

**PITHAPUR RAJAH'S GOVERNMENT COLLEGE
(AUTONOMOUS)
NAAC A GRADE
KAKINADA**



XXI-BOARD OF STUDIES

**DEPARTMENT OF
BIOTECHNOLOGY**

2021-22

(CHOICE BASED CREDIT SYSTEM)

P.R.GOV.T.COLLEGE (AUTONOMOUS) KAKINADA.
2021-22, XXI BOARD OF STUDIES MEETING.
DEPARTMENT OF BIOTECHNOLOGY

The members present have discussed the syllabi and model question papers (Theory and Practical) related to I to VI semesters in Biotechnology and made the following Resolutions.

- Resolution I:** Resolved to Continue CBCS System as instructed by Commissioner of Collegiate Education(CCE), Amaravati.
- Resolution II:** Resolved to implement 50% external and 50% internal marks for theory for first year from the academic year 2021-22.
- Resolution III:** Resolved to split 50 marks of theory internal as 25 marks for mid exams and 25 marks for co-curricular activities (project / seminar / assignment /quiz / group discussion).
- Resolution IV:** Resolved to continue 60% external and 40% internal marks for both theory and practical's for second year and final year for the academic year 2021-22.
- Resolution V:** Resolved to split 40 marks of theory internal as 20 marks for mid exams and 20 marks for co-curricular activities (seminar/assignment/quiz/group discussion).
- Resolution VI:** Resolved to continue three subject electives (Advanced electives) in the VI semester- A- **Biostatistics, bioinformatics and IPRS**, B- **Ecology** and C- **Developmental biology**.
- Resolution VII:** Resolved to continue cluster paper in VI semester with Cluster A1- **Plant and animal biotechnology**, ClusterA2- **environmental biotechnology** and cluster A3 – **Industrial biotechnology**.
- Resolution VIII:** Resolve to continue project work for final students in the VI semester.
- Resolution IX:** Resolve to continue same question bank for second & third year students
- Resolution X:** Resolved to continue the same paper setters and examiners for all the semesters.
- Resolution XI:** Resolved to introduce certificate course in Clinical Lab techniques by biotechnology department.
- Resolution XII:** It is resolved to organize a field trip for the biotechnology students during this academic year
- Resolution XIII:** It is also resolved to conduct a national seminar by the department of Biotechnology during this academic year.
- Resolution XIV:** It is resolved to follow the given action plan for the academic year 2021-22. It is further resolved to take the approval from the Principal regarding the financial commitment to fulfil the above action plan.

Chairperson
Board of Studies
Dept. of Biotechnology

**P.R. GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
DEPARTMENT OF BIOTECHNOLOGY**

S.No.	Sem No.	Paper	Title	Mar ks	Cred its
1	I	I	Bio-molecules & analytical techniques	100	04
			Practicals	50	01
2	II	II	Microbiology, cell and molecular biology	100	04
			Practicals	50	01
3	III	III	Immunology and rDNA technology	100	04
			Practicals	50	01
4	IV	IV	Plant and animal biotechnology	100	04
			Practicals	50	01
		V	Environmental & Industrial Biotechnology	100	04
			Practicals	50	01
5	V	General core	Molecular biology	100	03
Practicals			50	02	
6		General Core	Genetics and rdna technology	100	03
Practicals			50	02	
7		Elective I	Biostatistics, bioinformatics and IPRS	100	03
			Practicals	50	02
		Elective II	Ecology	100	03
			Practicals	50	02
		Elective III	Developmental biology	100	03
			Practicals	50	02
8	VI	Cluster Elective A1	Plant and animal biotechnology	100	03
			Practicals	50	02
		Cluster Elective A2	Environmental biotechnology	100	03
			Practicals	50	02
		Cluster Elective A3	Industrial biotechnology	100	03
			Project work	50	02
		Cluster Elective B1	Diversity in life	100	03
			Practicals	50	02
		Cluster Elective B2	Evolution	100	03
			Practicals	50	02
		Cluster Elective B3	Project	100	03
			Viva-voce	50	02
		Cluster Elective C1	Plant physiology	100	03
			Practicals	50	02
Cluster Elective C2	Animal physiology	100	03		
	Practicals	50	02		

	Cluster Elective C3	Inheritance biology	100	03
		Practicals	50	02

CHOICE BASED CREDIT SYSTEM

P.R. GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
BIOTECHNOLOGY SYLLABUS
(WITH EFFECTIVE FROM 2021-22)
SEMESTER – I
BIO-MOLECULES & ANALYTICAL TECHNIQUES

Hrs : 4

CREDITS-4

Aim and objectives of Course:

To ensure students gain knowledge about the structure, properties and functions of biomolecules and characterization of biomolecular using analytical techniques

MODULE I:

Carbohydrates, Proteins and Lipids: Classification, structure, properties of carbohydrates. Classification, structure and properties of amino acids, peptide bond. structure (primary, secondary, tertiary, quaternary) of proteins. Classification structure and properties of saturated and unsaturated fatty acids. Structure and functions of glycolipids, phospholipids, and cholesterol.

MODULE II:

Nucleic acid & Bioenergetics: Structure and functions of DNA and RNA. Watson Crick model of DNA. Free energy, entropy, enthalpy and redox potential. High energy compounds, Glycolysis, TCA cycle, Electron-Transport System and Oxidative Phosphorylation.

MODULE III:

Centrifugation and Chromatography: Basic principles of sedimentation, RCF and Types of rotors and types of differential and Density gradient Centrifugation, Principle, instrumentation and application of partition, absorption, paper, TLC, ion exchange, gel permeation, affinity chromatography.

MODULE IV:

Spectroscopy and Electrophoresis: Beer-Lambert law, light absorption and transmission. Extinction coefficient, Design and application of photoelectric colorimeter and UV-visible spectrophotometer. Basic principles and types of electrophoresis, factors affecting electrophoretic migration. Agarose gel electrophoresis, PAGE (Native, SDS-PAGE).

MODULE V:

Microscopy and Laser Techniques: Principles of microscopy, Types and design of microscopes - compound, phase contrast, electron microscopy (TEM, SEM). Introduction to radioisotopes, measurement of radioactivity (GM Counter & scintillation counter).

RECOMMENDED BOOKS:

1. Outlines of Biochemistry, 5th Edition, (2009), Erice Conn & Paul Stumpf; John Wiley and Sons, USA
2. Principles of Biochemistry, 4th edition, (1997), Jeffery Zubey; McGraw-Hill College, USA
3. Principles of Biochemistry, 5th Edition (2008), Lehninger, David Nelson & Michael Cox; W.H. Freeman and Company, NY
4. Fundamentals of Biochemistry, 3rd Edition (2008), Donald Voet & Judith Voet; John Wiley and Sons, Inc. USA
5. Biochemistry, 7th Edition, (2012), Jeremy Berg & Lubert Stryer; W.H. Freeman and Company, NY
6. Textbook of Biochemistry with Clinical Correlations, 7th Edition, (2010), Thomas M. Devlin; John Wiley and Sons, USA
7. Proteins: biotechnology and biochemistry, 1st edition, (2001), Gary Walsch; Wiley, USA
8. Biochemical Calculations, 2nd Ed., (1997), Segel Irvin H; John Wiley and Sons, NY
9. Biophysical Chemistry Principles & Techniques Handbook, (2003), A. Upadhyay, K. Upadhyay, and N. Nath
10. Enzymes: Biochemistry, Biotechnology & Clinical chemistry, (2001), Palmer Trevor, Publisher: Horwood Pub. Co., England.
11. Analytical Biochemistry, 3rd edition, (1998), David Holmes, H. Peck, Prentice-Hall, UK
12. Introductory Biostatistics, 1st edition, (2003), Chap T. Le; John Wiley, USA.
13. Methods in Biostatistics, (2002), B. K. Mahajan –Jaypee Brothers.
14. Statistical methods in biology, (1995), Bailey, N. T.; Cambridge university press

P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
(WITH EFFECTIVE FROM 2021-22)
BIO-MOLECULES & ANALYTICAL TECHNIQUES
BLUE PRINT FOR QUESTION PAPER SETTER

Time : 21/2hours

Max marks: 50

MODULE NO.	ESSAY QUESTIONS 10 MARKS	SHORT ANSWER QUESTIONS 5 MARKS	MARKS ALLOTTED TO THE UNIT
MODULE – I	01	02	20
MODULE – II	01	01	15
MODULE – III	01	01	15
MODULE – IV	01	02	20
MODULE – V	01	01	15
Total no. of Questions	05 Of which 3 to be answered	07 Of which 4 to be answered	85 Marks including choice. Of which 50 marks to be answered

NOTE: The question paper setters are requested to kindly adhere to the format given in the above table.

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P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
(WITH EFFECTIVE FROM 2021-22)
BIO-MOLECULES & ANALYTICAL TECHNIQUES
MODEL QUESTION PAPER

Time: 2 1/2 hrs.

Marks :50M

SECTION - I

Note: Answer any **THREE** questions from the following. Draw the diagrams where ever necessary.
3 x 10 = 30M

1. Explain primary, secondary, tertiary and quaternary structure of proteins.
2. Describe in detail about the Watson and crick model of DNA.
3. Explain principle and procedure for ion exchange chromatography
4. Explain the instrumentation of UV and visible spectrophotometry.
5. Write an essay on electron microscopy

SECTION – II

Answer any **FOUR** Questions from the following.

4 x 5= 20M

6. Mutarotation.
7. Peptide bond.
8. Short notes on high energy compounds.
9. Short notes on paper chromatography
10. Short notes on Beer – Lamberts law
11. Factors affecting electrophoretic mobility.
12. Numerical aperture and its importance.

P.R.GOVERNMENT COLLEGE (A), KAKINADA
SEMESTER - I
BIO-MOLECULES & ANALYTICAL TECHNIQUES
QUESTION BANK

Module I

Essay questions

1. Explain structure and functions of glucose and fructose.
2. What are disaccharides and explain structure and functions of sucrose.
3. Explain primary, secondary, tertiary and quaternary structure of proteins.
4. Write about classification of lipids.
5. Write about Classification of amino acids.

Short answer questions

1. Classification of carbohydrates.
2. Mutarotation.
3. Peptide bond.
4. Properties of fatty acids.
5. Short notes on glycolipids.
6. Structure and function of Cholesterol.

Module II

Essay questions

1. Describe in detail about the Watson and crick model of DNA.
2. Explain steps involved in glycolysis
3. Explain steps involved in TCA cycle
4. Write an essay on Electron transport chain.

Short answer questions

1. Structure of RNA.
2. Short notes on high energy compounds.
3. Short notes on entropy and enthalpy.

Module III

Essay questions

1. Write an essay on preparative centrifugation.
2. What is principle of centrifugation and explain different types of centrifuges
3. Explain principle and procedure for ion exchange chromatography

4. Explain principle and procedure for affinity chromatography.

Short answer questions

1. Short notes on gel permeation chromatography.
2. Short notes on paper chromatography.
3. Short notes on TLC.

Module IV

Essay questions

1. Explain the instrumentation of UV and visible spectrophotometry.
2. Explain principle and procedure of agarose electrophoresis
3. Explain principle and procedure of SDS-PAGE electrophoresis

Short answer questions

1. Short notes on colorimeter.
2. Short notes on Beer – Lamberts law
3. Factors affecting electrophoretic mobility.
4. Applications of UV-Vis spectrophotometer.

Module V

Essay questions

1. Describe basic principle and instrumentation for measurement of radioactivity.
2. Write an essay on electron microscopy

Short answer questions

1. Short notes on phase contrast microscope.
2. Numerical aperture and its importance.
3. Resolving power.

P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
(WITH EFFECTIVE FROM 2021-22)
SEMESTER – I
PRACTICAL: BIO-MOLECULES & ANALYTICAL TECHNIQUES

Hrs : 2

CREDITS-2

1. Introduction to basic instruments (Principle standard operation procedure) demonstration and record.
2. Calculation of molarity, normality and molecular weight of compounds.
3. Qualitative analysis of carbohydrates (sugars)
4. Quantitative analysis of carbohydrates – Anthrone method
5. Quantitative estimation of protein – Bi-uret method.
6. Estimation of DNA by diphenylamine reagent.
7. Estimation of RNA by orcinol reagent.
8. Preparation of starch from potato and its hydrolyze by salivary amylase
9. Preparation of standard buffer and pH determination.
10. Separation of amino acids by paper chromatography
11. Agarose gel electrophoresis

P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
(WITH EFFECTIVE FROM 2021-22)
AT THE END OF I SEMESTER
MODEL PRACTICAL PAPER

Time: 2 1/2 hrs.

Marks: 50

- I. Estimate the amount of DNA present in the given sample by DPA method. **20M**
(Split: Principle & Procedure – 05, Conduct of Experiment – 10, Values and Report – 05)
- II. Minor Experiment 10 M
- III. Identify and write a brief notes on given spotters – **A and B.** **2X5 = 10M**
(Identification– 01, Notes – 04)
- IV. Practical Record **05 M**
- V. Viva voce **05 M**

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P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
BIOTECHNOLOGY SYLLABUS
(WITH EFFECTIVE FROM 2021-22)
SEMESTER - II
MICROBIOLOGY, CELL AND MOLECULAR BIOLOGY

Hrs : 4

CREDITS-4

Course Objectives: To acquaint students with concepts of microbiology, cell and molecular biology. This course is aimed to give an understanding of the basics of microbiology, dealing types of microbes, classification and their characterization, structure and function of prokaryotic and eukaryotic cell organelles, cell division and basics of molecular biology including DNA replication, transcription, translation and regulation of gene expression.

MODULE I:

Scope and Techniques of Microbiology: History and contribution of Leeuwenhoek, Louis Pasteur and Robert Koch. Bacteria, Ultrastructure of a bacterial cell and growth curve. Sterilization techniques, principles and application of physical methods (autoclave, hot air oven, incineration), chemical methods and radiation methods. Staining- Simple, gram and acid-fast staining. Microbial production of penicillin.

MODULE II:

Viruses: General characteristics of viruses. Structure of TMV and HIV. Structure, infection, diagnosis and treatment of dengue virus and SARS- CoV-2.

MODULE III:

Cell Biology: differentiation between plant and animal cell. Structure, properties and functions of cellular organelles (E.R, Golgibodies, Mitochondria, Ribosomes and Vacuoles) of eukaryotic cells. Cell cycle and cell division (mitosis and meiosis). Cell signaling via G- protein coupled receptors

MODULE IV:

DNA Replication, Damage and Repair: DNA replication in prokaryotes (semiconservative, dispersive, conservative, uni and bi-direction, rolling circle). Mechanism of DNA replication, enzymes and proteins involved in DNA replication. DNA damage and repair.

MODULE V:

Transcription and Translation: Prokaryotic transcription, promoters and structure of RNA Polymerase, Mechanism of Transcription, Post-transcriptional modification (Capping, Poly adenylation and splicing.)

Genetic code, mechanism of translation in prokaryotic and eukaryotic cells (initiation, elongation, termination).

P.R. GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
(WITH EFFECTIVE FROM 2021-22)
II SEMESTER – MICROBIOLOGY, CELL AND MOLECULAR BIOLOGY
BLUE PRINT FOR QUESTION PAPER SETTER

Time: 2 1/2hours

Max marks: 50

MODULE NO.	ESSAY QUESTIONS 10 MARKS	SHORT ANSWER QUESTIONS 5 MARKS	MARKS ALLOTTED TO THE UNIT
MODULE – I	01	02	20
MODULE – II	01	01	15
MODULE – III	01	02	20
MODULE – IV	01	01	15
MODULE – V	01	01	15
Total no. of Questions	05 Of which 3 to be answered	07 Of which 4 to be answered	85 Marks including choice. Of which 50marks to be answered

NOTE: The question paper setters are requested to kindly adhere to the format given in the above table.

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P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
(WITH EFFECTIVE FROM 2021-22)
MICROBIOLOGY, CELL AND MOLECULAR BIOLOGY
MODEL QUESTION PAPER

Time: 2 1/2 hrs.

Marks :50M

SECTION - I

Note: Answer any THREE questions from the following. Draw the diagrams where ever necessary.

3 x 10 = 30M

1. Write an essay on different sterilization methods used in microbiological laboratory
2. Explain structure of HIV
3. Explain different stages in meiosis with neat labelled diagrams
4. Write an essay on enzymology of DNA replication.
5. Explain mechanism of translation in prokaryotes

SECTION – II

Answer any FOUR Questions from the following.

4 x 5= 20M

6. Contributions of Robert Koch
7. Short notes on growth curve of bacteria
8. Structure of TMV
9. Short notes on G – protein coupled receptors.
10. Structure of nucleus.
11. Short notes on DNA damage.
12. Short notes on genetic code

P.R.GOVERNMENT COLLEGE (A), KAKINADA
SEMESTER - II
MICROBIOLOGY, CELL AND MOLECULAR BIOLOGY

QUESTION BANK

Module I

Essay questions

1. Write an essay on ultra structure of bacterial cell .
2. Write an essay on different sterilization methods used in microbiological laboratory.
3. Explain steps in microbial production of penicillin.

Short answer questions

1. Contributions of Robert Koch.
2. Contributions of Louis Pasteur.
3. Short notes on growth curve of bacteria.
4. Short notes on differential staining.

Module II

Essay questions

1. Write an essay on general characteristics of viruses.
2. Explain structure of HIV.
3. Explain structure and infection of SARS – CoV2

Short answer questions

1. Structure of TMV.
2. Structure of dengue virus.
3. Treatment for SARS – CoV 2.

Module III

Essay questions

1. Explain different stages in mitosis with neat labelled diagrams.
2. Explain different stages in meiosis with neat labelled diagrams.
3. Describe the structure and function of mitochondria.

Short answer questions

1. Short notes on G – protein coupled receptors.
2. Structure of nucleus.
3. Short notes on difference between plant and animal cell.
4. Structure of Golgi.

Module IV

Essay questions

1. Explain any two repair mechanisms of DNA.
2. Write an essay on enzymology of DNA replication.
3. Write an essay on DNA replication in prokaryotes

Short answer questions

1. Short notes on DNA damage.
2. Short notes on semi-conservative mechanism of DNA replication.
3. Short notes on rolling circle replication.

Module V

Essay questions

4. Explain mechanism of transcription in prokaryotes.
5. Explain mechanism of translation in prokaryotes.
6. Write an essay on post-transcriptional modifications.

Short answer questions

4. Short notes on genetic code.
5. Short notes on structure of t-RNA.
6. Short notes on promoters.

P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
(WITH EFFECTIVE FROM 2021-22)
SEMESTER - II
PRACTICALS - MICROBIOLOGY, CELL AND MOLECULAR BIOLOGY

Hrs : 2

CREDITS-2

1. Demonstration, use and care of microbial equipment
2. Cleaning and preparation of glassware
3. Preparation of nutrient agar medium for bacteria
4. Preparation of PDA medium for fungi
5. Sterilization techniques (autoclave, hot air oven, filter)
6. Isolation of bacteria from soil
7. Simple staining technique
8. Differential staining technique
9. Microbial counting by Hemocytometer
10. Identification of different bacteria
11. Motility test by hanging drop
12. Biochemical identification of bacteria
13. Preparation of pure culture by slab, slant, streak culture
14. Study of stages of mitotic cell division
15. Study of stages of meiotic cell division
16. Extraction and isolation of DNA from bacteria.

P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
(WITH EFFECTIVE FROM 2021-22)
AT THE END OF II SEMESTER
MODEL PRACTICAL PAPER

Time: 2 1/2 hrs.

Marks: 50

- I.** Write procedure for isolation of bacteria from soil and carryout the experiment **20 M**
(Split: Principle & Procedure – 05, Conduct of Experiment – 10, Values and Report – 05)
- II.** Minor experiment **10 M**
- III.** Identify and write a brief notes on given spotters – **A and B.** (Identification– 01, Notes – 02).
2 X 5 = 10M
- IV.** Practical Record **05 M**
- V.** Viva voce **05 M**

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RECOMMENDED BOOKS:

1. Microbiology–6th Edition, (2006), Pelczar M.J., Chan E.C.S., Krieg N.R.; The McGrawHill Companies Inc. NY
2. Prescott's Microbiology, 8th edition, (2010), Joanne M Willey, Joanne Willey, Linda Sherwood, Linda M Sherwood, Christopher J Woolverton, Chris Woolverton; McGrawHill Science Engineering, USA
3. Textbook of Microbiology, Anantnarayan and Paniker (2017)
4. Brock biology of microorganisms, 2003, Brock, T. D., Madigan, M. T., Martinko, J. M., & Parker, J.; Upper Saddle River (NJ): Prentice-Hall, 2003.
5. Genes XI, 11th edition, (2012), Benjamin Lewin; Publisher - Jones and Barlett Inc.USA
6. Molecular Biology of the Gene, 6th Edition, (2008), James D. Watson, J. D., Baker T.A., Bell, S. P., Gann, A., Levine, M., and Losick, R.; Cold Spring Harbour Lab. Press, Pearson Pub.
7. Molecular Biology, 5th Edition, (2011), Weaver R.; McGraw Hill Science. USA
8. Fundamentals of Molecular Biology, (2009), Pal J.K. and Saroj Ghaskadbi; Oxford University Press.
9. Molecular Biology: Genes to Proteins, 4th edition (2011), Burton E Tropp Jones& Bartlett Learning, USA.
10. Cell and Molecular Biology: Concepts and Experiments, 6th Edition, Karp, G. 2010.; John Wiley & Sons. Inc.
11. Cell and Molecular Biology, 8th edition. De Robertis, E.D.P. and De Robertis, E.M.F. 2006; Lippincott Williams and Wilkins, Philadelphia.
12. Cell Biology, (2017), De Robertis & De Roberis, Blaze Publishers & Distributors Pvt.Ltd.
13. The Cell: A Molecular Approach. 5th edition. Cooper, G.M. and Hausman, R.E. 2009. ASM Press & Sunderland, Washington, D.C.; Sinauer Associates, MA.
14. The World of the Cell, 7th edition, Becker, W.M., Kleinsmith, L.J., Hardin. J. and Bertoni, G. P. 2009 Pearson Benjamin Cummings Publishing, San Francisco.
15. George M. Malacinski. 2013. Freifeder's Essentials of Molecular Biology. Narosa Publishing House.

P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
BIOTECHNOLOGY SYLLABUS
(WITH EFFECTIVE FROM 2021-22)
III SEMESTER
IMMUNOLOGY AND rDNA TECHNOLOGY

Hrs : 4

CREDITS-4

Aim and objectives of Course:

To acquaint students with concepts of immunology and recombinant DNA technology. This course is aimed to give an understanding of the basics of immunology dealing cells and organs of the immune system, types of immune responses, antigen-antibody interactions, vaccines and tools, techniques and strategies and applications of genetic engineering.

Learning outcomes of Course:

The course will provide an insight into basic aspects of immunology and rDNA technology

MODULE I:

Cells and Organs of the Immune System: Hematopoiesis, Innate and adaptive immunity. Cells and organs of the immune system. antigen, hapten, antibody – Structure and types. Antigen and antibody interactions - precipitation, agglutination, immune diffusion and ELISA.

MODULE II:

Hybridoma technology, Hypersensitivity and Vaccines: MHC: Types, Hybridoma technology, monoclonal antibodies and their application in immunodiagnosis. Hypersensitivity - Types. Vaccines - Live, killed, attenuated, subunit and recombinant vaccines. Role and properties of adjuvants.

MODULE III:

Tools and Techniques of rDNA Technology: Introduction to rDNA technology, steps involved in cloning, tools of genetic engineering (Genes, Cloning vectors - plasmids and cosmids, Enzymes – restriction endonucleases and DNA Ligase, Hosts – bacteria and yeast). Methods of transformation, recombinant selection and screening methods – Blue-White Screening. Construction of Genomic and cDNA libraries.

MODULE IV:

Cloning Strategies and Application of rDNA Technology: Principles and application of PCR. Blotting techniques - Southern Blotting. Introduction to DNA sequencing (Sanger Sequencing). DNA fingerprinting.

MODULE V:

Biophysical Techniques: Centrifugation – Concept of RCF, differential and density gradient centrifugation. Chromatography – Paper and Ion-exchange. Beer-Lambert law, light absorption and transmission. UV-Vis Spectrophotometer.

P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
(WITH EFFECTIVE FROM 2021-22)

III SEMESTER – IMMUNOLOGY AND rDNA TECHNOLOGY

BLUE PRINT FOR QUESTION PAPER SETTER

Time: 21/2hours

Max marks: 60

MODULE NO.	ESSAY QUESTIONS 10 MARKS	SHORT ANSWER QUESTIONS 5 MARKS	MARKS ALLOTTED TO THE UNIT
MODULE – I	02	02	30
MODULE – II	01	02	20
MODULE – III	01	02	20
MODULE – IV	01	01	15
MODULE – V	01	03	25
Total no. of Questions	06 Of which 3 to be answered	10 Of which 6 to be answered	110 Marks including choice. Of which 60marks to be answered

NOTE: The question paper setters are requested to kindly adhere to the format given in the above table.

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P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
(WITH EFFECTIVE FROM 2021-22)
IMMUNOLOGY AND rDNA TECHNOLOGY
MODEL QUESTION PAPER

Time: 21/2 hrs.

Marks: 60M

PART - I

Note: Answer any THREE questions choosing at least one question from each section. Draw the diagrams where ever necessary.

3 x 10 = 30M

SECTION - A

1. Explain structure and functions of secondary lymphoid organs.
2. Explain structure and functions of different classes of antibody.
3. Define hypersensitivity and explain type-I and type-II hypersensitivity reactions.

SECTION – B

4. Explain steps in construction of Genomic DNA libraries.
5. Write essay on Sanger Sequencing method.
6. Write essay on ion-exchange chromatography.

PART – II

Answer any SIX Questions.

6 x 5= 30M

7. Factors affecting antigenecity.
8. Short notes on Humoral immunity
9. What are second generation vaccines.
10. Applications of monoclonal antibodies.
11. Cosmids.
12. Action of DNA ligase.
13. Steps in southern blotting.
14. Short notes on Paper chromatography.

15. Write short notes on RCF.
16. Short notes on differential centrifugation.

P.R.GOVERNMENT COLLEGE (A), KAKINADA
SEMESTER - III
IMMUNOLOGY AND rDNA TECHNOLOGY
QUESTION BANK

Module I

Essay questions

1. Write in detail about innate immune mechanism.
2. Explain structure and functions of secondary lymphoid organs.
3. Write an essay on cells of the immune system.
4. Explain structure and functions of different classes of antibody.
5. Write in detail about ELISA and its types.
6. Explain any three antigen-antibody reactions.

Short answer questions

1. Short notes on primary lymphoid organs.
2. Short notes on acquired immunity.
3. Factors affecting antigenicity.
4. Short notes on Humoral immunity

Module II

Essay questions

1. What are monoclonal antibodies and explain procedure for production of monoclonal antibodies.
2. Define MHC and explain structure of different classes of MHC molecules.
3. Define hypersensitivity and explain type-I and type-II hypersensitivity reactions.
4. Define vaccines and explain different types of vaccines with examples.
5. Explain in detail about type-III and type-IV hypersensitivity reactions.

Short answer questions

1. What are second generation vaccines.
2. Delayed type hypersensitivity.
3. Erythroblastosis fetalis.

4. Applications of monoclonal antibodies.

Module III

Essay questions

1. Write an essay on enzymes in rDNA technology.
2. Define restriction endonucleases and explain types of restriction endonucleases with examples.
3. Explain steps in construction of Genomic DNA libraries.
4. Explain steps in construction of cDNA libraries.
5. Define vector and explain plasmid vectors.

Short answer questions

1. Cosmids.
2. Characteristics of vector.
3. Short notes on pUC vector.
4. Action of DNA ligase.

Module IV

Essay questions

1. Explain Principle and steps in PCR.
2. Write essay on Sanger Sequencing method.
3. Write an essay on DNA fingerprinting.

Short answer questions

1. Steps in southern blotting.
2. Applications of PCR.

Module V

Essay questions

1. Write an essay on density gradient centrifugation.
2. Write essay on ion-exchange chromatography.
3. Explain the instrumentation of UV and visible spectrophotometry

Short answer questions

1. Short notes on Paper chromatography.
2. Write short notes on RCF.
3. Short notes on differential centrifugation.
4. Short notes on Beer's law.

P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
(WITH EFFECTIVE FROM 2021-22)
SEMESTER - III
IMMUNOLOGY AND rDNA TECHNOLOGY LAB

Total Hours: 30

Credits: 2

List of Practical: -

1. Determination of Blood Groups
2. Pregnancy test
3. Widal test
4. Ocuteroloney immunodiffusion
5. Radial immune diffusion
6. ELISA
7. Isolation of plasmid DNA (alkaline lysis method)
8. Analysis of plasmid DNA by Agarose gel electrophoresis
9. Paper chromatography.

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P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
(WITH EFFECTIVE FROM 2021-22)
AT THE END OF III SEMESTER
MODEL PRACTICAL PAPER

Time: 11/2 hrs.

Marks: 35

- | | | |
|------|--|-------------------|
| I. | Identify the blood group of given blood sample.
(Split: Principle & Procedure – 05, Conduct of Experiment – 08, Values and Report – 03) | 16 M |
| II. | Identify and write a brief notes on given spotters – A,B,C
(Identification– 01, Notes – 02). | 3 x 3 = 9M |
| III. | Practical Record | 05 M |
| IV. | Viva voce | 05 M |

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P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
BIOTECHNOLOGY SYLLABUS
(WITH EFFECTIVE FROM 2021-22)
IV SEMESTER
PAPER – IV – PLANT AND ANIMAL BIOTECHNOLOGY

Hrs : 4

CREDITS-3

Aim and objectives of Course:

The objectives of this course are to introduce students to the principles, practices and application of animal biotechnology, plant tissue culture, plant and animal genomics, genetic transformation.

Learning outcomes of Course:

Students should be able to gain fundamental knowledge in animal and plant biotechnology and their applications.

MODULE I:

Plant tissue culture techniques & secondary metabolites production: Plant tissue culture: totipotency, media preparation – nutrients and plant hormones; sterilization techniques; establishment of cultures – callus culture, cell suspension culture, applications of tissue culture-micro propagation; Somatic embryogenesis; synthetic seed production; protoplast culture and somatic hybridization - applications.

MODULE II:

Transgenesis and Molecular markers: Plant transformation technology- *Agrobacterium* mediated Gene transfer (Ti plasmid), hairy root features of Ri plasmid, Transgenic plants as bioreactors. Herbicide resistance – glyphosphate, Insect resistance- Bt cotton,, Molecular markers- RAPD, RFLP.

MODULE III:

Animal tissue culture techniques: Animal cell culture: cell culture media and reagents; culture of mammalian cells, tissues and organs; primary culture, secondary culture, cell lines, stem cell cultures; Tests: cell viability and cytotoxicity, Cryopreservation. Transfection methods (calcium phosphate precipitation, electroporation, Microinjection) and applications.

MODULE IV:

Transgenic animals & Gene Therapy: Production of vaccines, diagnostics, hormones and other recombinant DNA products in medicine (insulin, somatostatin, vaccines), IVF, Concept of Gene therapy, Concept of transgenic animals – Merits and demerits -Ethical issues in animal biotechnology.

MODULE V:

Biostatistics and IPR: Mean, median, mode, standard deviation, One-way Anova, chi-square.
Types of IPR, Patents, trademarks & copyright.

P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
(WITH EFFECTIVE FROM 2021-22)
IV SEMESTER

PAPER – IV - PLANT AND ANIMAL BIOTECHNOLOGY

BLUE PRINT FOR QUESTION PAPER SETTER

Time: 2 1/2 hours

Max marks: 60

MODULE NO.	ESSAY QUESTIONS 10 MARKS	SHORT ANSWER QUESTIONS 5 MARKS	MARKS ALLOTTED TO THE UNIT
MODULE – I	02	02	30
MODULE – II	01	01	15
MODULE – III	01	02	20
MODULE – IV	01	02	20
MODULE – V	01	03	25
Total no. of Questions	06 Of which 3 to be answered	10 Of which 6 to be answered	110 Marks including choice. Of which 60marks to be answered

NOTE: The question paper setters are requested to kindly adhere to the format given in the above table

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P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
(WITH EFFECTIVE FROM 2021-22)
PAPER – IV - PLANT AND ANIMAL BIOTECHNOLOGY
MODEL QUESTION PAPER

Time: 2 1/2 hrs.

Marks: 60M

PART - I

Note: Answer any THREE questions choosing at least one question from each section. Draw the diagrams where ever necessary. **3 x 10 = 30M**

SECTION - A

1. Define sterilization and explain different methods of sterilization techniques.
2. Explain protoplast culture and its importance.
3. Write an essay on RFLP.

SECTION – B

4. Write an essay on gene transfer methods in animal cell culture.
5. Explain steps involved in production of insulin.
6. Write an essay on chi square test.

PART – II

Answer any SIX Questions.

6 x 5= 30M

7. Define callus and explain callus culture.
8. Role of growth regulators in plant tissue culture media.
9. Short notes on Ti plasmids.
10. Culture vessels used for animal cell culture.
11. Short notes on cell viability test.
12. Applications of IVF.
13. Short notes on one-way ANOVA.

14. Short notes on patent.
15. Short notes on ethical issues in animal biotechnology
16. Short notes on mean and median.

P.R.GOVERNMENT COLLEGE (A), KAKINADA
IV SEMESTER
PAPER – IV - PLANT AND ANIMAL BIOTECHNOLOGY
QUESTION BANK

Module I

Essay questions

1. What is MS media and explain composition of MS media.
2. Define sterilization and explain different methods of sterilization techniques.
3. Write an essay on micropropagation .
4. Explain protoplast culture and its importance.

Short answer questions

1. What is explants and importance of explants in plant tissue culture
2. Define callus and explain callus culture.
3. Role of growth regulators in plant tissue culture media.
4. Applications of transgenic plants.
5. Short notes on synthetic seed production.

Module II

Essay questions

1. Write an essay on *Agrobacterium* mediated Gene transfer.
2. Write an essay on RFLP.
3. Write an essay on RAPD.

Short answer questions

1. Short notes on Ti plasmids.
2. Short notes on Ri plasmids.
3. Short notes on Bt cotton.

Module III

Essay questions

1. Write an essay on culture media used for animal tissue culture.
2. Write essay on characteristics of cells in culture.
3. Write an essay on gene transfer methods in animal cell culture.

Short answer questions

1. Short notes on growth factors in animal cell culture.
2. Laboratory facilities for animal cell culture.
3. Culture vessels used for animal cell culture.
4. Short notes on cell viability test.

Module IV

Essay questions

1. Explain steps involved in production of insulin.
2. Explain steps involved in production of somatostatin.
3. Gene therapy and its significance.
4. Describe in detail about the process of IVF.

Short answer questions

1. Define vaccines and explain types of vaccines.
2. Applications of IVF.
3. Short notes on ethical issues in animal biotechnology

Module V

Essay questions

1. Write an essay on Mean, Median and Mode.
2. Write essay on standard deviation.
3. Write an essay on chi square test.

Short answer questions

1. Short notes on one-way ANOVA.
2. Short notes on patent.
3. Short notes on trade marks and copy rights.

P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
(WITH EFFECTIVE FROM 2021-22)
II B.Sc- BIOTECHNOLOGY– PRACTICAL SYLLABUS
IV SEMESTER
PAPER – IV - PLANT AND ANIMAL BIOTECHNOLOGY

Total Hours: 30

Credits: 2

List of Practical's:

1. Plant culture media and composition of MS media
2. Raising of aseptic seedlings
3. Induction of callus from different explants, cytology of callus
4. Plant propagation through Tissue culture (shoot tip culture)
5. Establishing a plant cell culture (both in solid and liquid media)
6. suspension cell culture
7. Cell count by hemocytometer.
8. Establishing primary cell culture of chicken embryo fibroblasts.
9. Animal tissue culture – maintenance of established cell lines.
10. Estimation of cell viability by dye exclusion (Trypan blue).

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P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
(WITH EFFECTIVE FROM 2021-22)
AT THE END OF IV SEMESTER
MODEL PRACTICAL PAPER

Time: 1 1/2 hrs.

Marks: 35

- | | |
|---|-------------------|
| 1. Cell count by hemocytometer | 16 M |
| (Split: Principle & Procedure – 05, Conduct of Experiment – 08, Values and Report – 03) | |
| 2. Identify and write a brief notes on given spotters – A,B,C
(Identification– 01, Notes – 02). | 3 x 3 = 9M |
| 3. . Practical Record | 05 M |
| 4. . Viva voce | 05 M |

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P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
BIOTECHNOLOGY SYLLABUS
(WITH EFFECTIVE FROM 2019-2020)
SEMESTER - V
MOLECULAR BIOLOGY

Hrs : 4

CREDITS-3

INSTRUCTIONAL OBJECTIVES

1. To provide knowledge on Mendel's laws, genetic variations and chromosomal abnormalities.
2. To provide knowledge on Enzymology of DNA Replication and steps in replication process.
3. To provide knowledge on enzymes involved in transcription and process of transcription.

MODULE – I

DNA Replication

Enzyme machinery of replication (detailed treatment of DNA polymerase I, brief treatment of polymerase II and III) helicases, topoisomerases, single strand binding proteins, DNA melting proteins, Primase and RNA primer etc.),

Proof for semi conservative replication, discontinues replication and okazaki fragments.

Replication origins, initiation, primosome formation, elongation and termination.

MODULE – II

Transcription – Enzymatic synthesis of RNA: Basic features of transcription, structure of prokaryotic RNA polymerase (core enzyme and holoenzyme, significant of sigma factor). Concept of promoter (Pribnow box -10 and -35 sequences and their significance).

Four steps of transcription (Promoter binding and activation, RNA chain initiation and promoter escape, chain elongation, termination and release) and regulation. Reverse transcription.

Transcription – Eukaryotic transcription – enzyme machinery of eukaryotic transcription and steps in eukaryotic transcription. Post-transcriptional modifications.

MODULE-III

Gene expression

Genetic code: code and its characteristics, experimental elucidation of codons, identification of start and stop codons, universality, degeneracy and comma less nature of codons.

The decoding system: aminoacyl synthetases, the adaptor hypothesis, attachment of amino acids to tRNA. Codon-anticodon interaction – the wobble hypothesis.

Selection of initiation codon – Importance of Shine-Dalgarno sequence.

Protein Synthesis:

Initiation, elongation, termination and post translational modification.

Regulation of translation: T4 protein p32 translation regulation. Antibiotics affecting translation.

MODULE – IV

Gene regulation

Regulation of transcription in Prokaryotes - Lac- and Trp operons.

Components of Operon. Negative and positive control of lac operon.

Eukaryotic gene regulation – Gal-Operon

P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
(WITH EFFECTIVE FROM 2019-2020)
V SEMESTER
PAPER – V MOLECULAR BIOLOGY
BLUE PRINT FOR QUESTION PAPER SETTER

Time: 2 1/2hours

Max marks: 60

MODULE NO.	ESSAY QUESTIONS 10 MARKS	SHORT ANSWER QUESTIONS 5 MARKS	MARKS ALLOTTED TO THE UNIT
MODULE – I	02	02	30
MODULE – II	02	02	30
MODULE – III	01	03	25
MODULE – IV	01	03	25
Total no. of Questions	06 Of which 3 to be answered	10 Of which 6 to be answered	110 Marks including choice. Of which 60marks to be answered

NOTE: The question paper setters are requested to kindly adhere to the format given in the above table.

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P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
(WITH EFFECTIVE FROM 2019-2020)
Paper – V MOLECULAR BIOLOGY
MODEL QUESTION PAPER

Time: 2 1/2 hrs.

Marks: 60M

PART - I

Note: Answer any **THREE** questions choosing at least one question from each section. **Draw the diagrams where ever necessar**

3 x 10 = 30M

SECTION - A

1. Explain steps in DNA replication process with neat labeled diagram.
2. What is transcription and explain steps in transcription process.
3. Write about post transcriptional modifications in prokaryotes.

SECTION – B

4. explain experiment that proves DNA replication is semi-conservative.
5. Explain steps in translation process with labeled diagrams.
6. Define operon and explain lac operon system in bacteria.

PART – II

Answer any **SIX** Questions.

6 x 5= 30M

7. Modes of DNA replication.
8. Short notes on types of DNA polymerases.
9. Short notes on RNA polymerase
10. Define promoter and explain different types of promoters in transcription.
11. Short notes on wobble hypothesis.
12. Structure of tRNA.
13. Components of operon.
14. Short notes on trp operon.
15. Short notes on Gal operon.
16. Antibiotics affecting translation process.

P.R.GOVERNMENT COLLEGE (A), KAKINADA
SEMESTER - V
MOLECULAR BIOLOGY

QUESTION BANK

Module I

Essay questions

1. Write an essay on enzymology DNA replication.
2. Explain the process of DNA replication with neat labelled diagrams.
3. What are different modes of DNA replication and explain experiment that proves DNA replication is semi-conservative.

Short answer questions

1. Types of DNA polymerases and their role in replication.
2. Short notes on lagging strand synthesis.
3. Action of DNA ligase.
4. Short notes on modes of DNA replication.
5. Explain role of DNA gyrase in replication process.

Module II

Essay questions

1. Define transcription and explain steps involved in prokaryotic transcription process with neat labelled diagrams.
2. Explain steps involved in eukaryotic transcription process with neat labelled diagrams.
3. Write an essay on post-transcriptional modifications.

Short answer questions

1. Structure of RNA polymerase.
2. Define promoter and explain different types of promoters in transcription.

3. Short notes on reverse transcription.

Module III

Essay questions

1. What is genetic code and explain characteristics of genetic code.
2. Explain steps in translation process with labeled diagrams.

Short answer questions

1. Wobble hypothesis.
2. Antibiotics affecting translation process.
3. Role of Shine-Dalgarno sequence in translation process.
4. Structure of t- RNA with labelled diagram.
5. Amino acylation.

Module IV

Essay questions

1. Define operon and explain components of operon with their role in regulation process.
2. Explain Lac operon with neat labelled diagram.

Short answer questions

1. Short notes on Trp operon
2. Positive regulation of Lac operon.
3. Structure of gene.
4. Gal operan.

P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
BIOTECHNOLOGY SYLLABUS
(WITH EFFECTIVE FROM 2019-2020)
SEMESTER - V
PAPER – VI GENETICS AND rDNA TECHNOLOGY

Hrs : 4

CREDITS-3

INSTRUCTIONAL OBJECTIVES

1. To provide knowledge on how the information present on DNA is converted into Protein.
2. To provide knowledge on Gene Expression and Regulation.
3. To provide knowledge of types of restriction enzymes and vector used in recombinant DNA technology.
4. To provide knowledge on DNA libraries and applications of recombinant DNA technology in various fields.

MODULE – I

Mendels Laws and Inheritance

- 1.1 Mendel experiments, Mendel's laws and deviations: Incomplete dominance and Co-dominance.
- 1.2 Penetration and Pleiotropism.
- 1.3 Recessive and dominant epistatic gene interactions. Concept of multiple alleles.

MODULE – II

Genes and their variations

- 2.1 Structure of gene – Prokaryotes and eukaryotes, gene and environment, gene copies and heterogeneity.
- 2.2 Meiotic non-disjunction of chromosomes, chromosome abnormalities in animals and plants.
- 2.3 Linkage, recombination and gene maps.
- 2.4 **Mutations** - Gene mutation: Induced and Spontaneous, Missense, nonsense and frameshift mutations.
- 2.5 **Mutagens** – Physical and chemical mutagens.

MODULE - III

- 3.1 DNA cloning: Basics of genetic engineering, restriction endonucleases, other enzymes of DNA manipulation.

- 3.2 Vectors – Plasmids, Phage vectors, Cosmids, Phagemids and YAC's.
- 3.3 Cutting and joining of DNA (cohesive end ligation and methods of blunt end ligation).
- 3.4 Transfection and transformation. Selection of transformed cells and screening methods.

MODULE - IV

Genomic DNA libraries and cDNA libraries

- 4.1 Concept of Genome
- 4.2 Concept and methods of creating these libraries. Advantages and disadvantages of cDNA library over genomic DNA library.
- 4.3 PCR – Working of PCR
- 4.4 Expression of Cloned genes – general features of an expression vector. Expression of eukaryotic gene in prokaryotes – advantages and problems.
- 4.5 Applications of rDNA technology.

P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
(WITH EFFECTIVE FROM 2019-2020)
V SEMESTER
PAPER – VI GENETICS AND rDNA TECHNOLOGY
BLUE PRINT FOR QUESTION PAPER SETTER

Time: 2 1/2 hours

Max marks: 60

MODULE NO.	ESSAY QUESTIONS 10 MARKS	SHORT ANSWER QUESTIONS 5 MARKS	MARKS ALLOTTED TO THE UNIT
MODULE – I	01	03	25
MODULE – II	02	02	30
MODULE – III	02	02	30
MODULE – IV	01	03	25
Total no. of Questions	06 Of which 3 to be answered	10 Of which 6 to be answered	110 Marks including choice. Of which 60 marks to be answered

NOTE: The question paper setters are requested to kindly adhere to the format given in the above table.

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P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
(WITH EFFECTIVE FROM 2019-2020)
Paper – VI GENETICS AND rDNA TECHNOLOGY
MODEL QUESTION PAPER

Time: 21/2 hrs.

Marks: 60M

PART - I

Note: Answer any THREE questions choosing at least one question from each section. Draw the diagrams where ever necessar

3 x 10 = 30M

SECTION - A

1. Describe Mendel's laws and deviations.
2. Write an essay on structure of Eukaryotic Gene.
3. Define mutation and explain different types of gene mutations.

SECTION – B

4. Describe enzymes involved in r DNA technology.
5. Explain selection of transformed cells and screening methods.
6. Explain steps involved in construction of cDNA libraries.

PART – II

Answer any SIX Questions.

6 x 5= 30M

7. Short notes on Pleiotropism.
8. Short notes on multiple alleles.
9. Short notes on structure of the gene.
10. Short notes on pBR322.
11. Define test cross and back cross with examples
12. Short notes on Cohesive end ligation.
13. What is non-disjunction and explain its consequences.
14. Genomic libraries.

15. Applications of rDNA technology.
16. Features of expression vectors.

P.R.GOVERNMENT COLLEGE (A), KAKINADA
SEMESTER - V
GENETICS AND rDNA TECHNOLOGY
QUESTION BANK

Module I

Essay questions

1. Explain Mendel's laws with examples.
2. Describe dominant epistatic gene interactions.
3. Describe Recessive epistatic gene interactions.
4. Write an essay on deviations of Mendel's laws.

Short answer questions

1. Short notes on penetration.
2. Short notes on Pleiotropism.
3. Short notes on multiple alleles.
4. Define test cross and back cross with examples.

Module II

Essay questions

1. Describe the concept of linkage.
2. Define mutation and explain different types of gene mutations.
3. Define mutagen and explain physical and chemical mutagens with examples.
4. Write an essay on eukaryote gene structure.

Short answer questions

1. Structure of gene.
1. Short notes on chromosomal abnormalities in plants.

2. Short notes on gene maps.
3. What is non-disjunction and explain its consequences.

Module III

Essay questions

1. Enzymes involved in r DNA technology
2. Explain selection of transformed cells and screening methods.

Short answer questions.

3. PBR 322
4. Cosmids.
5. Phage vectors.
6. Cohesive end ligation.
7. Transfection.
8. Blunt end ligation.

MODULE - IV

Essay questions

1. Explain the steps involved in PCR.
2. Explain the steps involved in construction of C-DNA libraries.

Short answer questions

3. Features of expression vectors.
4. Concept of genome.
5. Genomic libraries.
6. Write about applications of r DNA technology.

P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
(WITH EFFECTIVE FROM 2019-2020)
SEMESTER - V
PAPER – V MOLECULAR BIOLOGY
PRACTICAL SYLLABUS

Hrs : 3

CREDITS-2

1. To measure concentration of DNA & RNA by UV spectrophotometry.
2. Estimation of proteins by Bradford method.
3. Isolation of genomic DNA.
4. Estimation of DNA by diphenyl amine method.
5. Isolation of plasmid DNA from bacteria.
6. Agarose gel electrophoresis of genomic DNA.
7. Karyotyping of *Allium* or *Drosophila*.
8. Mutation of bacteria by UV.

Note:- Mandatory to perform atleast 6 practicals.

P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
(WITH EFFECTIVE FROM 2019-2020)
AT THE END OF V SEMESTER
PAPER – V MOLECULAR BIOLOGY
MODEL PRACTICAL PAPER

Time: 11/2 hrs.

Marks: 35

- I. Isolation of plasmid DNA from bacteria. **16 M**
(Split: Principle & Procedure – 05, Conduct of Experiment – 08, Result – 03)
- II. Identification of Spotters and write brief notes on it. **3 x 3 = 9M**
(Identification– 01, Notes – 02).
- A. Problem in Mendilian genetics.
B. Electrophoretic chamber.
C. Identification of Reagent (Description).
- III. . Practical Record **05 M**
- IV. . Viva voce **05 M**

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P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
(WITH EFFECTIVE FROM 2019-2020)
SEMESTER - V
PAPER – VI GENETICS AND rDNA TECHNOLOGY
PRACTICAL SYLLABUS

Hrs : 3

CREDITS-2

1. Problems and assignments in Mendelian genetics.
2. Effect of UV radiation on the growth of microorganisms.
3. Chemical induced mutation in bacteria.
4. Demonstration of replica plating technique.
5. Identification of Lac⁺ bacteria by blue white screening using IPTG.
6. Restriction digestion of DNA.
7. Ligation of DNA.
8. Isolation of auxotrophic mutants (plants or insects).

Note:- Mandatory to perform atleast 6 practical.

P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
(WITH EFFECTIVE FROM 2019-2020)
AT THE END OF V SEMESTER
PAPER – VI GENE EXPRESSION AND rDNA TECHNOLOGY
MODEL PRACTICAL PAPER

Time: 11/2 hrs.

Marks: 35

- I. Estimation of proteins by Bradford method. **16 M**
(Split: Principle & Procedure – 05, Conduct of Experiment – 08, Result – 03)
- II. Identification of Spotters and write brief notes on it. **3 x 3 = 9M**
(Identification– 01, Notes – 02).
- A. Restriction enzymes.
B. Electrophoretic chamber.
C. Identification of Reagent (Description).
- III. . Practical Record **05 M**
- IV. . Viva voce **05 M**

P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
BIOTECHNOLOGY SYLLABUS
(WITH EFFECTIVE FROM 2019-2020)
SEMESTER - VI

Elective A: BIOSTATISTICS, BIOINFORMATICS AND IPRs

INSTRUCTIONAL OBJECTIVES

1. To impart Knowledge on data collection and tabulation of data.
2. To impart Knowledge on standard statistical distributions.
3. To impart Knowledge on different biological databases and their role in biology.

MODULE I

Concept of Sampling, Collection, Classification and Tabulation of data, Bar diagrams and Pie diagrams, Histogram, Frequency curve and frequency polygon. Mean, median, mode, Standard deviation, standard error, ANOVA.

MODULE II

Random variable,(.discrete and continuous), Probability density function(discrete and continuous). Standard distributions - Uniform distribution. (Discrete and continuous).Exponential distribution Gamma distribution, Beta distribution. Binomial distribution, Poisson distribution, Normal distributions. Standard normal distributions.

MODULE III

Sequence Analysis: Introduction to biological databases: NCBI, EMBL, EXPASY, PIR, Pfam. Concept of World Wide Web: HTML, HTTP. Similarity measures - Euclidean, Mahalanobis distance, Edit distance, similarity matrices (PAM, BLOSUM) Searching sequence databases using BLAST. Multiple sequence alignment – progressive alignment – profiles – multidimensional dynamic programming.

MODULE IV

Introduction to Intellectual property: Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights.

P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
(WITH EFFECTIVE FROM 2019-2020)

SEMESTER - VI

Elective A: BIOSTATISTICS, BIOINFORMATICS AND IPRs
BLUE PRINT FOR QUESTION PAPER SETTER

Time: 2 1/2 hours

Max marks: 60

MODULE NO.	ESSAY QUESTIONS 10 MARKS	SHORT ANSWER QUESTIONS 5 MARKS	MARKS ALLOTTED TO THE UNIT
MODULE – I	02	02	30
MODULE – II	01	03	25
MODULE – III	02	02	30
MODULE – IV	01	03	25
Total no. of Questions	06 Of which 3 to be answered	10 Of which 6 to be answered	110 Marks including choice. Of which 60 marks to be answered

NOTE: The question paper setters are requested to kindly adhere to the format given in the above table.

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P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
(WITH EFFECTIVE FROM 2019-2020)
SEMESTER - VI
Elective A: BIOSTATISTICS, BIOINFORMATICS AND IPRs
MODEL QUESTION PAPER

Time: 21/2 hrs.

Marks: 60M

PART - I

Note: Answer any THREE questions choosing at least one question from each section.

Draw the diagrams where ever necessary

3 x 10 = 30M

SECTION – A

1. Write essay on data collection methods and its merits and demerits?
2. Explain mean, median and mode with examples.
3. Write about concept of poisson distribution.

SECTION – B

4. Explain the procedure for searching a sequence in database using BLAST.
5. What are Biological databases? Differentiate between primary and secondary databases.
6. Write essay on intellectual property rights.

PART – II

Answer any SIX Questions.

6 x 5 = 30M

7. Represent the given data graphically through histogram.

Plant Height (Cm)	0-10	10-20	20-30	30-40	40-50
Number of verities	5	9	15	22	25

8. Short notes on probability multiplication theorem.
9. Short notes on standard deviation.

10. Briefly explain probability addition theorem.
11. Short notes on binomial distribution.
12. BLOSUM.
13. Short notes on data retrieval from databases.
14. International organizations and agencies related to IPR.
15. Importance of intellectual property rights.
16. Treaties related to IPR.

P.R.GOVERNMENT COLLEGE (A), KAKINADA
SEMESTER - VI
BIostatistics, BIOinformatics AND IPRs

QUESTION BANK

Module I

Essay questions

1. Write essay on data collection methods, its merits and demerits.
2. What is standard deviation. Calculate standard deviation for the given data. Variable (χ) = 10,13,17,22,27,30,31.
3. Explain mean, median and mode with examples.
4. Write an essay on sampling.

Short answer questions

1. Represent the given data through Bar diagram

Mutants	Frequency
Albina	50
Chlorina	30
Virids	25
Chloro viridis	20

2. Represent the given data graphically through histogram.

Plant Height (CM)	0-10	10-20	20-30	30-40	40-50
No.Of Varieties	5	7	6	10	12

3. Short notes on tabulation of data.
4. Short notes on frequency polygon.
5. ANOVA.
6. Short notes on standard deviation.

Module II

Essay questions

1. Write about concept of binomial distribution. Calculate the probability of getting two males in three child births.
2. Write about the concept of Poisson distribution. If alpha particles are emitted by radio active source at the rate of 3 per every minute on the average and the number of particles is distributed according to Poisson distribution. Calculate the probability of getting exactly 5 emissions in one minute. $e=2.71$
3. Write an essay on Normal distribution
4. Write an essay on Standard distributions.

Short answer questions

1. Short notes on random variable.
2. Briefly explain probability addition theorem.
3. Briefly explain probability multiplication theorem.

Module III

Essay questions

1. Write an essay on biological databases.
2. Write the procedure for searching a sequence in data base using BLAST.
3. Write an essay on Multiple sequence alignment.

Short answer questions

1. Data retrieval tools.
2. Short notes on BLOSUM.
3. Short notes HTML, HTTP.

Module IV

Essay questions

1. Write an essay on intellectual property rights.
2. Write an essay on importance of intellectual property right

Short answer questions

1. International organizations and agencies related to IPR.
2. Treaties related to IPR.
3. Infringement of IPR.

P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
(WITH EFFECTIVE FROM 2019-2020)
III B.Sc BIOTECHNOLOGY, SEMESTER - VI
Elective A: BIOSTATISTICS, BIOINFROMATICSAND IPRS
PRACTICAL SYALLABUS

Hrs : 3

CREDITS-2

1. Calculation of Mean of given data
2. Draw pie chart of the following data
3. Align the given sequences and calculate genetic similarity of the sequences
4. Calculate median and mode of the following given data
5. Arrange the given data in continuous and discrete form
6. Calculate standard deviation of the given following data
7. Identify the sequence of the given gene through blast
8. Align the sequences using multiple alignment tool.

Note: perform any 5 practicals

P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
(WITH EFFECTIVE FROM 2019-2020)
AT THE END OF VI SEMESTER
Elective A: BIostatistics, Bioinformatics and IPRs

MODEL PRACTICAL PAPER

Time: 1 1/2 hrs.

Marks: 35

I. Calculate mode of the following given data

16 M

Class Interval	Frequency
0-11	3
11-21	5
21-31	7
31-41	8
41-51	9

II. Identify and write a brief notes on given spotters –
(Identification– 01, Notes – 02).

3 x 3 = 9M

- A. _____
B. _____
C. _____

III. . Practical Record

05 M

IV. . Viva voce

05 M

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P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
BIOTECHNOLOGY SYLLABUS
(WITH EFFECTIVE FROM 2019-2020)
SEMESTER - VI

Cluster Elective- A1: PLANT AND ANIMAL BIOTECHNOLOGY

HOURS 2T+3P

CREDITS 2+2

INSTRUCTIONAL OBJECTIVES:

1. To provide basic knowledge on different media used in Plant cell culture.
2. To impart basic Principles of Micro propagation, Gene transfer techniques and production of transgenic plants.
3. To provide basic knowledge on different media used in Animal cell Culture.
4. To impart basic Principles of animal cell culture cell lines, IVF, and Embryo Transfer technology.

MODULE I:

Cell and tissue culture: Introduction to cell and tissue culture laboratory facilities, sterilization, Explant. Tissue culture media (composition and preparation) Callus and suspension cultures: initiation and maintenance of callus and suspension cultures; single cell clones.

MODULE II:

Tissue and micropropagation: Direct and indirect regeneration, production of haploids, protoplast culture and Somatic hybridization.

Cloning in plants -Ti plasmid organization. Concept of transgenic plants Bt-cotton and other plant applications.

MODULE III:

Various techniques of animal cell and tissue culture: Culture media, growth factors, laboratory facilities for animal cell culture. Characteristics of cells in culture: Contact inhibition, anchorage dependence, cell-cell communication etc.; Cell senescence; cell and tissue response to trophic factors. Primary culture, immortal cells, cell lines. Maintenance of cell lines in the laboratory.

MODULE IV:

rDNA products: Brief idea about recombinant DNA products in medicine (insulin, somatostatin, vaccines), Concept of Gene therapy, Production of recombinant vaccines–hepatitis. Concept of transgenic animals *In-vitro* fertilization and embryo transfer in humans and farm animals.

P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
(WITH EFFECTIVE FROM 2019-2020)

VI SEMESTER

Cluster Elective- A1: PLANT AND ANIMAL BIOTECHNOLOGY
BLUE PRINT FOR QUESTION PAPER SETTER

Time: 2 1/2 hours

Max marks: 60

MODULE NO.	ESSAY QUESTIONS 10 MARKS	SHORT ANSWER QUESTIONS 5 MARKS	MARKS ALLOTTED TO THE UNIT
MODULE – I	01	03	25
MODULE – II	02	02	30
MODULE – III	01	03	25
MODULE – IV	02	02	30
Total no. of Questions	06 Of which 3 to be answered	10 Of which 6 to be answered	110 Marks including choice. Of which 60 marks to be answered

NOTE: The question paper setters are requested to kindly adhere to the format given in the above table.

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P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
(WITH EFFECTIVE FROM 2019-2020)
SEMESTER - VI
Cluster Elective- A1: PLANT AND ANIMAL BIOTECHNOLOGY
MODEL QUESTION PAPER

Time: 21/2 hrs.

Marks: 60M

PART - I

Note: Answer any THREE questions choosing at least one question from each section. Draw the diagrams where ever necessar

3 x 10 = 30M

SECTION – A

1. Describe the constituents of plant tissue culture media.
2. Write an essay on protoplast culture.
3. Write an essay on applications of transgenic plants.

SECTION – B

4. Write an essay on IVF.
5. Write an account on culture media for animal cells.
6. Explain steps involved in production of insulin.

PART – II

Answer any SIX Questions.

6 x 5= 30M

7. Short notes on physical methods of sterilization.
8. Induction of callus.
9. Short notes on laboratory facilities needed for tissue culture.
10. Short notes on somatic hybridization.
11. Ti-Plasmid.
12. Short notes on cell-lines.
13. Explain laboratory facilities needed for animal cell culture.
14. Explain characteristics of cells in animal cell culture.
15. Types of vaccines.
16. Short notes on gene therapy.

P.R.GOVERNMENT COLLEGE (A), KAKINADA
SEMESTER - VI

Cluster Elective- A1: PLANT AND ANIMAL
BIOTECHNOLOGY

QUESTION BANK

Module I

Essay questions

1. Write about laboratory facilities and physical environment in plant tissue culture.
2. What is MS media and explain composition of MS media.
3. Define sterilization and explain different methods of sterilization techniques.

Short answer questions

1. What is explants and importance of explants in plant tissue culture?
2. Define callus and explain callus culture.
3. Role of growth regulators in plant tissue culture media.
4. Short notes on single cell clones.

Module II

Essay questions

1. Write an essay on micropropagation .
2. Explain protoplast culture and its importance.
3. Explain organization of Ti plasmid and its importance in plant tissue culture.
4. Haploids production and their significance in plant tissue culture.

Short answer questions

1. Short notes somatic hybridization.
2. Applications of transgenic plants.
3. Short notes on indirect regeneration.

Module III

Essay questions

1. Write an essay on culture media used for animal tissue culture.
2. Write essay on characteristics of cells in culture.
3. Write an essay on maintenance of cell lines in laboratory.

Short answer questions

1. Short notes on growth factors in animal cell culture.
2. Laboratory facilities for animal cell culture.
3. Immortal cell lines.
4. Culture vessels used for animal cell culture.

Module IV

Essay questions

5. Explain steps involved in production of insulin.
6. Explain steps involved in production of somatostatin.
7. Gene therapy and its significance.
8. Describe in detail about the process of IVF.

Short answer questions

4. Define vaccines and explain types of vaccines.
5. Short notes on gene therapy.
6. Applications of IVF.
7. Briefly explain steps in production of hepatitis.
8. Applications of transgenic animals.

P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
(WITH EFFECTIVE FROM 2019-2020)
III B.Sc BIOTECHNOLOGY, SEMESTER - VI
Cluster Elective- A1: PLANT AND ANIMAL BIOTECHNOLOGY
PRACTICAL SYALLABUS

Hrs : 3

CREDITS-2

1. Sterilisation techniques – hot air oven, autoclave and other chemical sterilization techniques.
2. Preparation of plant tissue culture media.
3. Callus culture
4. Suspension culture.
5. Cell count by hemocytometer.
6. Cytology of callus.
7. Establishing primary cell culture of chicken embryo fibroblasts.
8. Cell viability – Dye MTT method.

P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
(WITH EFFECTIVE FROM 2019-2020)
AT THE END OF VI SEMESTER
Cluster Elective- A1: PLANT AND ANIMAL BIOTECHNOLOGY

MODEL PRACTICAL PAPER

Time: 11/2 hrs.

Marks: 35

- | | |
|---|-------------------|
| I. Cell count by hemocytometer. | 16 M |
| II. Identify and write a brief notes on given spotters –
(Identification– 01, Notes – 02).
A. _____
B. _____
C. _____ | 3 x 3 = 9M |
| III. . Practical Record | 05 M |
| IV. . Viva voce | 05 M |

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P.R.GOVERNMENT COLLEGE (A), KAKINADA

CHOICE BASED CREDIT SYSTEM

BIOTECHNOLOGY SYLLABUS

(WITH EFFECTIVE FROM 2019-2020)

SEMESTER - VI

Cluster Elective A2: ENVIRONMENTAL BIOTECHNOLOGY

HOURS 2T+3P

CREDITS 2+2

INSTRUCTIONAL OBJECTIVES:

1. To provide basic knowledge on basic principles of environmental biotechnology.
2. To provide basic knowledge on Renewable and non-renewable energy resources.
3. To provide basic knowledge on Xenobiotic compounds.
4. To provide knowledge on waste water management and bioremediation.

MODULE-I

- 1.1 Introduction to environmental biotechnology.
- 1.2 Renewable and non-renewable energy resources.
- 1.3 Conventional energy sources and their impact on environment.
- 1.4 Non-conventional fuels and their impact on environment – Production of Biogas, microbial hydrogen production.

MODULE -II

- 2.1 Waste Treatment – Treatment of Solid waste.
- 2.2 Microbiological treatment of municipal and industrial effluents.
- 2.3 Digestion of Organic slurries

MODULE -III

- 3.1 Microbiological analysis of milk.
- 3.2 Microbiological analysis of food and water.
Xenobiotic compounds – introduction, methods to eliminate xenobiotic compounds
- 3.3 Microbial degradation of pesticides and toxic chemicals.

MODULE - IV

- 4.1 Biopesticides and Biofertilizers (Nitrogen fixing, phosphate solubilizing microorganisms).
- 4.2 Microbial ore leaching.
- 4.3 Bioremediation, Biostimulation and Bioaugmentation.

P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
(WITH EFFECTIVE FROM 2019-2020)

VI SEMESTER

Cluster Elective A2: ENVIRONMENTAL BIOTECHNOLOGY
BLUE PRINT FOR QUESTION PAPER SETTER

Time: 2 1/2 hours

Max marks: 60

MODULE NO.	ESSAY QUESTIONS 10 MARKS	SHORT ANSWER QUESTIONS 5 MARKS	MARKS ALLOTTED TO THE UNIT
MODULE – I	02	02	30
MODULE – II	01	03	25
MODULE – III	01	03	25
MODULE – IV	02	02	30
Total no. of Questions	06 Of which 3 to be answered	10 Of which 6 to be answered	110 Marks including choice. Of which 60 marks to be answered

NOTE: The question paper setters are requested to kindly adhere to the format given in the above table.

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P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
(WITH EFFECTIVE FROM 2019-2020)
SEMESTER - VI
Cluster Elective A2: ENVIRONMENTAL BIOTECHNOLOGY
MODEL QUESTION PAPER

Time: 2 1/2 hrs.

Marks: 60M

PART - I

Note: Answer any **THREE** questions choosing at least one question from each section. **Draw the diagrams where ever necessar** **3 x 10 = 30M**

SECTION – A

1. Write an essay on Renewable and non-renewable energy resources.
2. Write an essay on production of Biogas
3. Write an essay on various methods used in Microbiological treatment of Municipal water.

SECTION – B

4. Define biodegradation & explain the process of biodegradation of pesticides.
5. Write an essay on Biofertilizers.
6. Explain Bioremediation.

PART – II

Answer any **SIX** Questions.

6 x 5= 30M

1. Applications of environmental biotechnology.
2. Short notes on conventional energy sources.
3. Short notes on solid waste management
4. Short notes on Superiority biological indicators.
5. Short notes on digestion of organic flurrries.
6. Short notes on sludge treatment.
7. MBRT.
8. Short notes on xenobiotic compounds.
9. Short notes on microbial ore leaching.
10. Short notes on bioaugmentation.

P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
(WITH EFFECTIVE FROM 2019-2020)
III B.Sc BIOTECHNOLOGY, SEMESTER - VI
Cluster Elective A2: ENVIRONMENTAL
BIOTECHNOLOGY
PRACTICAL SYALLABUS

Hrs : 3

CREDITS-2

1. Detection of coliforms for determination of the purity of potable water.
2. Determination of total dissolved solids of water
3. Determination of Hardness and alkalinity of water sample.
4. Determination of dissolved oxygen concentration of water sample
5. Determination of biological oxygen demand of sewage sample.
6. Estimation of heavy metals in water/soil
7. Estimation of nitrate in drinking water.
8. Isolation of industrially important microorganisms from soil.
9. Isolation of amylase producing organisms from soil.
10. Production of alcohol or wine using different substrates.
11. Estimation of alcohol by titrimetry.
12. Estimation of alcohol by calorimetric method

Note: perform any 8 practicals

P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
(WITH EFFECTIVE FROM 2019-2020)
AT THE END OF VI SEMESTER
Cluster Elective A2: ENVIRONMENTAL
BIOTECHNOLOGY

MODEL PRACTICAL PAPER

Time: 11/2 hrs.

Marks: 35

- | | |
|---|-------------------|
| I. Estimate the DO of the given water sample. | 16 M |
| II. Identify and write a brief notes on given spotters –
(Identification– 01, Notes – 02). | 3 x 3 = 9M |
| A. _____ | |
| B. _____ | |
| C. _____ | |
| III. . Practical Record | 05 M |
| IV. . Viva voce | 05 M |

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P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
BIOTECHNOLOGY SYLLABUS
(WITH EFFECTIVE FROM 2019-2020)

SEMESTER - VI

Cluster Elective- A3: INDUSTRIAL BIOTECHNOLOGY

HOURS 2T+3P

CREDITS 2+2

INSTRUCTIONAL OBJECTIVES:

1. To provide basic knowledge on isolation, screening and preservation methods of industrially important microorganisms.
2. To study the principles of bioreactor and operational methods of different bioreactors.
3. To provide basic knowledge on steps involved in industrial production of ethanol and various important products like enzymes, antibiotics.

MODULE I:

Isolation, Screening, Preservation and Improvement of Industrially Important Microorganisms. Synthetic and Natural Medium, Precursors, Antifoams, Sterilization Methods and Inoculum Preparation.

MODULE II:

Definition of bioreactor, basic principles of bioreactor. Types of bioreactors. Analysis of batch, continuous, fed batch and semi-continuous bioreactors.

MODULE III:

Ethanol Production by Fermentation using Molasses, Starchy Substances. Production of Alcoholic Beverages like Beer and Wine. Production of Citric Acid by Submerged and Solid State Fermentations.

MODULE IV:

Sources of Industrial Enzymes, Production of Microbial Enzymes like Amylase and protease. Baker's Yeast and SCP Production. Production of Antibiotics: Penicillin.

Biotechnology Products- Production of recombinant proteins having therapeutic and diagnostic applications (Insulin, Growth Hormone, Recombinant vaccines, Monoclonal Antibody).

P.R.GOVERNMENT COLLEGE (A), KAKINADA

CHOICE BASED CREDIT SYSTEM

(WITH EFFECTIVE FROM 2019-2020)

SEMESTER - VI

Cluster Elective- A3: INDUSTRIAL BIOTECHNOLOGY

BLUE PRINT FOR QUESTION PAPER SETTER

Time: 2 1/2 hours

Max marks: 60

MODULE NO.	ESSAY QUESTIONS 10 MARKS	SHORT ANSWER QUESTIONS 5 MARKS	MARKS ALLOTTED TO THE UNIT
MODULE – I	02	02	30
MODULE – II	01	03	25
MODULE – III	01	03	25
MODULE – IV	02	02	30
Total no. of Questions	06 Of which 3 to be answered	10 Of which 6 to be answered	110 Marks including choice. Of which 60marks to be answered

NOTE: The question paper setters are requested to kindly adhere to the format given in the above table.

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P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
(WITH EFFECTIVE FROM 2019-2020)
SEMESTER - VI
Cluster Elective- A3: INDUSTRIAL BIOTECHNOLOGY
MODEL QUESTION PAPER

Time: 21/2 hrs.

Marks: 60M

PART - I

Note: Answer any THREE questions choosing at least one question from each section. Draw the diagrams where ever necessar **3 x 10 = 30M**

SECTION – A

1. Define sterilization and explain different sterilization techniques used for media and glassware.
2. Write an essay on different types of media used in fermentation technology.
3. Write an essay on continuous fermentation.

SECTION – B

4. Explain different steps involved in production of Citric acid.
5. Describe the production of Baker's Yeast.
6. What is Hybridoma technology and explain production of monoclonal antibodies.

PART – II

Answer any SIX Questions.

6 x 5= 30M

7. Short notes on Precursors.
8. Short notes on preservation techniques.
9. Bubble column bioreactor.
10. Short notes on fed-batch bioreactor.
11. Short notes on basic principles of bioreactor.
12. Molasses.
13. Steps involved in production of wine.
14. Short notes on solid state fermentation.
15. Short notes on SCP production.
16. Short notes on recombinant vaccines.

P.R.GOVERNMENT COLLEGE (A), KAKINADA
SEMESTER - VI
Cluster Elective A3: INDUSTRIAL BIOTECHNOLOGY

QUESTION BANK

Module I

Essay questions

1. Give an account on sterilization of media, equipment and preparation of inoculation for fermentation.
2. Write an essay on different types of media used in fermentation technology.
3. Write an essay on different isolation and screening methods of industrially important microorganisms.

Short answer questions

1. Short notes on Precursors.
2. Short notes on antifoam agents and its importance.
3. Short notes on preservation methods of microorganisms.
4. Short notes on strain improvement.

Module II

Essay questions

1. Write an essay on bioreactor.
2. Explain different types on bioreactors.
3. Write an essay on continuous cultures.

Short answer questions

1. Bubble column bioreactor.
2. Fluidized bed reactor.
3. Short notes on batch culture.
4. Short notes on fed batch culture.

Module III

Essay questions

1. Explain different steps involved in production of Citric acid.
2. Explain steps involved in production of wine.

Short answer questions

1. Molasses.
2. Steps in ethanol production.
3. Short notes on solid state fermentation.
4. Short notes on submerged fermentation.

Module IV

Essay questions

1. Describe the production of Baker's Yeast.
2. What is Hybridoma technology and explain production of monoclonal antibodies.
3. Describe the production of enzyme amylase.
4. Write an essay on synthesis of recombinant Growth Hormone.

Short answer questions

1. Short notes on SCP production.
2. Penicillin structure.
3. Short notes on recombinant Hepatitis-B vaccine.
4. Applications of industrial biotechnology.

P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
(WITH EFFECTIVE FROM 2019-2020)
III B.Sc BIOTECHNOLOGY, SEMESTER – VI
PRACTICAL SYALLABUS

Cluster Elective- A3 : PROJECT WORK

P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
BIOTECHNOLOGY SYLLABUS
(WITH EFFECTIVE FROM 2019-2020)
SEMESTER - VI
Elective B: ECOLOGY

HOURS 2T+3P

CREDITS 2+2

INSTRUCTIONAL OBJECTIVES

1. To impart Knowledge on biotic, abiotic interactions and concept of habitate and niche.
2. To know the inter-relationship between organisms in population and communities.
3. To impart Knowledge on different interactions between the species.
4. To impart Knowledge on components of different ecosystems.

MODULE - I

The Environment: Physical environment; biotic environment; biotic and abiotic interactions. Habitat and Niche: Concept of habitat and niche; niche width and overlap; fundamental and realized niche; resource partitioning; character displacement.

Population Ecology: Characteristics of a population; population growth curves; population regulation;

MODULE II

Community Ecology: Nature of communities; community structure and attributes; levels of species diversity and its measurement; edges and ecotones. Ecological Succession: Types; mechanisms; changes involved in succession; concept of climax.

MODULE III

Species Interactions: Types of interactions, interspecific competition, herbivory, carnivory, pollination, symbiosis.

MODULE IV

Ecosystem Ecology: Ecosystem structure; ecosystem function; energy flow and mineral cycling (C,N,P); primary production and decomposition; structure and function of some Indian ecosystems: terrestrial (forest, grassland) and aquatic (fresh water, marine, eustarine).

P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
(WITH EFFECTIVE FROM 2019-2020)
VI SEMESTER
Elective B: ECOLOGY
BLUE PRINT FOR QUESTION PAPER SETTER

Time: 2 1/2hours

Max marks: 60

MODULE NO.	ESSAY QUESTIONS 10 MARKS	SHORT ANSWER QUESTIONS 5 MARKS	MARKS ALLOTTED TO THE UNIT
MODULE – I	02	02	30
MODULE – II	01	03	25
MODULE – III	01	03	25
MODULE – IV	02	02	30
Total no. of Questions	06 Of which 3 to be answered	10 Of which 6 to be answered	110 Marks including choice. Of which 60marks to be answered

NOTE: The question paper setters are requested to kindly adhere to the format given in the above table.

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P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
(WITH EFFECTIVE FROM 2019-2020)
VI SEMESTER
Elective B: ECOLOGY
MODEL QUESTION PAPER

Time: 2 1/2 hrs.

Marks: 60M

PART - I

Note: Answer any **THREE** questions choosing at least one question from each section. **Draw the diagrams where ever necessary** **3 x 10 = 30M**

SECTION – A

1. What is ecosystem? What are the different approaches to ecology based on level of organization?
2. Write an essay on abiotic and biotic interactions.
3. Illustrate the climax concept in succession.

SECTION – B

4. Describe different types of species interactions.
5. Write an essay on Forest and grassland ecosystem.
6. Illustrate aquatic ecosystem in detail.

PART – II

Answer any **SIX** Questions.

6 x 5= 30M

7. Short notes on thermal stratification.
8. Short notes on population regulation.
9. Short notes on Lotic communities.
10. Short notes on Biome.
11. Short notes on population density.
12. Commensalism with example.
13. Short notes on symbiosis.
14. Short notes on pollination.
15. Y – shaped energy flow model.
16. Short notes on nutrient cycling.

P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
(WITH EFFECTIVE FROM 2019-2020)
III B.Sc BIOTECHNOLOGY, SEMESTER - VI
Elective B: ECOLOGY
PRACTICAL SYALLABUS

Hrs : 3

CREDITS-2

1. To determine basal cover of trees in a forest ecosystem/forest plantation.
2. Quantitative analysis of soil organic carbon.
3. Quantitative analysis of soil pH.
4. To study pore space, water holding capacity and bulk density of soil.
5. Identification of rocks and minerals on the basis of physical characters.

P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
(WITH EFFECTIVE FROM 2019-2020)
AT THE END OF VI SEMESTER
Elective B: ECOLOGY

MODEL PRACTICAL PAPER

Time: 1 1/2 hrs.

Marks: 35

- | | | |
|------|---|-------------------|
| I. | Quantitative analysis of soil organic carbon | 16 M |
| II. | Identify and write a brief notes on given spotters –
(Identification– 01, Notes – 02). | 3 x 3 = 9M |
| | A. _____ | |
| | B. _____ | |
| | C. _____ | |
| III. | . Practical Record | 05 M |
| IV. | . Viva voce | 05 M |

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P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
BIOTECHNOLOGY SYLLABUS
(WITH EFFECTIVE FROM 2019-2020)
SEMESTER - VI
Cluster Elective- B1: DIVERSITY IN LIFE

HOURS 2T+3P

CREDITS 2+2

INSTRUCTIONAL OBJECTIVES

1. To impart Knowledge on principle and methods of taxonomy of different species.
2. To impart Knowledge on levels of organization of tissues and organs.
3. To impart Knowledge on geographic origins and migration of species.

MODULE I

Principles & methods of taxonomy: Concepts of species and hierarchical taxa, biological nomenclature, classical & quantitative methods of taxonomy of plants, animals and microorganisms.

MODULE II

Levels of structural organization: Unicellular, colonial and multicellular forms. Levels of organization of tissues, organs & systems. Comparative anatomy, adaptive radiation, adaptive modifications.

MODULE III

Natural history of Indian subcontinent: Major habitat types of the subcontinent, geographic origins and migrations of species.

MODULE IV

Organisms of health & agricultural importance: Common parasites and pathogens of humans, domestic animals and crops.

Organisms of conservation concern: Rare, endangered species. Conservation strategies.

P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
(WITH EFFECTIVE FROM 2019-2020)
SEMESTER - VI
Cluster Elective- B1: DIVERSITY IN LIFE
BLUE PRINT FOR QUESTION PAPER SETTER

Time: 2 1/2hours

Max marks: 60

MODULE NO.	ESSAY QUESTIONS 10 MARKS	SHORT ANSWER QUESTIONS 5 MARKS	MARKS ALLOTTED TO THE UNIT
MODULE – I	02	02	30
MODULE – II	01	03	25
MODULE – III	01	03	25
MODULE – IV	02	02	30
Total no. of Questions	06 Of which 3 to be answered	10 Of which 6 to be answered	110 Marks including choice. Of which 60marks to be answered

NOTE: The question paper setters are requested to kindly adhere to the format given in the above table.

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P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
(WITH EFFECTIVE FROM 2019-2020)
SEMESTER - VI
Cluster Elective- B1: DIVERSITY IN LIFE
MODEL QUESTION PAPER

Time: 2 1/2 hrs.

Marks: 60M

PART - I

Note: Answer any THREE questions choosing at least one question from each section.

Draw the diagrams where ever necessary

3 x 10 = 30M

SECTION – A

1. Explain principles of taxonomy
2. What are different methods of taxonomy in animals
3. What are different levels of structural organizations

SECTION – B

4. Explain migration of species.
5. Explain the importance agriculture.
6. What are common parasites of humans.

PART – II

Answer any SIX Questions.

6 x 5= 30M

7. Biological nomenclature
8. Plant taxonomy
9. Unicellular organization
10. Short notes on adaptive radiation
11. Short notes on Organization of tissues
12. What are geographic origins?
13. Short notes on natural history of Indian subcontinent.
14. What are major habitat types in the Indian subcontinent.
15. What are common pathogens of domestic animals.
16. Write short notes on conservation strategies.

P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
(WITH EFFECTIVE FROM 2019-2020)
III B.Sc BIOTECHNOLOGY, SEMESTER - VI
Cluster Elective- B1: DIVERSITY IN LIFE
PRACTICAL SYALLABUS

Hrs : 3

CREDITS-2

1. Identification of museum specimens of some economically important fishes.
2. Study of flora and fauna through charts and maps.
3. Preparation of field report based on the visit to a Wild Life Sanctuary/National Park/Zoo/Biosphere Reserve.
4. Preparation of field report based on the survey of local flora.
5. Study of centre of diversity of plants from maps.

P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
(WITH EFFECTIVE FROM 2019-2020)
AT THE END OF VI SEMESTER
Cluster Elective- B1: DIVERSITY IN LIFE

MODEL PRACTICAL PAPER

Time: 11/2 hrs.

Marks: 35

- | | |
|---|-------------------|
| I. Field report based on the survey of local flora. | 16 M |
| II. Identify and write a brief notes on given spotters –
(Identification– 01, Notes – 02). | 3 x 3 = 9M |
| A. _____ | |
| B. _____ | |
| C. _____ | |
| III. . Practical Record | 05 M |
| IV. . Viva voce | 05 M |

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P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
BIOTECHNOLOGY SYLLABUS
(WITH EFFECTIVE FROM 2019-2020)

SEMESTER - VI
Cluster Elective- B2: EVOLUTION

HOURS 2T+3P

CREDITS 2+2

INSTRUCTIONAL OBJECTIVES

1. To impart Knowledge on different theories of evolution.
2. To impart Knowledge on origin of prokaryotic and eukaryotic cells.
3. To impart Knowledge on Hardy-Weinberg Law and genetic drift.

MODULE I

Emergence of evolutionary thoughts Lamarck; Darwin—concepts of variation, adaptation, struggle, fitness and natural selection; Mendelism; Spontaneity of mutations; The evolutionary synthesis.

MODULE II

Origin of cells and unicellular evolution: Origin of basic biological molecules; Concept of Oparin and Haldane; Experiment of Miller (1953); The first cell; Evolution of prokaryotes; Origin of eukaryotic cells; Evolution of unicellular eukaryotes; Anaerobic metabolism, photosynthesis and aerobic metabolism.

MODULE III

Molecular Evolution: Concepts of neutral evolution, molecular divergence and molecular clocks; Molecular tools in phylogeny, classification and identification;

MODULE IV

The Mechanism: Population genetics- Populations, Gene pool, Gene frequency; Hardy-Weinberg Law; concepts and rate of change in gene frequency through natural selection, migration and random genetic drift;

Adaptive radiation; Isolating mechanisms; Speciation; Allopatricity and Sympatricity; Convergent evolution; Sexual selection; Co-evolution.

P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
(WITH EFFECTIVE FROM 2019-2020)
SEMESTER - VI
Cluster Elective- B2: EVOLUTION
BLUE PRINT FOR QUESTION PAPER SETTER

Time: 2 1/2hours

Max marks: 60

MODULE NO.	ESSAY QUESTIONS 10 MARKS	SHORT ANSWER QUESTIONS 5 MARKS	MARKS ALLOTTED TO THE UNIT
MODULE – I	02	02	30
MODULE – II	01	03	25
MODULE – III	01	03	25
MODULE – IV	02	02	30
Total no. of Questions	06 Of which 3 to be answered	10 Of which 6 to be answered	110 Marks including choice. Of which 60marks to be answered

NOTE: The question paper setters are requested to kindly adhere to the format given in the above table.

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P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
(WITH EFFECTIVE FROM 2019-2020)
III B.Sc BIOTECHNOLOGY, SEMESTER - VI
Cluster Elective- B2: EVOLUTION
PRACTICAL SYALLABUS

Hrs : 3

CREDITS-2

- 1) Give detailed description of different symbolic representation of Pedigree analysis
- 2) Give diagrammatic representation of X-linked recessive trait
- 3) In a plant species the ability to grow in soil contaminated with nickel is determined by a dominant allele.
 - i. If 60% of the seeds in a randomly mating population are able to germinate in contaminated soil, what is the frequency of the resistance allele?
 - ii. Among the plants that germinate, that proportion is homozygous?
- 4) $\alpha\beta\gamma$ is an autosomal recessive disorder of man. The frequency of effected newborn infants is about 1 in 14000. Assuming random mating, what is the frequency of heterozygotes?
- 5) DNA isolation and Polymerize chain reaction of the DNA
- 6) Agarose gel electrophoresis of the amplified solution and check the amplified bands in UV transilluminator/UV Gel documentation.

P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
(WITH EFFECTIVE FROM 2019-2020)
AT THE END OF VI SEMESTER
Cluster Elective- B2: EVOLUTION

MODEL PRACTICAL PAPER

Time: 11/2 hrs.

Marks: 35

- I. Separate the given DNA sample by Agarose gel electrophoresis. **16 M**
- II. Identify and write a brief notes on given spotters – **3 x 3 = 9M**
(Identification– 01, Notes – 02).
A. _____
B. _____
C. _____
- III. . Practical Record **05 M**
- IV. . Viva voce **05 M**

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P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
BIOTECHNOLOGY SYLLABUS
(WITH EFFECTIVE FROM 2019-2020)
SEMESTER - VI

Cluster Elective- B3: PROJECT

P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
BIOTECHNOLOGY SYLLABUS
(WITH EFFECTIVE FROM 2019-2020)
SEMESTER - VI
Elective C: DEVELOPMENTAL BIOLOGY

HOURS 2T+3P

CREDITS 2+2

INSTRUCTIONAL OBJECTIVES

1. To impart Knowledge on listed key terms of embryology.
2. To Impart Knowledge on process of Gametogenesis and Fertilization.
3. To map the path on egg follows starting at the ovary to implantation. Name the major structures and stages involved.

MODULE I

Potency, commitment, specification, induction, competence, determination and differentiation; cell fate and cell lineages; stem cells; genomic equivalence and the cytoplasmic determinants; imprinting; mutants

MODULE II

Production of gametes; embryo sac development and double fertilization in plants; zygote formation, cleavage, blastula formation, embryonic fields, gastrulation and formation of germ layers in animals; embryogenesis, establishment of symmetry in plants; seed formation and germination.

MODULE III

Cell aggregation and differentiation in Dictyostelium; axes and pattern formation in Drosophila, amphibia and chick; organogenesis– vulva formation in Caenorhabditis elegans, post embryonic development-larval formation, metamorphosis; environmental regulation of normal development; sex determination.

MODULE IV

Organization of shoot and root apical meristem; shoot and root development; leaf development and phyllotaxy; transition to flowering, floral meristems and floral development in Arabidopsis and Antirrhinum. Programmed cell death, aging and senescence.

P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
(WITH EFFECTIVE FROM 2019-2020)
SEMESTER - VI
Elective C: DEVELOPMENTAL BIOLOGY
BLUE PRINT FOR QUESTION PAPER SETTER

Time: 21/2hours

Max marks: 60

MODULE NO.	ESSAY QUESTIONS 10 MARKS	SHORT ANSWER QUESTIONS 5 MARKS	MARKS ALLOTTED TO THE UNIT
MODULE – I	01	03	25
MODULE – II	02	02	30
MODULE – III	02	02	30
MODULE – IV	01	03	25
Total no. of Questions	06 Of which 3 to be answered	10 Of which 6 to be answered	110 Marks including choice. Of which 60marks to be answered

NOTE: The question paper setters are requested to kindly adhere to the format given in the above table.

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P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
(WITH EFFECTIVE FROM 2019-2020)
SEMESTER - VI
Elective C: DEVELOPMENTAL BIOLOGY
MODEL QUESTION PAPER

Time: 2 1/2 hrs.

Marks: 60M

PART - I

Note: Answer any **THREE** questions choosing at least one question from each section. **Draw the diagrams where ever necessary** **3 x 10 = 30M**

SECTION – A

1. Describe cell fate and cell lineages.
2. Describe embryo sac development and double fertilization in plants.
3. What is gastrulation and formation of germ layers in animals.

SECTION – B

4. Write an essay on sex determination.
5. Describe cell aggregation and differentiation in Dictyostelium.
6. What is programmed cell death, aging and senescence.

PART – II

Answer any **SIX** Questions.

6 x 5= 30M

7. Short notes on stem cells.
8. Short notes on imprinting.
9. What are mutants and types.
10. Embryo sac.
11. Types of cleavage.
12. Post embryonic development.
13. What is organogenesis?
14. Phyllotaxy.
15. Floral meristems.
16. Shoot development.

P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
(WITH EFFECTIVE FROM 2019-2020)
III B.Sc BIOTECHNOLOGY, SEMESTER - VI
Elective C: DEVELOPMENTAL BIOLOGY
PRACTICAL SYALLABUS

Hrs : 3

CREDITS-2

2. Structure of young anther wall, microsporogenesis, mature anther (permanent slides).
3. Study of monoscopic (Polygonium) type of embryo sac development (permanent slides/photographs).
4. Study of embryo sac through electron micrographs showing egg apparatus.
5. Determination of stomatal index of leaf of the given plant material.
6. Determination of effect of an environmental factor on the rate of transpiration by an excised twig using photometer.

P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
(WITH EFFECTIVE FROM 2019-2020)
AT THE END OF VI SEMESTER
Elective C: DEVELOPMENTAL BIOLOGY

MODEL PRACTICAL PAPER

Time: 1 1/2 hrs.

Marks: 35

- | | |
|--|-------------------|
| 1. Determine stomatal index of leaf of the given plant material | 16 M |
| 2. Identify and write a brief notes on given spotters –
(Identification– 01, Notes – 02).
A. _____
B. _____
C. _____ | 3 x 3 = 9M |
| 3. . Practical Record | 05 M |
| 4. . Viva voce | 05 M |

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P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
BIOTECHNOLOGY SYLLABUS
(WITH EFFECTIVE FROM 2019-2020)
SEMESTER - VI
Cluster Elective- C1: PLANT PHYSIOLOGY

HOURS 2T+3P

CREDITS 2+2

INSTRUCTIONAL OBJECTIVES

1. To impart Knowledge on process of photosynthesis and CO₂ fixation in different plants.
2. To impart Knowledge on respiration process and photorespiration pathway.
3. To impart Knowledge on nitrogen metabolism and transport of different solutes and macromolecules through xylem and phloem.

MODULE I

Photosynthesis - Light harvesting complexes; mechanisms of electron transport; photo protective mechanisms; CO₂ fixation -C₃, C₄and CAM pathways.

MODULE II

Respiration and photorespiration–Citric acid cycle; plant mitochondrial electron transport and ATP synthesis; alternate oxidase; photorespiratory pathway.

MODULE III

Nitrogen metabolism- Nitrate and ammonium assimilation; amino acid biosynthesis
Solute transport and photo assimilate translocation–uptake, transport and translocation of water, ions, solutes and macromolecules from soil, through cells, across membranes, through xylem and phloem; transpiration; mechanisms of loading and unloading of photo assimilates

MODULE IV

Sensory photobiology-Structure, function and mechanisms of action of phytochromes, cryptochromes and phototropins; stomatal movement; photoperiodism and biological clocks.

P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
(WITH EFFECTIVE FROM 2019-2020)
SEMESTER - VI
Cluster Elective- C1: PLANT PHYSIOLOGY
BLUE PRINT FOR QUESTION PAPER SETTER

Time: 2 1/2hours

Max marks: 60

MODULE NO.	ESSAY QUESTIONS 10 MARKS	SHORT ANSWER QUESTIONS 5 MARKS	MARKS ALLOTTED TO THE UNIT
MODULE – I	02	02	30
MODULE – II	01	03	25
MODULE – III	02	02	30
MODULE – IV	01	03	25
Total no. of Questions	06 Of which 3 to be answered	10 Of which 6 to be answered	110 Marks including choice. Of which 60marks to be answered

NOTE: The question paper setters are requested to kindly adhere to the format given in the above table.

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P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
(WITH EFFECTIVE FROM 2019-2020)
SEMESTER - VI
Cluster Elective- C1: PLANT PHYSIOLOGY
MODEL QUESTION PAPER

Time: 2 1/2 hrs.

Marks: 60M

PART - I

Note: Answer any THREE questions choosing at least one question from each section. Draw the diagrams where ever necessary

3 x 10 = 30M

SECTION – A

1. Describe the events occur during non-cyclic electron flow.
2. Explain and describe the reactions and significance of the C4 pathway of photosynthesis.
3. Explain steps involved in citric acid cycle.

SECTION – B

4. Explain mechanism by which solutes are transported in the phloem.
5. Explain steps involved in amino acid biosynthesis.
6. What is phytochrome. Describe structure and mechanism of action of phytochromes.

PART – II

Answer any SIX Questions.

6 x 5= 30M

7. Difference between C3 and CAM plants.
8. Structure of chloroplast.
9. Briefly explain the synthesis of ATP.
10. Short notes on photorespiration.
11. Briefly explain different complexes present in electron transport chain.
12. Short notes on nitrate assimilation.
13. Short notes on transpiration.
14. Short notes on photoperiodism.
15. Explain the functions of phytochromes.
16. Structure of cryptochromes.

P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
(WITH EFFECTIVE FROM 2019-2020)
III B.Sc BIOTECHNOLOGY, SEMESTER - VI
Cluster Elective- C1: PLANT PHYSIOLOGY
PRACTICAL SYALLABUS

Hrs : 3

CREDITS-2

1. Osmosis – by potato osmoscope experiment
2. Determination of osmotic potential of plant cell sap by plasmolytic method using leaves of Rhoeo / Tradescantia.
3. Structure of stomata (dicot & monocot)
4. Determination of rate of transpiration using cobalt chloride method.
5. Demonstration of transpiration by Ganongs' photometer
6. Demonstration of ascent of sap/Transpiration pull.
7. Effect of Temperature on membrane permeability by colorimetric method.
8. Study of mineral deficiency symptoms using plant material/photographs.
9. Separation of chloroplast pigments using paper chromatography technique.
10. Rate of photosynthesis under varying Co₂ concentrations.
11. Effect of light intensity on oxygen evolution in photosynthesis using

NOTE: Perform any 6 practical

P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
(WITH EFFECTIVE FROM 2019-2020)
AT THE END OF VI SEMESTER
Cluster Elective- C1: PLANT PHYSIOLOGY

MODEL PRACTICAL PAPER

Time: 11/2 hrs.

Marks: 35

- I. Separation of chloroplast pigments using paper chromatography technique **16 M**
- II. Identify and write a brief notes on given spotters – **3 x 3 = 9M**
(Identification– 01, Notes – 02).
A. _____
B. _____
C. _____
- III. . Practical Record **05 M**
- IV. . Viva voce **05 M**

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P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
BIOTECHNOLOGY SYLLABUS
(WITH EFFECTIVE FROM 2019-2020)
SEMESTER - VI
Cluster Elective- C2: ANIMAL PHYSIOLOGY

HOURS 2T+3P

CREDITS 2+2

INSTRUCTIONAL OBJECTIVES

1. To impart Knowledge on circulatory system and different pigments involved in circulatory systems.
2. To impart Knowledge on respiratory systems and comparative approach of respiration in different species.
3. To impart Knowledge on nervous system and process of gametogenesis.

MODULE I

Blood and circulation- Blood corpuscles, haemopoiesis and formed elements, plasma function, blood volume, blood volume regulation, blood groups, haemoglobin, immunity, homeostasis.

MODULE II

Respiratory system - Comparison of respiration in different species, anatomical considerations, transport of gases, exchange of gases, waste elimination, neural and chemical regulation of respiration.

MODULE III

Nervous system- Neurons, action potential, neuroanatomy of the brain and spinal cord, central and peripheral nervous system, neural control of muscle tone and posture. Sense organs - Vision, hearing and tactile response.

MODULE IV

Digestive system -Digestion, absorption, energy balance, BMR.

Endocrinology and reproduction- Endocrine glands, basic mechanism of hormone action, hormones and diseases; reproductive processes, gametogenesis, ovulation, neuro endocrine regulation

P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
(WITH EFFECTIVE FROM 2019-2020)
SEMESTER - VI
Cluster Elective- C2: ANIMAL PHYSIOLOGY
BLUE PRINT FOR QUESTION PAPER SETTER

Time: 2 1/2hours

Max marks: 60

MODULE NO.	ESSAY QUESTIONS 10 MARKS	SHORT ANSWER QUESTIONS 5 MARKS	MARKS ALLOTTED TO THE UNIT
MODULE – I	02	02	30
MODULE – II	01	03	25
MODULE – III	01	03	25
MODULE – IV	02	02	30
Total no. of Questions	06 Of which 3 to be answered	10 Of which 6 to be answered	110 Marks including choice. Of which 60marks to be answered

NOTE: The question paper setters are requested to kindly adhere to the format given in the above table.

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P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
(WITH EFFECTIVE FROM 2019-2020)
SEMESTER - VI
Cluster Elective- C2: ANIMAL PHYSIOLOGY
MODEL QUESTION PAPER

Time: 2 1/2 hrs.

Marks: 60M

PART - I

Note: Answer any THREE questions choosing at least one question from each section. Draw the diagrams where ever necessary **3 x 10 = 30M**

SECTION – A

1. Describe in detail the components of blood.
2. Define blood groups and their importance.
3. Describe the transport of carbon dioxide.

SECTION – B

4. Explain structure of neuron.
5. Explain the process of digestion.
6. What are the diseases caused by hormone deficiency.

PART – II

Answer any SIX Questions.

6 x 5= 30M

7. Explain homeostasis.
8. Explain respiratory pigments.
9. Chemical regulation of respiration.
10. Structure of lungs.
11. Bohr's effect.
12. Neuro anatomy of spinal cord.
13. Define neural control of muscle tone and posture.
14. Short notes on sense organs.
15. Gametogenesis .
16. Short notes on BMR.

P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
(WITH EFFECTIVE FROM 2019-2020)
III B.Sc BIOTECHNOLOGY, SEMESTER - VI
Cluster Elective- C2: ANIMAL PHYSIOLOGY
PRACTICAL SYALLABUS

Hrs : 3

CREDITS-2

1. Detection of protein, carbohydrate and lipid.
2. Study of Human salivary enzyme activity in relation to pH.
3. Detection of nitrogenous waste products - Ammonia & Urea
4. Exercise on Haematology - Counting of RBC /WBC and Blood grouping in blood samples.
5. Estimation of Haemoglobin in blood samples.

P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
(WITH EFFECTIVE FROM 2019-2020)
AT THE END OF VI SEMESTER
Cluster Elective- C2: ANIMAL PHYSIOLOGY

MODEL PRACTICAL PAPER

Time: 11/2 hrs.

Marks: 35

- I. Estimate the amount of Hemoglobin in blood sample. **16 M**
- II. Identify and write a brief notes on given spotters – **3 x 3 = 9M**
(Identification– 01, Notes – 02).
A. _____
B. _____
C. _____
- III. . Practical Record **05 M**
- IV. . Viva voce **05 M**

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P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
BIOTECHNOLOGY SYLLABUS
(WITH EFFECTIVE FROM 2019-2020)
SEMESTER - VI
Cluster Elective- C3: INHERITANCE BIOLOGY

HOURS 2T+3P

CREDITS 2+2

INSTRUCTIONAL OBJECTIVES

1. To impart Knowledge on different gene mapping methods.
2. To impart Knowledge on extra chromosomal inheritance and karyotyping.
3. To impart Knowledge on types of mutations and process of recombination.

MODULE I

Gene mapping methods: Linkage maps, tetrad analysis, mapping with molecular markers, mapping by using somatic cell hybrids.

MODULE II

Extra chromosomal inheritance: Inheritance of Mitochondrial and chloroplast genes, maternal inheritance.

MODULE III

Human genetics: Pedigree analysis, lod score for linkage testing, karyotypes, genetic disorders.

MODULE IV

Mutation: Types, causes and detection, mutant types– lethal, conditional, biochemical, loss of function, gain of function, germinal verses somatic mutants, insertional mutagenesis.

Recombination: Homologous and non-homologous recombination including transposition.

P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
(WITH EFFECTIVE FROM 2019-2020)
SEMESTER - VI
Cluster Elective- C3: INHERITANCE BIOLOGY
BLUE PRINT FOR QUESTION PAPER SETTER

Time: 2 1/2hours

Max marks: 60

MODULE NO.	ESSAY QUESTIONS 10 MARKS	SHORT ANSWER QUESTIONS 5 MARKS	MARKS ALLOTTED TO THE UNIT
MODULE – I	02	02	30
MODULE – II	01	03	25
MODULE – III	01	03	25
MODULE – IV	02	02	30
Total no. of Questions	06 Of which 3 to be answered	10 Of which 6 to be answered	110 Marks including choice. Of which 60marks to be answered

NOTE: The question paper setters are requested to kindly adhere to the format given in the above table.

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P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
(WITH EFFECTIVE FROM 2019-2020)
SEMESTER - VI
Cluster Elective- C3: INHERITANCE BIOLOGY
MODEL QUESTION PAPER

Time: 2 1/2 hrs.

Marks: 60M

PART - I

Note: Answer any THREE questions choosing at least one question from each section.

Draw the diagrams where ever necessary

3 x 10 = 30M

SECTION – A

1. Describe gene mapping methods.
2. Write an essay on molecular markers.
3. Explain extra chromosomal inheritance with examples.

SECTION – B

4. Write an essay on pedigree analysis.
5. Define mutations and explain various types of mutations.
6. Write an essay on recombination.

PART – II

Answer any SIX Questions.

6 x 5= 30M

7. Short notes on linkage maps.
8. Short notes on somatic cell hybrids.
9. Short notes on maternal inheritance.
10. Short notes on chloroplast genome.
11. Short notes on mitochondrial genome.
12. Short notes on linkage testing.
13. Short notes on Karyotyping.
14. Explain genetic disorders with examples.
15. Short notes on lethal genes.
16. Short notes on somatic mutants.

P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
(WITH EFFECTIVE FROM 2019-2020)
III B.Sc BIOTECHNOLOGY, SEMESTER - VI
Cluster Elective- C3: INHERITANCE BIOLOGY
PRACTICAL SYALLABUS

Hrs : 3

CREDITS-2

1. Scoring of Drosophila and Maize cobs for Monohybrid and Dihybrid segregations.
2. Problems on Mendilian Segregations (Monohybrid, Dihybrid & Trihybrid Crosses).
3. Problems on Multiple alleles and non-allelic interactions.
4. Problems on Linkage analysis and mapping of genes.
5. Phenotyping of ABO blood groups.
6. Screening for Barr body.

P.R.GOVERNMENT COLLEGE (A), KAKINADA
CHOICE BASED CREDIT SYSTEM
(WITH EFFECTIVE FROM 2019-2020)
AT THE END OF VI SEMESTER
uster Elective- C3: INHERITANCE BIOLOGY

MODEL PRACTICAL PAPER

Time: 11/2 hrs.

Marks: 35

- | | |
|---|-------------------|
| I. Problem on Dihybrid / trihybrid cross. | 16 M |
| II. Identify and write a brief notes on given spotters –
(Identification– 01, Notes – 02).
A. _____
B. _____
C. _____ | 3 x 3 = 9M |
| III. . Practical Record | 05 M |
| IV. . Viva voce | 05 M |

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