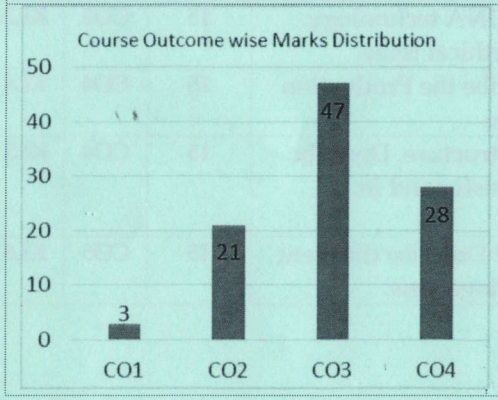
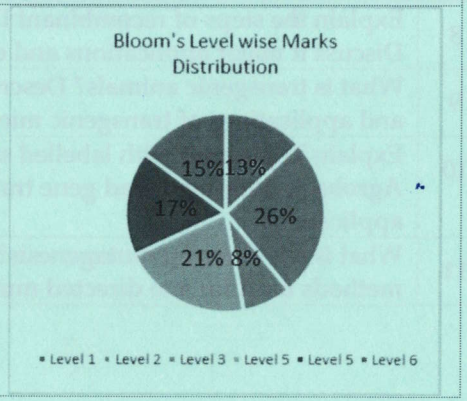
CO- Course Outcomes, **KL**- Knowledge Level, **PO** – Program Outcome

Course Outcomes	CO1	Students will understand the basic concept of innate and acquired immunity.
	CO2	Students will gain knowledge about immunoglobulin structures and diversity of antibodies, morphology and functions of various immune cells such as dendritic cells, macrophages, Neutrophils and their association with MHC molecules will be studied.
	CO3	The main goal of the course is to provide basic understanding of immunology and immune responses in response to various infectious and non-infectious diseases.
	CO4	Students will gain knowledge about Vaccine

GRAPHICAL REPRESENTATION





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[18-11-2025]
END SEM EXAMINATION
School of Health & Allied Sciences

Program	**Bachelor of Science-Biotechnology**		
Subject Name	**Recombinant DNA Technology**	**Session**	**Odd, 2025-26**
Semester	**V**	**Year**	**Nov, 2025**
Time: 3 Hour Max. Marks : **60**	• Start writing from 2nd page onwards; **don't Write on the 1st Page Backside** • **Answer all Questions of Section A (Compulsory)** • **Answer Any Four out of Six of Section B** • **Answer Any Two out of Four of Section C** • **Possession of Mobile Phones** or any kind of **Written Material, Arguments with the Invigilator or Discussing with Co-Student** will comes under **Unfair Means** and will **Result** in the **Cancellation of the Papers**.		
Knowledge Level (KL)	**K1** : Remembering	**K3** : Applying	**K5** : Evaluating
	K2 : Understanding	**K4** : Analysing	**K6** : Creating

Section A (Each question Carry 01 Mark from Q1-i to x) – 10 Marks

Q. N 1	QUESTIONS	Marks	COs	KL
i	The function of alkaline phosphatase in molecular cloning is to a) Cut DNA at specific sites b) Add phosphate groups to DNA ends c) Remove phosphate groups to prevent self-ligation d) Add nucleotides during PCR	01	CO1	KL1
ii	In PCR, primers are used to: a) Act as templates for DNA synthesis b) Initiate DNA synthesis by providing a 3'-OH group c) Serve as enzymes for amplification d) Replace the need for DNA polymerase	01	CO1	KL3
iii	The restriction-modification system in bacteria protects the host DNA by: a) Degrading all foreign DNA b) Methylating specific sequences on host DNA c) Replicating plasmid DNA d) Removing phosphate groups from DNA ends	01	CO2	KL5
iv	Southern blotting is primarily used for the detection of:	01	CO2	KL4

	a) RNA sequences b) DNA sequences c) Protein molecules d) Lipid molecules			
v	A cDNA library is constructed using: a) Genomic DNA b) mRNA and reverse transcriptase c) rRNA and DNA polymerase d) Plasmid DNA only	01	CO3	KL3
vi	If a DNA fingerprinting analysis is to be performed, which type of probe or sequence is typically used? a) Random primers b) Variable number tandem repeats (VNTRs) or microsatellites c) Ribosomal RNA genes d) Transfer RNA sequences	01	CO4	KL3
vii	Which recombinant vaccine uses a genetically engineered yeast to produce its antigen? a) Rabies vaccine b) Hepatitis B vaccine c) Polio vaccine d) Influenza vaccine	01	CO4	KL2
viii	To study the effect of substituting one amino acid in an enzyme's active site, the most suitable method would be: a) Random mutagenesis b) Gene shuffling c) Site-directed mutagenesis d) Transformation	01	CO5	KL1
ix	Agrobacterium tumefaciens causes crown gall disease in plants due to: a) Transfer of T-DNA from Ti plasmid into plant genome b) Production of antibiotics c) Secretion of plant hormones d) Suppression of plant immunity	01	CO5	KL5
x	Which of the following is a direct DNA transfer method for plant transformation? a) Agrobacterium-mediated transfer b) Electroporation c) Infection by Rhizobium d) Bacteriophage transduction	01	CO5	KL1

Section B (Answer any FOUR out of SIX) – 20 Marks
(Each question Carry 5 Marks)

Q. No.	QUESTIONS	Marks	COs	KL
2	What is Isoschizomers and neoschizomers? Give example of each.	05	CO1 CO3	KL1
3	Describe any two DNA end modifying enzymes.	05	CO2	KL2
4	Write the difference between cDNA and genomic DNA library.	05	CO4	KL4
5	Describe anyone method of recombinant screening.	05	CO4	KL3
6	Describe the production of recombinant insulin.	05	CO1	KL1
7	What is vector? Draw a label diagram of pUC18	05	CO5	KL2

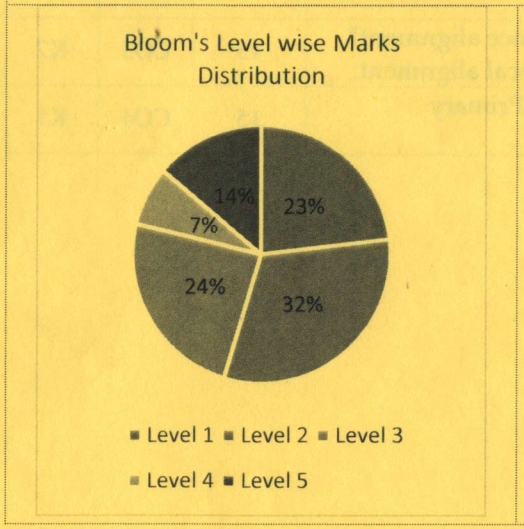
Section C (Answer any TWO out of FOUR) – 30 Marks
(Each question Carry 15 Marks)

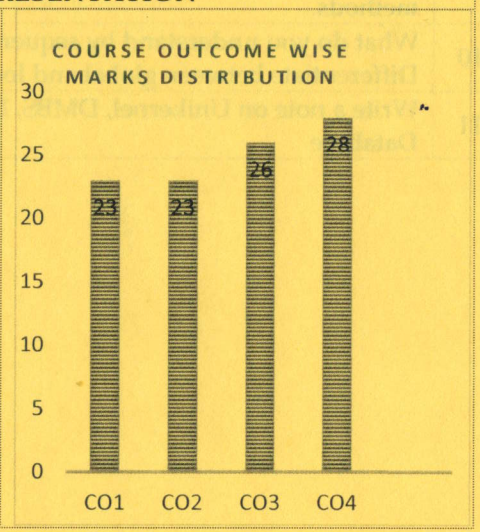
Q. No.	QUESTIONS	Marks	COs	KL
8	Explain the steps of recombinant DNA technology. Discuss it major applications and ethical issue.	15	CO2	KL2
9	What is transgenic animals? Describe the Production and applications of transgenic mice	15	CO4	KL4
10	Explain Ti plasmid with labelled structure. Describe Agrobacterium-mediated gene transfer and its applications.	15	CO4	KL5
11	What is site directed mutagenesis? Describe different methods used for site directed mutagenesis.	15	CO5	KL6

CO- Course Outcomes, **KL**- Knowledge Level, **PO** – Program Outcome

Course Outcomes	CO1	Students will be able to understand and describe and use the biological databases, perform structured query and analyze and discuss the results in biologically significant way.
	CO2	Students will acquire knowledge of BLAST, in silico molecular biology
	CO3	Students will be able to explain principle, algorithm and different methods of sequence alignments as well as execute alignments to address research problems
	CO4	Students will become familiar with a wide variety of bioinformatics tools and softwares and apply these to conduct basic bioinformatics research and thus develop platform for molecular biology experiments

GRAPHICAL REPRESENTATION





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END SEM EXAMINATION
School of Health & Allied Sciences

Program	**Bachelor of Science-Biotechnology**		
Subject Name	**Bioinformatics**	**Session**	**Odd, 2025-26**
Semester	**V**	**Year**	**Nov, 2025**
Time: 3 Hour Max. Marks: **60**	• Start writing from 2nd page onwards; **don't Write on the 1st Page Backside** • **Answer all Questions of Section A (Compulsory)** • **Answer Any Four out of Six of Section B** • **Answer Any Two out of Four of Section C** • **Possession of Mobile Phones** or any kind of **Written Material,** • **Arguments with the Invigilator or Discussing with Co-Student** will comes under **Unfair Means** and will **Result** in the **Cancellation of the Papers.**		
Knowledge Level (KL)	**K1 :** Remembering	**K3 :** Applying	**K5 :** Evaluating
	K2 : Understanding	**K4 :** Analysing	**K6 :** Creating

Section A (Each question Carry 01 Mark from Q1-i to x) – 10 Marks

Q. N 1	QUESTIONS	Marks	COs	KL
i	Which of the following is not the objective to perform sequence comparison? a) To find the common motifs present in both sequences b) To study the physical properties of molecules c) To study evolutionary relationships d) To observe patterns of conservation	01	CO1	K2
ii	Swiss-Prot database contains: a) Nucleotide sequences b) Protein sequences with annotation c) Enzyme reaction data d) Gene expression profiles	01	CO2	K2
iii	A *motif* in bioinformatics refers to: a) Short conserved region of sequence with biological significance b) A gene regulatory protein c) A transcription start site d) Random mutation in sequence	01	CO3	K3
iv	The *E-value* in BLAST indicates: a) The evolutionary distance b) The expected number of matches by chance	01	CO3	K3

	c) Enzyme classification value d) Expression level of gene			
v	The dot matrix method is used in bioinformatics for: a) Visualizing sequence similarity b) Protein purification c) Gene cloning d) Enzyme kinetics	01	CO4	K4
vi	Which of these following are not Bioinformatics Applications? a) Data storage and management b) Understand the relationships between organisms c) Drug designing d) None of the above	01	CO1	K2
vii	What is the stepwise method for solving problems in computer science? a) Flowchart b) Algorithm c) Procedure d) Sequential design	01	CO1	K2
viii	What is the term for the laboratory work using computers and associated with web-based analysis generally online? a) In silico b) Dry lab c) Wet lab d) All of the above	01	CO2	K3
ix	What is the computational methodology that attempts to find the best matching between two molecules, a receptor and ligand? a) Molecular matching b) Molecular docking c) Molecule affinity checking d) Molecular fitting	01	CO4	K3
x	Which of the factors listed below is not an advantage of BLAST? a) Speed b) Statistical rigor c) Handling gaps d) More perceptive	01	CO2	K3

Section B (Answer any FOUR out of SIX) – 20 Marks
(Each question Carry 5 Marks)

Q. No.	QUESTIONS	Marks	COs	KL
2	Database Heterogeneity is very common in biological database. Justify it.	05	CO3	K1
3	Define Composite database with example.	05	CO1	K3
4	Write short notes on: a. SWISS PROT b. TREMBL.	05	CO4	K4
5	Write short notes on: a. LAN b. FASTA	05	CO3	K4
6	Discuss Micro array and its application.	05	CO4	K3
7	Differentiate between Pairwise alignment and multiple sequence alignment.	05	CO2	K1

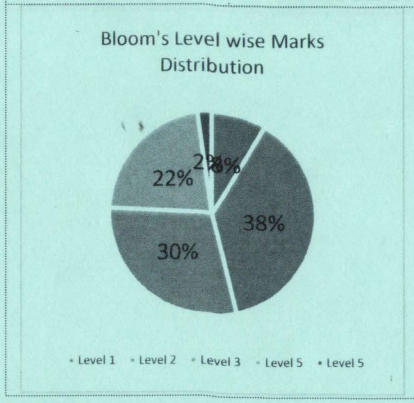
Section C (Answer any TWO out of FOUR) – 30Marks
(Each question Carry 15 Marks)

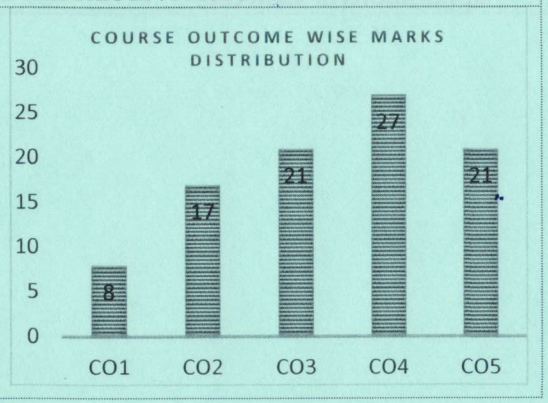
Q. No.	QUESTIONS	Marks	COs	KL
8	Explain methods used in structural analysis of proteins.	15	CO2	K2
9	Elaborate on Gene prediction using computational methods.	15	CO1	K2
10	What do you understand by sequence alignment? Differentiate between global and local alignment.	15	CO3	K2
11	Write a note on Unikernel, DMBS, Primary Database	15	CO4	K1

CO- Course Outcomes, **KL**- Knowledge Level, **PO** – Program Outcome

Course Outcomes	CO1	Students will understand gene transfer technologies for animals and animal cell lines.
	CO2	Students will understand how Biotechnology helps Animal diseases control.
	CO3	Students will understand basic principles and techniques in genetic manipulation and genetic engineering.
	CO4	Students will understand Genetic modification in Medicine like gene therapy
	CO5	Students will understand the techniques and problems both technical and ethical in animal and human cloning.

GRAPHICAL REPRESENTATION





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[22-11-2025]
END SEM EXAMINATION
School of Health & Allied Sciences

Program	**Bachelor of Science (Biotechnology)**		
Subject Name	**Animal Biotechnology**	**Session**	**Odd, 2025-26**
Semester	**V**	**Year**	**Nov, 2025**
Time: 3 Hour Max. Marks : **60**	• Start writing from 2nd page onwards; **don't Write on the 1st Page Backside** • **Answer all Questions of Section A (Compulsory)** • **Answer Any Four out of Six of Section B** • **Answer Any Two out of Four of Section C** • **Possession of Mobile Phones** or any kind of **Written Material, Arguments with the Invigilator or Discussing with Co-Student** will comes under **Unfair Means** and will **Result** in the **Cancellation of the Papers**.		
Knowledge Level (KL)	**K1** : Remembering	**K3** : Applying	**K5** : Evaluating
	K2 : Understanding	**K4** : Analysing	**K6** : Creating

Section A (Each question Carry 01 Mark from Q1-i to x) – 10 Marks

Q. N 1	QUESTIONS	Marks	COs	KL
i	This method involves the introduction of genes into host cell's genome using viruses as carrier is called. a) Conjugation b) Transduction c) Transformation d) None of these	01	CO1	KL1
ii	Electroporation efficiency of the DNA in mammalian cells has increased by the use of a) Dimethyl sulphoxide b) Ethylene glycol c) Ethylenediaminetetraacetic acid d) Ethidium bromide	01	CO1	KL3
iii	Abbreviation "SIT" stand for a) Sterile Insect Technique b) Sperm infertility type c) Small Insect Technique d) None of these	01	CO3	KL5
iv	Which is macrophage cell line? a) Coca 2 b) Hep G2 c) Raw 264.7 d) All of these	01	CO1	KL4
v	Tsetse flies is the vector for a) Theileria b) Eimeria	01	CO2	KL3

	c) Trypanosoma d) None of these			
vi	Mouse is preferred mammal for studies on gene transfer due to a) Short generation time b) Convenient in-vitro fertilization c) Produce more offspring d) All of these	01	CO3	KL3
vii	Which of the following is NOT the part of growth medium for animal culture? a) Starch b) Serum c) Carbon source d) Inorganic salts	01	CO4	KL2
viii	Which deficiency of the immune system was the first disorder researchers treated with gene therapy? a) Severe combined immunodeficiency (SCID) b) Ornithine transcarbamylase (OTC) c) Duchenne muscular dystrophy (DMD) d) Sickle Cell Anemia (SCA)	01	CO2	KL1
ix	Fetal hematopoietic stem cells used in gene therapy can be obtained from a) The Embryo b) The Fetus c) The placenta d) The yolk sac	01	CO4	KL5
x	The cell line used for production of Polio Vaccine was a) Primary Kidney Cell Line b) CHO Cell Line c) Mouse Fibroblast cell line d) Dog Kidney Cell Line	01	CO5	KL1

Section B (Answer any FOUR out of SIX) – 20 Marks
(Each question Carry 5 Marks)

Q. No.	QUESTIONS	Marks	COs	KL
2	Describe the role of biotechnology in Foot-and mouth disease control.	05	CO3	KL1
3	Describe the liposome mediated gene transfer.	05	CO1	KL2
4	What are the major ethical issues in human genetic engineering?	05	CO5	KL4
5	What is the difference between primary culture and continuous cell lines?	05	CO4	KL3
6	Define artificial insemination and mention applications in animal breeding.	05	CO3	KL1
7	Define gene therapy and differentiate between somatic and germ-line gene therapy.	05	CO4	KL2

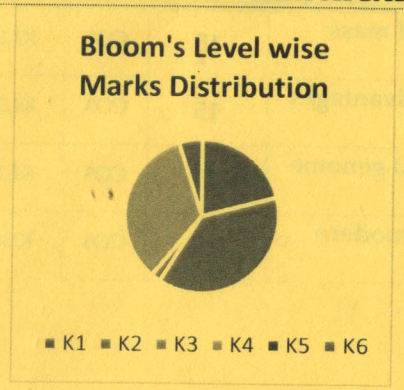
Section C (Answer any TWO out of FOUR) – 30 Marks
(Each question Carry 15 Marks)

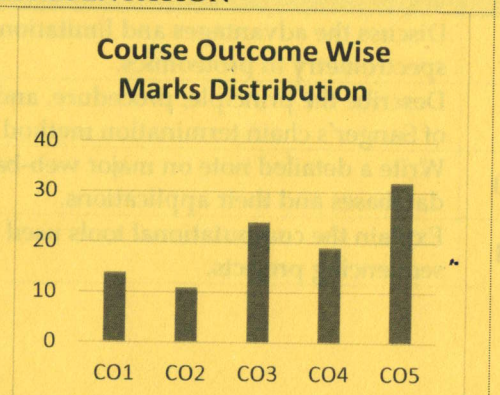
Q. No.	QUESTIONS	Marks	COs	KL
8	What is gene transfer? Describe different physical methods of gene transfer.	15	CO4	KL2
9	Describe organ culture and their applications.	15	CO3	KL4
10	What is transgenic animal? Describe the application of transgenic Mice, Cow, Pig, Bird and Insect.	15	CO2	KL3
11	What is stem cell? Write the characteristic and applications of stem cell.	15	CO5	KL2

CO- Course Outcomes, **KL**- Knowledge Level, **PO** – Program Outcome

Course Outcomes	CO1	Explain scope of genomics and proteomics
	CO2	Gain insight into Protein sequencing methods
	CO3	Analyse Genome sequences, human genome project
	CO4	Use Genomic databases and genome analysis
	CO5	carry out analysis of proteomes
	CO6	Explain mass spectrometry based methods for protein identification

GRAPHICAL REPRESENTATION





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[25-11-2025] END SEM EXAMINATION
School of Health & Allied Science

Program	**Bachelor of Science (Biotechnology)**		
Subject Name	**Genomics & Proteomics**	**Session**	**Odd, 2025-26**
Semester	**V**	**Year**	**Nov, 2025**

Time: 3 Hour
Max. Marks : 60

- Start writing from 2nd page onwards; **don't Write on the 1st Page Backside**
- **Answer all Questions of Section A (Compulsory)**
- **Answer Any Four out of Six of Section B**
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Knowledge Level (KL)			
	K1 : Remembering	**K3** : Applying	**K5** : Evaluating
	K2 : Understanding	**K4** : Analysing	**K6** : Creating

Section A (Each question Carry 01 Mark from Q1-i to x) – 10 Marks

Q. N 1	QUESTIONS	Marks	COs	KL
i	The Maxam–Gilbert sequencing method is based on: a) Chain termination b) Chemical cleavage of DNA c) Pyrophosphate detection d) Fluorescent labeling	01	CO2	KL1
ii	Shotgun sequencing involves: a) Mapping before sequencing b) Sequencing random DNA fragments and assembling them c) Using only long DNA fragments d) Sequencing entire chromosomes in order	01	CO2	KL2
iii	ENSEMBL provides: a) Protein structure databases b) Genome annotation and visualization tools c) Phylogenetic trees d) RNA secondary structure prediction	01	CO4	KL4
iv	VISTA is mainly used for: a) Comparative genomics b) Protein modelling c) DNA sequencing	01	CO2	KL1

	d) Gene expression analysis			
v	SDS-PAGE separates proteins based on: a) Charge b) Shape c) Molecular weight d) Hydrophobicity	01	CO2	KL1
vi	Edman degradation helps in: a) Sequencing amino acids from the N-terminus b) Determining 3D structure c) Measuring protein charge d) Estimating protein size	01	CO2	KL2
vii	The first dimension in 2D-PAGE is: a) SDS-PAGE b) Isoelectric focusing c) Chromatography d) Capillary electrophoresis	01	CO4	KL4
viii	MALDI-TOF is used in: a) DNA sequencing b) Protein identification c) RNA quantification d) None of the above	01	CO4	KL2
ix	Which software is commonly used for sequence assembly? a) BLAST b) SPAdes c) ClustalW d) AutoDock	01	CO4	KL4
x	The main goal of genome assembly is to: a) Translate DNA to protein b) Reconstruct the genome from sequence reads c) Annotate genes d) Compare genomes	01	CO3	KL5

Section B (Answer any FOUR out of SIX) – 20 Marks
(Each question Carry 5 Marks)

Q. No.	QUESTIONS	Marks	COs	KL
2	What is genome assembly? Differentiate between de novo and reference-based assembly.	05	CO1	KL1
3	Explain the term "de novo sequencing" in protein analysis.	05	CO1	KL1
4	What is PAGE? How does SDS-PAGE differ from Native PAGE?	05	CO3	KL4
5	Explain the principle and applications of gel filtration chromatography.	05	CO4	KL2
6	What are model organism databases? Give two examples.	05	CO1	KL1
7	Explain the workflow of a typical proteomics experiment using 2D-PAGE	05	CO1	KL1

Section C (Answer any TWO out of FOUR) – 30 Marks
(Each question Carry 15 Marks)

Q. No.	QUESTIONS	Marks	COs	KL
8	Discuss the advantages and limitations of mass spectrometry in proteomics.	15	CO1	KL1
9	Describe the principle, procedure, and advantages of Sanger's chain termination method.	15	CO3	KL2
10	Write a detailed note on major web-based genome databases and their applications.	15	CO3	KL3
11	Explain the computational tools used in modern sequencing projects.	15	CO4	KL4