PITHAPUR RAJAH'S GOVERNMENT COLLEGE
(AUTONOMOUS)
KAKINADA

(Affiliated to Adikavi Nannaya University)

BOARD OF STUDIES

DEPARTMENT OF BIOCHEMISTRY

(2021-22)

(CHOICE BASED CREDIT SYSTEM)

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P.R. GOVT. COLLEGE (AUTONOMOUS) KAKINADA.
2021-22. BOARD OF STUDIES MEETING .
DEPARTMENTOF BIOCHEMISTRY

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

Resolution I: Resolved to continue CBCS System as instructed by Commissioner of Collegiate Education) CCE, Vijayawada.

Resolution II: : Resolved to implement 50% external and 50% internal marks for admitted batch 2021 and 60% external and 40% internal marks for admitted batch prior to 2021 both theory and practical's from the academic year 2021 – 22

Resolution III: Resolved to reduce 40 marks of Theory internal to 20 marks for mid exams and 20 marks for co-curricular activities (Seminar / Assignment / Quiz / Group Discussion) and reduce 50 marks of theory internal to 25 marks for mid exams and 25 marks for co-curricular activities (Seminar / Assignment / Quiz / Group Discussion).

Resolution IV: Resolved to conduct Practical Examination also at the end of each semester even for I year II year students.

Resolution V: Resolved to follow the same syllabus and exam pattern for the coming II- and III-year students.

Resolution VI : Resolved to follow the same syllabus for I year in to be prescribed by APSCHE in the near future.

Resolution VII: Resolved to encourage the students to enroll MOOCS Online courses.

Resolution VIII: Resolved to continue two subject electives (Advanced electives) in the V semester Immunology and clinical biochemistry

Resolution IX: Resolved to continue cluster papers (1-Clinicalbiochemistry, 2-Haematology, 3-Medical Microbiology along with project for final year students at the end of VI semester)

Resolution X: Resolved to introduce an cluster paper in VI semester with Paper-1-Organization of cell structure, Paper-2 Genetic & Ecology and Paper III–Applied Biochemistry

Resolution XI: Resolved to continue the same paper setters and examiners for all the semesters.

Resolution XII: Resolved to include Blue Prints for model question papers for all semesters.

Chairperson
Board of Studies
Dept. of Biochemistry

P.R. GOVERNMENT COLLEGE (AUTONOMOUS) KAKINADA
DEPARTMENTOF BIOCHEMISTRY

BOARD OF STUDIES MEETING 2021-22

Time: 2.00pm Online mode **Date:02-12-2021**

Mode of Conduct of meeting: Online mode through Google meet

The BOARD OF STUDIES Meeting of the Department of Food Science took place at 11.00 A.M. on 02-12-2021 in online mode through Video conference in Google meet in the Department of Food Science P.R. Govt. College(A) Kakinada for the year 2021-22.

The following members attended in the Videoconference BOS meeting.

Sl No	Name and affiliation	Designation	Signature
01	Smt.M. Suvarchala Lecturer in Home Science, A.S.D. Govt. Degree College (W), Kakinada	University Nominee	M. Suvarchala 2/12/21
02	V. Anantha Lakshmi Lecturer in Chemistry G.D.C Pithapuram	Subject Expert	V. Ananta Lakshmi 2/12/21
03	Sri V. Mallikarjuna Sarma Lecturer in Chemistry A.S.D Women's degree college, Kakinada.	Subject Expert	
04	Dr.D.RamaRao Lecture in charge Department of Chemistry P.R.Govt. College, Kakinada	Member	
05	T.V.V.Satya Narayana Lecture in charge Department of Biochemistry P.R.Govt. College, Kakinada	Member	T.V.V. 2/12/21
06	B. Vineela Devi Guest Faculty in biochemistry P.R.Govt College, Kakinada	Member	B. Vineela Devi 2/12/21
07	Y. Laxmi Sai Ramya Guest Faculty in Food Science P.R.Govt College, Kakinada	Member	Y. Laxmi Sai Ramya 2/12/21
08	M.B.S.S.Guru Dev B.Sc(FBC)Third year Regd.No. 2201504	Student member	M.B.S.S. Gurudev
09	K. Prem Sekhar B.Sc(FBC)Third Year Regd.No. 2201503	Student member	K. Prem Sekhar

P.R.GOVT. COLLEGE(AUTONOMOUS)KAKINADA

DEPARTEMENT OF BIOCHEMISTRY AND FOOD SCIENCE

BOARD OF STUDIES MEETING IN BIOCHEMISTRY

2021-2022

LIST OF EXAMINERS

S.No	Name of the Examiner	Subject	Name of the College
1	D.Kalyani	Assistant professor in Biosciences	Adikavi Nannaya University RAJAHMAHENDRAVARM.
2	Dr.P.Jyothi Kumari	Lecturer in Biosciences	St.Theresa Degree College, Eluru.
3	Dr.Srirangam	Lecturer in Food Technology	Layola College Vijayawada.
4	G.V.Sowmya	Lecturer in Biosciences	Dr.V.S.Krishna Degree College, Visakhapatnam.
5	Dr. Sandeep	Assistant Professor in Biosciences	Gitam University, Visakhapatnam.

ACTION PLAN BOS MEETING -BIO CHEMISTRY HELD ON 02-12-2021.

Department activities for the academic year 2021-2022.

Organizing National/ State level seminars/Workshops/ Conferences/ Training Programmes etc., with topics and other details.

(Mandatory for each Department)

i) National Science Day - Last week of February
ii) Guest Lectures
iii) Biochemists' Day- Third week of March
iv) World Blood Donor Day- Second week of June
v) DNA Day- Third week of April
vi) World Health Day- First week of April

P.R. GOVERNMENT COLLEGE (A), KAKINADA

Department of Biochemistry and Food Science

Objectives of Department of Biochemistry

- To acquaint students with various fields of Biochemistry and their applications.
- To acquaint students with concept of Cell Biology and Cytogenetics.
- To acquaint students with basic techniques in Staining and Sterilization.
- To understand the structure and biological functions of Carbohydrates, Amino Acids, Lipids and Nucleotides.
- To familiarize students with the various cells and organs of the immune system, Immune Effector Mechanisms and various Immuno techniques.
- To acquaint students with DNA Replication, Repair, gene expression and regulation.
- To gain awareness about different Types of Environmental Pollution and Related Issues

B. Sc Biochemistry, Food Science and Chemistry Course
PROGRAMME OUTCOMES

For every degree program expectations are listed out by the institution under the Program Outcomes. For B. Sc Biochemistry, Food Science and Chemistry Stream the following are set as Program Outcomes.

P01 Knowledge and understanding of:

- Students will be able design, conduct experiments, analyze and interpret data for investigating problems in Biotechnology and allied fields.
- Describe how scientific methodologies are used to conduct experiments and develop products
- The students understood the concept of cell and their activities.

P02. Intellectual skills-be able to:

- Think logically and organize tasks into a structured form.
- Assimilate knowledge and ideas based on wide reading and through the internet.
- Transfer of appropriate knowledge and methods from one topic to another with in the subject.
- Understand the evolving state of knowledge in a rapidly developing field.
- Construct and test hypothesis.
- Plan, conduct and write are important independent term project.

PO3. Practical skills:

- Understand the importance of laboratory security as it applies to working with hazardous chemicals, biohazards, recombinant material, and general biotechnology security precautions.
- Students will evaluate the accuracy of different types of measuring devices to accurate measure a solution. They will statistically analyze their data to determine the best measuring device to use data
- Characterize isolated DNA and RNA using agarose gel electrophoresis and analyze agarose gel
- Perform basic microbiological techniques such as sterile plating and isolation of single colonies, culturing bacteria in liquid broth.
- PCR amplify target genomic DNA and ligate into vector and transform bacteria with r DNA.

PO4. Transferable skills:

- Use of IT (word-processing, use of internet, statistical packages and databases).
- Communication of scientific ideas in writing and orally.
- Ability to work as part of a team.
- Ability to use library resources/Equipment.
- Time management.

PO5. Problem analysis

- Identify the taxonomic position of animals
- Design solutions from medicinal animals for health problems, disorders and disease of human beings / animals which meet the specified needs
- Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data,

PO6. Environment and sustainability:

- Understanding of the causes, types and control methods for Environmental Pollution.
- Application of different life forms in Environmental Remediation.

PO7. Ethics:

- Apply ethical principles and commit to environmental ethics and responsibilities and norms the environment

PO8. Individual and team work:

- Function effectively as an individual, and as a member or leader in diverse teams, and in multi-disciplinary settings.
- Elicit views of others, mediate disagreements and help reach conclusions in group settings

PO9. Communication:

- Communicate effectively on complex group activities and with society at large. Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language Manage projects and in multidisciplinary environments.

PO10.Critical Thinking:

- Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.

PO11. Effective Citizenship:

- Demonstrate empathetic social concern and equity centred national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.

PO12. Life-long learning:

- Recognize the need for, and have the preparation and ability to engage in independent and life long learning in the broadest context of technological change.

Course outcomes

I Semester - Biomolecules

The objective of this paper is to learn biological concepts, carbohydrates & their classification. Amino acids & their classification proteins& their classification and to learn about the structures and functions of carbohydrates, amino acids and proteins.

II Semester- Nucleic Acids and Biochemical Techniques

1. The objective of this paper is to learn nature of nucleotides, their physical and chemical properties and about porphyrins and their properties.

2. This course deals with the Biochemical techniques of chromatography, electrophoresis & Spectrophotometry of their principles and applications.

III Semester - Enzymology and Bioenergetics

1) This curriculum gives an opportunity to learn about Enzymes.

2) This also imparts knowledge about biological oxidation& their enzymes, mitochondrial electron transport chain, oxidative phosphorylation and about photo phosphorylation

Semester IV - Intermediary metabolism

1. This course aims at the biological energy transformations

2. This also imparts knowledge about metabolism of carbohydrates fatty acids Amino acids, nucleic acids and Inborn errors.

Semester V- Physiology, Clinical Biochemistry and immunology

1.This gives an insight into the digestion, absorption of carbohydrates, protein and lipid. Transport of gases and endocrine system.

2. This is to provide knowledge to the students to learn about human nutrition concepts and disorders associated and vitamins and minerals.

3. To provide basic knowledge about organization of immune system and antibodies function and activity.

Semester V- Molecular biology and Recombinant DNA technology

1. This is to provide knowledge about protein synthesis & their events, regulation of gene expression
2. This is to provide knowledge to the students to learn about recombinant DNA technology
3. This also imparts knowledge about molecular biology blotting techniques and bioinformatics

Semester VI - Basic Microbiology

1. This is to provide knowledge about development of microorganisms, development of microorganism
2. This also imparts knowledge about viruses, bacteria, protozoa, algae and fungi.

Semester VI- Biochemical correlation and disorders

1. This is to provide knowledge about disorders of endocrine glands-pituitary & thyroid gland.
2. This also imparts knowledge about protein malnutrition, disorders of vitamins & digestive system.

P.R.GOVT. COLLEGE (AUTONOMOUS) KAKINADA
DEPARTMENT OF BIOCHEMISTRY
BOARD OF STUDY MEETING 2021-22
CHOICE BASED CREDIT SYSTEM
FOR ADMITTED BATCH 2021-2022
I YEAR FBC

YEAR	SEMESTER	PAPER	TITLE	No. of Hrs./ Week	No of credits	Evaluation		
						Internal	External	TOTAL
I	I	I	Biomolecules	4	2	50	50	100
			Practical – I	2	1	-	50	50
	II	II	Nucleic acids and Biochemical Techniques	4	2	50	50	100
			Practical – II	2	1	-	50	50

P.R.GOVT. COLLEGE (AUTONOMOUS) KAKINADA
DEPARTMENT OF BIOCHEMISTRY
BOARD OF STUDY MEETING 2021-22
CHOICE BASED CREDIT SYSTEM
ADMITTED BATCH 2020-2021
II YEAR FBC

YEAR	SEMESTER	PAPER	TITLE	No. of Hrs./ Week	No of credits	Evaluation		
						Internal	External	TOTAL
II	III	III	Enzymology and bioenergetics	4	4	40	60	100
			Practical – III	2	1	15	35	50
	IV	IV	Intermediate metabolism	4	4	40	60	100
			Practical – IV	2	1	15	35	50
		V	Physiology, clinical Biochemistry and Immunology	4	4	40	60	100
			Practical – V	2	1	15	35	50

P.R.GOVT. COLLEGE (AUTONOMOUS) KAKINADA
DEPARTMENT OF BIOCHEMISTRY
BOARD OF STUDY MEETING 2021-22
CHOICE BASED CREDIT SYSTEM
ADMITTED BATCH 2019-2022
III YEAR FBC SEMESTER -V

YEAR	SEMESTER	PAPER	TITLE	No. of Hrs./ Week	No of credits	Evaluation		
						Internal	External	TOTAL
III	V	V	Physiology, clinical Biochemistry and Immunology	3	4	40	60	100
			Practical – V	2	2	15	35	50
		VI	Molecular biology and Recombinant DNA Technology	3	4	40	60	100
			Practical – VI	2	2	15	35	50

P.R.GOVT. COLLEGE (AUTONOMOUS) KAKINADA
DEPARTMENT OF BIOCHEMISTRY
BOARD OF STUDY MEETING 2021-22
CHOICE BASED CREDIT SYSTEM
ADMITTED BATCH 2019-2022
III YEAR FBC SEMESTER -VI

YEAR	SEMESTER	PAPER	TITLE	No. of Hrs./ Week	No of credits	Evaluation		
						Internal	External	TOTAL
III	VI	Any One paper from VI A or VI B	Basic Microbiology	3	4	40	60	100
			Practical – VI A	2	2	15	35	50
			Biochemical correlation and disorders	3	4	40	60	100
			Practical – VI B	2	2	15	35	50
		CLUSTER VII A	I. Clinical Biochemistry	3	4	40	60	100
			Practical – VII-I	2	2	15	35	50
			II. Hematology	3	4	40	60	100
			Practical – VII-II	2	2	15	35	50
			III. Medical Microbiology	3	4	40	60	100
			PROJECT	2	2	-	50	50
		CLUSTER VII B	I. Organization of Cell structure	3	4	40	60	100
			Practical – VII-I	2	2	15	35	50
			II. Genetics and Ecology	3	4	40	60	100
			Practical – VII-II	2	2	15	35	50
			III. Applied Biochemistry	3	4	40	60	100
			PROJECT	2	2	-	50	50

GUIDELINES FOR ALLOTMENT OF EXTRA CREDITS

S.No.	Activity	Details of achievement	Credits
1	MOOC Course	SWAYAM NPTEL CEC etc. (Course Completion certificate with credits should be produced for the claim of extra credits)	Total credits achieved will be considered
2	NCC	B CERTIFICATE	2
		Participation in National Camp after 'B' certificate	3
		C certificate	4
		Adventure camp RD parade along with 'B'	5
		Failed in B certificate Examination	1
3	Sports	Intercollegiate selection	2
		South zone selection	3
		All India participation	4
		Winning medals in all India competitions	5
4	NSS	40% attendance in regular NSS activities	1
		50% attendance with Community Service	2
		Conduct of survey Youth exchange/RD	3
5	JKC	Enrollment and training	1
		Campus recruitment local level	2
		MNCs reputed companies	3
6	Community service	Participation in community service by departments (outreach Programmes)	2
7	Cultural activity	Winning medals at state level-2, District level-1	2 1
8	COP/Add on Course	Pass in Certificate Exam-1, Diploma-2	1 2
9	Support services	Lead India, Health club, RC and Eco Club etc., participation in various Programmes	1

Details of Online courses proposed for the year 2021 – 22

S.No.	Name of Online Course	Conducted by	No. of credits
1	Basic concepts of Enzymology	UGC	4
2	Human Genetics	UGC	4
3	Basics of Human Genetics	UGC	2
4	Human Nutrition and Biochemistry	UGC	4

P.R.GOVERNMENT COLLEGE(A)
KAKINADA CHOICE BASED CREDIT SYSTEM
II B.Sc. BIOCHEMISTRY
SYLLABUS III SEMESTER
PAPER-III
Enzymology and Bioenergetics
ADMITTED BATCH 2020-2021

COURSECODE–BC3212 CREDITS–4

Hrs :60

INSTRUCTIONALOBJECTIVES:

1.This curriculum gives an opportunity to learn about Enzymes.

2.This also imparts knowledge about Biological oxidation & their enzymes, mitochondrial electron transport chain, oxidative phosphorylation and about photo phosphorylation

Unit-I: Classification of Enzymes, Physical factors and Enzyme activity **24 hours**

Introduction to biocatalysts, differences between chemical and biological catalysis. Nomenclature and classification of enzymes. Enzyme specificity. Active site. Principles of energy of activation, transition state. Interaction between enzyme and substrate- lock and key, induced fit models. Definition of holo-enzyme, apo-enzyme, coenzyme, cofactor. Fundamentals of enzyme assay, enzyme units.
Factors affecting the catalysis- substrate concentration, *p*H, temperature. Michaelis – Menten equation for uni-substrate reaction(derivation not necessary),significance of K_M and V_{max}.Enzyme inhibition-irreversible and reversible, types of reversible inhibitions- competitive and non-competitive.

Unit-II: Mechanism of enzyme action **12hours**

Outline of mechanism of enzyme action-acid-base catalysis, covalent catalysis, electrostatic catalysis, and metal ion catalysis. zymogen activation - activation of trypsinogen and chymo trypsinogen. Isoenzymes (LDH).Multi enzyme complexes (PDH). Ribozyme.

Unit-III: Bioenergetics **12hours**

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

Unit IV: Biological Oxidations in Mitochondria **12hours**

Organization of electron transport chain and enzyme complexes, inhibitors of electron transport. Oxidative phosphorylation. Uncouplers and inhibitors of oxidative phosphorylation. Mechanism of oxidative phosphorylation.

P.R.GOVERNMENT COLLEGE(A), KAKINADA
CHOICE BASED CREDIT SYSTEM
II B.Sc. BIOCHEMESTRY III SEMESTER PAPER-III
Enzymology and Bioenergetic
ADMITTED BATCH 2020-2021
MODEL QUESTION PAPER

Time:2.30hrs. Marks: 60M

PART-I

Note :Answer any THREE questions choosing atleast one question from each Section. 10 x 3 = 30

SECTION-A

1.Write the factors affecting the enzyme catalysis.

2.Write an account on enzyme classification.

3.Write an essay on enzyme inhibition.

SECTION-B

4. Explain about the Mechanism of Acid-Base catalysis

5.Discuss about the High energy compounds.

6.Write an account on mitochondrial electron transport chain.

PART-II

Answer any Four questions. 4x5=20Marks

7. Enzyme specificity and active site

8. Lock and key mechanism of enzyme substrate reaction

9.Multi enzyme complex(PDH)

10.Metal ion catalysis.

11.Oxidation and reduction reaction.

12.Oxidative phosphorylation.

13.Mitochondria.

PART-III

Answer any **Five** questions **5x2=10 M**

14. Enzyme units

15. Ribozyme

16. Enthalpy

17. Entropy

18. Isoenzyme

19. Uncoupler

P.R.GOVERNMENT COLLEGE(A), KAKINADA
CHOICE BASED CREDIT SYSTEM
II B.Sc. BIOCHEMESTRY III SEMESTER PAPER-III
Enzymology and Bioenergetics
ADMITTED BATCH 2020-2021

BLUE PRINT FOR QUESTION PAPER SETTER

Time:2.30hours **Max marks:60**

MODULE NO.	ESSAY QUESTIONS 10 MARKS	SHORT ANSWER QUESTIONS 5 MARKS	VERY SHORT ANSWER QUESTIONS 2 MARKS	MARKS ALLOTED TO THE UNIT
UNIT– I	03	02	01	42
UNIT– II	01	02	01	24
UNIT– III	01	01	02	19
UNIT– IV	01	02	02	24
Total no. of Questions	**06**	**07**	**06**	
Total Marks including choice				**107**

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
II B.Sc. BIOCHEMISTRY III SEMESTER PAPER-III
ENZYMOLOGY AND BIOPHYSICAL TECHNIQUES
ADMITTED BATCH 2020-2021
QUESTION BANK

EASY QUESTIONS (10 Marks)

Unit-I

1. Write an essay on enzyme inhibition.

2. Write the factors affecting the enzyme catalysis.

3. Write an account on enzyme classification.

4. Explain the lock and key induced fit model.

5. Write about the differences between chemical and biochemical catalysis.

Unit-II

6. Explain about the Mechanism of Acid-base catalysis.

7. Explain about the Multi-enzyme complex. 8. Write about the Metal ion catalysis.

Unit-III

9. Write about the Thermodynamics principles.

10. Discuss about the High energy compounds.

11. Explain about the free energy changes in biological

12. Transformation in living system

Unit-IV

13. Explain about the mitochondrial electron transport chain.

14. Explain about the Mechanism of Oxidative phosphorylation.

SHORT ANSWER QUESTIONS (5Marks)

Unit-I

1. Michael's-menten equation.
2. Competitive inhibition
3. Enzyme speficity
4. Biocatalysis.
5. Fundamentals of enzyme assay

Unit-II

6. Isoenzyme (LDH)
7. Activation of trypsinogen
8. Electrostatic catalysis
9. Covalent catalysis.

Unit-III

10. Oxidation reduction reactions
11. Free energy

Unit-IV

12. Oxidative phosphorylation.
13. Inhibitors of oxidative phosphorylation
14. Inhibitors of electron transport chain.

VERY SHORT ANSWER QUESTIONS (2 Marks)

Unit-I

1. Apo enzyme
2. Holo enzyme
3. Co enzyme
4. Enzyme assay
5. Enzyme units.
6. Significance Km and Vmax

Unit-II

7. Ribozyme

8. Trypsinogen

9. Zymogen action

Unit-III

10. Enthalpy

11. Free energy

12. Entropy.

Unit-IV

13. Uncouplers

14. Oxidative phosphorylation

15. ETC.

P.R.GOVERNMENT COLLEGE(A),KAKINADA
CHOICEBASED CREDIT SYSTEM
IIB.Sc. BIOCHEMISTRY IISEMESTER PAPER-III PRACTICALS
ENZYMOLOGY AND BIOPHYSICAL TECHNIQUES
ADMITTED BATCH 2020-2021

CREDITS-1

List of Experiments:

1.Assay of amylase

2. Assay of urease
3. Assay of catalase.
4. Assay of phosphatase
5. Determination of optimum temperature for amylase.
6. Determination of optimum *p*H for phosphatase

Recommended books for Enzymology & Bioenergetics

1.Fundamentals of Enzymology–Price .N.C.and Stevens.L., Oxford University Press.
2.Understanding Enzymes–Palmer.T.,Ellis Harwood.
3.Enzymes–Biochemistry,Biotechnology,Clinical Chemistry–Palmer.T., Affiliated East-West Press.
4.Lehninger's Principles of Biochemistry–Nelson.D.L. andCox.M.M.,Freeman&Co.
5.Biochemistry– Berg.J.M.,Tymoczko.J.L.andStryer.L.,Freeman&Co.
6.Biochemistry– Voet.D and Voet., J.G.,John Wiley& Sons

P.R.GOVERNMENT COLLEGE(A), KAKINADA

CHOICE BASED CREDIT SYSTEM

AT THE END OF III SEMESTER

ENZYMOLOGY AND BIOPHYSICAL TECHNIQUES

ADMITTED BATCH 2020-2021

MODEL PRACTICAL PAPER

Time:11/2hrs. Marks:35M

1.Assay of Amylase.

Principle and Procedure--	04Marks	
Conduct of Experiment	08Marks	15Marks
Report	3Marks	

2.Determination of optimum temperature for Amylase.

Principle and Procedure 3Marks		
Conduct of Experiment	5 Marks	10Marks
Report 2Marks		

3.Practical Record	5Marks
4.VivaVoice	5Marks
TOTAL	35 Marks

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