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. of Hrs/Week*	*No. of Credits*
I	I	I	BCN-1325 Biomolecules	100	4	04
			BCN-1325P Biomolecules	50	2	01
	II	II	BCN-2325 Analytical techniques	100	4	04
			BCN-2325P Analytical Techniques	50	2	01
II	III	III	BCN-3325 Enzymology, Bioenergetics, and Intermediary Metabolism	100	4	04
			BCN-3325P Enzymology and Bioenergetics	50	2	01
		IV-1	BCN-4325-1 Physiology, Nutritional and Clinical Biochemistry	100	4	04
	IV		BCN-4325-1P Nutritional and Clinical Biochemistry	50	2	01
		IV-2	BCN-4325-2 Microbiology and Immunology	100	4	04
			BCN-4325 2P Human Physiology & Endocrinology	50	2	01
III V/VI		VA1	BCN-5325-A1 Molecular Biology & rDNA Technology-	100	4	04
			BCN-5325-A1P Molecular Biology & rDNA Technology-	50	2	01
		VA2	BCN-5325-A2 Bioinformatics & Biostatistics	100	4	04
			BCN-5325-A2P Bioinformatics & Biostatistics	50	2	01
III V/VI		VB1	BCN-5325B1 Animal Biotechnology and Biostatistics	100	4	04
			BCN-5325-B1P Animal Biotechnology and Biostatistics	50	2	01
		VB2	BCN-5325B2 Cell biology, Genetics, Molecular biology and Evolution	100	4	04
			BCN-5325B2P Cell biology, Genetics, Molecular biology and Evolution	50	2	01

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Machavaram, Vijayawada, Krishna District, AP-520 004

Department of Biochemistry

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

Title of the Course: Biomolecules -BCN-1325

Common for 313 &309 : BSc MBC & MBF 1

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 Objectives:

- To give knowledge on biomolecules such as carbohydrates, lipids, proteins, nucleic acid and porphyrins.
- To understand about the different categories of biomolecules and their functions
- To understand the characterization of biomolecules, their significant role in biological systems

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

- General properties of proteins (Solubility, Isoelectric pH, Denaturation, and renaturation
- Structural organization of proteins- Primary, Secondary, Tertiary, and Qaternary structures (E.g., Hemoglobin and Myoglobin), Ramachandran plot.

Unit-V: Nucleic acids and porphyrins 12 hours

- Structure of purines and pyrimidines, nucleosides, nucleotides.
- Watson-Crick D.N.A. Double helix structure
- RNA structure and types
- Denuration and renaturation kinetics of nucleic acids-
  (*T*m-values and their significance, cot curves and their significance)
- Structure &Properties of porphyrins (Structure of –Heme, Cytochromes (a,b,c), Chlorophylls (a,b,c).)

BCN-1325 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. Biochemistry - Zubay C, Addison – Wesley, 1986.
2. Biochemistry, A problem Approach, 2nd Edn. Wood, W.B. Addison Wesley 1981.
3. Biochemistry, Lehninger A.H.
4. Textbook of Biochemistry West, E.S., Todd, Mason & Vanbruggen, Macmillian &Co.
5. Principles of Biochemistry White-A, Handler, Pand Smith E.L. Mc Grew Hill.
6. Fundamentals of Biochemistry by Donald Voet (1999).
7. Indian Pharmacopeia available in the pharmacy department
8. The biochemistry of Nucleic acids; Adams et al., Chapman and Hall, 1986.
9. Proteins: A guide to study by physical & chemical methods Haschemeyer and Haschemeyer,
10. Proteins: Structure, function, and evolution. Dickerson & Geis, 2nd Edn, Benjamin/Cummings.

BLUEPRINT FOR QUESTION PAPER-BCN1325

S.NO	TYPE OF QUESTIONS UNITS	SA 4 marks Questions given	S.A. 4 marks Questions To attempt	S.A. 4 marks Total marks	LA 8 marks Questions To attempt	LA 8 marks Total marks	Total 60 marks Total 60 marks
1	**UNIT-1** **Biophysical concept**	1Q	STUDENT CHOICE	4M	1Q	8M	12M
2	**UNIT-II** **Carbohydrates**	2Q		8M	1Q	8M	16M
3	**UNIT-III** **Lipids**	3Q		12M	1Q	8M	20M
4	**UNIT-IV** **Aminoacids and proteins**	2Q		8M	1Q	8M	16M
5	**UNIT-V** **Nucleic acids and proteins**	2Q		8M	1Q	8M	16M
	Total questions to attempt	5Q		20M	5Q	40M	60M

BIOCHEMISTRY- MODEL QUESTION PAPER
SEMESTER-I
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 DNA 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
2. Analysis of 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. Non-protein 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 DNA double helix structure.
2. D.N.A. Re-association Kinetics, cot curves, and their significance.
3. Discuss about different types of RNAs
4. Discuss about the Structure and functions of chlorophyll a and chlorophyll b.
5. Structure of Metallo-porphyrins.
6. Structure of Cytochromes.
7. Structure of Chlorophylls.

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Title of the Course: Analytical Techniques- BCN-2325

Common for 313&309: B.Sc. 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 Objectives: Analytical Techniques

- To understand the importance of analytical techniques in the study of biomolecules
- To learn how the analytical techniques are used in isolation purification and characterization of biomolecules
- To learn the chromatography technique principle, procedure and applications
- To understand the principle and applications of the electrophoresis technique
- To understand the principle and applications of spectroscopy
- To learn the techniques related to isolation and identification of bacteria

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**

- Prokaryotic and eukaryotic cells & Cell Lysis
- Methods of tissue homogenization :(Mechanical, Sonicator and Enzymatic).
- Centrifugation techniques, principle, and applications
- Ultra-centrifugation- preparative (Differential, Density gradient) and analytical.

Unit-II: Chromatographic techniques **12 hours**

- Types of chromatographic techniques, Principle and applications –
- Paper chromatography- Solvents, Rf value, Thin layer Chromatography
- Gel filtration -Chromatography
- Ion- exchange- Chromatography
- Affinity- Chromatography. Introduction to HPLC.

Unit-III: Spectroscopy and tracer techniques **12 hours**

- Beer-Lambert's law, Introduction to Woodward Fieser rule.
- Instrumentation and applications of Colorimetry
- Instrumentation and applications of Spectrophotometry
- 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;-

- S.D.S PAGE
- Agarose gel electrophoresis
- Iso-electric focusing
- 2D Gel electrophoresis
- Immuno-Electrophoresis-Types

Unit-V: Microbial techniques: **12 hours**

Microscopy: Basic principle and applications

- Light microscopy , Confocal microscopy
- Electron microscopy and Fluorescent microscopy
- Preparation of different growth media, isolation and cultivation of bacteria, antibiotic resistance.

- Gram's staining, Sterilization Techniques-Physical methods, chemical methods

ANALYTICAL TECHNIQUES- BCN-2325P

List of Experiments:

1. Isolation of R.N.A. and D.N.A. from tissue/culture.
2. Isolation of egg albumin from egg white.
3. Isolation of cholesterol from egg yolk.
4. Isolation of starch from potatoes.
5. Isolation of casein from milk.
6. Separation of amino acids by paper chromatography.
7. Separation of plant pigments by TLC
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 Questions given	S.A. 4 marks Questions To attempt	S.A. 4 marks Total marks	LA 8 marks Questions To attempt	LA 8 marks Total marks	Total 60 marks Total 60 marks
1	UNIT-1 **Cell homogenization and centrifugation**	1Q	STUDENT CHOICE	4M	1Q	8M	16M
2	UNIT-II **Chromatographic techniques**	3Q		12M	1Q	8M	16M
3	UNIT-III **Spectroscopy and tracer techniques**	2Q		8M	1Q	8M	16M
4	UNIT-IV **Electrophoresis**	2Q		8M	1Q	8M	16M
5	UNIT-V **Microbial techniques**	2Q		8M	1Q	8M	16M
	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. Principle for fluorescent microscope
4. Beer-Lambert law.
5. Radioisotopes, units of radio activity
6. Gel filtration.
7. Tracer techniques
8. Iso-electric 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 Gel filtration 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. Woodward Fieser rule.
14. Beer-Lambert's law
15. Tracer techniques
16. Use of radioactive isotopes in biology
17. SDS PAGE
18. Iso-electric focusing
19. Immune-electrophoresis-types and applications.
20. The basic principle of light microscopy
21. Phase-contrast microscope
22. Electron microscope applications
23. Fluorescent microscope principle
24. Preparation of different growth media
25. Gram's staining
26. Sterilization Techniques-Physical methods.
27. 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 Ion exchange chromatography
4. Principles and applications of Gel filtration chromatography
5. Principles and applications of Affinity chromatography
6. Explain about the principle and types of ELISA
7. Principles and applications of Spectrophotometry
8. Discuss applications of radioisotopes in biology
9. Principles and applications of Polyacrylamide electrophoresis
10. Define types and applications of immune electrophoresis.
11. Principles and applications of a light microscope
12. Principles and applications of a fluorescent microscope
13. Principles and applications of electron microscope
14. Discuss about sterilization techniques in detail

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

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

Common for 313&309: 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 Objectives: Enzymology, Bioenergetics, and Intermediary Metabolism

- Understand the basic nature of enzymes
- To learn the reaction mechanism of enzymes
- To learn about the thermodynamic principles and energy transformations in living systems
- To understand how life sustained with metabolism.
- To appreciate the mechanism of production of ATP

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

12 hours

Unit-I: Enzymology

- 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. Definition for activation energy and transition state.
- Interaction between enzyme and substrate-lock and key, induced fit models.
- Michaelis -Menten equation for the uni-substrate reaction, Significance of Km and Vmax.
- Enzyme inhibition –competitive and non-competitive. Factors affecting enzyme activity.

12 hours

Unit-II: Carbohydrate Metabolism.

- Concept of anabolism and catabolism.
  - Glycolytic pathway and energy yield, 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.

12 hours

Unit-III: Lipid Metabolism

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

12 hours

Unit-IV: Metabolism of Amino acids

- General reactions of amino acid metabolism- transamination, decarboxylation and deamination,
- Urea cycle and regulation
- Metabolism of aromatic amino acid-phenylalanine. – inborn errors -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.
- In born errors of nucleotide metabolism- ex: Gout, Lesch- Nyhan syndrome

Unit-IV: Bioenergetics and Biological oxidation 12 hours

- Gibbs free energy, enthalpy, and entropy

- Coupled reactions in biological systems (one example)
- High energy compounds.
- Oxidation-reduction reactions (one example)
- Structure of mitochondria
- Organization of components of electron transport chain
- Mechanism of oxidative phosphorylation.
- Uncouplers and inhibitors of oxidative phosphorylation.

Enzymology, Bioenergetics, and Intermediary Metabolism BCN-3325P

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-3325P

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	16M
2	UNIT-II Carbohydrate Metabolism	2Q		4M	1Q	8M	16M
3	UNIT-III Lipid Metabolism	2Q		4M	1Q	8M	16M
4	UNIT-IV Metabolism of Amino acids	2Q		4M	1Q	8M	16M
5	UNIT-V Bioenergetics and Biological oxidation	2Q		4M	1Q	8M	16M
	Total questions to attempt	5Q		20M	5Q	40M	60M

BIOCHEMISTRY MODEL QUESTION PAPER

SEMESTER-III

Enzymology, Bioenergetics, and Intermediary Metabolism BCN-3325P

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

Enzymology, Bioenergetics, and Intermediary Metabolism BCN-3325P

Question Bank

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, V & VI are under CBCS with Learning Outcomes-based Curriculum Framework (LOCF)

Title of the Course - Physiology, Nutrition and Clinical Biochemistry BCN-4325-1

Common for 313&309: BSc MBC & MBI

Course Code :	BCN-4325-1	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

Objectives:

Human physiology, Nutrition and Clinical Biochemistry

To understand the organ systems and their functioning

To appreciate the role of blood as transporter, and blood cells as protecting cells

To get knowledge on the organ function tests

To understand the significance of nutrition in health

To apply the skills of clinical biochemistry in disease diagnosis

Course Outcomes (C.O.s): Physiology, Nutrition 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 Excretion 12hours

- Digestion and absorption of carbohydrates, lipids, and proteins.
- Role of enzymes and Gastrointestinal hormones in digestion
- Liver functions
- Kidney-structure, structure and functions of the nephron
- Mechanism of Urine formation
- Normal and abnormal constituents of the urine.

Unit-II: Nerve impulse transmission and Muscle Contraction 12hours

- Neurons-structure, types
- Neurotransmitters.
- Mechanism of nerve impulse transmission. (Resting potential, Action potential)
- Types of muscles, skeletal muscle structure
- Mechanism of muscle contraction

Unit-III: Blood & Heart

- Composition of the blood
- Coagulation of blood
- Transport of gases in the blood (oxygen and CO_2)
- Heart structure (diagram)
- Cardiac cycle.

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.
- Bulk and trace elements-Ca, Mg, Fe, I, Cu, Mo, Zn, Se, and F.

Additional inputs: Introduction to nutraceutical and functional foods.

Unit-V Clinical biochemistry 12hours

- Liver function tests
- Serum enzymes in liver diseases-SGOT, SGPT, G.G.T., C.P.K., acid, and alkaline phosphatases
- Kidney function tests: G.F.R., Urea, Creatinine, Cystatin C,
- Types of anaemias
- Enzymes in diagnostics of heart disease including aspartate transaminase isoenzymes of creatinekinase, lactate dehydrogenase and troponin.

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-4325-1

S.NO	TYPE OF QUESTIONS UNITS	SA 4 marks Questions given	S.A. 4 marks Questions To attempt	S.A. 4 marks Total marks	LA 4 marks Questions To attempt	LA 4 marks Total marks	Total 60 marks Total 60 marks
1	**UNIT-1 Digestion and Excretion**	2Q	STUDENT CHOICE	4M	1Q	8M	16M
2	**UNIT-II Nerve impulse transmission and Muscle Contraction**	2Q		4M	1Q	8M	16M
3	**UNIT-III <u>Blood and Heart</u>**	2Q		4M	1Q	8M	16M
4	**UNIT-IV <u>Nutritional Biochemistry</u>**	2Q		4M	1Q	8M	16M
5	**UNIT-V <u>Clinical Biochemistry</u>**	2Q		4M	1Q	8M	16M
	Total questions to attempt	5Q		20M	5Q	40M	60M

MODEL QUESTION PAPER

SEMESTER-IV

Physiology, Nutritional and Clinical Biochemistry- BCN-4325-1

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. Cardiac cycle
3. Neuron structure.
4. kidney-Structure.
5. GFR
6. Transportation of oxygen
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). Write an essay on digestion and absorption of proteins.

Or

(b).Discuss about the mechanism of urine formation

2(a).Discuss about the mechanism of skeletal muscle contraction

Or

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

3(a). Discuss in detail about the composition of blood

Or

(b) Write in detail about the mechanism of coagulation of blood

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 in detail about the kidney function tests.

Or

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

QUESTION BANK

Physiology, Nutritional and Clinical Biochemistry- BCN-4325-1

UNIT -1

Short answer questions

1. Enzymes in digestion
2. Structure of Nephron
3. Normal constituents of urine
4. Abnormal constituents of urine
5. Gastrointestinal hormones

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. Structure of sarcomere
5. Types of muscles

Long answer questions

1. Nerve impulse transmission mechanism
2. Mechanism of muscle contraction
3. Neuro transmitters

Unit -3

1. Blood cells
2. Plasma

3. Heart structure (diagram)
4. Cardiac cycle
5. Discuss in detail about the Transport of oxygen in the blood
6. Discuss abou the transportation of Co2 in the blood

Long answer questions:

1. Write about the Composition of the blood
2. Discuss about the Coagulation of blood
3. Write an account on transportation of gases in blood

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
2. Brief introduction to water-soluble vitamins
3. 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
3. Disorders of blood coagulation
4. Hemoglobinopathies
5. Serum lipids and lipoproteins
6. GFR
7. Jaundice

8. Nutritional deficiency anemia
9. Hereditary anemia

Long answer questions

1. Serum enzymes in liver disease
2. Serum markers in heart disease
3. Liver function tests
4. Kidney function tests
5. Types of Anemia

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Department of Biochemistry

Syllabi for Courses in ALL Semesters are under CBCS with Learning Outcomes-based Curriculum Framework (LOCF)

Title of the Course:- **Microbiology & Immunology** BCN-4325-2

Common for 313&309: BSc MBC & MBF

Course Code :	BCN-4325-2	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 concepts in Microbiology helps to understand the classification of microorganisms , cultivation and characterizationof microbes
- CO2: Students will understand the pathological characteristics of microorganisms and will apply in understanding the diseases caused by microbes
- **CO3:** The understanding of immunology concepts involves in-depth knowledge of tissues, cells, and molecules involved in host defense mechanisms.
- CO4: It helps understand types of immunity, antigens-antibodies, and their properties, complement system, MHCs, and immune responses.
- CO5: 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.
- CO6: 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

Microbiology & Immunology- BCN-4325-2

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

- Photosynthetic organelles in plants
- Light-dependent reactions, Photophopsphorylation & Photolysis
- Light-independent reactions –Calvin cycle
- C4 cycle and CAM photosynthesis
- Nitrogen cycle,
- Non-biological and biological nitrogen fixation.
- Nitrogenase enzyme system.

Additional inputs: Factors effecting photosynthesis

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 and structure of immunoglobulins,
- 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
- Autoimmune diseases

Microbiology & Immunology- BCN-4325-2P

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).

BLUEPRINT

Microbiology & Immunology- BCN-4325-2

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	16M
2	UNIT-II Nitrogen Fixation	2Q		4M	1Q	8M	16M
3	UNIT-III Applied Biochemistry	2Q		4M	1Q	8M	16M
4	UNIT-IV Immunology-1	2Q		4M	1Q	8M	16M
5	UNIT-V Immunology 2	2Q		4M	1Q	8M	16M
	Total questions to attempt	5Q		20M	5Q	40M	60M

BIOCHEMISTRY MODEL QUESTION PAPER

SEMESTER-IV

Microbiology & Immunology- BCN-4325-2

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.

1

Microbiology & Immunology- BCN-4325-2

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

Define autoimmunity discuss about the types of autoimmunity

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Department of Biochemistry

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

Title of the Course: Molecular biology & rDNA technology - BCN-5325 A1

Common for -313&309: B.Sc. MBC & MBF

Course Code :	BCN-5325 A1	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 Objectives: Molecular biology & rDNA technology

To understand the organization of genetic material in pro and eukaryotes

To conceptualize the replication of DNA

To understand the regulated transcription of genes

View on how the genetic material is translated as proteins

To understand the tools of genetic engineering and the process of genetic engineering

To conceptualize the basic techniques used in molecular biology

Course Outcomes (C.Os): Molecular biology & rDNA technology

- CO1: To provide students with a comprehensive background of Salient features of Nucleic Acids and DNA models.
- CO2: To impart a detailed understanding of critical molecular biology events comprising DNA Replication, Transcription, and Translation in Prokaryotes and Eukaryotes.
- CO3: To provide adequate knowledge about Post Transcriptional Modifications and Processing of Eukaryotic RNA
- CO4: To give a detailed explanation to students about the Transcriptional Regulation with examples of lac operon and tryptophan operon in prokaryotic and eukaryotic organisms along with the critical concept of Gene Silencing.
- CO5: Students can develop a comprehensive understanding of DNA Repair Mechanisms
- CO6: By understanding molecular biology concepts, students can apply their knowledge in rDNA technology to produce new genetically modified organisms.

- CO7: The strong foundation in rDNA technology will provide good opportunities for students to work in various industries.

Molecular Biology & rDNA Technology- BCN-5325 –A1

Unit- I: Genome, DNA replication mechanism

- Organization of genetic material
- Experiments to prove DNA as genetic material
- Concept of gene, Nature and structure of gene.
- DNA replication (Prokaryotic) - Meselson-Stahl's experiment, Enzymes in replication
- Mechanism of DNA Replication, (Bidirectional replication model. Okazaki fragments)
- Inhibitors of DNA replication.

Additional inputs- Rolling circle model, Brief note on eukaryotic DNA replication

UNIT- II: Transcription

- Transcription - RNA polymerases of prokaryotes, Promote site
- Mechanism of transcription (Prokaryotic)
- Regulation of prokaryotic gene expression at transcriptional level- Lac operon concept.
- Post transcriptional modifications-mRNA capping, polyadenalytion, splicing

. Additional inputs-Eukaryotic RNA polymerases, promoter site

Unit- III: Translation

- Characteristics of genetic code, Wobble hypothesis,
- Activation of amino acids (aminoacyl t-RNA synthetase), Ribosome structure.
- Mechanism of protein synthesis (Prokaryotic)
- Post- translational modifications.
- Inhibitors of protein synthesis.

Additional inputs: Transposons

Unit-IV: Recombinant DNA Technology

- Basic steps involved in cloning
- Enzymes used in molecular cloning; Polymerases, ligases, phosphatases, kinases and nucleases. restriction endonucleases (classification,nomenclature)
- Cloning vectors- Plasmid vectors, λ phage vectors, cosmid vectors,,YAC vectors, Expression vectors.
- Gene transfer methods: Electroporation, transformation, Gene gun methods.
- Construction of c-DNA and Genomic libraries.

- Isolation of cloned genes- Colony hybridization.

Unit V -Applied Biochemistry

- DNA sequencing- Maxam Gilbert and Sanger method.
- Polymerase Chain Reaction- principle and applications.
- Outlines of blotting techniques-Southern, Northern and Western.
- Applications of gene cloning, production of insulin and Bt cotton by rDNA technology

Additional inputs: C-Value paradox, Telomerase.

Molecular Biology & rDNA Technology- BCN-5325 –A1P

LIST OF EXPERIMENTS

1. Preparation of Buffer stocks
2. Extraction of DNA from Fish fins
3. Agarose Gel Electrophoresis (AGE)
4. Restriction digestion
5. Isolation of RNA
6. Plasmid isolation
7. SDS PAGE
8. PCR Technique
9. Discuss about the organisation of genetic material at chromosomal level

Biochemistry- BCN-5325-A1

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. Okazaki fragments
2. Wobble hypothesis
3. Promoter site in prokaryotic genes
4. Ribosome structure in prokaryotes
5. Basic steps in cloning
6. Restriction endonucleases
7. Plasmid vectors
8. Isolation of cloned genes by colony hybridization
9. The concept of gene
10. Recombinant insulin

Part-B

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

Each question carries **EIGHT** marks

1. a. Write about the mechanism of DNA replication in detail

   Or

   b. Write about the experiments that proved DNA as genetic material

2. a Discuss about the mechanism of transcription in detail

   Or

   b. Write about the regulation of gene expression at transcriptional level taking Lac Operon as a model

3. a. Discuss in detail about the mechanism of protein synthesis

   Or

   b. Write about the post translational modifications in detail

4. a. Write about the significance of the different enzymes used in molecular cloning

   Or

   b: Explain the different types of gene transfer methods

5. a. Write about the principle and applications of PCR

   Or

   b. Discuss about Sangers method for DNA Sequencing

Molecular Biology & rDNA Technology- BCN-5325 --A1

Question bank

Short Answer questions:

1. Chromosomal organization
2. The concept of gene
3. Meselson and stahl experiment
4. Inhibitors of DNA replication
5. Okazaki fragments
6. RNA polymerases
7. Promoter site in prokaryotic genes
8. Characteristics of genetic code
9. Wobble hypothesis
10. Ribosome structure in prokaryotes
11. Inhibitors of protein synthesis
12. Basic steps in cloning
13. Restriction endonucleases
14. Plasmid vectors
15. Isolation of cloned genes by colony hybridization
16. Principle for PCR
17. Applications of Southern blotting
18. Applications of Western blotting
19. BT cotton
20. Recombinant insulin

Essay questions

1. Write about the experiments that proved DNA as genetic material
2. Discuss about the nature and structure of gene
3. Write about the mechanism of DNA replication in detail
4. Discuss about the role of RNA polymerase in transcription
5. Write about the regulation of gene expression at transcriptional level taking Lac Operon as a model
6. Discuss about the mechanism of transcription in detail

7. Write about the post transcriptional modifications in detail
8. Discuss in detail about the mechanism of protein synthesis
9. Write about the post translational modifications in detail
10. Write about the significance of the different enzymes used in molecular cloning
11. Discuss about the cloning vectors
12. Explain the different types of gene transfer methods
13. Write about the construction of cdna libraries
14. Write about the construction of genomic libraries
15. Discuss about Sangers method for DNA Sequencing
16. Write about the principle and applications of PCR
17. Write about the principle and applications of Southern blotting
18. Write about the principle and applications of Northern blotting
19. Write about the principle and applications of Western blotting
20. Discuss about the applications of gene cloning
21. Write about the steps involved in production of insulin using rDNA technology
22. Discuss about the steps involved in production of BT Cotton by rDNA technology

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Department of Biochemistry

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

Title of the Course: Bioinformatics & Biostatistics - BCN-5325-A2

Common for -313&309: B.Sc. MBC & MBF

Course Code :	BCN-5325-A2	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

Objectives: Bioinformatics & Biostatistics - BCN-5325-A2

- To understand about the various web-based resources for storage of biological information.
- To enrich the students with essential software/tools and techniques used in bioinformatics
- To describe the roles biostatistics that serves in the discipline of research
- To apply statistical knowledge to design and conduct research studies

Course outcomes: Bioinformatics & Biostatistics - BCN-5325-A2

CO1: Students will be able to appreciate the importance of bioinformatics and apply the knowledge gained in a variety of applications of bioinformatics.

CO2: Students will understand the distinction between DNA retrieval tools.

CO3: The application of bioinformatics on the overview of drug designing

CO4: The students get familiarized with basic principles and applications of bioinformatics.

CO5: The application of basic statistical concepts commonly used

CO6: Demonstration of basic analytical techniques to generate results

CO7: Interpretation of results that are used statistical analyses in written summaries.

Bioinformatics & Biostatistics - BCN-5325-A2

UIT-1 History, scope and importance (12 hours)

- Introduction to Bioinformatics –History & Scope
- Applications of Bioinformatics
- NCBI –History & Resources available at NCBI
- Sequence file formats-FASTA, Genbank /NCBI,EMBL
- Genomics (Structural, functional & comparative)
- Proteomics (Structural, functional & Protein expression)

UNIT II - Databases - Tools and their uses (12 hours)

- Biological databases types- (Primary; Composite &- Secondary)
- Nucleic acid sequence databases – GENBANK, DDBJ, EMBL
- Protein data bases – Sequence- (swisprot) structure (PDB) databases
- Metabolic pathway data base (KEGG)
- Genome annotations

UNIT III - Sequence alignment methods & predictive methods (12 hours)

- Local (Smith Waterman) and Global alignment (Dynamic programming)
- Pair wise sequence alignment (dot plot) methods, Multiple sequence alignment methods (Progressive method, Motif finding)
- Sequence alignment algorithms (BLAST, CLUSTALW)
- Gene predictions strategies –(Emperical method, Ab initio method)

UNIT-IV Sampling & design of experiments (12 hours)

- Concepts of population and sampling methods
- Types of data & variables
- Mean, median, mode ,range, standard deviation
- Designing experiments
- Null hypothesis , alternative hypothesis

UNIT-V Basic statistical tests (12 hours)

- Probability distribution-Binomial and Normal distribution
- P value and its significance.
- Regression test-Simple linear regression, multiple regression
- Comparison tests: Independent t test, Paired t test , ANOVA
- Correlation tests- Pearson correlation tests
- Chi square test, significance

Bioinformatics & Biostatistics - BCN-5325-A2P

Lab experiments

- Bioinformatics project
- Biostatistics lab

Biochemistry Model question paper

-BCN-5325-A2

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. Swissprot
2. KEGG
3. Global alignment NCBI
4. FASTA
5. Genbank
6. Sampling methods
7. Normal distribution
8. Pearson correlation test
9. ANOVA
10. P value significance

Part-B

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

Each question carries EIGHT marks

6. a. Describe the history and scope of bioinformatics

Or

b. Discuss about the applications of bioinformatics

7. a. Write about the resources available at ncbi in detail

Or

b. Discuss about genomics

8. a. Explain about the nucleic acid sequence databases

Or

b. Explain about genome annotations in detail

9. a. Write about the sampling methods in detail

Or

Give a note on designing the experiments

9. a. Explain about the Chi square test and its significance

Or

b. Write about the regression test in detail

Bioinformatics & Biostatistics - BCN-5325-A2
Question bank

ESSAY QUESTIONS

1. Describe the history and scope of bioinformatics
2. Discuss about the applications of bioinformatics
3. Write about the resources available at ncbi in detail
4. Discuss about genomics
5. Discuss in detail about proteomics
6. Explain about the nucleic acid sequence databases
7. Explain about the protein databases in detail
8. Explain about genome annotations in detail
9. Give in detail about the pairwise sequence alignment methods
10. Discuss about the gene prediction strategies
11. Write about the sampling methods in detail
12. Give a note on designing the experiments
13. Write about the binomial and normal
14. distribution
15. What is p-value describe its significance
16. Discuss about the student T test in detail
17. Explain about the Chi square test and its significance
18. Write about the regression test in detail

SHORT ANSWER QUESTIONS

11. NCBI
12. FASTA
13. Genbank
14. Structural genomics
15. Functional genomics
16. Structural proteomics
17. Functional proteomics
18. Swissprot
19. KEGG
20. Local alignment method
21. Global alignment

22. BLAST
23. Gene prediction strategies
24. Ab initio method
25. Sampling methods
26. Data types
27. Types of variables
28. Null Hypothesis and alternative hypothesis
29. Normal distribution
30. Pearson correlation test
31. ANOVA
32. P value significance

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-520004

Department of Biochemistry

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

Title of the Course: Animal Biotechnology & Biostatistics - BCN-5325-B1

Common for 313&309: B.Sc. MBC & MBF

Course Code :	BCN-5325-B1	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

Objectives

To provide knowledge on animal cell and tissue culture and their preservation

To empower students with latest biotechnology techniques like stem cell technology, genetic engineering, hyridoma technology, transgenic technology and their application in medicine and industry for the benefit of living organisms

To explain *in vitro* fertilization, embryo transfer technology and other reproduction manipulation methodologies.

To get insight in applications or recombinant DNA technology in agriculture, production of therapeutic proteins.

To describe the roles biostatistics that serves in the discipline of research

To apply statistical knowledge to design and conduct research studies

Course Outcomes:

CO1 Understand the applications of Biotechnology in the fields of industry and agriculture including animal cell/tissue culture, stem cell technology and genetic engineering.

CO2 Get familiar with the tools and techniques of animal biotechnology.

CO3: The application of basic statistical concepts commonly used

CO4: Demonstration of basic analytical techniques to generate results

CO5: Interpretation of results that are used statistical analyses in written summaries

Animal Biotechnology& Biostatistics - BCN-5325-B1

Unit – I Techniques

- Animal Cell, Tissue and Organ culture media: Natural and Synthetic media, Cell cultures: Establishment of cell culture (primary culture, secondary culture, types of cell lines; Protocols for Primary Cell Culture); Established Cell lines (common examples such as MRC, HeLa, CHO, BHK, Vero); Organ culture; Cryopreservation of cultures
    - Stem cells: Types of stem cells and applications
    - Hybridoma Technology: Production & applications of Monoclonal antibodies (mAb)

Unit – II Applications of Animal Biotechnology

- Genetic Engineering: Basic concept, Vectors, Restriction Endonucleases andRecombinant DNA technology
- Gene delivery: Microinjection, electroporation, biolistic method (gene gun),liposome and viral-mediated gene delivery
- Transgenic Animals: Strategies of Gene transfer; Transgenic - sheep, - fish; applications
- Manipulation of reproduction in animals: Artificial Insemination, *In vitro* fertilization, super ovulation, Embryo transfer, Embryo cloning

Unit - III

- PCR: Basics of PCR.
- DNA Sequencing: Sanger"s method of DNA sequencing- traditional and automated sequencing (2 hrs)
- Hybridization techniques: Southern, Northern and Western blotting
- DNA fingerprinting: Procedure and applications
- Applications in Industry and Agriculture: Fermentation: Different types of Fermentation and Downstream processing; Agriculture: Monoculturein fishes, polyploidy in fishes

UNIT-IV

Sampling & design of experiments (12 hours)

- Concepts of population and sampling methods
- Types of data & variables
- Mean, median, mode ,range, standard deviation
    - Designing experiments
    - Null hypothesis , alternative hypothesis

UNIT-V **Basic statistical tests** (12 hours)

- Probability distribution-Binomial and Normal distribution
- P value and its significance.
- Regression test-Simple linear regression, multiple regression
- Comparison tests: Independent t test, Paired t test , ANOVA
- Correlation tests- Pearson correlation tests
- Chi square test, significance

Animal Biotechnology& Biostatistics - BCN-5325-B1P

I. Animal biotechnology

1. DNA quantification using DPA Method.
2. Techniques: Western Blot, Southern Hybridization, DNA Fingerprinting
3. Separation, Purification of biological compounds by paper, Thin-layer and Column chromatography
4. Cleaning and sterilization of glass and plastic wares for cell culture.
5. Preparation of culture media.

1. Biostatistics

6. Biostatistics project

REFERENCE BOOKS

1. Immunology by Ivan M. Riott
2. Immunology by Kubey
3. Sreekrishna V. 2005. *Biotechnology –I, Cell Biology and Genctics.* New Age International Publ.New Delhi, India.
4. Immunology Lab Biology 477 Lab Manual; Spring 2016 Dr. Julie Jameson
5. Practical Immunology A Laboratory Manual; LAP LAMBERT Academic Publishing
6. Manual of laboratory experiments in cell biology by Edward, G
7. Laboratory Techniques by Plummer

BIOCHEMISTRY- MODEL QUESTION PAPER
SEMESTER-V/VI
Animal Biotechnology& Biostatistics- BCN-5325-B1

Time :3hrs Max. Marks: 60

Part-A

Answer any FIVE of thefollowing: 5×4 M=20 M

Each question carries FOUR marks.

1. 1

2.

3.

4.

5.

6.

7.

8.

9.

10.

Part-B

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

Each question carries 8marks

11.a.

(or)

b.

12. a

(or)

b.

13. a

(or)

b

14. a

(or)

b.

15. a.

(or)

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-520004

Department of Biochemistry

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

Title of the Course: Cell biology, Genetics, Molecular biology and Evolution-- BCN-5325-B2

Common for BCN-313&309 B.Sc. MBC & MBF

Course Code :	BCN-5325-B2	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:

The overall course outcome is that the student shall develop deeper understanding of what life is and how it functions at cellular level. This course will provide students with a deep knowledge in Cell Biology, Animal Biotechnology and Evolution and by the completion of the course the graduate shall able to –.

CO1 To understand the basic unit of the living organisms and to differentiate the organisms by their cell structure.

CO2 Describe fine structure and function of plasma membrane and different cell organelles of eukaryotic cell.

CO3 To understandthe history of origin of branch of genetics, gain knowledge on heredity, interaction of genes, various types of inheritance patterns existing in animals

CO4 Acquiring in-depth knowledge on various of aspects of genetics involved in sex determination, human karyotyping and mutations of chromosomes resulting in various disorders

CO5 Understand the central dogma of molecular biology and flow of genetic information from DNA to proteins.

CO6 Understand the principles and forces of evolution of life on earth, the process of evolution of new species and apply the same to develop new and advanced varieties of animals for the benefit of the society

Learning Objectives

- To understand the origin of cell and distinguish between prokaryotic and eukaryotic cell
- To understand the role of different cell organelles in maintenance of life activities
- To provide the history and basic concepts of heredity, variations and gene interaction
- To enable the students distinguish between polygenic, sex-linked, and multiple allelic modes of inheritance.
- To acquaint student with basic concepts of molecular biology as to how characters are expressed with a coordinated functioning of replication, transcription and translation in all living beings
- To provide knowledge on origin of life, theories and forces of evolution
- To understand the role of variations and mutations in evolution of organisms

Cell biology, Genetics, Molecular biology and Evolution-- BCN-5325-B2

Unit – I Cell Biology

- Definition, history, prokaryotic and eukaryotic cells, virus, viroids, mycoplasma
- Electron microscopic structure of animal cell.
- Plasma membrane –Models and transport functions of plasma membrane.
  - Structure and functions of Golgi complex, Endoplasmic Reticulum and Lysosomes
  - Structure and functions of Ribosomes, Mitochondria, Nucleus, Chromosomes

(Note: 1. General pattern of study of each cell organelle – Discovery, Occurrence, Number, Origin, Structure and Functions with suitable diagrams)

2. Need not study cellular respiration under mitochondrial functions)

Unit – II Genetics - I

- Mendel"s work on transmission of traits
- Gene Interaction – Incomplete Dominance, Codominance, Lethal Genes
- Polygenes (General Characteristics & examples); Multiple Alleles (General Characteristics and Blood group inheritance
- Sex determination (Chromosomal, Genic Balance, Hormonal, Environmental and Haplo-diploidy types of sex determination)
- Sex linked inheritance (X-linked, Y-linked & XY-linked inheritance)

Unit – III Genetics - II

- Mutations & Mutagenesis
- Chromosomal Disorders (Autosomal and Allosomal)
- Human Genetics – Karyotyping, Pedigree Analysis (basics)
- Basics on Genomics and Proteomics

UNIT IV: Molecular Biology

- Central Dogma of Molecular Biology

Basic concepts of -

- DNA replication – Overview (Semi-conservative mechanism, Semi-discontinuous mode, Origin & Propagation of replication fork)
- Transcription in prokaryotes – Initiation, Elongation and Termination, Post-transcriptional modifications (basics)

- Translation – Initiation, Elongation and Termination
- Gene Expression in prokaryotes (Lac Operon); Gene Expression in eukaryotes

Unit - V

- Origin of life
- Theories of Evolution: Lamarckism, Darwinism, Germ PlasmTheroy, Mutation Theory
- Neo-Darwinism: Modern Synthetic Theory of Evolution, Hardy-Weinberg Equilibrium
- Forces of Evolution: Isolating mechanisms, Genetic Drift, Natural Selection, Speciation

Cell biology, Genetics, Molecular biology and Evolution-- BCN-5325-B2P

Cell Biology

1. Preparation of temporary slides of Mitotic divisions with onion root tips
2. Observation of various stages of Mitosis and Meiosis with prepared slides
3. Mounting of salivary gland chromosomes of *Chiranomous*

II. Genetics

1. Study of Mendelian inheritance using suitable examples and problems
2. Problems on blood group inheritance and sex linked inheritance
3. Study of human karyotypes (Down"s syndrome, Edwards, syndrome, Patau syndrome, Turner"s syndrome and Klinefelter syndrome)

III. Evolution

1. Study of fossil evidences
2. Study of homology and analogy from suitable specimens and pictures
3. Phylogeny of horse with pictures
4. Study of Genetic Drift by using examples of Darwin"s finches (pictures)
5. Visit to Natural History Museum and submission of report

REFERENCE BOOKS

1. Burns GW. 1972. *The Science of Genetics. An Introduction to Heredity.* Mac MillanPubl. Co.Inc.
2. Gardner EF. 1975. *Principles of Genetics.* John Wiley & Sons, Inc. New York.
3. Harth and Jones EW. 1998. *Genetics – Principles and Analysis.* Jones and BarHett Publ.Boston.
4. Levine L. 1969. *Biology of the Gene.* Toppan.
5. Pedder IJ. 1972. *Genetics as a Basic Guide.* W. Norton & Company, Inc.
6. Rastogi VB. 1991. *A Text Book of Genetics.* KedarNath Ram Nath Publications, Meerut,Uttar Pradesh, India.
7. Rastogi VB. 1991. *Organic Evolution.* KedarNath Ram Nath Publications, Meerut,UttarPradesh, India.
8. Stahl FW. 1965. *Mechanics of Inheritance.* Prentice-Hall.
9. White MJD. 1973. *Animal Cytology and Evolution.* Cambridge Univ.

BIOCHEMISTRY- MODEL QUESTION PAPER
SEMESTER-V/VI
Cellbiology,Genetics,MolecularbiologyandEvolution- BCN-5325-B2

Time :3hrs Max. Marks: 60

Part-A

Answer any FIVE of thefollowing: 5×4 M=20 M

Each question carries FOUR marks.

1.

2.

3.

4.

5.

6.

7.

8.

9.

10.

Part-B

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

Each question carries 8marks

11.a.

(or)

b.

12. a

(or)

b.

13. a

(or)

b

14. a

(or)

b.

15. a.

(or)

b.

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.

interpretations and benchmarking are understood by everyone, there will be ambiguity in judgments.

3. In a changing context, the needs and aspirations of the students have to be met through the curriculum and curricular transactions to enable them to play an effective role in the employment sectors. The thrust of the education is shifting to employability based on the changing philosophy from idealism to pragmatism.

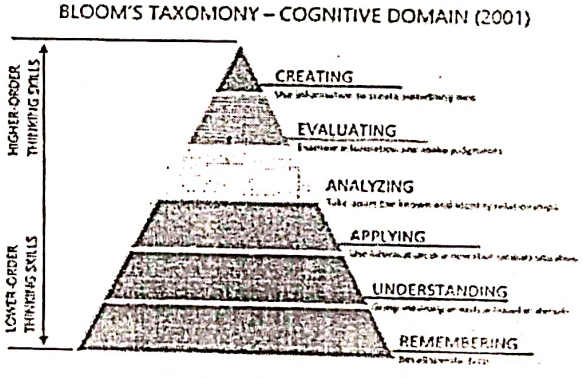
4. One of the key insights into the knowledge issue is that what you know is less important than how you know it and how you apply it. It boils down to the difference between two types of thinking. Low level concrete thinking, concerns simple observations, facts and figures and is the foundation of the next level of thinking-high level abstract thinking – concerns and relationships. Both kinds of thinking are necessary.

5. Examination reforms has been a prominent theme in the deliberations in connection with higher educationalists apparently had little impact; examinations are universally associated with anxiety and stress both for students and others. There are various malpractices that reduce the dependability and credibility of the examination system.

6. The academic quality of actual examination has long been a major complaint. The methodology in the system is the root cause that needs to be tackled on priority basis. The sizable weight for internal assessment is a major step. The main problem is the incomplete development and articulation of relevant and systematic schemes for internal assessment designed to suit the needs of different subjects and levels of the students.

7. In this regard, faculty members have not been offered sufficient support through clearly spells out SOPs specific to their subjects and effective orientation through manuals or workshops. The absence of clarity is leading students to perceive internal assessment lacking objectivity and transparency.

8. Benjamin Bloom, an educational Psychologist devised a pyramid model that represents different ways of learning which is known as "Blooms Taxonomy" and is described below:



Skills (HOTS)

9. There is every need for a change in focus in the internal assessment from question patterns that require simple memory recall to a judicious mix of questions which assess,

   - ✓ Knowledge acquired
   - ✓ Standard application of knowledge
   - ✓ Application of knowledge in new situations
   - ✓ Critical evaluation of knowledge
   - ✓ Ability to synthesize knowledge drawn from different sources

10. Therefore, the internal assessment should be aimed towards ensuring the descriptions of the abilities and other qualities a course seeks to develop in students. In other words, from inert product to processes and capacities that point to continued learning.

11. The major principle for improving the quality of internal assessment is that a variety of means of assessment should be used to match many dimensions of learning objectives. The use of many such devices is possible only in the college setting of internal assessment handled directly by the individual faculty member.

12. Under the above circumstances, the CIA has been divided into four categories of inventory tasks and activities as detailed below:

S.No	Type of Assessment	Weightage Assigned
(i)	Assignments	5
(ii)	Project-Work/Seminar/Group Discussion/Role play/Quizzes/Presentations	5
(iii)	Cleaning, Greening and Attendance	5
(iv)	Testing of knowledge though Mid-term examinations (Mid -1 + Mid -2)	20 + 15
	TOTAL	50

13. **Assignments:** A writing assignment encompasses any writing task a teacher asks of students that involves more and more thought processes including analysis, evaluation, interpretation, narration, syntheses, reflection, clarification summarization, creative expression and application or demonstration of knowledge or learning. Every faculty member should determine the purpose of the assignment and the levels of students and accordingly assignments should be given. There should be

at least one assignment for each unit/module as and when the syllabus (unit/module) is completed. The weightage of marks, assigned for the assignments should be awarded after completion of all the assignments in respect of all the units/modules and it should be finished before conduct of II Mid examination.

14. In class activities: laboratory/manipulative skill which include as described below for different subjects should be organized by every faculty member in respect of the subjects being taught by him/her

Sl. No	Subject	Suggested Activity/Activities for CIA
1	Chemistry Physics Mathematics Electronics	Peer teaching, Student seminars, quiz, worksheets on subjects, KWL (Know, Want-to-know, and Learned) Group work, Work sheets on subject, Industrial visit, Individual and Group Projects
2	Zoology, Botany, Geology, Geography, Computer Science	Field visit, Student projects, Student seminars, peer teaching, filling gaps, Matching, quiz, worksheets on subjects, KWL, Hydroponic gardening, live projects, Vermi compost Preparation, growing Nursery plants, Aquarium maintenance, Fish farming
3	Micro Biology, Bio chemistry, Food & Nutrition, Home Science, Horticulture, Agriculture, Aquaculture, Home Science	Industrial visit, Lab visit, Student seminars, quiz, worksheets on subjects, KWL, Student projects, Hydroponic gardening, live projects, Vermi compost Preparation, growing Nursery plants, Aquarium maintenance, Fish farming, Mushroom Cultivation, Organic farming
4	Statistics, Economics, History, Archeology, Political Science, Public Administration	Socio economic survey, Group discussions, Student seminars, peer teaching, quiz, worksheets on subjects, KWL, Field visits, Mock Parliament, Web assignments
5	Languages	Comprehension paragraphs, Book review, Think-pair-share actions, Student seminars, peer teaching, filling gaps, quiz, worksheets on subjects, KWL, Group Discussion, LSRW activities
6	Commerce and Management	Industry visits and tours, group discussion, group projects, Student seminars, one-word answers, Multiple choice questions, peer teaching, filling gaps, Matching, quiz, worksheets on subjects, KWL, Socio economic surveys

15. Students should be encouraged to participate in Activities like Clean & Green of the campus/in the community etc. Pucca record should be maintained showing the authenticity of the participation and accordingly marks should be awarded to each student. There should not be any malpractices in this regard. Attendance should also be taken into account for awarding total marks of 5. The award of marks for this should be completed before conduct of II Mid examinations.

16. Testing of knowledge subject-wise Mid Examinations is a very important outcome of learning, with a weightage to the extent of 70% of the total internal assessment.

17. Suggested to conduct Mid I Examination through three kinds of questions:

- Firstly, One out of Three Essay type questions carrying 5 marks should be given.
- Second, five out of seven short answer questions should be set carrying 5x2=10 marks with weightage and
- Third, ten objective type questions should be framed carrying 10x½=5 marks with weightage comprising multiple choice answers, fill in the blank questions, matching answers questions, comprehension etc.,
- The duration of examination is 1 Hour per paper for a total of 20 Marks.

18. Mid II examination is to be conducted after the completion of syllabus choosing two kinds of question, as explained above for a total of 15 Marks.

19. Two mid-term examinations as explained above should be conducted, I Mid after completion of 50 % syllabus and II Mid after completion of total Syllabus with 35 marks for Mid Exam (Mid -1 for 20 Marks and Mid-2 for 15 Marks).

For Assignment, Seminar/Quiz/Field trip/ Project work and Clean, Green and Attendance etc., for the three components, the marks to be allotted once in a semester before conduct of II Mid Examinations.

The marks obtained by a student for 50 marks (Total of two Mid exams for 35, Assignments 5, Classroom Activities 5, Clean, Green and Attendance 5) is to be scaled down to 25 and this should be treated as the CIA score of the student in that subject.

In case of Autonomous colleges whatever the weightage of internal assessment is fixed, it should be scaled down accordingly.

20. Blended mode of internal assessment should be followed. At least one-mid should be conducted through online and records of every student should be documented for reference.

21. All the staff members should maintain records/registers properly in the prescribed format. The details of the marks secured by the student subject-wise and component-wise should be uploaded by each faculty member in the SEMS App (Students Evaluation Management System) on real time basis without fail.

COMMISSIONERATE OF COLLEGIATE EDUCATION

GOVERNMENT OF ANDHRA PRADESH

STUDENT EVALUATION REPORT (CONSOLIDATED)

Name of the College: College Code: District: Zone:

S.NO	OAMDC Student ID	Name of the Student	University Register No	Program Code	Program Name	Specialization	Specialization Code	Course Code	Course Name	Year	Semester	PAPER-1 (TITLE)								PAPER-2 (TITLE)								PAPER-3 (TITLE)							
												THEORY						PRACTICAL		THEORY					PRACTICAL			THEORY						PRACTICAL	
												Internal	Result	External	Result	Total	Result	Total	Result	Internal	Result	External	Result	Total	Result	Total	Result	Internal	Result	External	Result	Total	Result	Total	Result
													P/F		P/F		P/F		P/F				P/F		P/F			P/F		P/F		P/F		P/F

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Machavaram, Vijayawada, Krishna District, AP-520 004

Department of Biochemistry

Report on 7th Board of Studies Meeting for U.G. Programmes of the Department for AY-2022-23

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	
2	Dr.L.Suseela Assistant professor Department of Biotechnology & Biosciences Krishna University Machilipatnam	University Nominee	
3	Dr. P.Kiranmayi Assistant professor Department of Biochemistry Acharya Nagarjuna University, Nagarjuna Nagar, Guntur	Subject Expert	
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	
6.	Lavanya Studying P.G. in Biochemistry Acharya Nagarjuna University Nagarjuna Nagar, Guntur	Postgraduate student	
7.	E. Sarojini Devi Lecturer in Biochemistry SRR&CVR GDC, Vijayawada.	Member	

To vocationalise education at the first-degree level, parallel utility-oriented certificate/diploma/advanced diploma courses have been introduced by UGC as Carrier Orientation Program (COP). The students can avail of these career-oriented courses and gain an extra qualification on graduating.

According to the University Grants Commission (UGC) regulations, a subject course that an institution proposes will be introduced in the existing three-degree programme by way of add-on skill-oriented subjects during the first, second and third year of education as **certificate/diploma/advanced** diploma courses, along with conventional degree programmes.

The certificate course in **medical lab technology** is a add on short-term specialization course of 6 months. This course trains a learner to help a doctor diagnose, detect, and treat diseases by collecting and testing samples and documenting the results of these tests for further analysis by the doctor.

Under the programme, each student would be awarded an additional certificate /diploma /advanced diploma in the 'add-on' course opted for. Students applying for college admissions after Class XII are also eligible to join the add-on/career-oriented courses, along with BA/ B.Com/ B.Sc./ (I, III and V semester), depending on the availability of seats in colleges which offer these courses.

Students who have passed the certificate course will be eligible for admission to the respective diploma course and those passed diploma course are eligible for admission in to advanced diploma in a progressive manner.This allows a student studying graduation to up skill and certifies themselves.

The **demand for certified MLTs** is growing with the rise in the number of hospitals and laboratories, which has been further stressed upon by the COVID-19 crisis. Completion of a **certificate course in MLT** allows a professional to work as a **phlebotomist** and can work as assistant to a medical professional.

COURSE DETAILSS

SALIENT FEATURES

Course duration: 40 days

Eligibility: 10+2 Science

Objective: Develop a pool of trained workforce, who can be employed by a diagnostic service provider to assist pathologist and microbiologists

Medium of Instruction: English

Attendance: 75% attendance is required to appear in final examination.

Course includes: .

Theory- 10 hours, Practical- 30 hours.

Note: At the time of SEM end examinations the regular classes are conducted on Sundays & Holidays

Marks: Practical 50 Marks

Grading system: Above 70% marks both in theory and practical A grade

60% to 69% B grade

50% t0 59% C grade

35% to 49% D grade

Certificate award:

Certificate in medical lab technology is awarded to the candidates who successfully complete the requirements as prescribed by the Governing body, SRR&CVR GDC (A), Vijayawada.

MLT SYLLABUS

Haematology	Haemoglobin	Capillary blood/ EDTA Whole blood	sahli's haemoglobinometer
	RBC count	Capillary blood/ EDTA Whole blood	Microscopy
	Reticulocyte count	Capillary blood/ EDTA Whole blood	Microscopy
	Absolute eosinophil count	Capillary blood/ EDTA Whole blood	Microscopy
	leucocyte count	Capillary blood/ EDTA Whole blood	Microscopy
	Differential leucocyte count	Capillary blood/ EDTA Whole blood	Microscopy
	ESR	EDTA whole blood	Manual
	Peripheral blood smear	EDTA whole blood	Manual
	Bleeding time	EDTA whole blood	Manual
	Clotting time	EDTA whole blood	Manual
	Blood grouping and Rh typing	EDTA whole blood	Manual
Clinical Pathology	Urine albumin and sugar	Urine	Strip method (Reading Manual or with a urine analyser)
	Haemoglobin, bile salts, bile pigments, ketone bodies, specific gravity, Reaction (pH) and leucocyte esterase	Urine	Urine Strip method (Reading Manual or with an analyser)
	Urine microscopy	Urine	Microscopy
Biochemistry	Pregnancy test	Urine	RDT
	Blood Sugar	Serum	Kit method
	Glucose tolerance test (GTT)	Plasma	Kit method
	Bilirubin (Total, Direct & Indirect)	Serum	Kit method
	SGOT	Serum	Kit method
	SGPT	Serum	Kit method
	Serum creatinine	Serum	Kit method
	Blood Urea	Serum	Kit method
	Serum Total Cholesterol	Serum	Kit method

	Serum Triglyceride	Serum	Kit metod
Specific diseases	Malaria	Peripheral smear for malaria parasite detection Capillary blood	Microscopy
	Antigen based bivalent RDT for detection of Malaria	Whole blood	RDT
Filariasis*	Peripheral smear for parasite detection	Thick smear) Whole blood	Microscopy