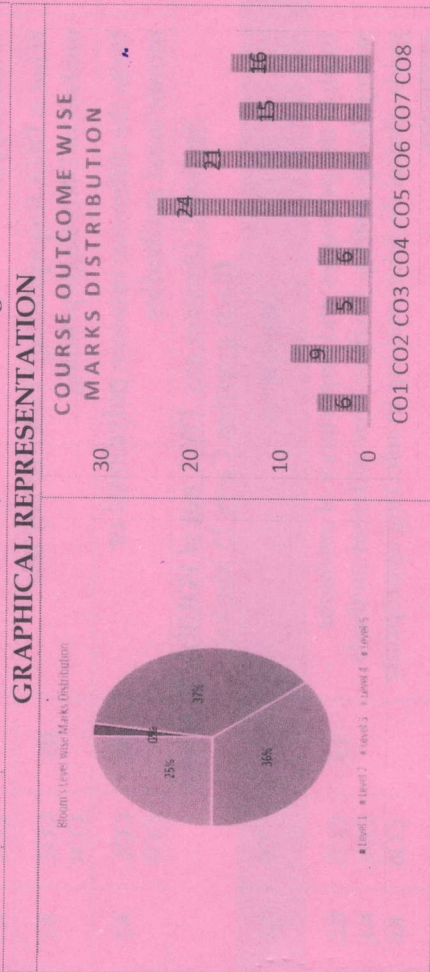


Course Outcomes	CO1	Immunoassays, different enzyme available for immunoassays and immunohistochemical techniques
	CO2	Application of enzyme immunoassays
	CO3	Use of monoclonal bodies in Immuno assays
	CO4	Application of PCR in clinical microbiology
	CO5	Different lab test in chemotherapy
	CO6	Rapid diagnostic approaches and standardization of antigen and specific antibodies
	CO7	Radioimmunoassay, and epitope designing
	CO8	HPLC, Flowcytometry and cell sorting



ARKA JAIN University Jharkhand		NAAC GRADE A ACCREDITED UNIVERSITY	[06-05-2025] END SEM EXAMINATION School of Health & Allied Science
Program	B.Sc Biotechnology		
Subject Name	Molecular Diagnostic	Session	Even, 2024-2025
Semester	IV	Year	May, 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 K2 : Understanding	K3 : Applying K4 : Analysing	K5 : Evaluating K6 : Creating

Section A (Each question Carry 01 Marks from Q1-i to x) – 10 Marks				
Q. N	QUESTIONS	Marks	COs	KL
1				
i	What is the main advantage of enzyme immunoassays over radioimmunoassay? a) Higher sensitivity b) Use of radioactive material c) Safer and more stable reagents d) Faster reaction times	01	CO1	K1
ii	Which property is not essential for a good enzyme used in conjugation? a) High specificity b) Stability c) Ability to self-replicate d) Signal-generating ability	01	CO2	K3
iii	SNP arrays are used in diagnostics to: a) Culture bacteria b) Visualize chromosomes c) Detect thousands of SNPs simultaneously d) Identify protein concentrations	01	CO4	K4
iv	Principle of Kirby Bauer test a) Diffusion of antibiotic agents b) Solubility of chemical agents	01	CO5	K5

v	c) Confluent growth of microorganism d) Dilution of antibiotic agents In real-time PCR, the quantification of DNA is achieved by: a) Agarose gel electrophoresis b) DNA hybridization c) Fluorescent signal detection d) UV light absorption	01	CO4	K6
vi	Nanotechnology improves the sensitivity of diagnostic tools primarily by: a) Increasing the color change b) Reducing the cost of tests c) Enhancing signal-to-noise ratio d) Making reagents more stable	01	CO6	K3
vii	What is an anti-idiotype antibody? a) An antibody against an antigen b) An antibody that binds to the Fc region of another antibody c) An antibody that binds to the variable region (idiotype) of another antibody d) An antibody that binds to T cells	01	CO3	K4
viii	The DNA fingerprinting pattern of child is a) Exactly similar to that of both the parents b) 100% similar to the father's DNA print c) 100% similar to the mother's DNA print d) 50% bands similar to father and rest similar to mother	01	CO8	K2
ix	GLC is most suitable for analysing a) High molecular weight proteins b) Thermally stable volatile compounds c) Ionic compounds in solution d) DNA fragments	01	CO4	K4
x	The idiotype of an antibody is primarily located in which region? a) Constant region b) Fc region c) Variable region d) Hinge region	01	CO7	K3

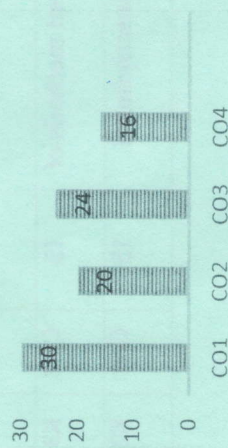
Section B (Answer any FOUR out of SIX) - 20 Marks
(Each question Carry 5 Marks)

Q. No.	QUESTIONS	Marks	COs	KL
2	Write short notes on i. Nanotechnology in molecular diagnostics ii. Enzyme-Antibody conjugation	05	CO2, CO6	K2, K6
3	Describe different solid support used for enzyme immunoassay.	05	CO7	K4
4	What is radioimmunoassay? Write the merits and demerits of RIA.	05	CO2, CO7	K3
5	What is Antiidiotypes? Write the application of Antiidiotypes.	05	CO7, CO1	K1, K3
6	What is DNA fingerprinting? Describe any one method of DNA fingerprinting.	05	CO2, CO4	K2
7	Write the difference between polyclonal or monoclonal antibodies	05	CO1, CO3	K1
Section C (Answer any TWO out of FOUR) - 30 Marks (Each question Carry 15 Marks)				
Q. No.	QUESTIONS	Marks	COs	KL
8	Explain the principles and importance of antibiotic susceptibility testing. Analyse how different methods guide clinical decision-making in selecting appropriate antibiotics.	15	CO5, CO4, CO6	K2, K4, K6
9	What is epitope? Describe the methods of epitope design for disease diagnosis.	15	CO1, CO7	K1, K6
10	Define a biosensor and describe its key components. Explain how biosensors are used in medical diagnostics	15	CO6, CO7	K1, K3
11	Define High Performance Liquid Chromatography (HPLC) and discuss at least three major applications of HPLC in pharmaceutical, clinical diagnosis, and environmental analysis.	15	CO1, CO4	K1, K7

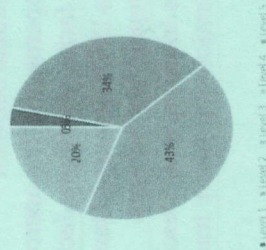
CO1	Understand the concept of DNA replication, transcription and translation
CO2	Attain knowledge about DNA damage and various DNA repair mechanisms
CO3	Understand the mechanism of recombination in DNA
CO4	Able to elaborate the modern tools and techniques of molecular biology and isolation and identification of genes
CO5	Able to understand the biology and application of antisense technologies and biology of cancer

GRAPHICAL REPRESENTATION

COURSE OUTCOME WISE MARKS DISTRIBUTION



Bloom's Level wise Marks Distribution



		ARKA JAIN University Jharkhand			[07-05-2025] END SEM EXAMINATION School of Health & Allied Science
Program	B.Sc Biotechnology				
Subject Name	Molecular Biology				
Semester	IV				
Time: 3 Hour Max. Marks : 60	• Start writing from 2nd page onwards; <u>don't Write on the 1st Page Backside</u> • 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 <u>Mobile Phones</u> or any kind of <u>Written Material</u>, <u>Arguments with the Invigilator or Discussing with Co-Student</u> will come under <u>Unfair Means</u> and will <u>Result</u> in the <u>Cancellation of the Papers.</u>				
Knowledge Level (KL)	K1 : Remembering K2 : Understanding	K3 : Applying K4 : Analysing	K5 : Evaluating K6 : Creating		

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

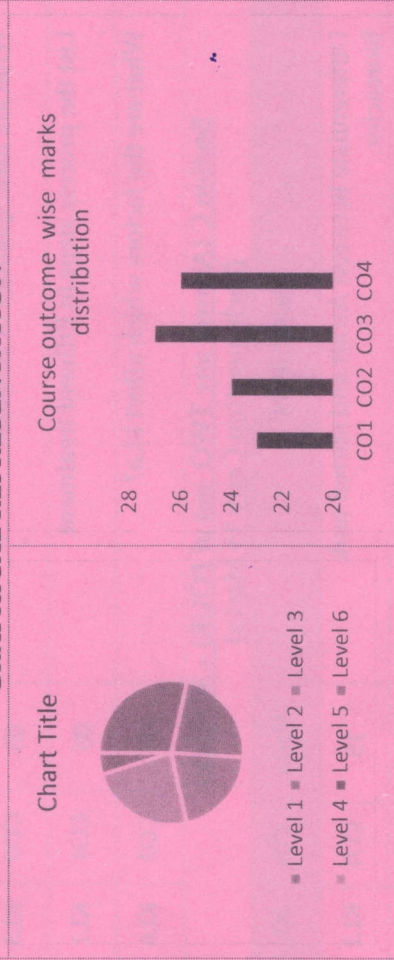
Q. N	QUESTIONS	Marks	COs	KL
i	DNA methylation occur at N-6 position of a) Adenine b) Guanine c) Thymine d) Cytosine	01	CO2	K2
ii	Mode of DNA replication is a) Conservative and bidirectional b) Semiconservative and unidirectional c) Semiconservative and bidirectional d) Conservative and unidirectional	01	CO1	K1
iii	Mitochondrial DNA replication is done by a) DNA polymerase β b) DNA polymerase α c) DNA polymerase γ d) DNA polymerase δ	01	CO1	K2
iv	What is the function of the ω subunit of RNA polymerase? a) Subunit association b) Promoter binding c) Initiation and elongation	01	CO1	K2

v	d) Cation binding TATA box is present at a) -10 position of promoter b) -35 position of promoter c) +10 position of promoter d) At any upstream site	01	CO1	K1
vi	What is the main enzyme that plays a major role in photo activation repair mechanism? a) DNA glycosylase b) DNA photolyase c) DNA gyrase d) DNA ligase	01	CO3	K2
vii	This is considered to be the start codon a) AGG b) UAG c) GUG d) AUG	01	CO2	K1
viii	This drug inhibits the initiation step of translation a) ricin b) tetracycline c) streptomycin d) cyclohexylamine	01	CO4	K2
ix	Lac operon is an example of a) only positive regulation b) only negative regulation c) both positive and negative regulation d) sometimes positive sometimes negative	01	CO3	K3
x	MutS and MutL involve in a) Base-excision repair, b) Mismatch repair c) Nucleotide-Excision Repair d) Error-prone repair	01	CO2	K3
Section B (Answer any FOUR out of SIX) - 20 Marks (Each question Carry 5 Marks)				
Q. No.	QUESTIONS	Marks	CO's	KL
2	Describe different types of eukaryotic promoters.	05	CO1	K2
3	Write short notes on i. Rolling circle replication ii. Homologous recombination	05	CO3	K2
4	Differentiate between i. Leading and lagging strands ii. Prokaryotic and Eukaryotic ribosome iii. Topoisomerase I and Topoisomerase II. iv. Monocistronic and polycistronic mRNA v. m-RNA and t-RNA	05	CO1, CO2, CO3	K4

5	Describe any one post translational modification of protein.	05	CO1	K3
6	With the help of suitable diagram describe the mechanism of transcriptional termination in prokaryotes.	05	CO1	K2
7	Describe the general properties of genetic codon.	05	CO3	K3
Section C (Answer any TWO out of FOUR) - 30 Marks (Each question Carry 15 Marks)				
Q. No.	QUESTIONS	Marks	COs	KL
8	Describe two experiments which prove that DNA is genetic material.	15	CO4	K4
9	Differentiate between i. Lac operon and Try operon ii. Rho factor and Sigma factor	15	CO3	K3
10	What is DNA damage? Describe different methods of DNA repair mechanisms.	15	CO2	K3
11	What is transcription? Describe post transcriptional modification of primary transcript.	15	CO1	K2

Course Outcomes	CO1	Understand various types of bioprocess carried out in industry and various types of bioreactor
	CO2	Understand the application and functioning of bioreactors system, computer aided Bioreactors
	CO3	Understand upstream, downstream process for different bioprocess, and their control
	CO4	Acquire the basic understanding of various parameters for mass transfer

GRAPHICAL REPRESENTATION



Program	B.Sc. Biotechnology		
Subject Name	Bioprocess Technology		
Semester	IV	Session	Even, 2024-2025
		Year	May, 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 <u>Written Material, Arguments with the Invigilator or Discussing with Co-Student</u> will comes under <u>Unfair Means</u> and will <u>Result</u> in the <u>Cancellation of the Papers.</u>		
Knowledge Level (KL)	K1 : Remembering K2 : Understanding	K3 : Applying K4 : Analysing	K5 : Evaluating K6 : Creating

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

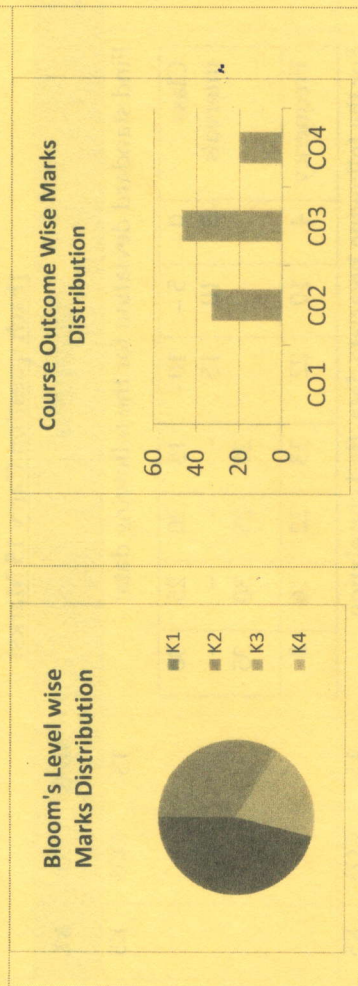
Q.N	QUESTIONS	Marks	COs	KL
1				
i	The Batch culture is a _____ culture system. a) Open b) Closed c) Isolated d) Semi-closed	01	CO1	KL1
ii	For Batch process sterilization which statement is correct a) Dependent on separate cooker b) Less chances of contamination c) Both of the above d) None of the above	01	CO1	KL2
iii	Sterilization can be achieved by a) Chemicals b) Depth filters c) Radiation d) All of these	01	CO3	KL3
iv	Antifoam agents collapse the foam and thus increase the transfer rate of the fermentation medium a) Carbon dioxide b) Nitrogen	01	CO3	KL4

v	c) Oxygen d) Hydrogen CIP is related to a) Contaminant in process b) Cleaning in process c) Crack in in bioreactor d) Cleaning in place	01	CO3	KL1
vi	Which of the following factors are not involved in the upstream process? a) Inoculum development b) Sterilization c) purification of product d) Medium design	01	CO4	KL2
vii	Which of the following is not a Carbon source? a) Blackstrap molasses b) Corn molasses c) Beet molasses d) Yeast extract	01	CO2	KL1
viii	Shortest time required to kill all the microorganism in a sample at a specific temperature is a) Thermal death time b) D value c) Z value d) F value	01	CO2	KL1
ix	Which of the following is not used in the construction of a fermentation vessel? a) Iron b) Steel c) Potassium d) Stainless steel	01	CO1	KL2
x	Identify the correct sequence during the industrial production of substances a) Inoculation, screening, fermentation, downstream processing, removal of waste b) Screening, Inoculation, fermentation, downstream processing, removal of waste c) Fermentation, screening, inoculation, removal of waste, downstream processing d) Fermentation, inoculation, fermentation, removal of waste, downstream processing	01	CO2	KL4

Section B (Answer any FOUR out of SIX) – 20 Marks (Each question Carry 5 Marks)				
Q. No.	QUESTIONS	Marks	COs	KL
2	Discuss any experiment to prove the importance of monitoring mass transfer is important.	05	CO4	KL2
3	Draw a diagram of fluidised bed bioreactor.	05	CO1	KL1
4	What are different components of fermentation?	05	CO2	KL4
5	What are ideal qualities of sensors?	05	CO3	KL3
6	List the process steps in Effluent treatment.	05	CO4	KL1
7	What are the factors which affect kLa?	05	CO3	KL6
Section C (Answer any TWO out of FOUR) – 30 Marks (Each question Carry 15 Marks)				
Q. No.	QUESTIONS	Marks	COs	KL
8	Differentiate between Airlift and stirred tank bioreactor.	15	CO1	KL2
9	Discuss different techniques to measure kLa.	15	CO4	KL3
10	Compare Batch and Fed batch mode of fermentation.	15	CO3	KL4
11	Describe in detail various steps of Downstream processing	15	CO2	KL1

Course Outcomes	CO1	Describe the roles biostatistics server in the discipline of public health.
	CO2	Apply basic statistical concepts commonly used in public health and health sciences.
	CO3	Demonstrate basic analytical techniques to generate results.
	CO4	Interpret results of commonly used statistical analysis in written summaries.

GRAPHICAL REPRESENTATION



 ARKA JAIN University Jharkhand  [08-05-2025] END SEM EXAMINATION School of Health & Allied Sciences							
Program		B.Sc Biotechnology					
Subject Name		Biostatistics		Session Even, 2024-2025			
Semester		IV		Year May, 2025			
Time: 3 Hour Max. Marks : 60		• Start writing from 2nd page onwards; <u>don't Write on the 1st Page Backside</u> • 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 <u>Unfair Means</u> and will <u>Result</u> in the <u>Cancellation of the Papers</u>.					
Knowledge Level (KL)		K1 : Remembering K2 : Understanding		K3 : Applying K4 : Analysing			
				K5 : Evaluating K6 : Creating			

Section A (Each question Carry 01 Marks from Q1-i to x) – 10 Marks		QUESTIONS	Marks	CO	KL
Q. N 1					
i		The median of first ten natural numbers is (a) 5 (b) 5.5 (c) 6 (d) none of these	01	CO2	K3
ii		Standard deviation is a measure of (a) Central tendency (b) Dispersion (c) Correlation (d) None of the above	01	CO2	K1
iii		Regression Analysis deals with the work of finding (a) Co-variation between two variables of a bivariate data (b) Approximate relationship between two variables of a bivariate data (c) Rank correlation between two variables of a bivariate data (d) None of these	01	CO2	K2
iv		If A and B are two mutually exclusive events, then (a) $P(A \cap B) = P(A) + P(B)$ (b) $P(A \cap B) = 0$ (c) $P(A \cap B) = P(A) \times P(B)$ (d) none of these	01	CO3	K2
v		The probability of getting a King when one card is chosen from a full pack is (a) $1/13$ (b) $3/13$	01	CO3	K5

vi	(c) 2/9	(d) None of these	01	CO2	K2
	A small part of any given population that can represent the entire population in respect of the character under study is taken as a (a) Parameter (c) Sample Systematic sampling is a case of (a) Purposive sampling (b) Probability sampling (c) Non-probability sampling (d) None of these	(b) Sampling unit (d) None of these	01	CO2	K2
vii					
viii	t - test is a case of (a) Chi-square test (c) Small sample test	(b) Large sample test (d) None of these	01	CO2	K2
ix	An alternative hypothesis is (a) Similar to the null hypothesis (b) Same as the null hypothesis (c) Just opposite to the null hypothesis (d) None of these		01	CO2	K2
x	In two-way classification of analysis of variance, there are (a) Only one assignable factor and no other factor (b) One assignable factor and a chance factor (c) Two assignable factors and a chance factor (d) None of these		01	CO2	K2
Section B (Answer any FOUR out of SIX) – 20 Marks (Each question Carry 5 Marks)					
Q. No.	QUESTIONS		Marks	CO	KL
2	Describe the role of biostatistics in the discipline of public health.		05	CO4	K4
3	Find median for the following data:		05	CO3	K5
	Class intervals	0 – 10 10 – 20 20 – 30 30 – 40 40 – 50 50 – 60 60 – 70			
	Frequency	4 12 23 36 25 15 5			
4	Write a note on scatter diagram.		05	CO2	K2

5	The pairs ranks for 10 persons in honesty and intelligence are given below: (1, 3), (2, 1), (3, 8), (4, 4), (5, 6), (6, 5), (7, 9), (8, 7), (9, 10) and (10, 2). Find rank correlation coefficient.	05	CO3	K5																																			
6	Explain stratified random sampling.	05	CO2	K2																																			
7	The probability that a problem will be solved by A, B and C are respectively 1/2, 1/3 and 3/5. Find the probability that the problem will be solved, if they all try independently.	05	CO3	K5																																			
Section C (Answer any TWO out of FOUR) – 30 Marks (Each question Carry 15 Marks)																																							
Q. No.	QUESTIONS	Marks	CO	KL																																			
8	Find standard deviation for the following data: <table><tr><td>Class intervals</td><td>0 - 5</td><td>5 - 10</td><td>10 - 15</td><td>15 - 20</td><td>20 - 25</td><td>25 - 30</td></tr><tr><td></td><td>5</td><td>10</td><td>15</td><td>-</td><td>-</td><td>-</td></tr><tr><td></td><td></td><td></td><td>20</td><td>25</td><td>30</td><td>35</td></tr><tr><td>Frequency</td><td>4</td><td>10</td><td>22</td><td>33</td><td>22</td><td>16</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td>3</td></tr></table>	Class intervals	0 - 5	5 - 10	10 - 15	15 - 20	20 - 25	25 - 30		5	10	15	-	-	-				20	25	30	35	Frequency	4	10	22	33	22	16							3	15	CO3	K5
Class intervals	0 - 5	5 - 10	10 - 15	15 - 20	20 - 25	25 - 30																																	
	5	10	15	-	-	-																																	
			20	25	30	35																																	
Frequency	4	10	22	33	22	16																																	
						3																																	
9	For the following bivariate data, find correlation coefficient between X and Y: <table><tr><td>X</td><td>12</td><td>15</td><td>15</td><td>18</td><td>20</td><td>22</td><td>23</td><td>25</td></tr><tr><td>Y</td><td>18</td><td>20</td><td>22</td><td>23</td><td>22</td><td>25</td><td>28</td><td>30</td></tr></table> Also comment on the value of correlation coefficient.	X	12	15	15	18	20	22	23	25	Y	18	20	22	23	22	25	28	30	15	CO3	K5																	
X	12	15	15	18	20	22	23	25																															
Y	18	20	22	23	22	25	28	30																															
10	Write an essay on tests for single mean.	15	CO2	K2																																			
11	In experiments on pea breeding, the following frequencies of seeds were obtained: <table><tr><td>Round and yellow</td><td>Wrinkled and yellow</td><td>Round and green</td><td>Wrinkled and green</td><td>Total</td></tr><tr><td>315</td><td>101</td><td>108</td><td>32</td><td>556</td></tr></table> Theory predicts that the frequencies should be in proportions 9 : 3 : 3 : 1. Examine the correspondence between theory and experiment. [Given that the value of χ^2 -statistic at 5% level for 3 d. f. is 7.815 and for 4 d. f. it is 9.488]	Round and yellow	Wrinkled and yellow	Round and green	Wrinkled and green	Total	315	101	108	32	556	15	CO4	K4																									
Round and yellow	Wrinkled and yellow	Round and green	Wrinkled and green	Total																																			
315	101	108	32	556																																			

Course Outcomes	CO1	Understand concept of resonance in various inorganic compounds
	CO2	Understand Intermolecular forces and their effect
	CO3	Acquire knowledge about Transition elements
	CO4	Clearly understand Lanthanides and actinides
	CO5	To be able to explain structural and stereoisomerism in complexes
	CO6	Understand Co-ordination compounds in biological systems

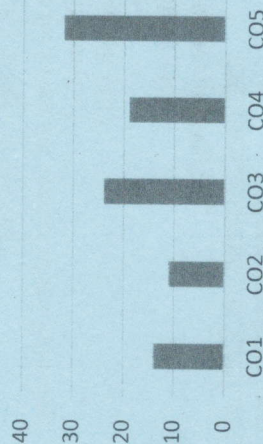
GRAPHICAL REPRESENTATION

Bloom's Level wise Marks Distribution



■ K1 ■ K2 ■ K3 ■ K4 ■ K5 ■ K6

Course Outcome Wise Marks Distribution



		ARKA JAIN University Jharkhand				[10-05-2025] END SEM EXAMINATION School of Health & Allied Sciences	
Program		B.Sc Biotechnology					
Subject Name		Chemistry 2					
Semester		IV					
Time: 3 Hour Max. Marks : 60		• Start writing from 2nd page onwards; <u>don't Write on the 1st Page Backside</u> • 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 <u>Mobile Phones</u> or any kind of <u>Written Material, Arguments with the Invigilator or Discussing with Co-Student</u> will comes under <u>Unfair Means</u> and will <u>Result</u> in the <u>Cancellation of the Papers.</u>					
		K1 : Remembering K2 : Understanding		K3 : Applying K4 : Analysing		K5 : Evaluating K6 : Creating	
Knowledge Level (KL)							

Section A (Each question Carry 01 Marks from Q1-i to x) – 10 Marks							
Q.N	QUESTIONS			Marks	COs	KL	
i	Lewis bases typically contain: a. Hydrogen ions b. Lone pairs of electrons c. Vacant orbitals d. Positive charges			01	CO2	K1	
ii	Which element can form four covalent bonds? a. Oxygen b. Carbon c. Fluorine d. Neon			01	CO1	K2	
iii	Which of the following does NOT support the Valence Bond Theory? a. Concept of localized bonding b. Hybridization c. Delocalization of electrons d. Orbital overlap			01	CO4	K3	
iv	What is the shape of a molecule with 6 bonding domains and 0 lone pairs? a. Tetrahedral			01	CO2	K1	

	b. Trigonal bipyramidal c. Octahedral d. Square pyramidal				
v	Which molecule has a square planar geometry? a. PF_5 b. XeF_4 c. SF_6 d. NH_3	01	CO1	K2	
vi	Which has the greatest repulsion according to VSEPR theory? a. Bonding-bonding b. Bonding-lone pair c. Lone pair-lone pair d. All equal	01	CO4	K3	
vii	What is the hybridization of the central atom in NH_3 ? a. sp^3 b. sp^2 c. sp^3d d. sp	01	CO4	K1	
viii	Which of the following has a trigonal bipyramidal geometry? a. SF_6 b. PCl_5 c. CH_4 d. NH_3	01	CO1	K2	
ix	The bond order in O_2 is: a. 1 b. 2 c. 3 d. 2.5	01	CO1	K3	
x	Which of these is not an intermolecular force? a. Hydrogen bonding b. Dipole-dipole interaction c. London dispersion force d. Ionic bond	01	CO4	K4	
Section B (Answer any FOUR out of SIX) – 20 Marks (Each question Carry 5 Marks)					
Q. No.	QUESTIONS	Marks	COs	KL	
2	On the basis of VSEPR Theory, predict and the shapes of the following molecules: a. SiCl_4 b. H_2S c. HgBr_2	05	CO1	K2	

	d. PH_3				
3	What types of hybridization are involved in the formation of following molecules? Draw the structure. a. C_2H_6 b. C_2H_4 c. C_2H_2 d. BeCl_2 e. BH_3	05	CO2	K2	
4	Write differences between σ bond and π bond.	05	CO3	K3	
5	Give reason for the following: a. NF_3 is pyramidal while BF_3 triangular planar. b. Bond angle in H_2O is larger than H_2S .	05	CO3	K2	
6	What is the difference between bonding molecules and anti-bonding molecular orbitals?	05	CO4	K5	
7	Give the Lewis dot symbol of the following: a) Lithium (Li^+) b) Chloride (Cl^-) c) O_2^- d) Nitrite (N^{3-}) e) Magnesium (Mg_2^{+})	05	CO5	K4	
Section C (Answer any TWO out of FOUR) – 30 Marks (Each question Carry 15 Marks)					
Q. No.	QUESTIONS	Marks	COs	KL	
8	Explain why: a. NH_3 has a bond angle equal to 107° ? b. Lone pair-lone pair repulsion is more than the bond pair bond pair repulsion? c. H_2O molecule is not linear although it is of the AB_2 type.	15	CO1	K1	
9	What do you understand by hybridization? Explain the various types of hybridization involving s and p orbitals.	15	CO3	K3	
10	What is bond order? How is it obtained from MO diagram? Show the molecular orbitals formed by overlapping of 1s, 2s and 2p atomic orbitals on an energy level diagram.	15	CO5	K4	
11	Draw the molecular orbital diagram of O_2 molecule. How would you explain the paramagnetic nature of the molecule on the basis of this diagram?	15	CO2	K2	