

Department of Zoology

M.Sc Zoology

PROGRAM OUTCOMES (PO)

PO1: Advanced Knowledge and Understanding

Graduates will possess an in-depth understanding of fundamental and advanced concepts across various disciplines, enabling them to apply this knowledge to solve complex problems and conduct innovative research. This encompasses advanced mathematical techniques, theoretical and classical physics, and comprehensive understanding in fields such as condensed matter physics, statistical mechanics, and thermodynamics.

PO2: Analytical and Problem-Solving Skills

Graduates will develop strong analytical skills, allowing them to critically assess and solve problems using various methodologies. They will be adept at utilizing mathematical and computational techniques, including numerical analysis, algorithm development, and programming, to model and solve intricate problems in their respective fields.

PO3: Research Proficiency and Methodological Expertise

Graduates will be equipped with advanced research skills, including literature review, research design, data collection, analysis, and interpretation. They will be capable of conducting independent research, presenting findings, and contributing to the academic community through publications and conferences.

PO4: Experimental and Practical Skills

Graduates will demonstrate proficiency in conducting advanced experiments, utilizing modern laboratory techniques, and adhering to safety protocols. They will be skilled in error analysis, data validation, and the application of practical knowledge to verify theoretical concepts.

PO5: Computational and Numerical Proficiency

Graduates will develop expertise in computational methods and numerical techniques, enabling them to perform simulations and solve complex problems in physics, mathematics, and other related fields. This includes proficiency in programming languages and software tools relevant to their discipline.

PO6: Interdisciplinary Integration and Application

Graduates will integrate knowledge from various disciplines to address complex research questions and practical challenges. They will be able to apply concepts from fields such as genetics, bioinformatics, physiology, and immunology to interdisciplinary problems, fostering innovation and collaboration.

PO7: Communication and Presentation Skills

Graduates will enhance their communication skills, both written and verbal, to articulate

complex concepts clearly and concisely. They will be proficient in presenting research findings, conducting seminars, and participating in comprehensive viva voce examinations.

PO8: Professional Development and Ethical Practices

Graduates will demonstrate professional development, ethical practices, and a commitment to lifelong learning. They will be prepared for professional roles in academia, industry, and beyond, with an understanding of the ethical implications of their work and the importance of continuous professional growth.

PO9: Cultural Sensitivity and Global Awareness

Graduates will cultivate cultural sensitivity and global awareness by engaging with diverse perspectives and traditions. They will appreciate the richness and diversity of their field, enabling them to navigate cultural differences with empathy and understanding.

PO10: Strategic Decision-Making and Management Skills

Graduates will develop strategic decision-making and management skills, enabling them to evaluate financial, organizational, and marketing strategies effectively. They will be adept at financial analysis, investment management, and applying quantitative techniques to support strategic decisions.

PO11: Adaptability to Emerging Trends and Technologies

Graduates will stay abreast of the latest trends and developments in their field, including emerging technologies and contemporary tools. They will be prepared to adapt to new advancements and incorporate innovative techniques into their research and professional practice.

PO12: Environmental and Societal Impact Awareness

Graduates will be aware of the environmental and societal impacts of their work, promoting sustainability and responsible practices. They will be equipped to contribute to conservation efforts, environmental management, and the development of solutions that address societal challenges.

Program Specific Outcomes (PSO)

Program Specific Outcomes (PSO)	Students will be able to.....	Program Outcomes (PO)
PSO1: Morphological Mastery	demonstrate a comprehensive understanding of animal morphology, spanning from invertebrates to vertebrates, and be able to elucidate the adaptations and modifications in various physiological functions across evolutionary transitions.	PO1, PO4
PSO2: Phylogenetic Proficiency	possess proficient knowledge of phylogenetic relationships among different animal groups, enabling them to construct cladograms and phylogenetic trees to appreciate the diversity, evolution, and adaptations in the animal kingdom.	PO1, PO3
PSO3: Taxonomic Expertise	exhibit expertise in animal taxonomy and phylogenetic biosystematics, including the application of cladistic analysis, allowing them to classify and categorize organisms based on morphological and phylogenetic characteristics.	PO1, PO2, PO3

<p>PSO4: Biological Research Acumen</p>	<p>demonstrate advanced skills in conducting research in evolutionary biology, ethology, and biochemistry, including experimental design, data collection, statistical analysis, and interpretation, fostering a culture of scientific inquiry and discovery.</p>	<p>PO3, PO4, PO5</p>
<p>PSO5: Cutting-edge Knowledge</p>	<p>stay abreast of the latest trends and developments in animal taxonomy and biosystematics, including molecular phylogeny and DNA barcoding techniques, equipping them with contemporary tools for species identification and classification.</p>	<p>PO11, PO3</p>
<p>PSO6: Fieldwork Proficiency</p>	<p>acquire practical skills in field ecology, enabling them to observe, document, and analyze ecological phenomena, species interactions, and ecosystem dynamics, contributing to conservation efforts and environmental management.</p>	<p>PO4, PO6</p>
<p>PSO7: Interdisciplinary Integration</p>	<p>integrate knowledge from diverse fields such as genetics, bioinformatics, physiology, and immunology to address complex research questions and practical challenges in animal biology, fostering interdisciplinary collaboration and innovation.</p>	<p>PO6, PO12, PO3</p>

Course Outcomes(CO)

Course	Course Outcome (CO)	Bloom's Taxonomy	Mapped PSO
ANIMAL DIVERSITY: PHYLOGENETIC AND TAXONOMIC APPROACHES	CO1: To understand the structure and organisation of organisms and to explain the modifications in various functions of animals during transition from invertebrates to vertebrates.	Understanding	PSO1
	CO2: To gain knowledge about the phylogenetic relationships among the different groups of animals and to develop a holistic appreciation of the diversity, phylogeny and adaptations in animals.	Understanding	PSO2
	CO3: To develop an in-depth knowledge on the principles and practices of animal taxonomy and phylogenetic biosystematics.	Understanding	PSO3
	CO4: To acquire a thorough understanding of cladistic analysis, construction of cladogram and phylogenetic trees.	Understanding	PSO3
	CO5: To understand the latest trends in animal taxonomy and biosystematics including molecular phylogeny, DNA barcoding, and operational taxonomic units.	Understanding	PSO5
EVOLUTIONARY BIOLOGY AND ETHOLOGY	CO1: To gain a deep understanding of the principles and mechanisms of evolutionary biology, including natural selection, genetic variation,	Understanding	PSO4

	adaptation, and molecular evolution.		
	CO2: To understand developmental and evolutionary genetics along with population genetics by studying concepts of gene flow, gene frequency, and Hardy Weinberg law leading to isolation and speciation.	Understanding	PSO4
	CO3: To comprehend primate evolution and human origins by studying the stages of primate evolution, geological time scale, mass extinction and its consequences.	Understanding	PSO2
	CO4: To develop a comprehensive knowledge of ethological concepts, including animal behaviour, behavioural ecology, behavioural genetics, communication, mating systems, social behaviour, and cognitive processes.	Understanding	PSO4
BIOCHEMISTRY	CO1: To develop an in-depth knowledge about the chemical nature of life and life processes.	Understanding	PSO7
	CO2: To understand the structure and functioning of biologically important molecules.	Understanding	PSO7
	CO3: To gain a deep understanding of the importance of metabolism of biomolecules in normal physiology of man.	Understanding	PSO4
	CO4: To acquire a thorough knowledge in the abnormal metabolism of biomolecules and resultant diseases.	Understanding	PSO4

	CO5: To gain an interest in the chemistry of biomolecules and explore the new developments in biochemistry.	Understanding	PSO7
BIOSTATISTICS AND RESEARCH METHODOLOGY	CO1: To understand the basic concepts of biostatistics, be able to appreciate the importance of statistics in life science research and prepare for a career in research.	Understanding	PSO4
	CO2: To develop advanced analytical and critical thinking skills through problem solving.	Analyzing	PSO4
	CO3: To demonstrate the ability to choose statistical methods appropriate to research data and develop skills in qualitative and quantitative data analysis.	Applying	PSO4
	CO4: To impart knowledge in research ethics and be able to develop innovative research design and research hypotheses for a research project.	Creating	PSO4
	CO5: To equip learners with enhanced report writing skills, presentation skills, computing skills and be able to prepare research papers and project proposals.	Applying	PSO4
ANIMAL DIVERSITY: EVOLUTIONARY, ETHOLOGICAL AND BIOCHEMICAL METHODS & APPROACHES	CO1: To identify and study about different species of vertebrates, invertebrates and larval forms and their morphological, phylogenetic, ecological and pathological significance.	Understanding	PSO1
	CO2: To understand and prepare keys and cladograms of various taxa based on their morphological, phylogenetic features.	Understanding	PSO3

	CO3: To acquire practical skills in conducting research in evolutionary biology and ethology. This includes designing experiments, data collection and analysis, fieldwork techniques, and the use of appropriate statistical methods.	Applying	PSO4
	CO4: To formulate and interpret the data by statistical analysis in experimental research.	Applying	PSO4
	CO5: To acquire analytical skills in biochemical estimations and critical problem solving skills in experimental research.	Applying	PSO7
FIELD ECOLOGY	CO1: To understand the basic theories and principles of ecology.	Understanding	PSO6
	CO2: To develop a comprehensive knowledge of animal adaptations to different environments.	Understanding	PSO6
	CO3: To understand the different aspects of population and its interactions.	Understanding	PSO6
	CO4: To gain critical understanding of man-made issues on the environment and to acquire the skills and techniques to solve and manage environmental issues.	Analyzing	PSO6
	CO5: To acquire an understanding of the basic tools and techniques in ecosystem monitoring.	Applying	PSO6

DEVELOPMENTAL BIOLOGY	CO1: To understand the fundamental concepts and principles of developmental biology, including cell differentiation, tissue development, organogenesis, and embryonic patterning.	Understanding	PSO7
	CO2: To gain knowledge about model organisms commonly used in developmental biology research by studying the axis and pattern formation of organisms such as Drosophila (fruit fly), Caenorhabditis elegans (roundworm) and Amphibians.	Understanding	PSO7
	CO3: To explain the role of genes and genetic regulation in development, including the processes of gene expression, signalling pathways, and the control of cell fate determination.	Understanding	PSO7
	CO4: To understand how developmental biology relates to human health and disease, including the study of developmental disorders, birth defects, and regenerative medicine.	Understanding	PSO7
	CO5: To recognize and discuss the ethical issues associated with developmental biology research, including the use of animals, stem cells, and human embryos.	Evaluating	PSO7
GENETICS AND BIOINFORMATICS	CO1: To gain a deep understanding of the fundamental principles and mechanisms of inheritance and variation.	Understanding	PSO7

	CO2: To understand the fine structure and molecular organization of genetic material and different levels of chromosome packaging.	Understanding	PSO7
	CO3: To acquire knowledge about the genetic mechanisms include, linkage, recombination, transposition, replication and mutation and how it affects inheritance and variation.	Understanding	PSO7
	CO4: To understand human genetics, quantitative genetics, population genetics along with epigenetics by studying concepts of karyotyping, pedigree analysis, Lod score, complex traits, heritability, epigenetic mechanisms and applications of molecular genetics.	Understanding	PSO7
	CO5: To expose the learners to the emerging field of bioinformatics and acquire knowledge about biological databases, sequence analysis, genomics, proteomics and systems biology.	Understanding	PSO7
MICROBIOLOGY AND BIOTECHNOLOGY	CO1: To understand the basic microbial structure and function and familiarize with basic microbial techniques.	Understanding	PSO7
	CO2: To gain a deeper understanding of the growth, microbial role in the environment and microbial interactions and communication.	Understanding	PSO7
	CO3: To develop an intensive and in-depth learning of the tools and techniques in biotechnology.	Applying	PSO7

	CO4: To acquire a thorough knowledge in the role of biotechnology in health care, industry, agriculture and environment.	Applying	PSO7
	CO5: To familiarize with the biosafety, bioethics and intellectual property rights and issues related to biotechnology.	Understanding	PSO7
DIVERSITY OF LIFE: ECOLOGICAL, EMBRYOLOGICAL, HEREDITARY AND MICROBIAL METHODS & APPROACHES	CO1: To acquire analytical skills in quantitative estimations in ecology and to inculcate in-depth knowledge about different ecosystems through field visits.	Applying	PSO6
	CO2: To acquire knowledge and skills in conducting genetics experiments. This includes genetics problem solving, culturing and sexing of Drosophila, study of mutants in Drosophila.	Applying	PSO7
	CO3: To acquire practical skills in conducting bioinformatics experiments. This includes database search and data retrieval, sequence alignment and phylogenetic tree construction using online tools and software.	Applying	PSO7
	CO4: To learn experimental techniques used in developmental biology research including vital staining.	Applying	PSO7
	CO5: To study the developmental stages of model organisms like Drosophila, Frog, Chick.	Understanding	PSO7

	CO6: To demonstrate basic laboratory skills in handling, culturing and identifying bacteria.	Applying	PSO7
ANIMAL PHYSIOLOGY	CO1: To understand the structure and function of major physiological systems in animals, including the nervous system, endocrine system, circulatory system, respiratory system, digestive system, excretory system, and reproductive system.	Understanding	PSO7
	CO2: To explain the cellular and molecular mechanisms underlying physiological processes in animals, such as membrane transport, cellular signaling, metabolism, and energy production.	Understanding	PSO7
	CO3: To understand the concept of homeostasis and how animals maintain a stable internal environment despite external changes and to study the mechanisms of feedback control, thermoregulation, osmoregulation, and acid-base balance.	Understanding	PSO7
	CO4: To compare and contrast physiological adaptations across different animal species and understand the principles of evolutionary physiology. Explore physiological diversity and how animals have adapted to various environments and lifestyles.	Understanding	PSO7

	CO5: To gain in-depth knowledge of the physiology of specific organ systems in animals, such as the nervous system (neurophysiology), cardiovascular system (cardiovascular physiology), respiratory system (respiratory physiology), and others.	Understanding	PSO7
	CO6: To understand how different physiological systems work together and are coordinated to maintain overall physiological function in animals. Study the integration of neural, endocrine, and other signaling pathways.	Understanding	PSO7
CELL AND MOLECULAR BIOLOGY	CO1: To acquire knowledge about the structural and functional details of the basic unit of life at the molecular level.	Understanding	PSO7
	CO2: To gain an intensive knowledge about the new developments in molecular biology and its implications in human welfare.	Understanding	PSO7
	CO3: To develop an in-depth knowledge about the structural and functional aspects cell and cell organelles.	Understanding	PSO7
	CO4: To explain the role of genes and genetic regulation in cellular responses, including the processes of gene expression, gene expression regulation, signaling pathways, cell cycle and the control of cell division and cell growth.	Understanding	PSO7

	CO5: To learn the basic properties of cancer cells, types of cancer, genetics of cancer and to explore new strategies for combating cancer.	Understanding	PSO7
BIOPHYSICS, INSTRUMENTATION AND BIOLOGICAL TECHNIQUES	CO1: To understand the physical principles, techniques and processes in the biological system and their applications in basic cellular functions.	Understanding	PSO7
	CO2: To appraise the importance of various biophysical and biochemical techniques in Zoology.	Understanding	PSO7
	CO3: To gain an in-depth theoretical knowledge about the operations of various tools and techniques available for biological studies.	Understanding	PSO7
	CO4: To develop an insight about the functions and fundamental applications of various instruments used in research labs.	Understanding	PSO7
	CO5: To learn the recent tools and techniques and to explore new scientific developments in biological research.	Understanding	PSO7
IMMUNOLOGY	CO1: To gain an intensive knowledge about the role of the immune system in human health and well-being.	Understanding	PSO7
	CO2: To understand the cells, organs and tissues involved in the immune system.	Understanding	PSO7
	CO3: To develop an in-depth knowledge about the functioning of the immune system.	Understanding	PSO7

	CO4: To understand the abnormalities and resultant diseases of the immune system and how it affects the different physiological systems.	Understanding	PSO7
	CO5: To learn the recent tools and techniques in immunology and to explore new scientific developments in immunology.	Understanding	PSO7
MOLECULAR, PHYSIOLOGICAL AND IMMUNOLOGICAL METHODS & APPROACHES IN BIOSCIENCES	CO1: To learn and apply experimental techniques used in animal physiology research, including physiological measurements, data analysis, and interpretation of experimental results. Develop skills in laboratory techniques.	Applying	PSO7
	CO2: To study Laboratory Simulations in Physiology.	Applying	PSO7
	CO3: To study and demonstrate the techniques of histological staining and histochemistry.	Applying	PSO7
	CO4: To learn and demonstrate cell and molecular biology research including detailed study of cells and nuclear materials.	Applying	PSO7
	CO5: To demonstrate operational skills of different instruments and illustrate their applications.	Applying	PSO7
	CO6: To study and understand the basic immunological techniques and their applications.	Applying	PSO7
	GENERAL MICROBIOLOGY AND PARASITOLOGY	CO1: To acquire knowledge of microorganism diversity, including taxonomy, morphology, physiology, and ecology, to understand their diverse nature.	Understanding

	CO2: To understand microbial growth processes, including phases and factors influencing growth, like temperature, pH, oxygen, and nutrient availability.	Understanding	PSO7
	CO3: To gain knowledge about antimicrobial agents, their mechanisms of action, and factors contributing to the emergence and spread of antimicrobial resistance.	Understanding	PSO7
	CO4: To learn about factors affecting food microbial growth, food preservation methods, water sources, and air quality. Understand treatment and disinfection principles, monitoring water quality, and microbial control measures in indoor and outdoor environments. Understand the potential impact of microorganisms on human health and implement air sampling and microbial control measures.	Understanding	PSO7
	CO5: To learn about parasite-host interactions, infection mechanisms, pathogenesis, and immune responses. Understand factors contributing to pathogenic virulence and host defense mechanisms, epidemiology principles, disease surveillance, outbreak investigation, and prevention strategies.	Understanding	PSO7

BACTERIOLOGY, VIROLOGY AND MYCOLOGY	CO1: To familiarize with the basic principles of medical microbiology and infectious disease. To know the conceptual basis for understanding pathogenic microbes and the mechanisms by which they cause disease in the human body.	Understanding	PSO7
	CO2: To learn the important pathogenic bacteria in human disease and also with respect to infections of the respiratory tract, gastrointestinal tract, urinary tract, skin and different other parts of the body system.	Understanding	PSO7
	CO3: To develop a comprehensive knowledge of different viruses, their properties, replication, types of infection, how viruses cause disease, immune response to infection and the inhibitory action of the antiviral chemotherapy. Also imparts a knowledge about emerging viruses and the role of viruses in oncogenesis.	Understanding	PSO7
	CO4: To understand the architecture of bacteriophages, their classification and the methods used in their study. To discern the replication strategies of representative viruses from the different classes and comprehend the intricate interaction between phages and host cells, and ways of preventing/ treating viral infections.	Understanding	PSO7

	CO5: To understand the essential concepts of Mycology which include the classification and basic techniques to identify the cultural and microscopic characters of fungi. To familiarize with the disease they cause in humans and their treatments.	Understanding	PSO7
CLINICAL MICROBIOLOGY	CO1: To understand the safety practices and basic laboratory techniques in microbiology and to familiarize with WHO safe code of practice for clinical microbiology laboratory.	Understanding	PSO7
	CO2: To acquire knowledge about the collection, transport and processing of various samples for microbial analysis.	Understanding	PSO7
	CO3: To learn comprehensively about the cultural, biochemical, serological and molecular diagnosis of infectious bacterial diseases.	Understanding	PSO7
	CO4: To gain knowledge about the different laboratory tests in the diagnosis of viral and fungal diseases and to appreciate the major measurements and varied laboratory techniques for prevention and control of these diseases ie., vaccines and antiviral drugs.	Understanding	PSO7
	CO5: To familiarize with varied methods and lab tests in the diagnosis of parasites and appreciate the role of lab animals in the medical field.	Understanding	PSO7

PRACTICAL: MICROBIOLOGY	CO1: To learn good microbiological practices in the laboratory, to know various culture media and their applications. and also understand various physical and chemical means of sterilization. To master aseptic techniques and be able to perform routine culture handling tasks safely and effectively.	Understanding	PSO7
	CO2: To perform staining, biochemical and cultural tests to characterize and identify microorganisms.	Understanding	PSO7
	CO3: To understand procedures for identification and cultivation of fungi.	Understanding	PSO7
	CO4: To perform serological diagnosis for various diseases.	Applying	PSO7
	CO5: To learn various methods for the enumeration of microorganisms and analysis of microbes in food.	Understanding	PSO7
SEMINAR/ASSIGNMENT	CO1: To provide opportunities for students to acquire and deepen their knowledge on specific topics within the field of study.	Understanding	PSO7
	CO2: To promote critical thinking skills by requiring students to evaluate information, analyze data, and synthesize complex concepts.	Analyzing	PSO7
	CO3: To help in effective communication both orally and in writing by discussing assigned topics in a group setting.	Applying	PSO7

	CO4: To develop research skills through literature reviews, data analysis, and evidence-based conclusions through conducting research and evaluating sources.	Applying	PSO7
	CO5: To develop their ability to apply theoretical knowledge to practical situations.	Applying	PSO7
	CO6: To develop time management and organizational skills by prioritizing tasks and completing activities within specified timelines.	Applying	PSO7
	CO7: To encourage student collaboration to develop interpersonal skills, appreciate diverse perspectives, and enhance teamwork effectiveness.	Applying	PSO7
FIELD VISIT	CO1: To develop observation skills, document organisms, habitats, and ecological processes to understand principles like succession, nutrient cycling, predator-prey dynamics, and community structure, while recognizing species interactions, adaptations, and ecosystem dynamics.	Analyzing	PSO6
	CO2: To provide firsthand experiences of ecological phenomena, allowing students to connect theoretical concepts with real-world examples.	Understanding	PSO6
	CO3: To practice various data collection techniques, learn sampling methods, measure environmental parameters, or collect specimens for further analysis.	Applying	PSO6

	CO4: To provide opportunities to assess and monitor habitats and ecosystems, evaluate ecosystem health, identify threats, and measure environmental factors that influence ecological communities.	Analyzing	PSO6
	CO5: To enhance species identification through direct observation, specimen collection, field guides, population surveys, and biodiversity monitoring for understanding distributions and conservation status.	Understanding	PSO6
	CO6: To gain proficiency in integrating field data with laboratory techniques and analytical tools to answer complex ecological research questions.	Applying	PSO6
	CO7: To observe ecosystems' roles in clean water, climate regulation, pollination, and recreational opportunities, emphasizing the significance of ecological conservation and sustainable resource management.	Understanding	PSO6
	CO8: To provide students with data and findings that can contribute to scientific publications and participate in scientific discussions within the ecological research community.	Applying	PSO6
INSTITUTE VISIT	CO1: To explore and familiarize themselves with advanced research facilities and equipment available at the institute.	Understanding	PSO7

	CO2: To facilitate networking, collaboration, and professional connections among faculty, researchers, and students within the scientific community.	Applying	PSO7
	CO3: To enhance research skills by learning new methodologies, techniques, data analysis, and computational tools, broadening their methodological repertoire.	Applying	PSO7
	CO4: To expose students in interdisciplinary research environments which broadens students' perspectives, encourages interdisciplinary thinking, and helps them understand research relevance within a larger scientific context.	Applying	PSO7
	CO5: To access specialized libraries, research archives, and digital resources to explore scientific literature, gather references, and improve literature review and citation skills.	Applying	PSO7
	CO6: To benefit from guidance on potential career paths, insights into the academic or industry landscape, and advice on professional growth within their field of study.	Applying	PSO7
	CO7: To inspire students by exposing them to successful researchers, innovative projects, and a vibrant research atmosphere, motivating them to pursue excellence in their own research endeavors.	Applying	PSO7

PROJECT	CO1: To provide skill development for critical thinking, problem-solving, experimental design, data collection, analysis, statistical methods, and scientific communication, valuing transferability in academic and professional contexts.	Creating	PSO7
	CO2: To address gaps and unanswered questions in the field, contributing to scientific understanding by exploring new research questions, providing insights into animal behavior, physiology, ecology, taxonomy or microbiology.	Analyzing	PSO7
	CO3: To evaluate literature, methodologies, and findings, refining information synthesization, identifying strengths and limitations, and identifying areas for future research. This process promotes intellectual growth and deeper understanding of the research topic.	Analyzing	PSO7
	CO4: To offer personal growth opportunities, fostering attributes like perseverance, resilience, adaptability, and self-motivation. Researchers gain confidence, independence, and self-reliance, overcoming challenges and setbacks.	Evaluating	PSO7
	CO5: To lead to scientific publications, allowing others to build upon and cite the work. These publications also enhance visibility within the scientific community through conferences and seminars.	Creating	PSO7

	CO6: To enhance their competitiveness for further studies, Ph.D. programs, or employment opportunities in academia, research institutions.	Creating	PSO7
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