders of insulin.

BC 5325-5

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BIOCHEMISTRY SYLLABUS FOR V SEMESTER
BIOCHEMISTRY - PAPER – V
IMMUNOLOGY & ENDOCRYNOLOGY
QUESTION BANK

Chapter 1

Short answers

1. Edward Jenner contributions to immunology.
2. Active immunity
3. Passive immunity
4. Natural active immunity.
5. Natural passive immunity.
6. Artificial active immunity.
7. Artificial passive immunity.
8. B lymphocytes & NK Cells.
9. T lymphocytes & NK Cells.
10. Primary lymphoid organs.
11. Secondary lymphoid organs.
12. Phagocytosis.

Essay questions

1. Discuss about the mechanism of innate immunity.
2. Explain about the types of acquired immunity.
3. Give a brief note on the cells of immune system.
4. Write about primary & secondary lymphoid organs.

Chapter 2

Short answers

1. Characteristics of antigen.
2. Antigenicity & immunogenicity.
3. Haptens.
4. Adjuvents.
5. Structure of IgG antibody.
6. Allergy.
7. Erythroblastosis foetalis.

Essay questions

1. Discuss about the structure & types of antibodies.
2. Write about the classification & types of hypersensitivity.
3. Define autoimmunity & give any four examples of auto immune diseases.

Chapter 3

Short answers

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1. Agglutination.
2. Precipitation.
3. ELISA.
4. RIA.

Essay questions

1. Describe about the types of major histocompatability complex.
2. Define monoclonal antibodies & discuss about hybridoma technology.
3. Discuss about the different types of vaccines in detail.

Chapter 4

Short answers

1. Classification of hormones.
2. GH.
3. Vasopressin.
4. Hormones of placenta.

Essay questions

1. Discuss in detail about the mechanism of hormonal action.
2. Write notes on pituitary hormones.

Chapter 5

Short answers

1. Diabetes Mellitus.
2. Parathyroid hormones.
3. GI Hormones.
4. Epinephrine & nor epinephrine.

Essay questions

1. Discuss about the hormones of pancreas.
2. Discuss about the hormones of adrenal glands.
3. Discuss about the thyroid hormones.

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BIOCHEMISTRY SYLLABUS FOR V SEMESTER

PAPER – VI

MOLECULAR BIOLOGY & r DNA TECHNOLOGY

Periods: 60 **Max. Marks: 60**

Programme objective:

- To gain knowledge on Central Dogma- Process of replication
- To gain knowledge in MolecularBiology,the process of Protein synthesis
- Ability to gain knowledge on Molecular tools necessary for rDNA technology
- Exposure with the importance of E.coli lac operon,PCR, expression vectors and their importance in Biotechnology
- To use the technique and modern tools necessary for Research methodology and can apply the technique of rDNA technology in various fields
- Acquaintance with the merits and demerits of transgenic crops

Course Outcomes:

- Will be able tounderstand the mechanism of Replication
- Will be able to understand the process of Protein synthesis
- Will be able to understand the tools involved in Recombinant DNA technology
- Will be able to become a Molecular Biologist
- will be able to establish Molecular Biotechnology Laboratory.

Unit- I: Gene & genome

1.1 Organisation of genetic material ,
1.2 Experiments to prove DNA as genetic material
1.3 Concept of gene, Nature and structure of gene.
1.4 DNA replication- models of replication, Meselson-Stahl's experimental proof for semi conservative model. DNA polymerases I, II and III of E.coli, helicase, topoisomerases, primase, ligase.
1.5 Mechanism of DNA Replication. Bidirectional replication model. Okazaki fragments, leading and lagging strands of DNA synthesis.
1.6 Inhibitors of DNA replication.

UNIT- II: DNA Replication and Transcription in prokaryotes

2.1 Transcription - RNA synthesis, RNA polymerases of prokaryotes. Promoters, Initiation sigma factors and their recognition sites. Elongation- role of core enzyme Termination- rho dependent and rho-independent.
2.2 Regulation of prokaryotic gene expression at transcriptional level- Lac operon concept.
2.3 Introduction to post transcriptional modifications-mRNA capping, polyadenalytion, splicing.

Unit- III Protein Synthesis and Regulation of Gene Expression

3.1 Genetic code, deciphering of genetic code.
3.2 Wobble hypothesis, degeneracy of genetic code.

3.3 Protein synthesis- activation of amino acids (aminoacyl t-RNA synthetase).
3.4 Ribosome structure. Initiation, elongation and termination of protein synthesis.
3.5 Introduction to Post- translational modifications.
3.6 Inhibitors of protein synthesis.

Unit-IV: Recombinant DNA Technology

4.1 Outlines of cloning strategies.
4.2 Tools of r-DNA technology: Enzymes- Restriction endonucleases, T4 DNA ligase,Ecoli DNA ligase phosphatases,reverse transcriptase, polynucleotide kinases, terminal transferases.
4.3 Cloning vectors- Plasmids,λ phage vectors,cosmids. Expression vectors-E.coli.
4.4 Construction of c-DNA and Genomic libraries. Isolation of cloned genes- Colony hybridization.

Unit V -Applied Biochemistry

5.1 DNA sequencing- Maxam Gilbert and Sanger's method.
5.2 Polymerase chain reaction- principle and applications.
5.3 Outlines of blotting techniques-Southern, Northern and Western.
5.4 Applications of gene cloning- production of insulin and human growth hormone, production of Bt cotton and golden rice.
Additional inputs: C-Value paradox, Telomerase.Signal hypothesis.

BIOCHEMISTRY - PAPER – VI

MOLECULAR BIOLOGY & rDNA TECHNOLOGY

List of Experiments:

2. Estimation of DNA by diphenylamine method.
3. Estimation of RNA by orcinol method.
4. Preparation of Buffer stocks (TBE,TE and TAE)
5. Agarose Gel Electrophoresis (AGE).
6. Extraction of DNA from Agarose gel
7. Plasmid Isolation (Mini prep)
8. Extraction of DNA from Fish Fins
9. Isolation of RNA
10. Restriction Digestion

BC 5325-6

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BIOCHEMISTRY SYLLABUS FOR V SEMESTER
BIOCHEMISTRY - PAPER – VI
MOLECULAR BIOLOGY& r DNA TECHNOLOGY
BLUE PRINT FOR QUESTION PAPER

S.No	Type of Questions→ / Units ↓	SA 4 marks	SA 4 marks	SA 4 marks	LA 8 marks	LA 8 marks	Total 60 Marks
		Questions given	Questions to attempt	Total marks	Questions to attempt	Total marks	Total 60 Marks
1	UNIT- I: Gene & genome	2Q	Student choice	8 M	1 Q	8 M	16M
2	UNIT-II: DNA Replication and Transcription in prokaryotes	2Q		8 M	1Q	8M	16M
3	UNIT-III : Protein Synthesis and Regulation of Gene Expression	2 Q		8M	1Q	8 M	16M
4	UNIT-IV Recombinant DNA Technology	2Q		8 M	1 Q	8 M	16M
5	UNIT- V Applied Biochemistry	2Q		8M	1 Q	8 M	16M
	Total Questions to attempt	5 Q		20 M	5 Q	40 M	60 M

SDVG Prasad

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BIOCHEMISTRY SYLLABUS FOR V SEMESTER

BIOCHEMISTRY - PAPER – VI

MOLECULAR BIOLOGY & r DNA TECHNOLOGY

Unit – I

SHORTS

1. Nucleosome.
2. Harshey& Chase experiment.
3. Concept of gene.
4. Split genes.
5. Messelson& Sthals experiment.
6. DNA polymerase I
7. Inhibitors of DNA replication.
8. Okazaki fragments.
9. Semi conservative mode of DNA Replication.

ESSAYS

1. Discuss about the experiments to prove DNA as genetic material.
2. Write about the mechanism of DNA replication in prokaryotes.
3. Explain in detail about the organization of genome in eukaryotes

Unit- II

SHORTS

1. Promoter sequences.
2. Operon concept.
3. RNA polymerases of prokaryotes
4. Capping & polyadenylation.
5. Restriction endonucleas.

ESSAYS

1. Discuss about the mechanism of transcription in prokaryotes
2. Discuss about the regulation of gene expression using Lac operon model.

UNIT-III

SHORTS

1. Characteristics of Genetic code.
2. Wobble hypothesis.
3. Nirenberg & Khorana experiments.
4. Aminoacyl tRNA
5. Inhibitors of protein synthesis.
6. Post translational modifications in brief.

ESSAYS

1. Discuss about the characteristics of genetic code in detail.
2. Discuss about the experiments involved in deciphering of genetic code.

UNIT-IV

SHORT

1. DNA ligases.

BC5325_b

2. pBR 322.
3. λPhage vector.
4. Cosmids.
5. C DNA.
6. Colony hybridization.

ESSAY

1. Give note on enzymes used in rDNA technology.
2. Discuss about the construction of cDNA libraries.
3. Discuss about any two cloning vectors.

UNIT-V

SHORT

1. Southern blotting.
2. Western blotting.
3. Bt cotton
4. Production of human insulin by rDNA technology.
5. Expression vectors.

ESSAY

1. Write about DNA sequencing by sangers method
2. Write the principle& applications of PCR
3. Write the principle & procedure for southern blotting technique.
4. Write the principle & procedure for northern blotting technique.
5. Write about any one application of gene cloning in detail
6. Write the various applications of gene cloning in agriculture.

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BIOCHEMISTRY SYLLABUS FOR VI SEMESTER BIOCHEMISTRY CLUSTER
PAPER: VIII-B-1 CELL BIOLOGY

Periods: 45 **Max. Marks: 60**

UNIT-I INTRODUCTION TO CELL BIOLOGY

Origin of life, Cell theory.

Structure of prokaryotic and eukaryotic cell.

Differences between Animal and Plantcell.

Mycoplasma.

Viruses and prions.

UNIT-II STRUCTURE AND FUNCTION OF SUBCELLULAR ORGANELLES –

Composition of biological membranes.

Nucleus: Structure of nuclear envelope, nuclear pore complex nucleolus and chromatin.

Endoplasmic Reticulum: RER - Brief overview of protein synthesis.

SER – Lipid synthesis, brief overview of export of proteins from ER.

Golgi apparatus: organization, brief overview of glycosylation of proteins

UNIT-III- CELL ORGANELLS

Lysosomes: Different forms of lysosomes, role in cellular digestion

Peroxisomes: assembly, functions and Glyoxysomes.

Mitochondria: structure, endosymbiont theory

Chloroplast: structure, endosymbiont theory

Cell Wall: Structure of prokaryotic and eukaryotic cellwall.

ECM components and adhesion proteins; anchoring junctions, tight junctions and communication junctions

UNIT-IVCELLCYTOSKELETON

Microtubules: Axonemal and cytoplasmic microtubules (cilia, flagella, centrioles, basal bodies).

Microfilaments: Actin and Myosin filaments.

Cell Cycle, Cell Division (Mitosis andMeiosis).

Apoptosis and necrosis (brief introduction).

UNIT-V CELL SEPERATION AND VISUALIZATION TECHNIQUES:

Centrifugation, Sedimentation Coefficient, Differential and Density Gradient (isopycnic and rate zonal) centrifugation.

Cell Visualization techniques: Principle of Light microscope, Phase Contrastmicroscope Only Principle of Fluorescence microscope, Confocalmicroscope, Electron microscopy Staining techniques for microscopy studies (light microscopy, fluorescent microscopy, electron microscopy)

BIOCHEMISTRY CLUSTER PAPER: VIII-B-1

CELL BIOLOGY

QUESTION BANK

Short answer questions:

1. Differences between prokaryotic and eukaryotic cell.
2. Differences between Animal and Plant cell.
3. Mycoplasma.
4. Prions.
5. Composition of biological membranes.
6. Structure of nuclear envelope with neat diagram
7. Endoplasmic Reticulum
8. Golgi apparatus
9. Lysosomes
10. Peroxisomes
11. Mitochondria
12. Chloroplast
13. Cell Wall
14. Structure of prokaryotic and eukaryotic cell wall.
15. ECM components– proteins, polysaccharides
16. Adhesion proteins
17. Microtubules
18. Microfilaments: Actin and Myosin filaments.
19. Cell Cycle
20. Cell Division -Mitosis
21. Meiosis
22. Apoptosis
23. Necrosis
24. Fluorescence microscope principle
25. Confocal microscope principle
26. Electron microscopy principle

Essay questions:

1. Discuss in detail about the Structure of prokaryotic and eukaryotic cell.
2. Discuss in detail about the characteristics of Mycoplasma.
3. Write an essay on Viruses
4. Discuss in detail about the composition of biological membranes with neat diagram
5. Give detailed notes on structure of nuclear envelope and nuclear pore complex
6. Give detailed picture on RER and SER
7. Describe the role of Golgi apparatus in organization and glycosylation
8. Explain about different forms of lysosomes and their role in cellular digestion
9. Discuss in detail about the mitochondrial structure and endosymbiont theory
10. Write an account on chloroplast structure and endosymbiont theory
11. Write in detail about the adhesion proteins, anchoring junctions, tight junctions and communication junctions
12. Discuss in detail about the Cell Cycle stages
13. Write in detail about the stages of Cell mitosis
14. Write in detail about the stages of Cell meiosis
15. Discuss about the principle and types of centrifugation
16. Give notes principle of Light microscope in detail
17. Give notes on phase contrast microscope in detail
18. Give in detail about the staining techniques used for microscope

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BIOCHEMISTRY SEMISTER VI

PAPER VIII-B-1

MODEL QUESTION PAPER

Cell Biology

Time: 3 hrs. **Max. Marks: 60 M**

Part-A

Answer any **FIVE** of the following questions 5×4 M=20 M

Each question carries **FOUR** marks.

1. Differences between Animal and Plant cell.
2. Prions.
3. Structure of nuclear envelope with neat diagram
4. Lysosomes
5. Cell Wall
6. Adhesion proteins
7. Necrosis
8. Confocal microscope principle

Part-B

Answer **ALL** the following questions. **5×8=4M**

Each question carries **EIGHT**marks

9. a. Discuss in detail about the Structure of prokaryotic and eukaryotic cell.

or

b. Write an essay on structure of viruses

10. a. Discuss in detail about the composition of biological membranes with neat diagram

Or

b. Give Describe the role of Golgi apparatus in protein organization and glycosylation

11. a. Explain about different forms of lysosomes and their role in cellular digestion

Or

b. Discuss in detail about the mitochondrial structure and endosymbiont theory

12. a. Write in detail about the adhesion proteins, anchoring junctions, tight junctions and communication junctions

Or

b. Discuss in detail about the stages of Cell Cycle s

13. Discuss about the principle and types of centrifugation

Or

Give in detail about the staining techniques used for microscope

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BIOCHEMISTRY SYLLABUS FOR VI SEMESTER
BIOCHEMISTRY CLUSTER PAPER: VIII-B-2
BIOTECHNOLOGY

Periods:45 **Max. Marks:60**

UNIT I: PLANT GENETIC ENGINEERING:

Gene isolation, gene transfer systems
Plant virus vectors: Tiplasmid
Gene transfer methods: Electroporation, microinjection, micro projectiletechnology
Selection and identification of transformed cells.

UNIT II: UPTAKE OF DNA BY CELLS

Transduction and transfection.
Chemical and physical methods of DNA introduction into cells.
cDNA and Genomiclibraries.
Southern and Northern hybridization.

UNIT III: PRINCIPLES OF GENE CLONING

Restriction and modification systems, restriction endonucleases and other enzymes used in manipulating DNA molecules.
DNA ligases, linkers and adapters.
Vectors and characteristics of Plasmids and bacteriophages,
Cloning vectors based on E. coli plasmids-pBR322.
Viruses as vectors, cloning vectors - M13 and λbacteriophage

UNIT IV: PROTEIN ENGINEERING

Production of recombinant pharmaceuticals such as insulin, human growth hormone.
Recombinant vaccines.
Yeast two hybrid systems,
Production of recombinant proteins by eukaryotic cells.

UNIT V: APPLIED BIOTECHNOLOGY

Tissue culture – brief introduction about Plant tissue culture, anther and pollen culture, protoplast culture, animal cell lines and organculture.
Transgenic plants and animals
Fermentation technology production of alcohols, antibiotics.
Immobilized enzymes (short notes)
Brief introduction on Enzyme electrodes,biosensors.

BIOCHEMISTRY CLUSTER PAPER: VIII-B-2

BIOTECHNOLOGY

QUESTION BANK

Short Answer questions:

1. Brief notes on Gene isolation
2. Brief notes on Gene transfer systems
3. Ti plasmids
4. Electroporation
5. Microinjection
6. Microprojectile technology
7. Selection and identification of transformed cells.
8. Brief notes on transduction
9. Brief notes on transfection.
10. cDNA libraries.
11. Genomic libraries
12. Southern blotting
13. Northern hybridization.
14. DNA ligases
15. linkers and adapters.
16. Characteristics of vectors
17. E. coli plasmids- pBR322.
18. M13 as viral vector
19. λ bacteriophage vector
20. Recombinant vaccines.
21. Plant tissue culture
22. Anther and pollen culture
23. Protoplast culture.
24. Animal cell lines.
25. Organ culture.

26. Immobilized enzymes.
27. Enzyme electrodes
28. Biosensors.

Essay questions:

1. Discuss about the steps involved in gene isolation
2. Discuss in detail about gene transfer systems
3. Write in detail about the Gene transfer methods
4. Explain about different methods for Selection and identification of transformed cells.
5. Describe about the Chemical methods of DNA introduction into cells.
6. Describe about the Physical methods of DNA introduction into cells.
7. Write about the synthesis and applications of cDNA libraries
8. Write about the synthesis and applications of genomic libraries
9. Give detail notes on restriction and modification systems
10. Write notes on Production of recombinant insulin
11. Give detailed notes on production of recombinant human growth hormone.
12. Write in detail about Recombinant vaccines.
13. Discuss about the principle and significance of Yeast two hybrid systems
14. Give an account on Production of recombinant proteins by eukaryotic cells.
15. Discuss about different types of plant Tissue culture methods
16. Give brief notes on animal cell lines and organ culture.
17. Explain about Transgenic plants with example
18. Discuss about the production of antibiotics by Fermentation technology.

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BIOCHEMISTRY SEMISTER VI PAPER VIII-B-II-

BIOTECHNOLOGY

MODEL QUESTION PAPER

Time: 3 hrs.Max. **Marks: 60 M**

Part-A

Answer any **FIVE** of the following questions 5×4 M=20 M

Each question carries **FOUR** marks.

1. Ti plasmids
2. Microinjection
3. Selection and identification of transformed cells.
4. linkers and adapters.
5. Characteristics of vectors
6. λ bacteriophage vector
7. Animal cell lines
8. Immobilized enzymes.

Part-B

Answer **ALL** the following questions. **5×8=4M**

Each question carries **EIGHT** marks

9. a. Discuss about the steps involved in DNA isolation

   Or

   b. Write in detail about the Gene transfer methods

10. a. Describe about the Physical methods of DNA introduction into cells.

    Or

    b. Write about the synthesis and applications of cDNA libraries

11. a. Give detail notes on restriction and modification systems

Or

b. Discuss about the Viruses as cloning vectors taking example of M13 and λbacteriophage

12. a. Write notes on Production of recombinant insulin

Or

b. Write in detail about Recombinant vaccines.

13. a. Discuss about the principle and significance of Yeast two hybrid systems

Or

b. Discuss about different types of plant Tissue culture methods

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BIOCHEMISTRY SYLLABUS FOR VI SEMESTER
BIOCHEMISTRY CLUSTER PAPER: VIII-B-3
BIOINFORMATICS AND BIOSTATISTICS

UNIT- I INTRODUCTION

Basics of Computer, Operating systems, Hardware and Software
Introduction to programming Languages and Paradigms
Role of supercomputers in biology
Introductions to bioinformatics
Applications of bioinformatics

UNIT- II SCOPE OF BIOINFORMATICS

Genomics and Proteomics
Comparative and functional genomics
Genomeannotation
Gene prediction approaches and tools.
DNA microarray

UNIT-III BIOLOGICAL DATABASES

Primary, secondary and composite databases
Nucleic acid databases (GenBank, EMBL, DDBJ)
Protein databases (PIR, Swiss-Prot, PDB)
Metabolic pathway database ((KEGG, EcoCyc)
Sequence alignment types and tools-BLAST

UNIT -IV DATA COLLECTION AND PRESENTATION

Concepts of population and sample, advantages ofsampling
Basic concepts in sampling
Designing experiments
Mean, median, mode, range and standard deviation
Probability

UNIT –V INTRODUCTION HYPOTHESIS TESTING & REGRESSION AND CORRELATION:

General concepts – Null hypothesis, alternative hypothesis.
P value and its significance
Student's t-test. Chi Square Test – Observed and expectedfrequencies,
Calculating p values –Pearson's correlationcoefficient
Regression- Concepts, simple linear regression;ANOVA

Short Answer questions:

1. Operating systems
2. Hardware
3. Software
4. Comparative genomics
5. Functional genomics
6. Brief notes on DNA microarrays
7. GenBank
8. EMBL
9. DDBJ
10. PDB
11. Metabolic pathway database
12. Sequence alignment
13. Mean, median, mode, range and standard deviation
14. P value and its significance
15. Pearson's correlationcoefficient
16. ANOVA

Essay questions:

1. Discuss about the Role of supercomputers inbiology
2. Give notes on Introduction tobioinformatics
3. Discuss about the applications ofbioinformatics
4. Write notes on Genomics
5. Give notes on Proteomics
6. Discuss about the genomeannotation methods
7. Discuss in detail about the Gene prediction approaches andtools
8. Give notes on DNA microarray
9. Discuss in detail about the biological databases
10. Discuss about Nucleic acid databases
11. Discuss in detail about the protein databases
12. Sequence alignment -BLAST
13. Discuss about the basic concepts in sampling
14. Discuss about the Designing ofexperiments
15. Discuss in detail about Student's t-test

16. Discuss in detail about the Chi Square Test – Observed and expectedfrequencies,
17. Discuss in detail about the concept of simple linear regression

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BIOCHEMISTRY SEMISTER VI PAPER VIII-B-3
BIOINFORMATICS AND BIOSTATISTICS

MODEL QUESTION PAPER

Time: 3 hrs. Max. **Marks: 60 M**

Part-A

Answer any **FIVE** of the following questions 5×4 M=20 M

Each question carries **FOUR** marks.

1. Software
2. Functional genomics
3. GenBank
4. DDBJ
5. PDB
6. Sequence alignment
7. P value and its significance
8. Pearson's correlationcoefficient

Part-B

Answer **ALL** the following questions. **5×8=4M**

Each question carries **EIGHT** marks

9. Discuss about the Role of supercomputers inbiology

Or

Discuss about the applications ofbioinformatics

10. Write notes on Genomics

Or

Give notes on DNA microarray

11. Discuss about Nucleic acid databases in detail

Or

Discuss in detail about the protein databases

12. Discuss about the basic concepts in sampling

Or

Discuss about the Designing of experiments

13. Discuss in detail about Student's t-test and its significance

Or

Discuss in detail about the Chi Square Test and its significance.

SRR & CVR GOVERNMENT DEGREE COLLEGE (A) Vijayawada

BLUE PRINT FOR QUESTION PAPER

SEMESTER VI

S.No	UNITS	Short answer 4 marks		Short answer 4 marks	Essay questions 8marks		Essay questions 8marks	Total marks
		Questions given	Questions To attempt	Total marks	Questions given		Total marks	
1	**UNIT-1**	2Q	STUDENTCHOICE	4M	1Q	STUDENT INTERNAL CHOICE	8M	12M
2	**UNIT-II**	2Q		4M	1Q		8M	12M
3	**UNIT-III**	2Q		4M	1Q		8M	12M
4	**UNIT-IV**	2Q		4M	1Q		8M	12M
5	**UNIT-V**	2Q		4M	1Q		8M	12M
	Total questions to attempt	5Q		20M	5Q		40M	60M

S.R.R. & CVR Government Degree College

An Autonomous & ISO 9001: 2015 Certified Institution:: Ranked by NIRF in 101-150 band at NIRF-2020 & 151-200 band in NIRF 2019
NAAC accredited Institution with grade B+ with C.G.P.A 2.6 during March 2017

Machavaram, Vijayawada, Krishna District, AP-520 004

Department of Biochemistry

Student Evaluation Policy and Procedure

1. EVALUATION POLICY AND PROCEDURE:

Students are evaluated for 100 marks in each course. These 100 Marks are split into Continuous Internal Assessment (C.I.A.) and Semester End Evaluation (SEE). Forty marks are allocated to C.I.A. and 60 marks for SEE.

1.1. CONTINUOUS INTERNAL ASSESSMENT (C.I.A.) FOR 40 MARKS:

1.1.1 Out of a maximum of 100 marks in each theory paper, 40 marks shall normally be allotted for continuous internal assessment. The teacher shall make the assessment handling that paper in the manner prescribed hereunder. Where the same paper is dealt with by two or more teachers, the Head of the Department shall decide upon the teacher, who shall make the internal assessment or fix the proportion of the marks among the teachers for the internal evaluation of the students.

1.1.2 **Out of these 40 marks, 10 marks are allotted to Continuous Internal Exams.** Two Continuous Internal exams are conducted for 20 marks in each exam. The average of these two exams scale down to 10 marks shall be deemed the marks obtained by the Student in Continuous Internal Exams.

1.1.3 **Out of these 40 marks, 10 marks are allotted to Assignments.** Two assignments are given to the students during the course. 5 marks are assigned for each assignment. The total of these two assignments is included in Continuous Internal Assessment.

1.1.4 **Out of these 40 marks, 10 marks are allotted to Project Work/ Group Discussion.** Students will be assigned a student study project for 10 Marks under C.I.A. The student must submit a project report under the supervision of a Faculty Member. These 10 marks may also be assigned to group discussion also. The student will be evaluated here based on their way of expression, conceptual strength, attitude, listening-understanding skills, and level of participation in the debate.

1.1.5 **Out of these 40 marks, 5 marks are allotted to Student Seminar and 5 marks for Viva-Voce.** Each student may give a student seminar to the peer team. This student seminar will carry 5 marks. Here feedback will be collected on 5 points scale from the participants in the student seminar [or] Viva- Voce will be conducted by the concerned subject faculty for five marks.

The summarized continuous internal assessment is:

1. Average of Two Continuous Internal exams	**-**	**10 Marks**
2. Total of Two Assignments	**-**	**10 Marks**
3. Project Work/ Group Discussion	**-**	**10 Marks**
4. Student Seminar	**-**	**5 Marks**
5. Feedback /Viva-Voce	**-**	**5 Marks**

-

1.2 CIA IN PROJECT WORK AND COMPREHENSIVE SEMINAR:

Each student must conduct Industry/Laboratory oriented Research work in their interested area and prepare a Project Report using primary or secondary data. This is different from the student study project. It is a research-oriented Industrial/laboratory project conducted under the supervision of a Faculty Member of the department. The students must submit the project work report to the supervision of the faculty at the end of the VI Semester End Evaluation process. After presenting the project work report, the students must give a Comprehensive Seminar by explaining their research in the industry/Lab. Project Work carries 40 Marks, and Comprehensive Seminar has 10 Marks.

Every student is required to take every test for Continuous internal Assessment unless the Principal permits them to write at a later date on valid reasons before the test is conducted. In the case where permission is not obtained, the decision of the Principal to hold or not to hold a separate examination for such candidate is final. Permission to write an Internal Assessment test at the end of corresponding semester-end exams may be given on medical grounds and other valid grounds. For such candidates, test/s is/are conducted by the faculty member concerned in consultation with the Head of the Department with a different question paper. The student must get a minimum of 40 percent (16 Marks) marks in the Continuous Internal Assessment to complete the Course Paper.

S.R.R. & CVR Government Degree College (A), Machavaram, Vijayawada
Department of BIOCHEMISTRY
Action Plan for A. Y. 2021- 2022:: Semesters I / III / V

Date: 21 - 10- 2021.

S No	Month	Week	Activity proposed by the lecturer	If Conducted or Not	Remarks
	December 2021	4 th Week	Name: Sd V Tahaseen Activity: Quiz		
2	November 2021	1st Week	Name: Sd V Tahaseen Activity: Guest lecture		
		2nd Week	Name: : E Sarojini Devi Activity: Blood grouping and B.M.I. estimation for freshers		
		4 th Week	Name: : Sd V Tahaseen & E Sarojini Devi Activity: Food adulation certificate course		
3	December 2021	1st Week	Name: : Sd V Tahaseen & E Sarojini Devi Activity: Students study project on R.N.A. viruses/ Focus on H.I.V.		
		4 th Week	Name: Sd V Tahaseen & E Sarojini Devi Activity: Field trip		

4	January 2022	1st Week	Name: Sd V Tahaseen & E Sarojini Activity : Survey on dietary habits		
		2nd Week	Name: Sd V Tahaseen & E Sarojini Devi Activity: Guest lecture		
5	February 2022	1st Week	Name: Sd V Tahaseen & E Sarojini Devi Activity: Webinar on Cancer biology (World cancer day)		
		3 rd Week	Name: Name: Sd V Tahaseen & E Sarojini Devi Activity: Workshop on tissue staining techniques		

		4 th Week	Name: Name: Sd V Tahaseen & E Sarojini Devi Activity: World Science Day (February- 28)		
6	March 2022	1st Week	Name: Name: Sd V Tahaseen & E Sarojini Devi Activity: Webinar Diversity in the living world (World life day)		
		3 rd Week	Name: Name: Sd V Tahaseen & E Sarojini Devi Activity: Laboratory visit clinically significant enzymes & and their role in the diagnosis		

Note: 1. As per the Resolutions of the Staff Council, all Lecturers are directed to comply with the Action Plan Execution and attend all the procedures through the Department and the Office.

2. If there is any deviation in any date schedule, please inform the H O D beforehand.
3. Please prepare a Report of the Activity completed with description, Photos, Signatures of the Staff and Students Attended, both in Soft and Hard Copies, and furnish to the H O D.

Sd V Tahaseen

In-charge of the Department.

Suggestive Question Paper Pattern for C.I.A. & SEE (Based on Blooms Taxonomy):

Though the faculty concerned is empowered to adopt their own pattern for question paper, a general and suggestive model for question paper is given below based on Blooms Taxonomy.

S.No	Learning Objective	Percentage of Marks
1	Memory based (Remember)	10
2	Understand (Comprehension)	10
3	Application	15
4	Analysis	15
5	Evaluation	25
6	Creativity	25
Total		**100**

Active verbs developed based on Bloom's Taxonomy

Knowledge	Understand	Apply	Analyze	Evaluate	Create
define	explain	solve	analyze	reframe	design
identify	describe	apply	compare	criticize	compose
describe	interpret	illustrate	classify	evaluate	create
label	paraphrase	modify	contrast	order	plan
list	summarize	use	distinguish	appraise	combine
name	classify	calculate	infer	judge	formulate
state	compare	change	separate	support	invent
match	differentiate	choose	explain	compare	hypothesize
recognize	discuss	demonstrate	select	decide	substitute
select	distinguish	discover	categorize	discriminate	write
examine	extend	experiment	connect	recommend	compile
locate	predict	relate	differentiate	summarize	construct
memorize	associate	show	discriminate	assess	develop
quote	contrast	sketch	divide	choose	generalize
recall	convert	complete	order	convince	integrate
reproduce	demonstrate	construct	point out	defend	modify
tabulate	estimate	dramatize	prioritize	estimate	organize
tell	express	interpret	subdivide	find errors	prepare
copy	Identify	Manipulate	survey	grade	produce
discover	indicate	Paint	advertise	measure	rearrange
duplicate	Infer	Prepare	appraise	predict	rewrite
enumerate	relate	produce	Break down	rank	role-play

2. SEMESTER END EVALUATION (SEE):

2.1 The maximum marks for Semester End Examinations shall generally be 60, and the duration of the examination shall be 3 hours.

2.2 Semester End Examinations shall be conducted in theory and practical paper at the end of every semester unless otherwise stated, I, II, III, IV, V& VI Semesters.

2.3 The principal fixes the date of Semester End Examinations in consultation with the Head of the Departments and the Controller of Examinations.

2.4 For Semester End Examinations, the question papers of Part-A and B shall be set by External Paper-setter, and the External Examiner shall value the answer scripts.