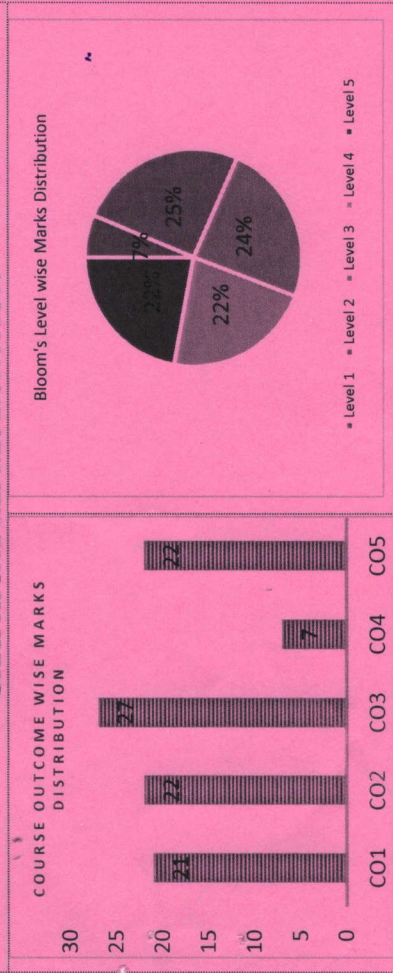


CO1	Foundational understanding of the chemical constituents of cells, the basic units of living organisms.
CO2	Explain various types of weak interactions between the biomolecules.
CO3	Know how the simple precursors give rise to large biomolecules such as proteins, carbohydrates, lipids, nucleic acids
CO4	Know about biocatalyst and their role
CO5	Know how biomolecules metabolized to produces energy and other precursor molecules.
CO6	Able to critically evaluate, interpret and correlate the biochemical information

GRAPHICAL REPRESENTATION



ARKA JAIN University
Jharkhand



[16-01-2026]
END SEM EXAMINATION
School of Health & Allied Sciences

Program	Bachelor of Science-Biotechnology	
Subject Name	Biochemistry & Metabolism	
Semester	I	Year
	Session	Odd, 2025-26
Time: 3 Hour Max. Marks : 60	<ul style="list-style-type: none"> Start writing from 2nd page onwards; don't Write on the 1st Page Backside Answer all Questions of Section A (Compulsory) Answer Any <u>Four</u> out of <u>Six</u> of Section B Answer Any <u>Two</u> out of <u>Four</u> of Section C Possession of <u>Mobile Phones</u> or any kind of <u>Written Material</u>, <u>Arguments with the Invigilator</u> or <u>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	K3 : Applying
	K2 : Understanding	K4 : Analysing
		K5 : Evaluating K6 : Creating

Section A (Each question Carry 01 Marks from Q1-i to x) – 10 Marks		QUESTIONS	Marks	COs	KL
Q. N 1	i	Major buffer system of blood is: a) Phosphate b) Protein c) Bicarbonate d) Ammonia	01	CO1	KL2
	ii	Zwitterion is formed at: a) Acidic pH b) Basic pH c) Isoelectric point d) Neutral pH only	01	CO2	KL2
	iii	Coenzymes are usually: a) Proteins b) Lipids c) Vitamins d) Minerals	01	CO4	KL3
	iv	Zinc is required for activity of: a) DNA polymerase b) Carbonic anhydrase c) Hexokinase d) Pepsin	01	CO2	KL5

v	Phospholipids are major components of: a) Nucleus b) Ribosome c) Cell membrane d) Mitochondria	01	CO3	KL1
vi	Nucleotide is a) Base + phosphate + Sugar b) Sugar + phosphate c) Base + sugar d) Sugar only	01	CO6	KL2
vii	Glycolysis occurs in: a) Mitochondria b) Cytoplasm c) Nucleus d) Lysosome	01	CO5	KL2
viii	Pentose phosphate pathway mainly produces: a) ATP b) NADH c) NADPH d) FADH ₂	01	CO5	KL3
ix	Amino acids are optically active except: a) Alanine b) Glycine c) Valine d) Leucine	01	CO3	KL4
x	Competitive inhibition increases: a) V _{max} b) K _m c) Enzyme activity d) Product formation	01	CO4	KL3

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

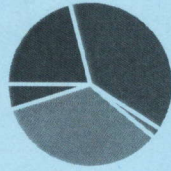
Q. No.	QUESTIONS	Marks	COs	KL
2	Explain the structure and biological functions of disaccharides.	05	CO1	KL4
3	Differentiate between purines and pyrimidines. Draw triple bond between guanine and cytosine.	05	CO3	KL5
4	Write a short note on prostaglandins and cholesterol.	05	CO3	KL2
5	Define enzymes and explain their classification with example.	05	CO4	KL1
6	Describe the biological importance of minerals in human health.	05	CO2	KL3

7	Explain the fate of pyruvate under aerobic conditions.	05	CO5	KL4
Section C (Answer any TWO out of FOUR) – 30 Marks (Each question Carry 15 Marks)				
Q. No.	QUESTIONS	Marks	COs	KL
8	Describe the β -oxidation of fatty acids and its energy yield.	15	CO5	KL5
9	Describe the double helical structure of DNA. Write the difference between A, B, and Z-DNA.	15	CO3	KL4
10	Describe the primary and secondary structure of proteins with examples.	15	CO2	KL2
11	Describe water as a solvent for biological molecules, highlighting hydrogen bonding and its role in cellular functions.	15	CO1	KL3

CO1	Understand structure and function of a prokaryotic and eukaryotic cells (both plant and animal cells)
CO2	Explain structure and function of different cell organelles such as mitochondria, nucleus, Golgi apparatus etc.
CO3	Understand Signal transduction and various cell signalling pathways
CO4	Attain knowledge about Cancer, causes of Cancer, agents of cancer and molecular basis of cancer.
CO5	Explain expression and regulation of cell receptor and their function.

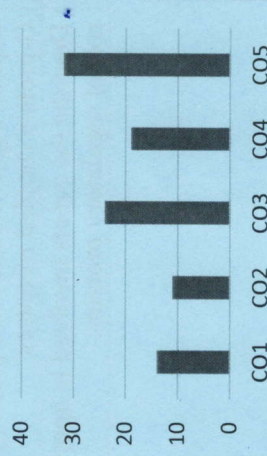
GRAPHICAL REPRESENTATION

Bloom's Level wise Marks Distribution



■ K1 ■ K2 ■ K3 ■ K4 ■ K5 ■ K6

Course Outcome Wise Marks Distribution





ARKA JAIN University
Jharkhand



NAAC GRADE A
ACCREDITED UNIVERSITY

[19-01-2026]
END SEM EXAMINATION
School of Health & Allied Sciences

Program	Bachelor of Science-Biotechnology	
Subject Name	Cell Biology	
Semester	I	Session Year
		Odd, 2025-26 Jan, 2026
Time: 3 Hour	<ul style="list-style-type: none"> 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 will come under <u>Unfair Means</u> and will <u>Result</u> in the <u>Cancellation of the Papers.</u></u> 	
Max. Marks : 60		
Knowledge Level (KL)	K1 : Remembering K2 : Understanding	K3 : Applying K4 : Analysing K5 : Evaluating K6 : Creating

Q. N	QUESTIONS	Marks	COs	KL
i	Active transport is characterized by: <ul style="list-style-type: none"> a) Movement along concentration gradient b) No energy requirement c) Involvement of membrane pumps d) Absence of proteins 	01	CO1	K2
ii	Rough endoplasmic reticulum is primarily involved in: <ul style="list-style-type: none"> a) Lipid synthesis b) Detoxification c) Protein synthesis d) ATP production Microfilament are composed of: <ul style="list-style-type: none"> a) Actin b) Tubulin c) Myosin d) Keratin 	01	CO2	K3
iii	Golgi apparatus is mainly involved in: <ul style="list-style-type: none"> a) Energy production b) Protein modification and sorting c) DNA replication 	01	CO2	K2

v	d) Lipid degradation Lysosomes are known as: a) Powerhouses of the cell b) Protein factories c) Suicide bags of the cell d) Control centres	01	CO1 CO2	K1
vi	Ribosomes are composed of: a) DNA and protein b) RNA and lipid c) rRNA and protein d) mRNA only	01	CO2	K2
vii	Mitochondrial genome is: a) Linear b) Circular c) Single-stranded d) Absent	01	CO2	K2
viii	Which enzyme produces cAMP in GPCR signalling a) Phospholipase C b) Adenyl cyclase c) Protein Kinase C d) MAP Kinase	01	CO2	K3
ix	The protein p53 plays a major role in: a) Mitosis initiation b) Apoptosis & DNA repair c) Cytokinesis d) Chromosome Condensation	01	CO2	K1
x	Microtubules are composed of a) Actin b) Tubulin c) Myosin d) Keratin	01	CO2	K5

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

Q. No.	QUESTIONS	Marks	COs	KL
2	What is meant by membrane fluidity? State any two functions of membrane proteins.	05	CO1	K2
3	Explain the organization and role of cytoskeleton in cell motility.	05	CO2	K3
4	Write a note on a. Autophagy b. Phagocytosis c. Endocytosis	05	CO4	K2

5	What are secondary messenger? Explain the role of cAMP in signal transduction.	05	CO2	K3
6	Define the structure and function of extracellular matrix in a Eukaryotic cell.	05	CO1	K2
7	Classify the different types of Chromosome on the basis of position of centromere	05	CO2	K2
Section C (Answer any TWO out of FOUR) - 30 Marks (Each question Carry 15 Marks)				
Q. No.	QUESTIONS	Marks	COs	KL
8	Describe various modes of transport across the plasma membrane with suitable examples.	15	CO1	K2
9	Describe the structure and functions of mitochondria and explain its biogenesis.	15	CO2	K3
10	Explain signal transduction pathways mediated by G-protein coupled receptors	15	CO4	K2
11	Describe the events involved in apoptosis and the role of regulatory proteins.	15	CO2	K3



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Jharkhand



[21-01-2026]

END SEM EXAMINATION
School of Health and Allied
Sciences

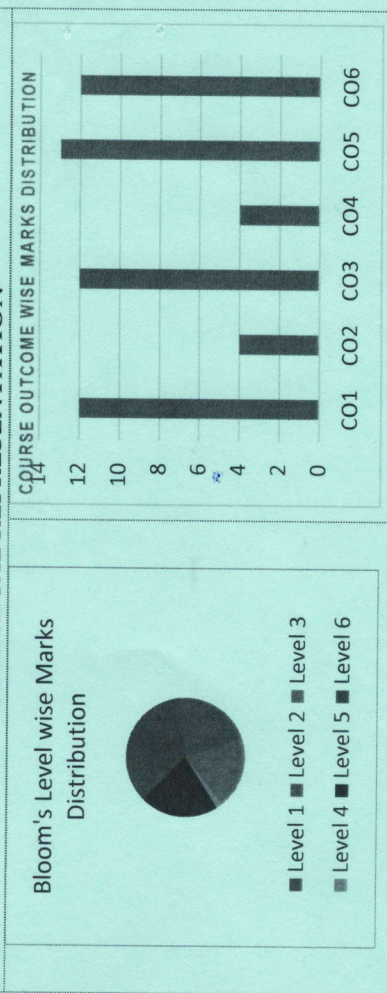
Program	Bachelor of Science-Biotechnology	
Subject Name	Biotechnology & Human Welfare	Session Odd, 2025-26
Semester	I	Year Jan, 2026
Time: 1.5 Hour Max. Marks : 35	<ul style="list-style-type: none"> Start writing from 2nd page onwards; don't Write on the 1st Page Backside Answer all Questions of Section A (Compulsory) Answer Any Five 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 v) – 05 Marks

Q. N	QUESTIONS	Marks	COs	KL
1 i	Gene therapy is mainly used for: a. Infectious diseases b. Genetic disorders c. Physical injuries d. Hormonal imbalance	01	CO4	KL1
ii	The primary aim of the Human Genome Project was to: a. Study proteins b. Sequence the entire human DNA c. Create GMOs d. Produce insulin	01	CO4	KL4
iii	Enzyme immobilization means: a. Making enzymes inactive b. Confining enzymes to a support or matrix c. Freezing enzymes d. Storing enzymes	01	CO2	KL2
iv	Most commonly used probiotic bacteria belong to – a. Pseudomonas b. Lactobacillus and Bifidobacterium c. Streptococcus pyogenes d. Pathogenic E. coli strains	01	CO2	KL1

Course Outcomes	CO1	Understand the basic concepts, history, branches, and scope and application of biotechnology
	CO2	Explain enzyme immobilization, biosensor applications, and fundamentals of genetic engineering.
	CO3	Describe uses of biotechnology in agriculture and industry, including biofertilizers and antibiotics, Transgenic animals, and Biofuel production, vaccines, and therapeutic products
	CO4	Analyze environmental biotechnology applications such as pollutant degradation and biodegradable polymer development
	CO5	Understanding of Human genome Project and applications of biotechnology in forensic such as DNA fingerprinting, Gene therapy and Recombinant vaccines
	CO6	Evaluate public perception, safety issues, and IPR related to biotechnology practices

GRAPHICAL REPRESENTATION



Q. No.	QUESTIONS	Marks	COs	KL
2	Define Enzyme Immobilization. List various types.	02	CO2	KL1
3	Define biosensor and bioremediation	02	CO1	KL2
4	Define Biosafety. Why do you think it is important?	02	CO6	KL5
5	Write a note on Biofuel. List its various sources.	02	CO3	KL1
6	What are the harmful effects of Pesticides?	02	CO4	KL2
7	What are the benefits of Gene therapy?	02	CO5	KL5
Section C (Answer any TWO out of FOUR) - 20 Marks (Each question Carry 10 Marks)				
Q. No.	QUESTIONS	Marks	COs	KL
8	How Biotechnology can be helpful in solving crime cases. Discuss any technique.	10	CO5	KL3
9	What are monoclonal antibodies? Discuss their application and classification.	10	CO3	KL2
10	Discuss applications of Biotechnology in various fields.	10	CO1	KL5
11	What is IPR? Explain different types of IPR?	10	CO6	KL1

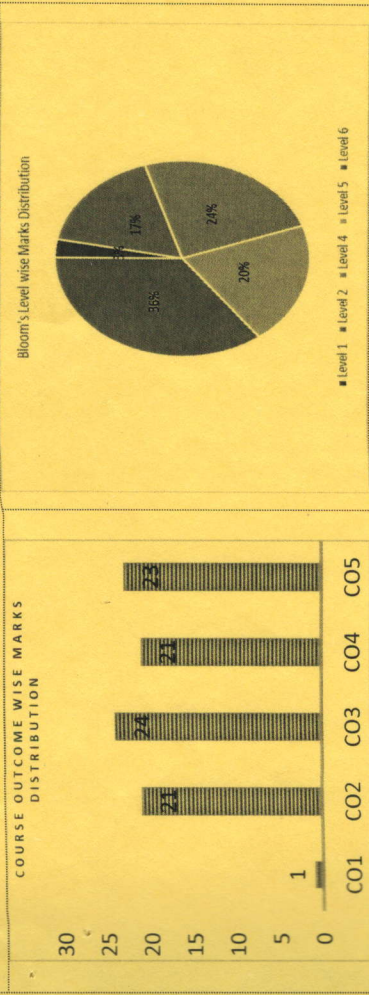
Which can be the biological sample for DNA finger printing
 a. Blood
 b. Hair
 c. Saliva
 d. All of them

Section B (Answer any FIVE out of SIX) - 10 Marks
(Each question Carry 02 Marks)

01 CO5 KL3

CO1	Recall and explain the composition and functions of digestive juices and describe the basic mechanisms of digestion and absorption of carbohydrates, proteins, lipids, and nucleic acids.
CO2	Explain and apply principles of respiration and circulation, including gas exchange, transport of O ₂ and CO ₂ , oxygen dissociation curve, chloride shift, blood composition, coagulation, and cardiac cycle and output.
CO3	Apply and analyze concepts of muscle physiology, including muscle types, threshold stimulus, all-or-none law, muscle contraction mechanisms, and evaluate excretory processes such as osmoregulation, ornithine cycle, and urine formation.
CO4	Analyze the mechanism of nervous coordination, including generation and propagation of nerve impulses, synaptic transmission, saltatory conduction, and assess the functional role of neurotransmitters.
CO5	Analyze and evaluate the endocrine regulation mechanisms, including hormonal control by major endocrine glands, disorders of hypo- and hyper-secretion, and compare the mechanisms of action of insulin and steroid hormones.

GRAPHICAL REPRESENTATION



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Jharkhand



[27-01-2026]
END SEM EXAMINATION
School of Health & Allied Sciences

Program	Bachelor of Science-Biotechnology	
Subject Name	Mammalian Physiology	
Semester	I	Session
		Year
		Odd, 2025-26
		Jan, 2026
Time: 3 Hour	Start writing from 2nd page onwards; don't Write on the 1st Page	
Max. Marks : 60	Backside	
	<ul style="list-style-type: none"> 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 come under <u>Unfair Means</u> and will <u>Result in the Cancellation of the Papers.</u> 	
Knowledge Level (KL)	K1 : Remembering K2 : Understanding	K3 : Applying K4 : Analysing K5 : Evaluating K6 : Creating

Q. N	QUESTIONS	Marks	COs	KL
1				
i	Pepsin works best at pH: a) 1.5-2 b) 5-6 c) 7-8 d) 9-10	01	CO1	KL1
ii	CO ₂ is transported mainly in blood as: a) Dissolved gas b) Carbamino Hb c) Bicarbonate d) Carbonic acid	01	CO2	KL3
iii	Normal cardiac output is approximately: a) 2 L/ min b) 3 L/ min c) 5 L/ min d) 8 L/ min	01	CO3	KL3
iv	Functional unit of skeletal muscle is: a) Myofibril b) Sarcomere c) Actin d) Myosin	01	CO3	KL1

v	Maximum reabsorption occurs in: a) DCT b) PCT c) Collecting duct d) Loop of Henle	01	CO3	KL2
vi	Saltatory conduction occurs in: a) Non-myelinated fibers b) Myelinated fibers c) Dendrites d) Synapses	01	CO3	KL3
vii	Adrenal medulla secretes: a) Cortisol b) Aldosterone c) Adrenaline d) Androgens	01	CO5	KL1
viii	Synaptic transmission is: a) Bidirectional b) Unidirectional c) Electrical only d) Mechanical	01	CO4	KL1
ix	Growth hormone excess causes: a) Dwarfism b) Cretinism c) Acromegaly d) Myxedema	01	CO5	KL2
x	Insulin lowers blood glucose by: a) Glycogenolysis b) Gluconeogenesis c) Glycogenesis d) Lipolysis	01	CO5	KL3
Section B (Answer any FOUR out of SIX) - 20 Marks (Each question Carry 5 Marks)				
Q. No.	QUESTIONS	Marks	COs	KL
2	Draw label diagram of sarcomere of skeletal muscle.	05	CO3	KL2
3	Compare protein hormone and steroid hormone mechanisms of action.	05	CO5	KL5
4	Describe the structure of a synapse with a diagram.	05	CO4	KL4
5	Explain the oxygen dissociation curve and factors affecting it.	05	CO2	KL2
6	Describe the composition and functions of bile juice.	05	CO1	KL2

7	Differentiate between isotonic and isometric contractions.	05	CO3	KL3
Section C (Answer any TWO out of FOUR) - 30 Marks (Each question Carry 15 Marks)				
Q. No.	QUESTIONS	Marks	COs	KL
8	Explain the hormones of the adrenal gland and evaluate their role in stress response.	15	CO5	KL4
9	Describe the mechanism of generation of nerve impulse with diagrams.	15	CO4	KL3
10	Describe the transport of oxygen and carbon dioxide in blood.	15	CO2	KL5
11	Describe the composition of blood and explain the functions of its individual components.	15	CO3	KL5



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Jharkhand



[29-01-2026]

END SEM EXAMINATION
School of Health & Allied
Sciences

Program	Bachelor of Science-Biotechnology		
Subject Name	Yoga and Holistic Wellness		Session Odd, 2025-26
Semester	I	Year	Jan, 2026
Time: 1.5 Hour Max. Marks : 35	<ul style="list-style-type: none"> 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 Five 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 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 v) – 05 Marks

Q. N	QUESTIONS	Marks	COs	KL
1 i	The main benefit of practicing yoga asanas is a. Increased stress b. Improved physical and mental health c. Weakening of muscles d. Reduced flexibility	01	CO1	K1
ii	Sitting asanas mainly help in a. Strengthening legs b. Meditation and relaxation c. Improving sleep only d. Increasing fear	01	CO3	K5
iii	Which is a balancing asana? a. Vrikshasana b. Bhujangasana c. Shalabhasana d. Vajrasana	01	CO2	K2
iv	Which of the following is a standing asana? a. Tadasana b. Padmasana c. Bhujangasana d. Shavasana	01	CO3	K2

v	Which asana helps reduce stress and calm the mind? a. Shavasana b. Trikonasana c. Dhanurasana d. Tadasana	01	CO4	K4
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Section B (Answer any FIVE out of SIX) – 10 Marks
(Each question Carry 02 Marks)

Q. No.	QUESTIONS	Marks	COs	KL
2	What do you mean by Yoga?	02	CO1	K1
3	Which yoga is good for balancing?	02	CO2	K2
4	Discuss the steps of Tadasana.	02	CO3	K1
5	What is box breathing?	02	CO4	K3
6	Discuss benefits of Pranayam.	02	CO4*	K5
7	Write a note on vrikshasana.	02	CO3	K2

Section C (Answer any TWO out of FOUR) – 20 Marks
(Each question Carry 10 Marks)

Q. No.	QUESTIONS	Marks	COs	KL
8	Explain the importance of yoga asanas in improving health.	10	CO2	K2
9	Discuss the diagram/ steps representation of Surya namaskar. What are the health benefits of performing Surya Namaskaar?	10	CO3	K1
10	Design a personal wellness routine.	10	CO5	K6
11	What is yog nidra and its benefit?	10	CO4	K3

Course Outcomes	CO1	CO2	CO3	CO4	CO5
Remembering: Recalling and describing the basic concepts and philosophy of yoga and holistic wellness systems.					
Understanding: Explaining the role of yogic practices and lifestyle modifications in promoting mental, physical, and emotional well-being.					
Applying: Demonstrating proficiency in performing fundamental yoga asanas, breathing techniques (pranayama), and meditation practices.					
Analyzing: Analyzing the impact of yoga and wellness practices on stress, anxiety, and lifestyle-related health issues.					
Creating: Designing a personal wellness routine incorporating yogic practices, mindfulness, and healthy lifestyle habits suitable for individual needs.					

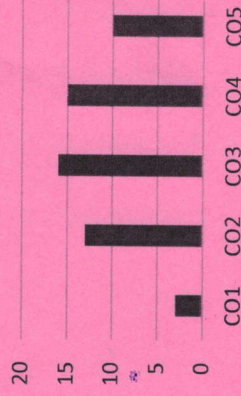
GRAPHICAL REPRESENTATION

BLOOM'S LEVEL WISE MARKS DISTRIBUTION



■ Level 1 ■ Level 2 ■ Level 3
■ Level 4 ■ Level 5 ■ Level 6

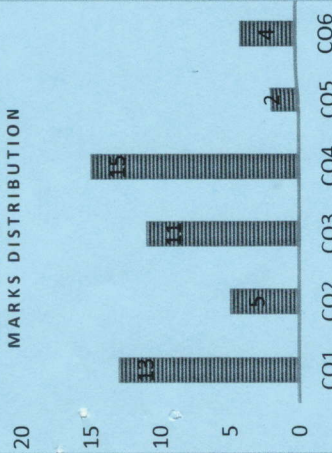
COURSE OUTCOME WISE MARKS DISTRIBUTION



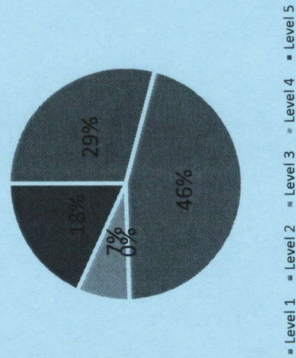
CO1	Explain the concept, objectives, and importance of entrepreneurship, with focus on biotech-based enterprises.
CO2	Differentiate types and classifications of entrepreneurs and understand characteristics of entrepreneurial personality.
CO3	Identify different forms of business organization and determine appropriate structure based on project needs.
CO4	Recognize and access institutional support systems such as DIC, NIESBUD, NSIC, and SIDO for enterprise development.
CO5	Formulate and appraise project proposals, particularly in biotechnology sectors.
CO6	Identify and evaluate potential biotechnology-based business ideas and develop basic marketing strategies for them.
CO7	Understand rural and women entrepreneurship concepts and their significance in inclusive economic growth.

GRAPHICAL REPRESENTATION

COURSE OUTCOME WISE MARKS DISTRIBUTION



Bloom's Level wise Marks Distribution



ARKA JAIN University
Jharkhand



[31-01-2026]
END SEM EXAMINATION
School of Health & Allied Sciences

Program	Bachelor of Science-Biotechnology	
Subject Name	Entrepreneurship Development	Session
Semester	I	Year
		Jan, 2026
	<ul style="list-style-type: none"> Start writing from 2nd page onwards; don't Write on the 1st Page Backside Answer all Questions of Section A (Compulsory) Answer Any Five 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 come under <u>Unfair Means</u> and will <u>Result in the Cancellation of the Papers.</u> 	
Time: 1.5 Hour		
Max. Marks : 35		
Knowledge Level (KL)	K1 : Remembering K2 : Understanding	K5 : Evaluating K6 : Creating

Section A (Each question Carry 01 Marks from Q1-i to v) – 05 Marks

Q.N	QUESTIONS	Marks	CO	KL
1				
i	Which type of entrepreneur introduces new products or methods? a) Imitative b) Fabian c) Innovative d) Drone	01	CO2	KL2
ii	The business form governed by the Indian Partnership Act, 1932 is: a) Sole proprietorship b) Partnership c) HUF d) Cooperative	01	CO3	KL1
iii	DIC stands for: a) District Industrial Council b) District Industries Centre c) Development Industrial Corporation d) District Investment Cell	01	CO4	KL1
iv	Nutraceuticals are products that provide: a) Only nutrition b) Only medicine c) Nutrition with health benefits	01	CO6	KL2

v	d) Industrial chemicals Biosensors are mainly used for: a) Decoration b) Detection and monitoring c) Food packaging d) Transportation	01	CO6	KL2
Section B (Answer any FIVE out of SIX) - 10 Marks (Each question Carry 02 Marks)				
Q. No.	QUESTIONS	Marks	CO	KL
2	Define entrepreneurship and discuss its importance.	02	CO1	KL2
3	What is role of District Industries Centre (DIC) in promoting entrepreneurship?	02	CO4	KL1
4	Describe the major problems faced by entrepreneurs in India.	02	CO2	KL4
5	Discuss the role of NSIC in supporting small and medium enterprises.	02	CO4	KL1
6	Write the steps involved in project formulation.	02	CO5	KL2
7	Explain the scope of business opportunities in the biotechnology sector.	02	CO6	KL4
Section C (Answer any TWO out of FOUR) - 20 Marks (Each question Carry 10 Marks)				
Q. No.	QUESTIONS	Marks	CO	KL
8	Discuss in detail the various forms of business organization – sole proprietorship and joint stock company.	10	CO3	KL1
9	Evaluate the effectiveness of institutional support systems in developing entrepreneurship in India.	10	CO4	KL5
10	Describe the factors which affect size of business organization	10	CO3	KL2
11	Classify the different types of entrepreneurship. Explain each type with suitable examples.	10	CO1	KL2