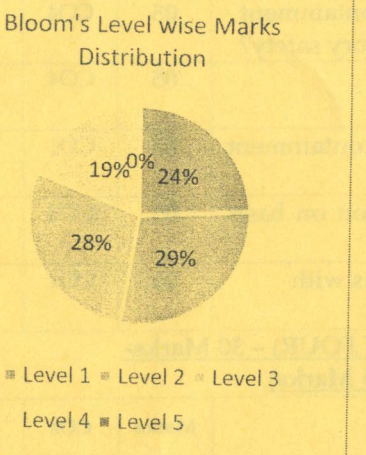
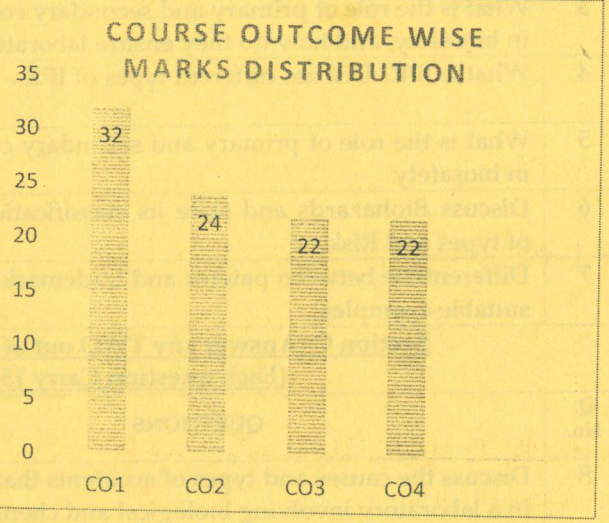
CO- Course Outcomes, **KL**- Knowledge Level, **PO** – Program Outcome

Course Outcomes	CO1	Interpret basics of Biosafety and bioethics and its impact on all the biological sciences and the quality of human life
	CO2	Recognize importance of Biosafety practices and guidelines in research
	CO3	Comprehend benefits of GM technology and related issues
	CO4	Recognize importance of protection of new knowledge and innovations and its role in business

GRAPHICAL REPRESENTATION





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ARKA JAIN University Jharkhand — NAAC GRADE A ACCREDITED UNIVERSITY

END SEM EXAMINATION
School of Health and allied Science

Program	**Bachelor of Science Biotechnology**		
Subject Name	**Bioethics and Biosafety**	**Semester**	**III**
		Year	**Nov/Dec 2024**
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 Marks from Q1-i to Q1-x) – 10 Marks

Q. N 1	QUESTIONS	Marks	COs	KL
i	What is a primary concern regarding genetically modified crops (GMOs)? a) They are unable to increase crop yields. b) They could cross-contaminate non-GMO crops and wild species. c) They require higher pesticide use than non-GMO crops. d) They are not commercially available	01	CO3	K4
ii	Which of the following is a key ethical issue surrounding embryonic stem cell research? a) The high cost of research. b) The destruction of human embryos to obtain stem cells. c) The inability to differentiate stem cells into various tissue types. d) The use of adult cells in place of embryonic cells.	01	CO2	K3
iii	Cartagena Protocol mainly concerned with? a) The regulation of human genetic modifications. b) The safe handling, transport, and use of GMOs and LMOs. c) The financial aspects of biosafety equipment. d) The import and export of laboratory chemicals.	01	CO1	K1

iv	At which Biosafety Level (BSL) would you handle foodborne and waterborne pathogens like Salmonella and E. coli? a) BSL-1 b) BSL-2 c) BSL-3 d) BSL-4	01	CO3	K4
v	What is the main purpose of a biological safety cabinet in a laboratory? a) To increase airflow in the room. b) To provide a safe environment for handling hazardous materials. c) To store chemicals. d) To test the efficiency of new drugs.	01	CO3	K2
vi	Most dangerous levels among the biosafety levels are a) BL1 b) BL2 c) BL3 d) BL4	01	CO2	K3
vii	Which of the following is NOT a type of intellectual property (IP)? a) Trade Secret b) Copyright c) Geographical Indication d) Public Domain	01	CO4	K2
viii	Farmers' rights under intellectual property laws are primarily concerned with: a) The protection of their land. b) The recognition and reward for developing plant varieties. c) The ability to export goods freely. d) Securing copyrights for agricultural machinery.	01	CO2	K1
ix	What is the main purpose of biosafety in a laboratory? a) To make experiments faster. b) To protect people and the environment from harmful substances. c) To improve the accuracy of results. d) To reduce the cost of materials.	01	CO1	K1
x	What was the main legal issue in the case studies concerning Turmeric and Neem? a) The effectiveness of the products. b) Patent infringement due to prior use and traditional knowledge. c) The geographical origin of the plants.	01	CO2	K2
	d) The marketing strategies of companies.			

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

Q. No.	QUESTIONS	Marks	COs	KL
2	Discuss Bioethics and its classification.	05	CO2	K3
3	What is the role of primary and secondary containment in biosafety, and how do they ensure laboratory safety?	05	CO4	K2
4	What is IPR? Discuss different types of IPR.	05	CO4	K6
5	What is the role of primary and secondary containment in biosafety	05	CO1	K2
6	Discuss Biohazards and state its classification on basis of types and Risk.	05	CO4	K3
7	Differentiate between patents and trademarks with suitable examples.	05	CO1	K1

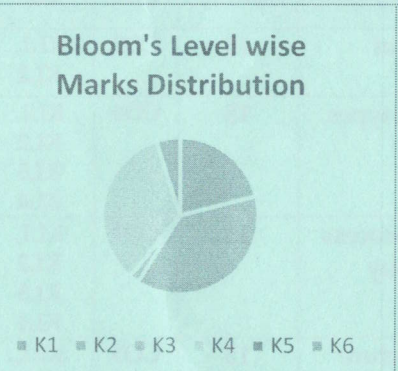
Section C (Answer any TWO out of FOUR) – 30 Marks-
(Each question Carry 15 Marks)

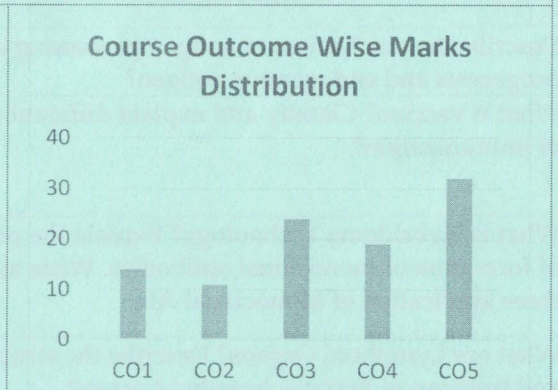
Q. No.	QUESTIONS	Marks	COs	KL
8	Discuss the causes and types of accidents that can occur in a laboratory involving biological and chemical materials. Explain its safety measures.	15	CO2	K2
9	Discuss the biosafety guidelines and regulations in India, focusing on the management of genetically modified organisms (GMOs)	15	CO1	K1
10	Describe the ethical, legal, and social implications of biowarfare and biopiracy.	15	CO3	K4
11	Describe the different types of patents available and the criteria for obtaining a patent in the biotechnology field.	15	CO1	K3

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





ARKA JAIN University
Jharkhand
NAAC GRADE A ACCREDITED UNIVERSITY

END SEM EXAMINATION
School of Health & Allied Science

Program	**Bachelor of Science Biotechnology**		
Subject Name	**Immunology**	**Semester**	**III**
		Year	**Nov/Dec 2024**
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. N1	QUESTIONS	Marks	COs	KL
i	Which type of T lymphocyte is responsible for directly killing infected or abnormal cells? a) Helper T cell b) Cytotoxic T cell c) Regulatory T cell d) Memory T cell	01	CO1	KL1, KL2
ii	What is the primary purpose of antigenic variation employed by pathogens? a) To enhance phagocytosis b) To evade host immune recognition c) To stimulate antibody production d) To promote inflammation	01	CO3	KL1, KL2
iii	What is the mechanism of tissue damage in Type II hypersensitivity reactions? a) Immune complex deposition b) Antibody-dependent cell-mediated cytotoxicity (ADCC) c) Complement activation d) Delayed-type hypersensitivity	01	CO2	KL1, KL2
iv	Which mechanism allows some pathogens to survive within host cells, avoiding direct exposure to the immune system? a) Antigenic variation b) Biofilm formation c) Intracellular survival d) Immune evasion	01	CO2	KL1, KL2 KL3

v	Which immune mechanism involves the recognition of pathogens through pattern recognition receptors (PRRs)? a) Humoral immunity b) Cell-mediated immunity c) Phagocytosis d) Immune evasion	01	CO4	KL1, KL2 KL3 KL4
vi	What is the role of autoantibodies in autoimmune diseases? a) Promote immune tolerance b) Inhibit inflammation c) Target and attack self-tissues d) Stimulate phagocytosis	01	CO2	KL1, KL2
vii	Which autoimmune disease is characterized by the immune system attacking the joints, causing inflammation and pain? a) Multiple sclerosis b) Rheumatoid arthritis c) Lupus d) Type 1 diabetes	01	CO2	KL1, KL2
viii	Which of the following is a common opportunistic infection associated with advanced HIV/AIDS? a) Influenza b) Tuberculosis c) Common cold d) Malaria	01	CO2	KL1, KL2
ix	In the ELISPOT assay, what is captured and immobilized on the membrane to identify individual cytokine-producing cells? a) Antibodies against T cells b) Enzyme-labeled antigens c) Cytokines released by cells d) Fluorescent dyes	01	CO2	KL1, KL2 KL3
x	What is the advantage of using radioimmunoassay says over other immunoassay techniques? a) Reduced sensitivity b) Lower cost c) Higher specificity d) Shorter assay times	01	CO4	KL1, KL2 KL3 KL4

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

Q. No.	QUESTIONS	Marks	COs	KL
2	What is Immunity? Describe the role of Thymus in the process of Immune Response.	05	CO1	KL1, KL2
3	What is an adjuvant? Explain the different type of adjuvant with example?	05	CO2	KL1, KL2
4	What is T-cell? Classify and define the function of different types of T-cell?	05	CO2	KL1, KL2
5	What is immunofluorescence technology? Write the principle and application of this technique.	05	CO4	KL1,
6	Write short note on: a. Phagocytosis b. Haematopoiesis	05	CO4	KL1, KL2
7	Explain the structure and function of following cells a. Granulocytic cells b. NK Cells	05	CO4	KL2

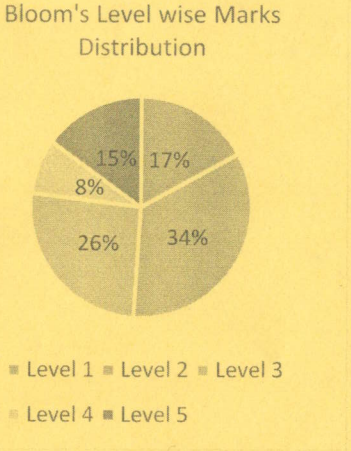
Section C (Answer any TWO out of FOUR) – 30 Marks
(Each question Carry 15 Marks)

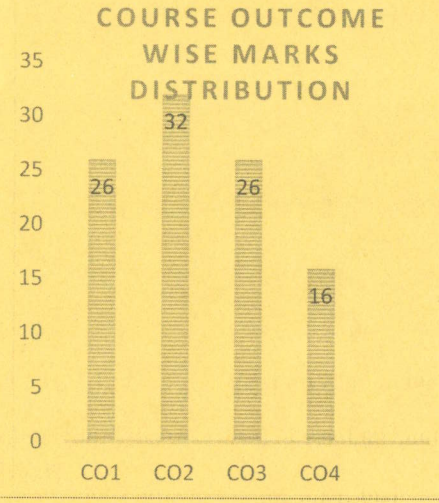
Q. No.	QUESTIONS	Marks	COs	KL
8	Describe the mechanism of antigen processing of exogenous and endogenous antigen?	15	CO2	KL1, KL2
9	What is vaccine? Classify and explain different types of immunization?	15	CO4	KL1, KL2 KL3 KL4
10	What is Hybridoma Technology? Explain the process of formation of monoclonal antibodies. Write any three application of Monoclonal Ab.	15	CO4	KL1, KL2 KL3 KL4
11	What are Lymphoid Organs? Describe the structure and function of primary lymphoid organ?	15	CO3	KL1, KL2

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

Course Outcomes	CO1	Apply the knowledge to understand the microbial physiology and to identify the microorganisms.
	CO2	Comprehend the concept of various pathways in the microbial metabolism
	CO3	Understand the regulation of biochemical pathway in microorganisms
	CO4	Attain knowledge about possible process modifications for improved control over microorganisms for microbial product synthesis.

GRAPHICAL REPRESENTATION





JGI ARKA JAIN University, Jharkhand — NAAC GRADE A, ACCREDITED UNIVERSITY			**END SEM EXAMINATION** **School of Health & Allied Science**
Program	**Bachelor of Science Biotechnology**		
Subject Name	**Microbial Metabolism**	**Semester**	**III**
		Year	**Nov/Dec 2024**
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	Ammonia or ammonium is oxidized to nitrite followed by the oxidation of nitrite to nitrate is a) Nitrogen fixation b) Nitrification c) Denitrification d) Nitrogen assimilation	01	CO3	KL2
ii	Stickland reaction is for a) Paired degradation of different carbon sources b) Paired degradation of amino acids c) Paired synthesis of lipids d) Paired synthesis of carbohydrates	01	CO2	KL4
iii	In aerobic respiration, the terminal electron acceptor is a) Oxygen b) Nitrogen c) Nydrogen d) Nitrate	01	CO3	KL1
iv	Which is period of initial adjustment during bacterial growth a) Stationary phase b) Lag phase c) Exponential phase d) Death phase	01	CO3	KL3
v	Pentose phosphate pathway exist in a) Prokaryotic b) eukaryotic c) both d) none of these	01	CO2	KL1

vi	Acetyl CoA is a _____ carbon compound. a) 1 b) 2 c) 3 d) 4	01	CO3	KL2
vii	ATP synthase complexes can generate ____ATPs for each FADH 2 that enterselectron transport. a) 1 b) 2 c) 3 d) 4	01	CO4	KL4
viii	Which of the following is correct sequence of processes in the oxidation ofglucose? a) Krebs cycle - glycolysis - electron transport b) Glycolysis - Krebs cycle - eletron transport c) Electron transport - Krebs cycle - glycolysis d) Krebs cycle - electron transport - glycolysis	01	CO3	KL4
ix	Fermentation is a) Aerobic reaction b) Anaerobic reaction c) Both of the above d) Oxidative phosphorylation	01	CO3	KL2
x	Thick Peptidoglycan layer in present in a) Gram-positive bacteria b) Fungi c) Gram-negative bacteria d) Algae	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	What is methyl glyoxal pathway, When does it occurs in bacteria.	05	CO2	KL2
3	Discuss methods of ammonia incorporation.	05	CO3	KL3
4	Discuss stickland reaction.	05	CO2	KL2
5	Discuss Glyoxylate pathway.	05	CO2	KL2
6	How Archaebacteria are different from eubacteria	05	CO1	KL4
7	What is significance of studying Microbial physiology?	05	CO1	KL3

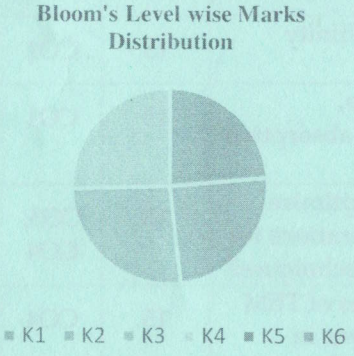
Section C (Answer any TWO out of FOUR) – 30 Marks
(Each question Carry 15 Marks)

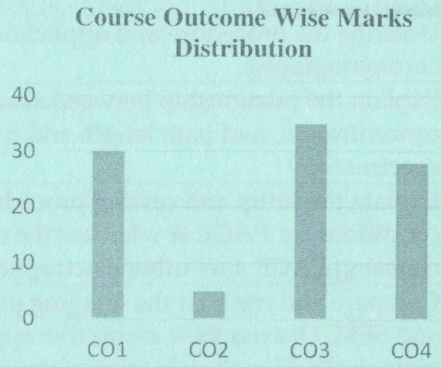
Q. No.	QUESTIONS	Marks	COs	KL
8	Classify different types of bacteria on basis of nutrition and oxygen requirement.	15	CO1	KL1
9	Discuss Pentose phosphate pathway with the help of diagram. Write its significance.	15	CO2	KL2
10	Differentiate between Batch and continuous fermentation.	15	CO4	KL5
11	Discuss electron transport chain in bacteria.	15	CO3	KL3

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

Course Outcomes	CO1	Understand the basic principle of different Bioanalytical techniques
	CO2	Understand the technique of DNA separation
	CO3	Understand techniques of protein separation
	CO4	To analyzed the biological analytes

GRAPHICAL REPRESENTATION





ARKA JAIN University Jharkhand — NAAC GRADE A ACCREDITED UNIVERSITY

END SEM EXAMINATION
School of Health & Allied Science

Program	**Bachelor of Science Biotechnology**		
Subject Name	**Bio Analytical Tools**	**Semester**	**III**
		Year	**Nov/Dec 2024**

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)**
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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	Resolving power of a microscope depends upon a) The focal length and aperture of the eye lens b) The focal length and objective of the eye lens c) The apertures of the objective and the eye lens d) The wavelength of light illuminating the object	01	CO1	K1
ii	What is the primary source of systematic errors in laboratory measurements? a) Instrumentation calibration b) Human bias c) Environmental factors d) All of the above	01	CO1	K1
iii	Retention time is the time a) Taken by the analyte to come out of the column b) Taken by the analyte to get inside the column c) Taken by the solvent inside the column d) Taken by the solvent to get inside the column	01	CO1	K1
iv	What is the primary principle of a pH meter? a) Electrochemical measurement b) Spectrophotometric measurement c) Chromatographic separation d) Titration reaction	01	CO1	K1
v	What is the primary principle of NMR spectroscopy? a) Electron spin resonance	01	CO1	K1

	b) Nuclear magnetic resonance c) Fourier transform infrared spectroscopy d) Mass spectrometry			
vi	_____ is an initiator of acrylamide polymerization. a) Ammonium persulfate b) TEMED c) Tris-HCl d) Acrylamide	01	CO3	K1
vii	Select the wavelength range corresponding to UV-Visible region a) 400-800 nm b) 200-800 nm c) 25 -2.5 micron m d) 2.5 micron m – 1 mm	01	CO1	K1
viii	Coomassie blue is a) Loading dye for DNA b) Staining dye for Protein c) Loading dye for protein d) Staining dye for DNA	01	CO2	K1
ix	What type of technique is FTIR spectroscopy? a) A dispersive technique b) An emission technique c) An absorbance technique d) A UV-Vis technique	01	CO1	K1
x	What is a limitation of biosensors? a) Selectivity issues b) Stability problems c) Calibration requirements d) All of the above	01	CO1	K1

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 a) Isoelectric focusing b) HPLC	05	CO1	K2
3	What is ion exchanger? Write the example of each types of ion exchanger.	05	CO4	K2
4	Describe strategies for improving sensitivity and specificity in immuno-electrophoresis.	05	CO3	K4
5	Describe the application of phase contrast microscopy in microbiology.	05	CO1	K3
6	What is nanotechnology? Write the application of nanotechnology.	05	CO1	K2
7	Describe strategies for minimizing protein degradation during cell fractionation.	05	CO3	K4

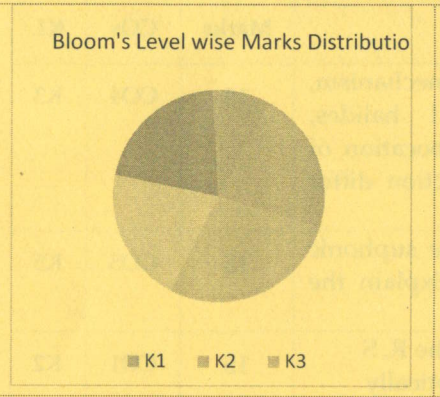
Section C (Answer any TWO out of FOUR) – 30 Marks
(Each question Carry 15 Marks)

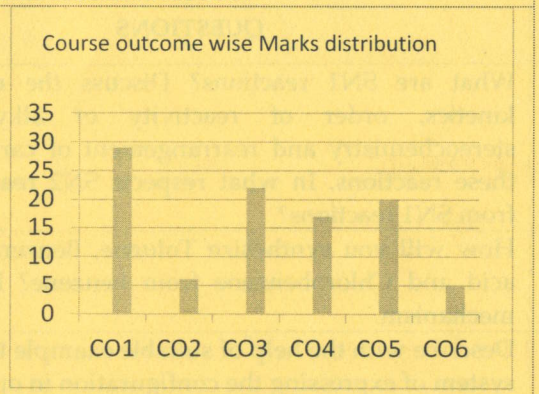
Q. No.	QUESTIONS	Marks	COs	KL
8	Describe the procedure and application of affinity chromatography.	15	CO1	K2
9	Explain the relationship between absorbance, concentration, and path length and types of absorption spectroscopy	15	CO1	K3
10	Explain the setup and casting procedures, optimize conditions for PAGE & what are the considerations for choosing PAGE over other electrophoresis techniques?	15	CO3, CO4	K4
11	Compare and contrast the imaging principles of TEM and SEM. Discuss their respective applications in biological and materials science research.	15	CO4	K3

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

Course Outcomes	CO1	Learn the concept of Stereochemistry, conformation and geometrical isomerism
	CO2	Discuss relative and absolute configuration
	CO3	Describe hydrogenation and hydro halogenation reactions.
	CO4	Demonstrate reactions of aldehydes and ketones with ammonia and its derivative
	CO5	Understand aldol, cross aldol and cannizzaro reactions
	CO6	Understand the reaction mechanism of halogenations of alkanes, allylic compounds and alkyl benzenes, elimination reaction

GRAPHICAL REPRESENTATION





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END SEM EXAMINATION
School of Health & Allied Science

Program	**Bachelor of Science Biotechnology**		
Subject Name	**Chemistry - I**	**Semester**	**III**
		Year	**Nov/Dec 2024**

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)**
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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	Which of the following is least stable? a) Anti conformation b) Gauche conformation c) Staggered conformation d) Eclipsed conformation	01	CO1	K1
ii	Plane polarized light is affected by a) identical molecules b) all polymers c) chiral molecules d) all biomolecules	01	CO1	K1
iii	Select the incorrect statement. a) A resonance may sometimes cause sp3 atoms to become sp2 hybridized b) Delocalizing one lone pair causes aromaticity c) One lone pair will be counted as two pi electrons according to Huckel's equation d) Two sigma bonds make up a double bond	01	CO1	K2
iv	In gauche conformations, the methyl groups are _____ a)60^0 apart b)90^0 apart c)180^0 apart d) 360^0 apart	01	CO1	K3

v	(+) Lactic acid and (-) lactic acid are a) Enantiomer b) Distereosomer c) Epimer d) Metamer	01	CO5	K1
vi	The Carbon atom of a Carbonyl group is _____. a) Sp hybridized b) Sp^2 hybridized c) Sp^3 hybridized d) Not hybridized	01	CO2	K2
vii	31When formaldehyde is treated with 50% NaOH solution, it undergoes a) Cannizaro reaction b) Wurtz reaction c) Aldol condensation d) Hydrolysis	01	CO3	K5
viii	In the addition of HX to a double bond, the hydrogen goes to the carbon that already has more hydrogen is a statement of a) Markovnikov's Rule b) Hunds rule c) Huckle rule d) Saytzeff rule	01	CO4	K6
ix	Acetaldehyde on treatment with Tollens reagent gives a precipitate of a) $AgNO_3$ b) Ag c) Cu_2O d) None of these	01	CO3	K4
x	Saytzeff's rule states the _____ is formed most readily. a) Least substituted alkane b) Most substituted alkane c) Least substituted alkene d) Most substituted alkene	01	CO4	K3

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

Q. No.	QUESTIONS	Marks	COs	KL
2	Write difference between E1 and E2 elimination reaction.	05	CO3	K4
3	Discuss the mechanism of Aldol condensation and Cannizzaro reaction.	05	CO1	K3
4	Write Short Notes on a) Optical Activity b) Enantiomers.	05	CO1	K1
5	Explain chlorination of alkane.	05	CO2	K2
6	Explain the mechanism for nitration of benzene.	05	CO5	K3
7	Discuss the mechanism of elimination reactions of alkyl halides.	05	CO6	K5

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

Q. No.	QUESTIONS	Marks	COs	KL
8	What are SN1 reactions? Discuss the mechanism, kinetics, order of reactivity of alkyl halides, stereochemistry and rearrangement of carbocation of these reactions. In what respects SN2 reaction differ from SN1 reactions?	15	CO4	K3
9	How will you synthesize Toluene, Benzene suphonic acid and Chlorobenzene from benzene? Explain the mechanism.	15	CO5	K5
10	Describe with the help of suitable example the R, S system of expressing the configuration in optically active compounds.	15	CO1	K2
11	Explain the mechanism of: i) Ozonolysis ii) Markownikoff's Rule.	15	CO3	K4