LESSON PLAN

Objective Oriented Learning Process RBT

Programme	B.Sc. Zoology
Semester	I
Subject Title	Major Core: Invertebrata
Code	21UZOC11
Hours	5
Total Hours	75
Credits	5
Max Marks	100
Unit & Title	Unit: 1I – Coelenterata and Platyhelminthes
Name of the Faculty	Dr. S. Selvi
T-L tools	Lecture method, Visual aid: PPT, slide - Obelia colony

Prerequisite Knowledge:

Knowledge of general characters and classification of animals: Kingdom, Phylum, Class, etc

Micro planning



• Learning Materials: Diagrams of Coelenterata, multimedia resources (videos/pictures), chart paper, markers for mind maps.

1. Topic for Learning through Evocation:

Phylum Coelenterata is a group of aquatic, or marine organisms and a member of the Animal kingdom. They are usually found attached to the rocks at the bottom of the sea. These are the multicellular and simplest group of invertebrate animals, found in colonies or solitarily. hey are diploblastic animals, in which, the body is made up of two layers of cells ie., Ectoderm and Endoderm. They have cavities in their body. The body is radially symmetrical. The digestion is both intracellular and extracellular. The nervous system and the circulatory system is absent. They excrete and respire through simple diffusion. The mode of reproduction is asexual, which is through budding. The sexual mode of reproduction is seen only in a few Coelenterates. E.g., Hydra, Rhizostoma, Xenia, etc. Coelenterates are classified into three different classes ie., Anthozoa, Hydrozoa and Scyphozoa.

2. Topic Introduction:

Coelenterata (also called Cnidaria) is a diverse group of radially symmetrical animals, primarily marine, that include jellyfish, corals, and sea anemones. These animals have a simple body structure with a single opening functioning as both mouth and anus, and they possess specialized cells (cnidocytes) for capturing prey.

3.1 General Objective:

To understand the general characteristics, classification, and significance of the Phylum Coelenterata, and to recognize its importance in marine ecosystems.

3. 2 Specific Objectives:

By the end of the lesson, students should be able to:

- 1. Define the phylum Coelenterata and its significance.
- 2. List and explain the general characteristics of Coelenterates.
- 3. Describe the body symmetry and modes of reproduction in Coelenterates.
- 4. Identify key members of the phylum (jellyfish, corals, etc.).
- 5. Understand the role of cnidocytes in feeding and defense.

3.3: Taxonomy of Objectives (Bloom's Taxonomy):

	Taxonomy of Objectives					
Knowledge	The Cognitive	Process Dimensi	ion			
Dimension	Remember	Understand	Apply	Analyse	Evaluate	Create
A. Factual	1					
Knowledge						
B. Conceptual		1,2				
Knowledge						
C. Procedural				3,4		
Knowledge						
D. Meta Cognitive					2,3	
Knowledge						

3.4. Key Words: Coelenterata, Cnidocytes, Radial Symmetry, Medusa, Polyp, Nematocysts, Tentacles, Gastrovascular cavity and Reproduction (budding, sexual)

3.5. Diagram:





Discussion:

Discuss the structure and function of **cnidocytes** (specialized cells with stinging organelles). Explain the **life cycle** of Coelenterates, highlighting the alternation between the medusa and polyp forms. Explore the importance of Coelenterates in marine ecosystems, focusing on their role in food webs and coral reefs.

4. Mind Map:



5. Summary:

Coelenterata is a phylum of radially symmetrical animals with a simple body structure. Key members include jellyfish, sea anemones, and corals. They possess **cnidocytes** for capturing prey and protection. Coelenterates reproduce sexually or asexually and alternate between medusa and polyp forms. These animals are important for marine biodiversity and ecosystems.

6.Assessment through Stimulating Questions/Analogy/New Ideas and Concepts:

• Stimulating Questions:

- "How do Coelenterates capture and immobilize their prey?"
- "What might happen if all the corals in the world disappeared?"
- o "What adaptations do Coelenterates have to survive in marine environments?"

- Analogy: Compare the nematocysts in Coelenterates to a trap or safety mechanism, where they act as both a tool for defense and for feeding.
- New Ideas: Encourage students to think about the ecological roles of Coelenterates in marine food chains and the impact of climate change on coral reefs.

1	Where do we	find Coelentr	ate		
	a. Only fresh	water	b. Only marine	c. Aquatic	d. Terrestrial
2	State the function of gastrozoid				
	a. Feeding	b. Locomo	otion c.Defer	ce d. Repro	duction
3	Find the sexua	al zooid of <i>Ol</i>	pelia		
	a.Polyp	b. Medusa	c. Redia	d. Planula	
4	Find the majo	r part of coral	reefs?		
	a. Polyps	b. Algae	c. Marine life	l. Sand	

8. References:

- Campbell, N. A., Reece, J. B., & Urry, L. A. (2014). *Biology* (10th ed.). Pearson Education.
- Hickman, C. P., et al. (2008). Gastropods and Bivalves: From Coelenterates to Mollusks. Academic Press.

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Verified by Subject Expert

Approved by HOD

LESSON PLAN SAMPLE FOR SCIENCE

Objective Oriented Learning Process RBT

Programme	B.Sc. Botany
Semester	Ι
Subject Title	Allied: Invertebrate & Chordate Zoology
Code	21UZOA11
Hours	4
Total Hours	60
Credits	3
Max Marks	75
Unit & Title	Unit -IV Identification of poisonous and non poisonous snakes
Name of the Faculty	Dr. Jemma Hermelin Jesy Diaz
T-L tools	Lecture method, Power point, Group discussion

Prerequisite Knowledge: (2min)

Knowledge about reptiles, snakes, poisonous and non poisonous snakes

Micro -planning : 60 minutes



1. Topic for Learning through evocation (3min)

Poisonous (venomous) and non-poisonous (non-venomous) snakes can be an interesting and practical exercise in distinguishing between the two types is a key step in understanding the world of reptiles, their behaviors, and how to stay safe when encountering them.

2. Topic Introduction: (5 min)

Snakes are a diverse group of reptiles found in nearly every part of the world. They can be broadly classified into two categories based on their ability to harm humans: poisonous and nonpoisonous. Poisonous snakes, often referred to as venomous snakes, have evolved specialized glands and fangs to inject venom into their prey or predators. This venom can serve various purposes, such as immobilizing prey or breaking down its tissues for easier digestion. Only a small percentage of snakes worldwide are dangerous to humans. Non-poisonous snakes, do not possess venom glands or fangs that inject poison.

2.1. General Objective: (3 min)

Enables the students to identify the poisonous and non poisonous snakes

- **2.2. Specific Objectives: (5min)** Enables the students to:
 - 1. describe the general characters of snakes
 - 2. differentiate the poisonous and non poisonous snakes
 - 3. compare role of both venomous and nonvenomous snakes play in ecosystems
 - 4. analyze the venom of poisonous snakes for discovering new drugs

2.3: Taxonomy of objectives:

Taxonomy of Objectives						
Knowledge	The Cognitive	Process Dimens	ion			
Dimension	Remember	emember Understand Apply Analyze Evaluate Create				
A. Factual	1					
Knowledge						
B. Conceptual		3	3			
Knowledge						
C. Procedural				4		
Knowledge						
D. Meta Cognitive					2	
Knowledge						

2.4: Key words:

Poisonous, non poisonous snakes, venom, venom gland

2.5: Key diagrams (if any):



3. Discussion: (10 Min)

Students were asked to discuss about the different types of snakes and how to differentiate the poisonous and non poisonous snakes.

4. Mind Map: (5 min)



5. Summary: (10 min)

Poisonous (Venomous) Snakes: These snakes possess venom, which they inject into their prey or potential threats through fangs. The venom can be lethal or cause severe illness. Some common poisonous snakes cobras, vipers, sea snakes.

Non-poisonous Snakes: These snakes do not possess venom, so they rely on constriction or other methods to catch and kill their prey. They are generally harmless to humans. Some common non-poisonous snakes include corn snakes, garter snakes etc.

6. Assessment through Stimulating questions/Analogy/New ideas and Concepts: (2min)

- What features helps to differentiate venomous snakes from non-venomous ones?
- What are the common behaviors of venomous vs. non-venomous snakes?

7. FAQ's:

- 1. Which one of the following exhibit creeping or crawling mode of locomotion?
 - a. Amphibians b. Aves c. Reptiles d. Birds

2. The example for the poisonous snake is_____

a. Rat snake b. Python c. Typhlops d. Krait

3. Which among the following has a characteristic spectacle mark on the dorsal side of the hood?

a. Cobra b. Krait c. Viper d. Enhydrina

4. Poison glands of snake are the modified _____

a. pituitary gland b. scales c. fins d. salivary glands

8.References: (Books/Periodicals/Journals)

- 1.Nair N.C., Leelavathi S, and Soundara Pandian. N.A. Text book of Invertebrates. Nagercoil: Saras Publication, 2006.
- 2. Thangamani A, PrasannaKumar S, Narayanan L.M Arumugam N. Chordata Nagercoil: Saras Publication, 2006.
- 3. Arumugam N. Text Book of Chordates. Revised edition Nagercoil: Saras Publication, 2010.

Jerry Diaz

Verified by Subject Expert Dr. Jemma Hermelin Jesy Diaz

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LESSON PLAN

Objective Oriented Learning Process RBT

Programme	B.Sc. Zoology
Semester	I
Subject Title	PROFESSIONAL ENGLISH FOR ZOOLOGY – I
Code	21UZOPE1
Hours	2
Total Hours	30
Credits	2
Max Marks	30
Unit & Title	UNIT 3: NEGOTIATION STRATEGIES
Name of the Faculty	DR. R. SRI PRIYA
T-L tools	Black Board, Over Head projector, Google Class room

Prerequisite Knowledge: A basic knowledge of English grammar. Micro -planning



1. Warm up : (5 mins)

a. Icebreaker: "Negotiation Scenarios" (5-7 minutes)
Ask students: "When was the last time you negotiated something?" (It could be a salary, a price, a deadline, etc.)

Have them share brief stories in pairs or small groups.

b. Word Association Activity (5 minutes) Write "NEGOTIATION" in the center of the board. Ask students to brainstorm words related to negotiation (e.g., compromise, deal, persuasion, offer, counteroffer, agreement, terms).

2. Phonics and Sight words: (10 mins)

- a. Strengthen students' phonics skills by focusing on letter sounds and blending.
- b. Improve sight word recognition for better reading fluency.

3. Introduction to topic: (5 mins)

- a. Define negotiation
- b. Introduce students to the concept of **negotiation** and its importance.
- c. Discuss key elements, types, and skills needed for successful negotiation.

4. Effective lecture: (20 mins)

4.1. General objective: The students will be able to prepare themselves for negotiation in

English

4.2. Specific Objectives:

- Define negotiation and explain its importance in professional and personal contexts.
- Identify different types of negotiation (e.g., distributive, integrative, multi-party).
- Recognize key elements of negotiation, including interests, offers, counteroffers, and agreements.
- Describe the role of cultural differences in negotiation and how they impact communication styles.
- Apply negotiation techniques to real-world business or workplace situations.
- Develop problem-solving skills by resolving conflicts through negotiation.

5. Interactive activity: (10 mins)

Role play by depicting a negotiation between a supplier and a consumer.

6. Summary: (5 mins)

Summarize the various negotiation strategies and compile the phrases that can be used for an effective negotiation.

7. Review: (5 mins)

Recap the major points in negotiation strategy and take up quiz.

Taxonomy of objectives:

Taxonomy of objectives						
Knowledge		The Cognitive Process Dimension				
dimension	Remember	Understand	Apply	Analyse	Evaluate	Create
A. Factual	1					
Knowledge						
B. Conceptual		2				
Knowledge						
C. Procedural						
Knowledge			3			
D. Meta		4				
Cognitive						
Knowledge						

Key Words: Interview, Brainstorm, Argue, Negotiate

a. Mind Map:



FAQ's:

1. In a group discussion 'I don't agree that the plant has a heart beat' has to be said as

- a. I don't like your point b. You are wrong
- b. It doesn't make sense c. I disagree because
- 2. ______ should not be used in a group discussion.

a. I disagree because b. I see it differently because

- c. Can you explain please c. That is crap
- 3. _____ can be used instead of 'You are dead wrong' in a discussion.

a. It might be better to b. I don't agree

- c. It is crap d. It doesn't make sense
- 4. Find one word for the following sentence.

"Essential elements required by plants in relatively low concentrations."

a. Macronutrients b. Micronutrients c. Sunlight d. Water

5. A substance that provides nourishment essential for the maintenance of life and for growth.

a. Nutrient b. Oxygen c. Carbon dioxide d. Sunlight

Books for Reference

1. English for Life Sciences, Tamil Nadu State Council for Higher Education (TANSCHE)

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Verified by Subject Expert

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LESSON PLAN

Objective Oriented Learning Process RBT

Programme	B.Sc. Zoology
Semester	VI
Subject Title	Chordata
Code	21UZOC21
Hours	6
Total Hours	100
Credits	4
Max Marks	100
Unit & Title	Unit III: Bird Migration: Patterns, Mechanisms, and Adaptations
Name of the Faculty	Dr. S.R.T. Sherly Cross
T-L tools	Lecture method, Visual aids (Videos)

Prerequisite Knowledge:

Basic understanding of animal behavior, ecological adaptations, and environmental changes affecting species movement

Micro -planning



1. Topic for Learning through evocation

Have you ever wondered how birds travel thousands of kilometers without getting lost? From the Arctic Tern's 70,000 km journey to the seasonal migration of swallows, bird migration is one of nature's most fascinating phenomena. Why do birds migrate, and how do they navigate across vast landscapes? How do climate change and human activities affect these migratory patterns? Today, we will explore the science behind bird migration, understanding its patterns, mechanisms, and the incredible adaptations that enable birds to embark on these epic journeys.

2. Topic Introduction:

Bird migration is one of nature's most extraordinary phenomena, involving the seasonal movement of birds across vast distances in search of food, breeding grounds, and favorable climates. Different species of birds follow specific migratory routes, known as flyways, using innate biological mechanisms and environmental cues for navigation. Factors such as climate change, habitat destruction, and human intervention significantly impact migration patterns, making conservation efforts essential. By studying bird migration, scientists gain insights into ecological balance, species interactions, and the broader implications of environmental changes on biodiversity

3.1 General Objective:

To enable students to understand the biological significance, mechanisms, and conservation concerns related to bird migration.

3.2 Specific Objectives:

Enables the students to:

- Define bird migration and explain its significance.
- Identify different types of migration patterns among bird species.
- Explain the physiological and behavioral adaptations for long-distance migration.
- Analyze the role of environmental factors in influencing migratory behavior.
- Evaluate conservation strategies to protect migratory bird species

Taxonomy of Objectives						
Knowledge	The Cognitiv	e Process Dimens	sion			
Dimension	Remember	Understand	Apply	Analyse	Evaluate	Create
A. Factual	1					
Knowledge						
B. Conceptual		1,2				
Knowledge						
C. Procedural				3,4		
Knowledge						
D. Meta Cognitive					2,3,4	
Knowledge						

3.4 : Key words:

Migration, Flyways, Navigation, Seasonal Adaptation, Stopover Sites, Conservation, Climate Change.

3.5 : Key diagrams (if any):

• Maps of Major Bird Migration Routes (Flyways)





Discussion:

Encourage students to think about how birds navigate long distances and the challenges they face. Discuss how modern tracking techniques, such as satellite telemetry, help scientists study migration patterns. Relate migration to climate change and habitat destruction.

4. Mind Map:



5. Summary:

Bird migration is a seasonal movement influenced by environmental factors and genetic predisposition. Birds utilize various navigation methods, including the Earth's magnetic field, the position of the sun, and even star maps for nocturnal migration. However, habitat destruction, climate change, and hunting pose significant threats. Conservation efforts are crucial to ensuring the survival of migratory species.

6. Assessment through Stimulating questions/Analogy/New ideas and Concepts:

- How do birds find their way during long-distance migration without GPS?
- What are the major factors influencing migration timing and routes?
- How does climate change impact migratory bird populations?
- What are the potential conservation strategies to mitigate threats to migratory birds?
- Can artificial intelligence and modern technology help in tracking and conserving migratory birds?

7. FAQ's:

What is the primary reason birds migrate?
a) To escape predators
b) To find food and breeding grounds
c) To avoid competition
d) To explore new territories
Which bird is known for the longest migration distance?
a) Arctic Tern
b) Swallow
c) Bar-tailed Godwit
d) Peregrine Falcon
How do birds use the Earth's magnetic field for navigation?
a) Through iron-rich cells in their beaks
b) By following other birds
c) By sensing the wind patterns
d) By using water currents
What is a key threat to migratory bird populations?
a) Increased rainfall
b) Habitat destruction
c) Less food availability in summer
d) Too many stopover sites

8. References

- 1. Newton, I. (2008). The Migration Ecology of Birds. Academic Press.
- 2. Berthold, P. (2001). Bird Migration: A General Survey. Oxford University Press.
- 3. Gill, F. B. (2007). Ornithology (3rd ed.). W.H. Freeman and Company.
- 4. Convention on Migratory Species (CMS) Reports and Publications.

Verified by Subject Expert

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Approved by HOD

LESSON PLAN

Objective Oriented Learning Process RBT

Programme	B.Sc. Botany
Semester	II
Subject Title	Allied II Genetics, Physiology and Developmental Zoology
Code	21UZOA21
Hours	4
Total Hours	60
Credits	3
Max Marks	100
Unit & Title	Respiration: Haemoglobin – transport and exchange of
	Oxygen and Carbondioxide
Name of the Faculty	Dr.M. PARIPOORANASELVI
T-L Tools	Lecture method, Visual aid: PPT

Prerequisite Knowledge:

- Understanding of basic respiratory anatomy (lungs, alveoli).
- Knowledge of gas properties (oxygen and carbon dioxide).
- Familiarity with cellular respiration and blood circulation.

Micro -planning



Topic for Learning through evocation:

Have you ever wondered how your body gets oxygen to every cell and removes carbon dioxide, especially when you're running or exercising?"

- 1. Why do we breathe faster when we exercise?
- 2. How does blood carry oxygen and carbon dioxide simultaneously?

Hemoglobin is like a delivery truck—picking up oxygen at the lungs and dropping it off at tissues, then collecting carbon dioxide for removal.

At high altitudes, oxygen levels drop, making it harder for hemoglobin to transport enough oxygen, leading to dizziness and fatigue.

Topic Introduction:

Respiration is essential for life, involving gas exchange in the lungs and tissue cells.

Hemoglobin, a specialized protein in red blood cells, plays a central role in transporting

oxygen from the lungs to tissues and carrying carbon dioxide back to the lungs for exhalation.

General Objective:

To understand the role of hemoglobin in the transport and exchange of respiratory gases.

Specific Objectives:

By the end of the lesson, students will be able to:

- Explain the structure and function of hemoglobin.
- Describe how hemoglobin binds and releases oxygen.
- Understand the Bohr effect and its physiological significance.
- Illustrate the transport of carbon dioxide in blood.
- Analyze factors affecting gas exchange efficiency.

Taxonomy of objectives:

	TAXONOMY OF OBJECTIVES								
Knowledge Dimension		COGNITIVE PROCESS DIMENSION							
		Remember	Understand	Apply	Analyze	Evaluate	Create		
A	Factual Knowledge	1							
B	Conceptual Knowledge		1	1.2					
С	Procedural Knowledge				1,2,3				
D	Meta Cognitive					2,3			
	Knowledge								

Key words: Hemoglobin, oxyhemoglobin, Bohr effect, carbaminohemoglobin, partial

pressure, gas exchange

Key diagrams:

Structure of Haemoglobin



Oxyhemoglobin dissociation curve



Gas exchange at the alveoli and tissue levels



Discussion:

1. Structure of Hemoglobin:

- Quaternary protein made of four subunits (two alpha, two beta).
- Each subunit contains a heme group that binds oxygen.

2. Oxygen Transport:

- Oxygen binds to hemoglobin in the lungs, forming oxyhemoglobin.
- Dissociation occurs at tissues where oxygen is needed.

3. Bohr Effect:

- Hemoglobin's oxygen affinity decreases at lower pH (higher CO2 levels), enhancing oxygen release.
- Importance during exercise: Increased CO2 production leads to better oxygen delivery to muscles.

4. Carbon Dioxide Transport:

- 70% as bicarbonate ions
- 20% bound to hemoglobin (carbaminohemoglobin)
- 10% dissolved in plasma

5. Factors Affecting Gas Exchange:

- Partial pressures of gases
- pH levels and temperature
- Presence of respiratory diseases



Mind Map:

Summary:

Hemoglobin is essential for efficient respiratory gas transport. Its ability to bind and release oxygen is influenced by pH and carbon dioxide levels (Bohr effect). Carbon dioxide is transported in multiple forms, primarily as bicarbonate ions. Understanding these mechanisms is critical for comprehending respiratory physiology and clinical conditions.

Assessment through Stimulating questions/Analogy/New ideas and Concepts:

- Why does hemoglobin release oxygen more easily during exercise?
- How would a mutation affecting hemoglobin structure impact oxygen transport?
- Imagine hemoglobin as a delivery truck. What factors would make the truck faster or slower in delivering its goods (oxygen)?
- What would happen if carbon dioxide could not bind to hemoglobin?

FAQ's

1. Why is hemoglobin essential for oxygen transport?

Hemoglobin increases the oxygen-carrying capacity of blood, allowing efficient delivery to tissues.

2. What is the Bohr effect?

The Bohr effect describes how lower pH (higher CO2 levels) decreases hemoglobin's oxygenbinding affinity, promoting oxygen release.

3. How is most carbon dioxide transported in the blood?

As bicarbonate ions formed through the reaction with water and carbonic anhydrase enzyme.

References

- 1. Guyton, A.C., & Hall, J.E. (2020). Textbook of Medical Physiology.
- 2. Campbell, N.A., & Reece, J.B. (2017). Biology. Pearson Education.
- 3. Marieb, E.N., & Hoehn, K. (2019). Human Anatomy & Physiology.

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9. Verified by Subject Expert Dr.M.Paripooranaselvi

LESSON PLAN

Objective Oriented Learning Process RBT

Programme	B.Sc. Zoology
Semester	П
Subject Title	PROFESSIONAL ENGLISH FOR ZOOLOGY – II
Code	21UZOPE2
Hours	2
Total Hours	30
Credits	2
Max Marks	30
Unit & Title	UNIT 5: CRITICAL THINKING SKILLS
Name of the Faculty	DR. R. SRI PRIYA
T-L tools	Black Board, Over Head projector, Google Class room

Prerequisite Knowledge: A basic knowledge of English grammar. Micro -planning



1. Warm up : (5 mins)

Icebreaker: Question the students about the importance of note making.

2. Phonics and Sight words: (5 mins)

Strengthen students' phonics skills by focusing on letter sounds and blending of key words used for notes making. Introduction to topic

3. Effective lecture: (20 mins)

a. General objective: Preparation of a notes for a given essay.

b. Specific Objectives:

- Why notes making is important.
- What format suits you best.
- Different formats for notes making.

4. Interactive Activity (10 Mins):

The students will be given a paragraph and they will be asked to make a concise notes using any one method

5. Summary: (5 mins) Summarize the different methods of notes making and discuss the role of notes making during class room teaching

6. Review: (5 mins) Review the discussion in class room and attend a quiz.

Taxonomy of objectives								
Knowledge	The Cognitive Process Dimension							
dimension	Remember	Understand	Apply	Analyse	Evaluate	Create		
A. Factual	1							
Knowledge								
B. Conceptual		3						
Knowledge								
C. Procedural			4			2		
Knowledge								
D. Meta								
Cognitive								
Knowledge								

Taxonmy of objectives:

Key Words: Annotation, Linear notes, Cornell, Mindmaps, Sketch map

Mind Map:



FAQ's:

- 1. What is the main purpose of making notes?
 - A) To copy everything from the source
 - B) To organize and summarize key information
 - C) To make writing more complicated
 - D) To replace textbooks
- Answer: B) To organize and summarize key information
- 2. Which of the following is NOT a characteristic of good notes?
 - A) Clear and concise
 - B) Well-organized
 - C) Written in complete sentences
 - D) Includes key points
- Answer: C) Written in complete sentences
- 3. What is the most effective method for structuring notes?
 - A) Writing everything in paragraph form
 - B) Using a structured format like bullet points, numbering, or mind maps
 - C) Copying directly from the textbook
 - D) Writing without headings or organization
- Answer: B) Using a structured format like bullet points, numbering, or mind maps
- 4. Which note-taking method is most useful for organizing information into key topics and subtopics?
 - A) The Outline Method
 - B) The Cornell Method
 - C) The Sentence Method
 - D) The Mapping Method
- Answer: A) The Outline Method
- 5. What are the three main sections of the Cornell Note-Taking Method?
 - A) Title, Body, Conclusion
 - B) Summary, Keywords, Notes
 - C) Questions, Notes, Summary
 - D) Introduction, Discussion, References
- Answer: C) Questions, Notes, Summary
- 6. Which of the following is an advantage of using abbreviations in note-making?
 - A) Makes notes longer
 - B) Saves time and space
 - C) Makes notes harder to understand
 - D) Avoids critical details
- Answer: B) Saves time and space
- 7. What is the purpose of reviewing and revising notes?
 - A) To add unnecessary details
 - B) To improve understanding and retention
 - C) To make notes look more decorative
 - D) To write more paragraphs
- Answer: B) To improve understanding and retention
- 8. Mind mapping is a note-taking method that is best used for:
- A) Linear and sequential notes
 - B) Visual representation of ideas and concepts
 - C) Copying information word-for-word

D) Writing long paragraphs Answer: B) Visual representation of ideas and concepts

9. What should be avoided when making notes?

A) Highlighting key points

B) Writing in your own words

C) Copying large portions of text

D) Using symbols and abbreviations

Answer: C) Copying large portions of text

10. Which of the following tools can help in digital note-making?A) Microsoft Word and Google DocsB) Evernote and OneNote

C) Notion and Trello

D) All of the above Answer: D) All of the above

Books for Reference

1. English for Life Sciences, Tamil Nadu State Council for Higher Education (TANSCHE)

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LESSON PLAN

Objective Oriented Learning Process RBT

Programme	B.Sc.Zoology
Semester	III
Subject Title	Developmental Zoology
Code	21UZOC31
Hours	4
Total Hours	60
Credits	4
Max.Marks	100
Unit&Title	Unit:III – Gastrulation in Human
Name of the Faculty	Dr.Mary Baptista Janet
T-Ltools	Lecture method, Visual aid: PPT, Videos

PrerequisiteKnowledge:

Knowledgeof Fertilization, Cleavage, Blastula.

Micro-planning



1. Topic for Learning through evocation

To learn about gastrulation in humans through evocation, students can first be prompted to recall earlier stages of embryonic development, such as fertilization, cleavage, and the formation of the blastula. Questions like "What happens after a sperm fertilizes an egg?" and "What do you think happens when cells in the early embryo start to move and change their positions?" will encourage students to connect their understanding of cell division and differentiation to the more complex process of gastrulation. By invoking these ideas, they can better understand how the three germ layers—ectoderm, mesoderm, and endoderm—form through cell migration and folding, setting the foundation for organ development.

1.1 Topic Introduction:

Gastrulation in humans is a crucial stage in early embryonic development where the foundations of the body's structure are established. During this process, the single-layered blastula transforms into a multi-layered structure, forming three primary germ layers: the ectoderm, mesoderm, and endoderm. These layers give rise to all the tissues and organs of the body. Gastrulation is characterized by dramatic movements of cells, including invagination, involution, and migration, that create the primitive streak and establish the body's axes. This stage not only sets up the blueprint for the entire organism but also plays a critical role in signaling for later stages of development, such as organogenesis. Understanding gastrulation is essential for grasping how the complex human body plan develops from a simple fertilized egg.

1.2 General Objective:

To understand the process of gastrulation in human development, including the formation of the three germ layers (ectoderm, mesoderm, and endoderm) and their role in establishing the body plan and organ formation.

1.3 Specific Objectives:

Enables the students to:

- Explain the process of gastrulation
- Identify the three primary germ layers
- Understand the key events of gastrulation
- Recognize the cellular movements involved in gastrulation

2.3: Taxonomy of Objectives:

Taxonomy of Objectives								
Knowledge	Knowledge The Cognitive Process Dimension							
Dimension	Remember	Understand	Apply	Analyse	Evaluate	Create		

A. Factual	1	2				
Knowledge						
B.Conceptual			3			
Knowledge						
C.Procedural				4		
Knowledge						
D.MetaCognitive					5	
Knowledge						
_						

2.4:Key words:

Ectoderm, Mesoderm, Endoderm.

2.5:Key diagrams (if any):



3. Discussion:

Students will engage in discussing the roles of the ectoderm, mesoderm, and endoderm in gastrulation, and how do they contribute to the formation of specific organs and tissues in the body

4. Mind Map:



5. Summary:

Gastrulation is a crucial phase in embryonic development, where the single-layered blastula reorganizes into a multi-layered structure called the gastrula. This process involves the formation of three primary germ layers: the ectoderm, mesoderm, and endoderm. These layers give rise to all tissues and organs in the body. During gastrulation, cells undergo significant movements, including invagination, involution, and migration, to establish the basic body plan. The development of the primitive streak marks the onset of gastrulation in many animals, and the process is fundamental for ensuring proper tissue differentiation and organ formation later in development.

6. Assessment through Stimulating questions/Analogy/New ideas and Concepts:

• How might the process of gastrulation in humans differ from that in other

animals, like frogs or birds, and what can these differences tell us about human evolution?

7. FAQ's:

What is the primary purpose of gastrulation in human development?
a) To form the placenta
b) To establish the three primary germ layers
c) To start organogenesis
d) To form the neural tube
Which of the following is NOT one of the three primary germ layers formed during
gastrulation?
a) Ectoderm
b) Mesoderm
c) Endoderm
d) Epiblast
What structure marks the beginning of gastrulation in humans?
a) Primitive streak
b) Neural plate
c) Blastocyst
d) Somite
During gastrulation, the ectoderm gives rise to which of the following?
a) Muscles
b) Skin and nervous system
c) Lungs and digestive system
d) Heart and kidneys
What is the function of the primitive streak during human gastrulation?
a) To produce the neural tube
b) To serve as the site for cell migration and formation of the three germ layers
c) To create the amniotic sac
d) To form the heart

8. References

1. Berril. M.J. Developmental Biology. New Delhi: Tata Mc Graw-Hill Publishing Company Ltd. 1982

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Verified by Subject Expert

N. Milinga Mary

Approved by HOD

LESSON PLAN

Objective Oriented Learning Process RBT

Programme	II B.Sc. Zoology
Semester	III
Subject Title	Fishery Product
Code	21UZOS31
Hours	2
Total Hours	30
Credits	2
Max Marks	50
Unit & Title	Unit II: Chitosan Preparation: Methods, Properties, and Applications
Name of the Faculty	Dr. S.R.T. Sherly Cross
T-L tools	Lecture method, Visual aids (Videos)

Prerequisite Knowledge:

Basic understanding of biopolymers, marine biology, and the chemical properties of chitin and its derivatives.

Micro -planning



1. Topic for Learning through evocation

Have you ever wondered how shrimp and crab shells can be converted into valuable biomedical materials? Chitosan, a unique biopolymer, has versatile applications, from wound healing to water purification. But how is it prepared, and what makes it so special? Today, we will explore the methods of chitosan extraction, its physicochemical properties, and its wide-ranging applications in modern industries.

2. Topic Introduction:

Chitosan is a natural biopolymer derived from chitin, the second most abundant biopolymer in nature, primarily obtained from crustacean shells. It has gained significant attention in various fields, including biomedical, pharmaceutical, agricultural, and environmental sciences. The preparation of chitosan involves deacetylation of chitin under alkaline conditions, altering its solubility and functional properties. Understanding chitosan's preparation, structure, and applications can help students appreciate its diverse industrial and scientific uses.

3.1 General Objective:

To enable students to understand the preparation, properties, and applications of chitosan.

3.2 Specific Objectives:

Enables the students to:

- Define chitosan and explain its origin.
- Identify the chemical process involved in chitosan preparation.
- Explain the physical and chemical properties of chitosan.
- Analyze the various applications of chitosan in different industries.
- Evaluate the environmental and biomedical benefits of chitosan

3.3 : Taxonomy of objectives:

Taxonomy of Objectives							
Knowledge	Knowledge The Cognitive Process Dimension						
Dimension	Remember	Understand	Apply	Analyse	Evaluate	Create	
A. Factual	1						
Knowledge							
B. Conceptual		1,2					
Knowledge							
C. Procedural				3,4			
Knowledge							
D. Meta Cognitive					2,3,4		
Knowledge							

3.4 : Key words:

Chitosan, Chitin, Deacetylation, Biopolymer, Biomedical Applications, Water Purification.

3.5 : Key diagrams (if any):


Discussion:

Encourage students to think about the importance of chitosan in sustainable applications. Discuss its role in medicine, food preservation, and environmental science. Highlight modern research trends in chitosan-based drug delivery and biomaterials.

4. Mind Map:



5. Summary:

Chitosan is an essential biopolymer derived from chitin, known for its biodegradable, biocompatible, and non-toxic properties. The preparation process involves deacetylation, affecting its solubility and application potential. Chitosan has significant uses in medicine, agriculture, water treatment, and food preservation. Its sustainable and eco-friendly nature makes it a promising material for future innovations.

6. Assessment through Stimulating questions/Analogy/New ideas and Concepts:

- How does deacetylation affect the properties of chitosan?
- What are the advantages of using chitosan over synthetic polymers?
- How can chitosan be utilized in drug delivery systems?
- What role does chitosan play in water purification?
- How can biotechnology improve the efficiency of chitosan production?

7. FAQ's:

1. What is chitosan derived from?
a) Plant fibers
b) Crustacean shells
c) Fungal spores
d) Synthetic polymers
2. Which process is essential for chitosan preparation?
a) Fermentation
b) Deacetylation
c) Hydrolysis
d) Polymerization
3. What is one of the major applications of chitosan?
a) Fuel generation
b) Biomedical use
c) Metal fabrication
d) Glass manufacturing
4. Why is chitosan considered environmentally friendly?
a) It is biodegradable and non-toxic
b) It is made from petroleum
c) It is resistant to decomposition
d) It emits harmful gases

8. References

- 1. Rinaudo, M. (2006). Chitin and Chitosan: Properties and Applications. Progress in Polymer Science.
- 2. Jayakumar, R., Prabaharan, M., et al. (2010). Chitosan-Based Biodegradable Materials in Medicine. *Biotechnology Advances*.
- 3. Peter, M. G. (1995). Applications and Environmental Aspects of Chitin and Chitosan. *Journal of Macromolecular Science*.
- 4. Kumar, M. N. V. R. (2000). A Review of Chitin and Chitosan Applications. *Reactive and Functional Polymers*.

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Objective Oriented Learning Process RBT

Programme	B.Sc. Zoology
Semester	III
Subject Title	BASIC BIOTECHNOLOGY
Code	21UZON31
Hours	2
Total Hours	30
Credits	2
Max Marks	30
Unit & Title	UNIT 4: Genetic Modification of Organisms
Name of the Faculty	DR. R. SRI PRIYA
T-L tools	Black Board, Over Head projector, Google Class room

Prerequisite Knowledge: A basic knowledge in biology.

Micro -planning



a. Warm up: (5 mins)

Discussion about the implications of biotechnology in welfare of human beings.

- b. Introduction to topic (10 minutes)
 - a. Start with a question: "Have you ever eaten genetically modified food?"
 - b. Briefly explain Genetic Modification:
 - c. Real-Life Importance
- c. Historical Overview: (5 mins)

Explain about the first events and historical milestones in development of transgenic animals.

4. Explanation of Key Concepts (20 minutes)

General Objective:

To understand about genetically modified organisms.

Specific Objectives

- a. Understand the concept of transgenic organisms and their role in biotechnology.
- b. Describe methods of producing transgenic animals using techniques like microinjectionmediated gene transfer.
- c. Identify and analyze examples of GMOs, including the Super Mouse, Goldfish, focusing on their genetic modifications and potential benefits and concerns.

5. Discussion & Debate (10minutes)

a. Are GMOs safe for humans and the environment?

6. Conclusion (5 minutes)

a. Summarize Key Learnings and present the conclusive remarks on the risks and benefits of transgenic organisms.

7. Review :

Review about the various genetically modified organisms with quiz.

Taxonomy of o	Taxonomy of objectives					
Knowledge		The Co	gnitive Pro	ocess Dime	nsion	
dimension	Remember	Understand	Apply	Analyse	Evaluate	Create
A. Factual	1					
Knowledge						
B. Conceptual		2				
Knowledge						
C. Procedural			3			
Knowledge						
D. Meta				4		
Cognitive						
Knowledge						

Taxonomy of objectives:

Key Words: Bt. Cotton, Golden rice, Glo fish, Enviro pig, Agrobacterium, Microinjection

Mind Map:



Review questions

- 1. Define genetic modification.
- 2. Name two methods used for genetic modification.
- 3. What is the role of Agrobacterium tumefaciens?
- 4. What is a major benefit of Golden Rice?
- 5. Why is Bt Cotton important in agriculture?

Books for Reference

1. Dubey, R.C. *A Textbook of Biotechnology*. New Delhi: S. Chand and Company Ltd., 2009.

2. Rastogi, S.C. *Biotechnology Principles and Applications*. Chennai: Reprint, Narosa. Publishing House, 2020.

3. Singh, B.D. Biotechnology. New Delhi: Kalyani Publishers. 2015.

4. Sathyanarayana, V. *Biotechnology*. Kolkatta:. Books and Allied (P) Ltd. 15th Edition. 2020.

5. Harisha S. *Biotechnology Procedures and Experiments Hand Book*. New Delhi: Lakshmi Publications. First Edition. 2008.

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Dr. R. Sri Priya Verified by Subject Expert

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Objective Oriented Learning Process RBT

Programme	B.Sc. Zoology
Semester	III
Subject Title	Women's Synergy
Code	21UAWS31
Hours	2
Total Hours	30
Credits	2
Max Marks	100
Unit & Title	Reproductive health – Hormonal Cycle and its Psycho-somatic
	implications
Name of the Faculty	Dr.M. PARIPOORANASELVI
T-L Tools	Lecture method, Visual aid: PPT

Prerequisite Knowledge:

- Basic understanding of the human reproductive system
- Awareness of hormones and their role in bodily functions
- Familiarity with menstruation

Micro -planning



Topic for Learning through evocation:

Imagine waking up one morning feeling energetic and positive, but a few days later, experiencing irritability, fatigue, and body aches without any clear reason. Have you ever wondered how these changes are connected to your body's hormonal rhythms?"

- Hormones act like "musical conductors" in the body's orchestra, coordinating physical and emotional responses throughout the cycle.
- The menstrual cycle can be likened to "seasons" phases of growth, release, preparation, and rest.

"Studies show that hormonal fluctuations during the menstrual cycle can affect not only mood but also cognitive functions like memory and decision-making."

Topic Introduction:

The hormonal cycle plays a central role in reproductive health, influencing both physical and psychological states. Understanding its regulation and psycho-somatic effects helps in promoting well-being and addressing menstrual health issues.

General Objective:

To understand the hormonal regulation of the reproductive cycle and its physical and emotional impacts.

Specific Objectives:

By the end of this lesson, students will be able to:

- Describe the hormonal phases of the menstrual cycle.
- Explain the functions of key reproductive hormones.
- Analyze psycho-somatic implications of hormonal fluctuations.
- Identify common hormonal cycle disorders and management strategies.

Taxonomy of objectives:

	TAXONOMY OF OBJECTIVES						
	Knowledge Dimension COGNITIVE PROCESS DIMENSION						
		Remember	Understand	Apply	Analyze	Evaluate	Create
A	Factual Knowledge	1					
B	Conceptual Knowledge		1	1.2			
С	Procedural Knowledge				1,2,3		
D	Meta Cognitive					2,3	
	Knowledge						

Key words: Hormonal cycle, estrogen, progesterone, follicular phase, luteal phase, PMS,

psycho-somatic

Key diagrams:





Phases of the menstrual cycle (follicular, ovulation, luteal, menstruation)



Brain-hormone interaction chart



Discussion:

1. Hormonal Regulation:

- Follicular Phase: Rise in estrogen; promotes follicle development
- Ovulation: LH surge; egg release
- Luteal Phase: Progesterone rise; prepares the uterus for implantation
- Menstruation: Hormone levels drop; shedding of the uterine lining

2. Psycho-Somatic Implications:

- Physical symptoms: bloating, cramps, fatigue
- Psychological symptoms: mood swings, anxiety, irritability
- Impact on daily activities and mental health

3. Disorders and Management:

- Premenstrual Syndrome (PMS) and Premenstrual Dysphoric Disorder (PMDD)
- Lifestyle changes (exercise, balanced diet)
- Hormonal therapies and mental health counseling

Mind Map:

[Hormonal Cycle]

- - Ovulation
- Luteal Phase
- └── Menstruation
- Bloating
- Breast Tenderness
- Cramps
- └── Fatigue
- [Psychological Changes]
- ----- Mood Swings
- ----- Anxiety
- Irritability
- L____ Depression (PMDD)
- ----- [Implications]

L

- Impact on Daily Activities
- Cognitive Performance
- └── Social and Emotional Well-being
- ----- [Management Strategies]
 - Lifestyle Changes
 - Balanced Diet
 - Exercise
 - L----- Stress Management
 - ------ Medical Interventions
 - Hormonal Therapies
 - Pain Management
- └── Mental Health Support
 - Counseling and Therapy

Summary:

The hormonal cycle regulates reproductive functions and influences both physical and emotional health. Understanding these changes helps in managing reproductive health effectively.

Assessment through Stimulating questions/Analogy/New ideas and Concepts:

- 1. Why do hormone levels fluctuate during the menstrual cycle?
- 2. How can lifestyle changes help manage hormonal imbalance?
- 3. What analogy can describe the interaction between hormones and emotions?

FAQ's

- 1. Why does mood change during the menstrual cycle? Hormonal fluctuations influence brain chemistry, affecting mood.
- What is the difference between PMS and PMDD?
 PMDD is a severe form of PMS with intense physical and emotional symptoms.
- Can lifestyle changes help in managing hormonal cycle issues?
 Yes, a balanced diet, regular exercise, and stress management can help.

References

- 1. Guyton, A.C., & Hall, J.E. (2020). Textbook of Medical Physiology.
- 2. Marieb, E.N., & Hoehn, K. (2019). Human Anatomy & Physiology.
- 3. WHO. (2023). Reproductive Health Guidelines.

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9. Verified by Subject Expert Dr.M.Paripooranaselvi

Objective Oriented Learning Process RBT

Programme	B.Sc. Zoology
Semester	IV
Subject Title	Major Core: Biochemistry and Bioinstrumentation
Code	21UZOC41
Hours	4
Total Hours	60
Credits	4
Max Marks	100
Unit & Title	Unit I:Carbohydrates
Name of the	Dr.P.Subavathy
Faculty	
T-L tools	Lecture method, Audio Visual aid: video showing about the study
	of carbohydrates. Visual aid: Picture of different
	types of carbohydrate-structure, classification and
	biological importance.

Pre requisite Knowledge: Knowledge about the classification, structure and functions of carbohydrate

Micro-planning



1. Topics for learning through Evocation:

Carbohydrates are also referred to as sugars. They include partially methylated sugars as well as amino sugars and amino sugars that naturally occur and one nitro sugar that is natural is recognized. All carbohydrates are polyhydroxyaldehydes or ketones or other substances that release the same by hydrolysis.

Types of Carbohydrates:

Carbohydrates can be classified into three main categories: monosaccharides, disaccharides, and polysaccharides.

- Monosaccharides are the simplest forms, consisting of single sugar units such as glucose and fructose.
- **Disaccharides**, like sucrose and lactose, are formed from the combination of two monosaccharides via glycosidic bonds.
- **Polysaccharides**, such as starch, glycogen, and cellulose, are long chains of monosaccharide units and serve various structural and energy-storage roles.

Properties of Carbohydrate:

Carbohydrates are essential biomolecules with a wide range of physical and chemical properties. These properties contribute to their functionality in biological systems, food applications, and beyond. Understanding their characteristics, including stereochemistry, optical activity, isomerism, and chemical reactivity, provides insight into their role in life processes and industrial applications.

Functions of Carbohydrates

- The main function of carbohydrates is to provide energy and food to the body and to the nervous system.
- Carbohydrates are known as one of the basic components of food, including sugars, starch, and fibre which are abundantly found in grains, fruits and milk products.
- Carbohydrates are also known as starch, simple sugars, complex carbohydrates and so on.
- It is also involved in fat metabolism and prevents ketosis.
- Inhibits the breakdown of proteins for energy as they are the primary source of energy.
- An enzyme by name amylase assists in the breakdown of starch into glucose, finally to produce energy for metabolism.

Sources of Carbohydrates

- 1. Simple sugars are found in the form of fructose in many fruits.
- 2. Galactose is present in all dairy products.
- 3. Lactose is abundantly found in milk and other dairy products.
- 4. Maltose is present in cereal, beer, potatoes, processed cheese, pasta, etc.
- 5. Sucrose is naturally obtained from sugar and honey containing small amounts of vitamins and minerals.

These simple sugars that consist of minerals and vitamins exist commonly in milk, fruits, and vegetables. Many refined and other processed foods like white flour, white rice, and sugar, lack important nutrients and hence, they are labelled "*enriched*." It is quite healthy to use vitamins, carbohydrates and all other organic nutrients in their normal forms.

2. Topic Introduction:

Carbohydrates are macronutrients and are one of the three main ways by which our body obtains its energy. They are called carbohydrates as they comprise *carbon*, *hydrogen* and *oxygen* at their chemical level. Carbohydrates are essential nutrients which include sugars, fibers and starches. They are found in grains, vegetables, fruits and in milk and other dairy products. They are the basic food groups which play an important role in a healthy life.

2.1 General Objective:

Enables the students to understand the types, functions and properties of carbohydrate

2.2 Specific Objectives:

Enables the students to:

- 1. describe the functions of carbohydrate
- 2. identify the different types of carbohydrate
- 3. summarize the properties of carbohydrates
- 4. give an outline of the natural sources of carbohydrate.

2.3: Taxonomy	of objectives:
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Taxonomy of Objectives						
Knowledge	The Cognitive	e Process Dimen	sion			
Dimension	Remember	Understand	Apply	Analyze	Evaluate	Create
A. Factual	1			2,3		4
Knowledge						
B. Conceptual		1,2,3,4	3,4		2,3	
Knowledge						
C. Procedural					4	
Knowledge						
D. Meta Cognitive						4
Knowledge						

2.4: Key words:

Carbohydrates, classification, structure, functions, sources

2.5:Key diagrams(if any):



The carbohydrates are further classified into simple and complex which is mainly based on their chemical structure and degree of polymerization. Simple Carbohydrates - Monosaccharides, Disaccharides and Pligosaccharides.



Eating too much sugar results in an abnormal increase in calories, which finally leads to obesity and in turn low calories leads to malnutrition. Therefore, a well-balanced diet needs to be maintained to have a healthy life. That is the reason a balanced diet is stressed so much by dietitians.

3.Discussion:

The students will be asked to discuss about carbohydrates. One member will be called from each group to draw the structure of carbohydrate.

4. Mind Map:



5. Summary:

Carbohydrates are necessary for all living things in our environment to survive. They are all organisms major source of energy. They aid in the production of genetic materials, as well as plant and animal cell architecture. Green plants make them and utilize them as energy in the form of ATP.

6. Assessment through Stimulating questions/Analogy/New ideas and Concepts:

- Generating mental ideas about creating an e-content on the topic carbohydrates.
- Producing the e-content.
- Knowing the different structure, properties and functions of carbohydrate
- Differentiating the types of carbohydrates

7.FAQ's: MCQ's/Descriptive questions:

1. What are carbohydrates?

Ans: Carbohydrates are biomolecules comprising carbon, hydrogen and oxygen atoms. They are an important source of energy. They are sugars, starch and fibres found in fruits and vegetables.

2. How are the carbohydrates digested?

Ans: Carbohydrates start being digested in the mouth by the action of salivary amylase. They are not completely broken down in the stomach, but in the intestine.

3. What are simple carbohydrates? Give examples.

Ans: Simple carbohydrates are the ones that are quickly broken down by the body to be converted into energy. Fruits, milk and milk products are the main sources of simple carbohydrates.

4. How are complex carbohydrates different from simple carbohydrates?

Ans: Complex carbohydrates are the ones in which the sugar molecules are strung in long,

complex chains. Peas, beans, vegetables and grains are the important sources of carbohydrates.

5. What are the three types of simple carbohydrates?

Ans: Three types of simple carbohydrates include:

- Monosaccharides
- Disaccharides
- Polysaccharides

8. References: (Books/Periodicals/Journals)

- 1. Satyanarayana, V. and U. Chakrapani. *Biochemistry* Elsivier Division of Reed Elsivier India PVT. Ltd. and Books and Allied Pvt.Ltd.2013.
- 2. Ambika Shanmugam. *Fundamentals of Biochemistry for Medical student*. Chennai: Navabharat Offset Works. 2000.
- 3. David L. Nelson and Michael M. Cox, *Lehninger Principles of Biochemistry* USA:W.H. Freeman & Co Ltd; 8th edition. 2021
- 4. Denise R. Ferrier. *Biochemistry*. Philadelphia Baltimore Newyork–London: Wolters Kluwer/ Lippincott Williams and Wilkins. 2011
- 5. Srivastava, H.S. Elements of Biochemistry. Meerut: Rastogi Publications. 2006.

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9. Verified by Subject Expert Dr.P.Subavathy

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Approved by HOD Dr.N.Arokiya Mary

Objective Oriented Learning Process RBT

Programme	B.Sc. Zoology
Semester	IV
Subject Title	Skill Based Elective: Clinical Laboratory Technology
Code	21UZOS41
Hours	2
Total Hours	30
Credits	2
Max Marks	100
Unit & Title	Unit II: Preparation of blood components and blood groupings
Name of the Faculty	Dr.M. PARIPOORANASELVI
T-L Tools	

Prerequisite Knowledge:

- Basic understanding of blood composition and functions.
- Familiarity with ABO and Rh blood grouping systems.
- Knowledge of blood transfusion principles and safety measures.



Topic for Learning through evocation:

Blood is a vital component of life, and its classification through blood grouping ensures safe transfusions and medical procedures. The preparation of blood components such as plasma, platelets, and red blood cells helps in the management of various medical conditions, ensuring better patient outcomes.

Topic Introduction:

- Overview of blood composition.
- Importance of blood grouping in transfusions.
- Introduction to blood component separation and its applications in medicine

General Objective:

To enable students to understand the preparation and application of blood components in clinical settings.

Specific Objectives:

Students will be able to:

- Explain the different blood groups and their significance.
- Describe the process of blood component separation.
- Identify the clinical applications of various blood components.
- Demonstrate proper techniques for blood grouping.
- Discuss the importance of cross-matching and compatibility testing.

Taxonomy of objectives:

	TAXONOMY OF OBJECTIVES						
Knowledge Dimension COGNITIVE PROCESS DIMENSION							
		Remember	Understand	Apply	Analyze	Evaluate	Create
A	Factual Knowledge	1					
B	Conceptual Knowledge		1,2				
С	Procedural Knowledge			1,2			
D	MetaCognitive Knowledge				2,3,4		

Key words:

Blood Components, ABO Blood Group, Rh Factor, Plasma, Platelets, Red Blood Cells, Compatibility, Cross-Matching

Key diagrams:

Blood Group	Antigens on	Antihodies	Donor's Group
biood Group	RBCs	in Plasma	Donor s Group
А	А	anti-B	A, O
В	В	anti-A	B, O
AB	A, B	nil	AB, A, B, O
0	nil	anti-A, B	0

ABO blood grouping chart

ABO BLOOD GROUP SYSTEM



Blood component separation process



Discussion:

The discussion will focus on the following key areas to provide an in-depth understanding of blood components and their significance:

1. Blood Grouping Systems:

- Explanation of the ABO and Rh systems.
- Importance of understanding antigen-antibody reactions.
- Implications of mismatched transfusions and hemolytic reactions.

2. Blood Component Separation:

- Techniques used, including centrifugation and apheresis.
- Storage conditions and shelf-life of components.
- Regulatory guidelines and quality control measures.

3. Clinical Applications:

- Use of red blood cells in anemia and surgical cases.
- Role of plasma in clotting disorders and burn treatments.
- Platelet transfusion in bleeding disorders and oncology.

4. Compatibility Testing:

- Steps in cross-matching procedures.
- Identification of possible transfusion reactions.
- Safety protocols in blood banks.

5. Ethical and Logistical Challenges:

- Challenges in donor recruitment and retention.
- Ethical considerations in blood donation.
- Addressing shortages and wastage of blood products.

Mind Map:



Summary:

Blood components play a crucial role in modern medicine, helping to manage a wide variety of conditions, from trauma to chronic diseases. A thorough understanding of blood grouping and compatibility testing is essential to ensure safe and effective transfusion practices. Key takeaways include:

- 1. Blood Grouping Significance: Ensuring compatibility to prevent adverse reactions.
- 2. Separation Techniques: Understanding how blood components are isolated and stored.
- 3. Clinical Applications: Using red blood cells, plasma, and platelets in specific conditions.
- 4. Safety Protocols: The importance of rigorous testing to maintain patient safety.
- 5. Challenges and Solutions: Ethical and logistical considerations in maintaining a reliable blood supply.

Students will be able to apply this knowledge in laboratory settings and contribute to better patient care by understanding the principles of transfusion medicine.

Assessment through Stimulating questions/Analogy/New ideas and Concepts:

- Why is it important to match blood groups before transfusion?
- How does plasma differ from whole blood in medical applications?
- Suggest innovative storage techniques for preserving blood components.
- Discuss real-world scenarios where blood component separation is critical.

FAQ's

- 1. What are the main types of blood groups?
 - The ABO and Rh blood grouping systems.
- 2. How are blood components separated?
 - Through centrifugation techniques.
- 3. What is the significance of cross-matching?
 - To prevent transfusion reactions by ensuring compatibility.
- 4. What conditions require platelet transfusion?
 - Thrombocytopenia and bleeding disorders.

References

- 1. Harmening, D. M. (2020). Modern Blood Banking & Transfusion Practices. FA Davis.
- 2. Guyton, A. C., & Hall, J. E. (2021). Textbook of Medical Physiology. Elsevier.
- 3. American Red Cross. (2022). Blood Basics and Components.

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Dr.M.Paripooranaselvi

Objective Oriented Learning Process RBT

Programme	B.Sc. Zoology
Semester	IV
Subject Title	APPLIED BIOTECHNOLOGY
Code	21UZON41
Hours	2
Total Hours	30
Credits	2
Max Marks	30
Unit & Title	UNIT 1: FOOD AND BEVERAGE BIOTECHNOLOGY
Name of the Faculty	DR. R. SRI PRIYA
T-L tools	Black Board, Over Head projector, Google Class room

Prerequisite Knowledge: A basic knowledge in biology.

Micro -planning



1. Warm up: (5 mins)

Discussion about the role of biotechnology in fermentation technology and the different types of fermented foods.

2. Introduction to topic (10 minutes)

- a. Start with a question: "Can you recall a common fermented food?"
- b. Give few examples of application of biotechnology in daily food
- c. Real-Life Importance

3. Historical Overview: (5 mins)

Explain about the history of cheese making.

4. Explanation of Key Concepts: (30 minutes) General Objective:

To understand about role of biotechnology in food industry for making fermented food.

Specific Objectives:

- a. Explain the role of microorganisms (bacteria and yeast) in the fermentation of yoghurt and bread.
- b. List the microbial process of bread making
- c. Explain the microbial fermentation process of yoghurt making

5. Summary and Conclusion: (5 minutes)

Summarize the different fermentation technology for preparation of food. Importance of biotechnology in beverage industry Compile the various biotechnology food products like mushroom and single cell protein.

6. Review : (5 minutes)

Review about the various genetically modified organisms with quiz.

Taxonomy of objectives						
Knowledge	The Cognitive Process Dimension					
dimension	Remember	Understand	Apply	Analyse	Evaluate	Create
A. Factual	1					
Knowledge						
B. Conceptual			2			
Knowledge						
C. Procedural				3		
Knowledge						
D. Meta		4				
Cognitive						
Knowledge						

Taxonomy of objectives:

Key Words: Bt. Cotton, Golden rice, Glo fish, Enviro pig, Agrobacterium, Microinjection

Mind Map:



Review questions

- 1. What is fermentation in food biotechnology?
- 2. Which microorganisms are used in yoghurt production?
- 3. How does yeast help in bread-making?
- 4. What are the health benefits of fermented foods?
- 5. What is Single Cell Protein (SCP)?
- 6. What are the advantages of SCP as a food source?
- 7. How long does it take to grow white button mushrooms?
- 8. What are the nutritional benefits of mushrooms?
- 9. What are the common problems in mushroom farming?

Books for Reference

1. Dubey, R.C. *A Textbook of Biotechnology*. New Delhi: S. Chand and Company Ltd., 2009.

2. Rastogi, S.C. *Biotechnology Principles and Applications*. Chennai: Reprint, Narosa. Publishing House, 2020.

3. Singh, B.D. Biotechnology. New Delhi: Kalyani Publishers. 2015.

4. Sathyanarayana, V. *Biotechnology*. Kolkatta:. Books and Allied (P) Ltd. 15th Edition. 2020.

5. Harisha S. *Biotechnology Procedures and Experiments Hand Book*. New Delhi: Lakshmi Publications. First Edition. 2008.

Dr. R. Sri Priya Verified by Subject Expert

N. Milina Mar

Approved by HODs

Objective Oriented Learning Process RBT

Programme	B.Sc. Zoology		
Semester	V		
Subject Title	BIOTECHNOLOGY		
Code	21UBCC51		
Hours	4		
Total Hours	60		
Credits	2		
Max Marks	40		
Unit & Title	UNIT 2: Gene Cloning and Screening		
Name of the Faculty	DR. R. SRI PRIYA		
T-L tools	Black Board, Over Head projector, Google Class room		

Prerequisite Knowledge: A basic knowledge in cell biology and microbiology.

Micro -planning



1. Warm up: (5 mins)

Brain storming session

- a. What do you already know about gene cloning?
- b. Can you list some methods used to introduce foreign genes into host cells?

2. Introduction to topic (10 minutes)

- a. Concept of gene cloning
- b. Examples where gene cloning is used in medicine, agriculture, or research?
- c. How scientists used to insert genes in earlier days.

3. Explanation of Key Concepts (25 minutes) General Objective:

To know the procedure for gene cloning and screening of recombinants.

Specific Objectives:

- a. Steps in gene cloning Gene Cloning
- b. Explain the Methods of Introduction of Cloned Genes into Host Cells
- c. Explain the methods of screening recombinant

4. Summary: (10 min)

- a. Summarize the steps in gene cloning in plasmid vectors and screening of recombinants.
- b. List the methods of introduction of genes into host cells.

5. Conclusion: (5 min)

To summarize the importance of cloning in the various fields of biotechnology

6. Review: (5 mins)

Review about the gene cloning methodology with a short quiz.

Taxonomy of objectives:

Taxonomy of objectives						
Knowledge	The Cognitive Process Dimension					
dimension	Remember	Understand	Apply	Analyse	Evaluate	Create
A. Factual	1					
Knowledge						
B. Conceptual		2				
Knowledge						
C. Procedural				3		
Knowledge						
D. Meta						
Cognitive						4
Knowledge						

Key Words: Cloning, Restriction Enzyme, Plasmid, Transformation

Mind Map:



Review questions

- 1. What is gene cloning, and why is it important in biotechnology?
- 2. List and briefly explain the key steps involved in gene cloning.
- 3. What are cloning vectors? Give two examples.
- 4. Differentiate between recombinant DNA technology and gene cloning.
- 5. What are the major applications of gene cloning in medicine and agriculture?
- 6. What is transformation, and how does it occur naturally in bacteria?

Books for Reference

1. 1. Clark and J. Pazdernik. *Biotechnology*, California, USA. 2009.

2. Elsevier Academic Press, Dubey, R.C. *Text Book of Biotechnology*, New Delhi. 4th edition, S. Chand

and Co Ltd, 2006.

3. Ramadass, P. Animal Biotechnology – Recent Concepts and Development. Chennai. MJP Publishers.

2009.

4. Rema, L.P. Applied Biotechnology, Chennai. MJP Publishers, 2009.

5. Shailendra Singh, *Applied Biotechnology*, 1st edition, New Delhi. Campus Books International, 2007.

6. Singh, B.D. Biotechnology, Chennai. Revised edition, Kalyani Publishers. 2005.

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Dr. R. Sri Priya Verified by Subject Expert

N. Milinga Mary

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Objective Oriented Learning Process RBT

Programme	B.Sc. Zoology				
Semester	V				
Subject Title	Major Core: Animal Physiology				
Code	21UZOC51				
Hours	4				
Total Hours	60				
Credits	4				
Max Marks	100				
Unit & Title	Unit: 1 – Digestion and Nutrition				
Name of the Faculty	Dr. S. Selvi				
T-L tools	Lecture method, Visual aid: PPT, Chart – Digestion in man				

Prerequisite Knowledge:

Knowledge of structure and function of the human digestive system.

Micro-Planning:



• Learning Materials: Diagrams of Human digestive system, PPT, multimedia resources (videos/pictures), chart paper, markers for mind maps.

1. Topic for Learning through Evocation:

The digestive system of the human body comprises a group of organs working together to convert food into energy for the body. Anatomically, the digestive system is made up of the gastrointestinal tract, along with accessory organs such as the liver, pancreas and gallbladder. The hollow organs that make up the gastrointestinal tract (GI tract) include the mouth, stomach, oesophagus, small intestine and large intestine that contains the rectum and anus. The digestion process involves the alimentary canal along with various accessory organs and organ systems. In humans, the process is quite simple due to our monogastric nature. This means that we have a one-chambered stomach, unlike other animals such as cows, which have four chambers. Some parts of nervous and circulatory systems also play a significant role in the digestion process. A combination of nerves, bacteria, hormones, blood and other organs of the digestive system completes the task of digestion.

2. Topic Introduction:

Digestion in humans is the complex process where food is broken down into smaller, absorbable molecules through a series of mechanical and chemical actions within the digestive system, starting in the mouth with chewing and primarily occurring in the stomach and small intestine, allowing the body to extract nutrients from food for energy, growth, and cell repair; this process involves the movement of food through the gastrointestinal tract (GI tract) where it mixes with digestive juices containing enzymes that break down carbohydrates, proteins, and fats into simpler forms that can be absorbed into the bloodstream. Undigested material is passed into the large intestine where water is reabsorbed, and the remaining waste is eliminated as stool through the anus.

3.1. General Objective:

To understand the structure and function of the human digestive system, the process of digestion, and its importance for human health.

3.2. Specific Objectives:

By the end of the lesson, students will be able to:

- 1. Identify the major organs involved in digestion (mouth, oesophagus, stomach, small intestine, large intestine, etc.).
- 2. Describe the process of digestion, including mechanical and chemical digestion.
- 3. Understand the role of enzymes in digestion.
- 4. Define key terms like digestion, absorption, enzymes, peristalsis, and nutrients.
- 5. Explain the importance of digestion for energy production and overall health.

3.3: Taxonomy of Objectives (Bloom's Taxonomy):

Taxonomy of Objectives						
Knowledge	Knowledge The Cognitive Process Dimension					
Dimension	Remember	Understand	Apply	Analyse	Evaluate	Create
A. Factual	1					
Knowledge						
B. Conceptual		1,2				
Knowledge						
C. Procedural				3,4		
Knowledge						
D. Meta Cognitive					2	
Knowledge						

3.4. Key Words:

Digestion, absorption, enzymes, nutrients, peristalsis, stomach, small intestine, large intestine, bile, enzymes, mechanical digestion and chemical digestion.

3.5. Diagram:



Discussion:

Digestion is a highly coordinated and vital process for converting food into usable energy and nutrients, supporting overall body functions. It's amazing how the body uses various organs and enzymes to make sure nutrients are absorbed effectively.Digestion is a finely tuned system designed to convert the food we eat into essential nutrients. From the enzymes in your mouth to the bacteria in your gut, every step plays a role in making sure our bodies get what they need to function. The process is so intricately connected that even small disruptions can lead to

noticeable effects on our health. Each type of food has its own specific enzyme: **Amylase**: Breaks down carbohydrates into sugars (starts in the mouth). **Protease**: Breaks down proteins into amino acids (produced in the stomach and pancreas). **Lipase**: Breaks down fats into fatty acids and glycerol (produced in the pancreas). **Lactase**: Breaks down lactose (milk sugar) into glucose and galactose.

4. Mind Map:



5. Summary:

The digestive system breaks down food mechanically and chemically into nutrients that the body can use for energy. The process begins in the mouth and ends in the large intestine. Enzymes play a vital role in breaking down specific nutrients. The nutrients are absorbed into the bloodstream through the small intestine.

6. Assessment through Stimulating Questions/Analogy/New Ideas and Concepts:

• Stimulating Questions:

- 1. What are the two types of digestion, and how do they differ?
- 2. Why do we need enzymes in digestion? Can you name one enzyme and its role?
- 3. What would happen if the digestive system couldn't absorb nutrients properly?

• Analogy/New Ideas/Concepts:

Use the analogy of a blender to explain digestion: "Just like a blender breaks down food into smaller parts for easier absorption, your digestive system does something similar, but with the help of enzymes."

• Classroom Activity:

Divide the class into groups and ask each group to create a short skit showing the journey of food through the digestive system, explaining each part of the process.

7. FAQs (Frequently Asked Questions):

1.	Name the largest	st part of the alimentary canal (K1)			
	a. Stomach	b. Oesophagus	c. Small inte	stine d.	Large intestine
2.	Name the first pa	art of the small in	testine (K1)		
	a. Ileum	b. Caecum	c. Jejunum	d. Du	odenum
3.	Choose the enzy	me that acts on ca	arbohydrates (K1)		
	a. Trypsin	b. Amylase	c. L	ipase	d. Pepsin
4. Name the readily available source of energy in the body (K1)					
	a. Proteins	b. Carbohy	drates	c. Lipids	d. Vitamins

15. References:

- Textbooks or educational resources on human biology or anatomy.
- Interactive learning websites like **Khan Academy** or **National Geographic Kids** for animated explanations.
- Journals and articles on digestive health (if available).

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Objective Oriented Learning Process RBT

Programme	B.Sc. Zoology
Semester	V
Subject Title	Core VII: Cell Biology and Genetics
Code	21UZOC52
Hours	4
Total Hours	60
Credits	4
Max Marks	100
Unit & Title	Unit V: Sex determination in man
Name of the Faculty	Dr.M. PARIPOORANASELVI
T-L Tools	

Prerequisite Knowledge:

- Basic understanding of human reproductive biology.
- Knowledge of chromosomes and their functions.
- Familiarity with Mendelian genetics and inheritance patterns.

Micro -planning


Topic for Learning through evocation:

Understanding how sex is determined genetically and hormonally enhances knowledge of human biology and its medical implications.

Topic Introduction:

- Sex determination refers to the genetic mechanisms that decide whether an individual develops as male or female.
- It involves the interplay between chromosomes, genes, and hormones.
- Applications in medicine and ethical considerations.

General Objective:

To provide students with an in-depth understanding of the genetic and molecular basis of sex determination in humans.

Specific Objectives:

Students will be able to:

- Explain the chromosomal basis of sex determination.
- Describe the role of the SRY gene in male differentiation.
- Identify disorders related to sex chromosome abnormalities.
- Compare sex determination mechanisms across species.
- Discuss the ethical and medical implications of sex determination.

Taxonomy of objectives:

	TAXONOMY OF OBJECTIVES						
	Knowledge Dimension COGNITIVE PROCESS DIMENSION						
	-	RememberUnderstandApplyAnalyzeEvaluateC					
A	Factual Knowledge	1	1				
B	Conceptual Knowledge		1,2				
С	Procedural Knowledge			1,2,3			
D	Meta Cognitive				2,3		
	Knowledge						

Key words:

Sex determination, Chromosomes, SRY gene, Karyotyping, XX/XY system, Genetic Disorders.

Key diagrams:

Chromosome pairing (XX and XY)



Punnett square for sex determination



Discussion:

1. Chromosomal Basis of Sex Determination:

- o 23 pairs of chromosomes in humans, including one pair of sex chromosomes
- XX for females, XY for males

2. Role of the SRY Gene:

- Located on the Y chromosome
- Triggers male gonadal differentiation

3. Gamete Formation and Fertilization:

- Sperm (X or Y) determines the offspring's sex
- Equal probability of male or female offspring

4. Chromosomal Disorders:

- Turner Syndrome (X0)
- Klinefelter Syndrome (XXY)

Mind Map:

[Sex Determination] — [Chromosomes (XX, XY)] XX (Female) L XY (Male) - [SRY Gene] Located on the Y Chromosome — Triggers Male Gonadal Development Absence Leads to Female Development - [Gamete Contribution] Egg (Always X) $\square Sperm (X \text{ or } Y)$ \longrightarrow X + X \rightarrow Female (XX) $\square X + Y \rightarrow Male(XY)$ - [Chromosomal Disorders] Turner Syndrome (X0) Klinefelter Syndrome (XXY) Triple X Syndrome (XXX) └── XYY Syndrome

Summary:

Sex determination in humans is a complex genetic process controlled by the combination of sex chromosomes and the presence of the SRY gene. Understanding this mechanism sheds light on developmental biology and chromosomal disorders.

Assessment through Stimulating questions/Analogy/New ideas and Concepts:

- Why is the Y chromosome critical for male development?
- What would happen if an individual had only one X chromosome?

• Can sex determination mechanisms vary in other organisms?

FAQ's

1. What determines the sex of a baby?

The sperm carrying either an X or Y chromosome determines the baby's sex.

2. What is the role of the SRY gene?

The SRY gene on the Y chromosome triggers male gonadal development.

3. Are there exceptions to typical sex determination?

Yes, chromosomal disorders like Turner and Klinefelter syndromes can affect typical patterns.

References

- 1. Guyton, A.C., & Hall, J.E. (2020). Textbook of Medical Physiology.
- 2. Campbell, N.A., & Reece, J.B. (2017). *Biology*. Pearson Education.
- 3. National Center for Biotechnology Information (NCBI) resources

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9. Verified by Subject Expert

Dr.M.Paripooranaselvi

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LESSON PLAN

Objective Oriented Learning Process RBT

Programme	III B.Sc. Zoology
Semester	V
Subject Title	Ecology
Code	21UZOC53
Hours	4
Total Hours	60
Credits	4
Max Marks	100
Unit & Title	Unit V: Global Warming: Causes & Effects
Name of the Faculty	Dr. S.R.T. Sherly Cross
T-L tools	Lecture method, Visual aids (Videos)

Prerequisite Knowledge:

Basic understanding of climate change, greenhouse gases, and human impact on the environment.

Micro -planning



1. Topic for Learning through evocation

Have you ever wondered why summers are getting hotter and storms are becoming more intense? The Earth's climate is changing, and global warming is at the heart of this transformation. What are the major factors driving this change? How do human activities contribute to it? Can we take steps to slow it down? Today, we will explore the science behind global warming, its impacts on ecosystems and human societies, and possible solutions to mitigate its effects

2. Topic Introduction:

. Global warming is the long-term rise in Earth's average surface temperature due to human activities, primarily the burning of fossil fuels, which increases greenhouse gas concentrations in the atmosphere. This phenomenon has led to climate change, causing extreme weather patterns, rising sea levels, and biodiversity loss. Understanding global warming, its causes, effects, and possible mitigation strategies is crucial for addressing this global crisis

3.1 General Objective:

To enable students to understand the causes, effects, and mitigation strategies of global warming.

3.2 Specific Objectives:

Enables the students to:

- Define global warming and explain its causes.
- Identify the role of greenhouse gases in climate change.
- Analyze the effects of global warming on biodiversity and ecosystems.
- Evaluate strategies to mitigate global warming, including renewable energy and conservation efforts.
- Discuss international policies and agreements aimed at combating global warming

3.3 : Taxonomy of objectives:

Taxonomy of Objectives						
Knowledge	The Cognitive	e Process Dimens	ion			
Dimension	Remember	Understand	Apply	Analyse	Evaluate	Create
A. Factual	1					
Knowledge						
B. Conceptual		1,2				
Knowledge						
C. Procedural				3,4		
Knowledge						
D. Meta Cognitive					2,3,4	
Knowledge						

3.4 : Key words:

Global Warming, Climate Change, Greenhouse Gases, Carbon Footprint, Renewable Energy, Mitigation Strategies.

3.5 : Key diagrams (if any):



Projected impact of climate change on agricultural yields



Discussion:

Encourage students to think about their daily activities and how they contribute to carbon emissions. Discuss global efforts to combat climate change, such as the Paris Agreement, carbon taxes, and the shift to renewable energy sources.



4. Mind Map:

5. Summary:

Global warming is primarily driven by human activities that increase greenhouse gas emissions. It has far-reaching effects on ecosystems, weather patterns, and global economies. While the impacts are severe, various mitigation strategies, such as renewable energy adoption and policy interventions, offer hope for reducing the progression of climate change. Collective action at individual, national, and global levels is essential for addressing this crisis.

6. Assessment through Stimulating questions/Analogy/New ideas and Concepts:

- How does deforestation contribute to global warming?
- What are the major greenhouse gases, and how do they trap heat?
- How can renewable energy sources help mitigate global warming?
- What role do international policies play in controlling climate change?
- How can individuals reduce their carbon footprint?

7. FAQ's:

1.	What is the primary cause of global warming?
	a) Volcanic eruptions
	b) Greenhouse gas emissions
	c) Natural climate cycles
	d) Solar radiation changes
2.	Which gas contributes the most to global warming?
	a) Oxygen
	b) Methane
	c) Carbon dioxide
	d) Nitrogen
3.	What is one major effect of global warming?
	a) Increased snowfall
	b) Rising sea levels
	c) Decreased humidity
	d) Stable temperatures
4.	What is a key mitigation strategy for global warming?
	a) Increasing fossil fuel use
	b) Reducing deforestation
	c) Enhancing industrial emissions
	d) Promoting urbanization

8. References

- 1. IPCC Reports on Climate Change.
- 2. NASA's Climate Change Facts and Data.
- 3. Pachauri, R. K., & Meyer, L. (2014). Climate Change 2014: Synthesis Report. *Intergovernmental Panel on Climate Change (IPCC)*.
- 4. United Nations Framework Convention on Climate Change (UNFCCC) Reports.

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LESSON PLAN

Objective Oriented Learning Process RBT

Programme	B.Sc Zoology
Semester	V
Subject Title	Core Elective : Introduction to Research
Code	21UZOE51
Hours	4
Total Hours	60
Credits	3
Max. Marks	100
Unit & Title	Unit I Types of Research
Name of the faculty	Dr. P.J.Joslin
T- L Tools	Lecture method, PPT, Design of Quizzes,
	chart

Prerequisite Knowledge:

Knowledge of basic definition of research

Microplanning



1. Topic for Learning through evocation

Research is a systematic process of exploring questions, finding solutions, and expanding knowledge. It can be categorized into different types based on purpose, process, and outcome. For instance, qualitative research focuses on understanding experiences and perceptions through methods like interviews and observations, while quantitative research emphasizes measurable data and statistical analysis. Mixedmethod research combines both to provide a comprehensive view. Each type serves unique purposes, such as descriptive research aiming to describe phenomena, exploratory research uncovering new insights, and experimental research testing cause-and-effect relationships.

Students are encouraged to share their knowledge and experiences with research or the methods they have encountered and are invited to write their responses on a board.

2. Topic Introduction:

Research is a systematic and creative process aimed at expanding knowledge, addressing questions, or solving problems. It serves as the foundation for scientific discovery and technological advancements across diverse disciplines. Broadly, research can be categorized based on its purpose, methodology, or approach. Descriptive research focuses on observing and documenting phenomena as they occur, while experimental research investigates cause-and-effect relationships through controlled experiments. Exploratory research seeks to explore new ideas or issues, whereas explanatory research aims to clarify underlying reasons or mechanisms. Additionally, research can be classified as qualitative, emphasizing non-numerical data and understanding human behavior, or quantitative, involving numerical data and statistical analysis.

3.1. General Objective:

Equip students with the skills to systematically generate knowledge, address questions, solve problems, and enhance understanding across various fields.

3.2. Specific Objectives:

To expand theoretical knowledge without immediate practical application To address practical problems and develop solutions with immediate real-world applications.

To analyze numerical data for generalizable results.

To understand subjective experiences, perceptions, and cultural or social contexts through non-numerical data.

3.3: Taxonomy of objectives:

Taxonomy of Objectives						
Knowledge	The Cogniti	ve Process Dir	nension			
Dimension	Remember	Understand	Apply	Analyse	Evaluate	Create
A. Factual	2					
Knowledge						
B. Conceptual		2				
Knowledge						
C. Procedural			2			
Knowledge						
D. Meta Cognitive						1
Knowledge						

3.4: Key words:

descriptive, quantitative, qualitative, research

3.5: Key diagrams (if any):



Discussion:

The class will be divided into small groups, and each group will analyse a piece of content describing different types of research. Students will extract key scientific terms, methodologies, and examples related to the research type discussed. One member from each group will present the group's findings, summarizing the scientific terms and explaining how these relate to the specific research type.

4. Mind Map:



5. Summary:

Research is broadly categorized into different types based on its purpose, methodology, and outcome. Descriptive research aims to observe and describe phenomena as they are, providing a clear picture of existing conditions. Exploratory research seeks to uncover new insights and develop understanding in areas where little is known. Experimental research is used to test hypotheses and establish cause-and-effect relationships under controlled conditions. Qualitative research focuses on understanding experiences, behaviours, and perceptions through non-numeric data, while quantitative research involves analysing numeric data to draw measurable conclusions.. Each type of research plays a critical role in advancing knowledge and addressing complex problems across various fields.

6. Assessment through Stimulating questions/Analogy/New ideas and Concepts:

- Provide case studies or news articles and have students identify the type of research being conducted, encouraging them to justify their reasoning with supporting evidence.
- Ask students to design their own mini-research projects for each type of research.
- Survey about biodiversity in their area.
- A solution-focused study on plastic pollution.

7. FAQ's:

- 1. What type of research focuses on solving specific, practical problems?
 - a) Fundamental Research
 - b) Descriptive Research
 - c) Applied Research
 - d) Exploratory Research
- 2. Which type of research aims to describe characteristics or phenomena as they exist?
 - a) Explanatory Research
 - b) Descriptive Research
 - c) Exploratory Research
 - d) Applied Research
 - 3. Fundamental research is also known as:
 - a) Practical Research
 - b) Basic Research
 - c) Applied Research
 - d) Problem-Solving Research
 - 4. Conducting a survey to understand customer preferences is an example of:
 - a) Explanatory Research
 - b) Descriptive Research
 - c) Fundamental Research
 - d) Exploratory Research
 - 5. When a researcher observes and records the behavior of animals in their natural habitat, this is an example of:

- a) Explanatory Research
- b) Descriptive Research
- c) Exploratory Research
- d) Applied Research

8. References: (Books/Periodicals/Journals)

1 . Palanichamy S. and M. Shanmugavelu. Research Methods in Biological Sciences. Palani: Paramount Publication.1997.

2 Ramadass P. and A. Wilson Aruni , Research and Writing Across the Disciplines .MJP Publications . 2009

3 Gurumani. Research Methodology for Biological Sciences. Chennai: M.J.P. Publishers. 2011.

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LESSON PLAN

Objective Oriented Learning Process RBT

Programme	B.Sc. Zoology	
Semester	V	
Subject Title Common Skill Based Core :Computer for Digital Era and Soft Skil		
Code 21UCSB51		
Hours	2	
Total Hours	30	
Credits	2	
MaxMarks	50	
Unit & Title	Unit I: Components of Computer	
Nameof the Faculty Dr.P.Subavathy		
T-Ltools	Mind maps, Charts and Short video clips	

Pre requisite Knowledge:

Knowledge about the Components of Computer

Micro-planning:



1. Topics for learning through Evocation

A computer device is made up of various elements which help in its effective functioning and processing.

Components of Computers

Any kind of computer consists of Hardware and Software.

Hardware:

Computer hardware is the collection of physical elements that constitutes a computer system. Computer hardware refers to the physical parts or components of a computer such as the monitor, mouse, keyboard, computer data storage, hard drive disk (HDD), system unit (graphic cards, sound cards, memory, motherboard and chips), etc. all of which are physical objects that can be touched.

Input Devices:

An input device is a piece of hardware used to provide data to a computer. It allows input of raw data to the computer for processing. Most common are keyboard and mouse.

Central Processing Unit (CPU):

A CPU is the brain of a computer. It is responsible for all functions and processes. The CPU is the most important element of a computer system. The CPU is comprised of three main parts:

* Arithmetic-Logic Unit (ALU): An arithmetic logic unit (ALU) is a digital circuit used to perform arithmetic and logic operations. It represents the fundamental building block of the central processing unit (CPU) of a computer. Modern CPUs contain very powerful and complex ALUs.

* **Control Unit (CU):** The control unit (CU) is a component of a computer's central processing **unit** (CPU) that directs the operation of the processor. It tells the computer's memory, arithmetic and logic unit and input and output devices how to respond to the instructions that have been sent to the processor. It directs the operation of the other units by providing timing and control signals.

* **Registers:** It is a temporary storage place for instruction or data. They are not part of the memory, but they are a special additional storage location that offers the advantage of speed.

Output devices: An output device is any piece of computer hardware equipment used to communicate the results of data processing carried out by an information processing system (such as a computer) which converts the electronically generated information into human readable form. Most prominent output devices are monitors and printers.

2. Topic Introduction:

A computer is an electronic device that accepts data, performs operations, displays results, and stores the data or results as needed. It is a combination of hardware and

software resources that integrate and provide various functionalities to the user. Hardware is the physical components of a computer, such as a processor, memory devices, monitor, keyboard, etc., while software is a set of programs or instructions that are required by the hardware resources to function properly.

2.1. General Objective:

Enables the students to gain basic knowledge about the components of computer.

2.2. Specific Objective:

- 1. a general introduction to computers
- 2. explain the components of computer
- 3. describe the functions of computer
- 4. summarize the types of CPU

2.3:Taxonomy of objectives:

Taxonomy of Objectives						
Knowledge	The Cognitive	Process Dimensi	ion			
Dimension	Remember	Understand	Apply	Analyze	Evaluate	Create
A. Factual	1			1,2		
Knowledge						
B. Conceptual			1,2		3,4	
Knowledge						
C. Procedural		1,2,3		4		
Knowledge						
D.Meta Cognitive					2,3,4	
Knowledge						

2.4:Key words:

Hardware, Input devices, CPU(Central Processing Unit), Output devices

2.5:Key diagrams(if any):





A computer will only respond when a command

is given to the device. These commands can be given using the input unit or the input devices. The output unit gives us the final result once the entire processing is done within the mechanism of a device.



Once the information is entered into the computer by the input device, the processor processes it. The CPU is called the brain of the computer because it is the control centre of the computer. It first fetches instructions from memory and then interprets them so as to know what is to be done. If required, data is fetched from memory or input device. Thereafter CPU executes or performs the required computation, and then either stores the output or displays it on the output device.

3. Discussion:

Students were asked to discuss about the components of computer and were asked to visit the computer lab for gaining profound knowledge.



4. Mind Map:

5. Summary:

Computer have been there for many years and and its use have been spread widely. Three important component of Computer are Input Unit, CPU and Output Unit. But there are some other components like Memory Unit, Control unit and Arithmetic and Logical unit. Using this all components we can easily do complex operations. 6. Assessment through Stimulating questions/Analogy/New ideas and Concepts:

- Generating mental ideas about creating an e-content on the components of computer
- Producing the e-content.
- Knowing the different components of computer
- Differentiating the input and output devices

7. FAQ's:

1. MU, ALU and CU are all part of the _____.

Storage Memory
Central Processing Unit
Input Devices
Output Unit
is the main memory of the computer

Random Access Memory 2) Read Only Memory 3) Internal Hard Drive 4) DVD
What is the full form of GUI?

1) Graphic User Interface 2) Games User Interface

3) Graphic Unified Interface 4) Graphic Unit Interface

4. A computer comprises how many types of memory?

1) One 2) Four 3) Three **4) Two**

5. Which of the following are the physical parts of a computer?

1) Software 2) Operating System 3) Software Applications 4) Hardware

8. References: (Books/Periodicals/Journals)

- 1. Peter Norton, Introduction to Computers 6th Edition
- 2. Charles P Pfleeger, Shari Lawrence Pfleeger, Security in Computing, I Edition, Pearson Education, 2003.
- 3. E. Balagurusamy, Fundamentals of Computers, McGraw Hill
- 4. Henry Chan, Raymond Lee, Tharam Dillon, Elizabeth Chang, E-Commerce fundamentals and applications, Wiley Student edition.
- 5. Benita Bhatia Dua, Deepa Jeyaraman, Profit with Social Media CNBC
- 6. Dr.K.Alex, Soft Skills, S.Chand & Co.
- 7. http://www.digitalindia.gov.in/content/social-media-analytics

- 8. https://www.researchgate.net/publication/307878962_Introduction_to_E-Governance
- 9. <u>http://www.ijqr.net/journal/v10</u>

10.https://www.researchgate.net/publication/258339295 FUNDAMENTALS OF COMPUTER <u>STUDIES</u>

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N. Milinga Mary

9. Verified by Subject Expert

Approved by HOD

Dr. N. Arokiya Mary

Dr. P. Subavathy

LESSON PLAN SAMPLE FOR SCIENCE

Objective Oriented Learning Process RBT

Programme	B.Sc. Zoology
Semester	VI
Subject Title	Major Core: Immunology & Microbiology
Code	21UZOC61
Hours	4
Total Hours	60
Credits	4
Max Marks	75
Unit & Title	Unit -III Structure and functions of immunoglobulin
Name of the Faculty	Dr. Jemma Hermelin Jesy Diaz
T-L tools	Lecture method, Power point, Group discussion

Prerequisite Knowledge:

Knowledge about immunity, antigen, antibody and defense mechanism

Micro -planning : 60 minutes



1. Topic for Learning through evocation

Protection of body from viruses, bacteria, fungi, protozoans, worms etc. with a defense mechanism. This protection or resistance of living organism to infection of microorganisms is called immunity. Students were asked about immunity, antigen, antibody and different types of immune globulins. How immunoglobulins are involved in immune activation, activation of a specific immune response involving the production of immunoglobulins.

2. Topic Introduction:

Immune system defend itself against infection. Immune system recognizes and neutralizes harmful invaders like bacteria and viruses by producing antibodies. Immunoglobulins are antibodies. Immunoglobulins are glycoproteins produced by plasma cells in response to antigens. Immunoglobulins are found in serum, body fluids and tissues. There are different types of immunoglobulins.

2.1. General Objective:

Enables the students to understand immunoglobulins and its types

2.2. Specific Objectives:

- Enables the students to:
- 1. describe the basic structure of immunoglobulins
- 2. explain the types of immunoglobulins
- 3. compare the properties of immunoglobulins
- 4. distinguish the functions of immunoglobulins

2.3: Taxonomy of objectives:

Taxonomy of Objectives						
Knowledge	The Cognitive	Process Dimens	ion			
Dimension	Remember	Understand	Apply	Analyze	Evaluate	Create
A. Factual	1					
Knowledge						
B. Conceptual		3	3			
Knowledge						
C. Procedural				4		
Knowledge						
D. Meta Cognitive					2	
Knowledge						

2.4: Key words:

Immunoglobulins, Antigen, Antibody, Pathogens resistance

2.5: Key diagrams (if any):



3. Discussion:

Students were asked to discuss about the properties of immunoglobulin and how to differentiate the types of immunoglobulin.

4. Mind Map:



5. Summary:

Students were asked to identify the types of immunoglobulins, properties and how they are protecting the body against pathogens.

6. Assessment through Stimulating questions/Analogy/New ideas and Concepts:

- Generating mental ideas about creating an e-content of basic structure of immunoglobulin
- Producing the e-content.
- Differentiating undernutrition, Overnutrition, Imbalance, Specific deficiency

7. FAQ's:

1. Who prop	1. Who proposed the basic structure of immunoglobulin?						
a. Rodney Porter		b. Landsteiner	c. Paul Ehrlich	d. Robert Koch			
2.The immu	noglobulin that	crosses the human p	lacenta is				
a. IgG	b. IgM	c. IgD	d. IgE				
3. The immunoglobulin found in colostrum is							
a. IgA	b. IgM	c. IgE	d. IgG				
4. Which and	4. Which antibody characterizes the allergic reaction?						
a. IgG	b. IgA	c. IgM	d. IgE				
5. Which one of the following is termed as antiseptic paint?							
a. IgG	b. IgM	c. IgE	d. IgA				

8. References: (Books/Periodicals/Journals)

- 1. Arumugam, N., Mani, A., Narayanan, L.M., Dulsy Fatima and A.M.Selvaraj. Immunology and Microbiology. Nagercoil : Saras Publication. 2015.
- 2. Rao, C.V. An Introduction to Immunology. New Delhi: Narosa Publishing House. 2005.
- 3. Joshi K.R and Osamo N.O. Immunology. India: Agro Botanical Publishers, 4th Edition, 1994.

Jerry Diaz

Verified by Subject Expert Dr. Jemma Hermelin Jesy Diaz

N. Milinga Mary

Approved by HOD Dr.Arokiya Mary

LESSON PLAN

Objective Oriented Learning Process RBT

Programme	B.Sc. Zoology		
Semester	VI		
Subject Title	Major Core: Biostatistics and Bioinformatics		
Code	21UZOC62		
Hours	4		
Total Hours	60		
Credits	4		
Max Marks	100		
Unit & Title	Unit: IV – Scope and Applications of Bioinformatics		
Name of the Faculty	Dr.C.Shibana		
T-L tools	Lecture method, Visual aid: PPT, Videos, Demo session.		

Prerequisite Knowledge:

Knowledge of Molecular Biology and Genetics

Micro -planning



1. Topic for Learning through evocation

Have you ever wondered how scientists decode the mysteries of life hidden in DNA? From understanding genetic disorders to designing life-saving drugs, the field of bioinformatics bridges biology and technology, empowering breakthroughs that were once unimaginable. Imagine a scenario where a farmer's crops are failing due to a disease caused by a mysterious pathogen. How can scientists identify the culprit and find a solution? Or think about how a doctor can now tailor treatments based on a patient's unique genetic makeup. These are real-world problems being solved with the power of bioinformatics. As we delve into this topic, consider this question: how do you think computers analyze biological data to unravel these mysteries? By combining biology, data science, and technology, bioinformatics has transformed research, healthcare, agriculture, and environmental science. Today, we'll explore the immense scope and impactful applications of this fascinating field.

2. Topic Introduction:

Bioinformatics is an interdisciplinary field that combines biology, computer science, and mathematics to analyze and interpret biological data. With the rise of modern technologies like genome sequencing and proteomics, the sheer volume of biological data has grown exponentially. Bioinformatics provides the tools and techniques needed to store, retrieve, analyze, and visualize this data, transforming it into meaningful insights.

3.1 General Objective:

To enable students to understand the vast scope and diverse applications of bioinformatics.

3.2 Specific Objectives:

Enables the students to:

- Define bioinformatics
- Identify key areas of application
- Demonstrate an understanding of how bioinformatics tools and software are used to analyze biological data
- Evaluate the role of bioinformatics in advancing scientific research and addressing global challenges

3.3 : Taxonomy of objectives:

		Taxonomy of	Objectives			
Knowledge	The Cognitive	Process Dimensio	n			
Dimension	Remember	Understand	Apply	Analyse	Evaluate	Create

A. Factual	1					
Knowledge						
B. Conceptual		1,2	1			
Knowledge						
C. Procedural				3,4		
Knowledge						
D. Meta Cognitive					2,3,4	
Knowledge						

3.4 : Key words:

Genomics, Proteomics, Sequence alignment, Gene expression

3.5 : Key diagrams (if any):

CODES IN BIOINFORMATICS

DNA:
Nucleotide Code: Base:
AAdenine CCytosine GGuanine T (or U)Thymine (or Uracil) RC or T YC or T SG or C WA or T KG or T
MA or C BC or G or T DA or G or T HA or C or T VA or C or G NA or C or G NA or C or G

PROTEIN CODES

Sequences are represented in the standard IUB/IUPAC amino acid codes, a single hyphen or dash can be used to represent a gap of indeterminate length.

For amino acid query sequences (BLASTP and TBLASTN), the accepted 1-letter amino acid codes are:

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BIOINFORMATICS- A MULTIDISCIPLINARY APPROACH



APPLICATION

 It is the comprehensive application of mathematics (e.g., probability and statistics), science (e.g., biochemistry), and a core set of problemsolving methods (e.g., computer algorithms) to the understanding of living systems.



Discussion:

Ask students to think about how bioinformatics is used in real-life scenarios, such as developing vaccines, understanding genetic disorders, or improving crops.

4. Mind Map:



5. Summary:

Bioinformatics combines biology, computer science, and information technology to analyze and interpret biological data. Its scope includes sequence alignment, gene expression analysis, protein structure prediction, and data mining of vast biological datasets. Applications of bioinformatics are wide-ranging, including drug discovery, personalized medicine, disease diagnosis, agricultural improvements, and understanding genetic variations. It is essential in advancing genomics, proteomics, and systems biology, helping scientists make sense of complex biological data to drive innovations in health, medicine, and biotechnology.

6. Assessment through Stimulating questions/Analogy/New ideas and Concepts:

- How might bioinformatics change the way we approach medical treatments or drug development?
- What are some challenges you think bioinformaticians face when analyzing large-scale genomic data?
- Can bioinformatics help predict the outcome of diseases based on genetic data?
- How do you think artificial intelligence and machine learning could enhance bioinformatics in the future?

7. FAQ's:

What is bioinformatics primarily used for?
a) Data analysis in physics
b) Biological data management and analysis
c) Mechanical engineering
d) Chemical reaction optimization
Which database is commonly used for storing nucleotide sequences?
a) Protein Data Bank (PDB)
b) GenBank
c) Swiss-Prot
d) PubMed
What is the primary goal of proteomics?
a) To study the properties of RNA molecules
b) To predict protein structures and functions
c) To study the behavior of lipids
d) To sequence DNA
Which tool is used for pairwise sequence alignment?
a) BLAST
b) ClustalW
c) FASTA
d) PHYLIP

8. References

- 1. Gurumani N. An Introduction to Biostatistics. 2nd edition, Chennai: MJP Publishers, 2005.
- 2. Prakash Lohar. Bioinformatics. 1st edition Chennai: MJP Publishers, 2019.

N. Milinga Mary

Verified by Subject Expert

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Approved by HOD

LESSON PLAN

Objective Oriented Learning Process RBT

Programme	B.Sc. Zoology
Semester	VI
SubjectTitle	Marine Biology
Code	21UZOC63
Hours	4
Total Hours	60
Credits	4
MaxMarks	100
Unit & Title	Unit I:Classification of marine habitat
Nameof the Faculty	Dr.P.Subavathy
T-Ltools	Lecture methods. Audio Visual aid: video showing about the features of
	marine habitat. Visual aid: Picture of different zones of
	marine environment.

Pre requisite Knowledge:

Basics about the classification of marine habitat.

Micro-planning:



1. Topics for learning through Evocation:

Ocean is the largest biomass on Earth. Each biome in the ocean is supported by a unique biodiversity, climate, geology, and oceanography. Plants and animals adapt to specific habitat conditions which are crucial for their survival success. These conditions include Water movement, Nutrient availability, Water pressure, Amount of Light, Salinity, and Temperature. Some animals are adapted to live in a shallow, warm habitat whereas, others like deep, dark, and cold ocean worlds.

2. Topic Introduction:

The general classification of marine habitat:

a. Based on Depth

- Intertidal Zone: The area between high and low tide marks, periodically submerged and exposed.
- **Neritic Zone**: Shallow waters extending from the shoreline to the edge of the continental shelf.
- Oceanic Zone: Deep waters beyond the continental shelf.
 - **Epipelagic Zone (Sunlit Zone)**: 0–200 meters, where sunlight supports photosynthesis.
 - **Mesopelagic Zone (Twilight Zone)**: 200–1,000 meters, with limited light and cooler temperatures.
 - **Bathypelagic Zone (Midnight Zone)**: 1,000–4,000 meters, in total darkness.
 - **Abyssopelagic Zone (Abyssal Zone)**: 4,000–6,000 meters, near freezing temperatures.
 - Hadal Zone: Below 6,000 meters, found in ocean trenches.

b. Based on Substrate

- Sandy Shores: Composed of loose sediments like sand or gravel.
- **Rocky Shores**: Hard substrates like rocks and cliffs.
- Muddy Flats: Fine-grained sediments, often in estuaries.
- Coral Reefs: Calcium carbonate structures formed by coral organisms.
- Seagrass Beds: Underwater meadows of flowering plants.

c. Based on Light Availability

- **Photic Zone**: The upper layer where sunlight penetrates, supporting photosynthesis.
- Aphotic Zone: Below the photic zone, where no sunlight reaches.

d. Based on Salinity

- Marine: Open ocean and seas with stable salinity levels (~35 PSU).
- **Brackish**: Coastal areas, estuaries, and mangroves with mixed salinity.
- Hypersaline: Environments like salt flats or lagoons with high salinity levels.

e. Specialized Marine Habitats

- **Coral Reefs**: Biodiverse systems built by coral polyps in tropical, shallow waters.
- Mangroves: Coastal wetlands with salt-tolerant trees.

- Seagrass Meadows: Submerged flowering plants in shallow, sheltered waters.
- Kelp Forests: Dense underwater forests formed by large brown algae.
- **Hydrothermal Vents**: Found at tectonic plate boundaries, where mineral-rich, heated water emerges.
- **Cold Seeps**: Areas where hydrocarbons seep from the seabed, supporting unique ecosystems.

f. Polar and Deep-Sea Habitats

- Arctic and Antarctic Marine Habitats: Icy waters with extreme temperatures.
- **Deep-Sea Habitats**: Dark, high-pressure environments, including trenches and abyssal plains.

2.1: General objective:

Enables the students to understand the classification of marine habitat.

2.2: Specific Objectives:

Enables the students to:

- 1. describe the different zones of classification
- 2. summarize the adaptations of animals in marine habitat
- 3. give an outline of the animals occupying in different zones
- 4. explain the features of different zones of sea

2.3:Taxonomy of Objectives:

Taxonomy of Objectives													
Knowledge	The Cognitive	e Process Dimens	sion										
Dimension	RememberUnderstandApplyAnalyzeEvaluate												
A. Factual	1			1,2,3									
Knowledge													
B. Conceptual		1, 2,3,4			2,3,4								
Knowledge													
C. Procedural		2,3		3,4									
Knowledge													
D.Meta Cognitive			1,2			4							
Knowledge													

2.4:Key words: Zones of the oceans, adaptations, significance

2.5: Key diagrams(if any):



Experts have divided the world ocean into five main layers or zones based on their depth from the surface. Each layer has different temperatures, amount of light, and living creatures inhabiting them.



3. Discussion:

The students will be asked to retrieve the scientific terms, facts, and concepts about classification of marine habitat. One member will be called from each group to present the outcome of the group. Arrange the class to visit a any beaches or marine environment to gain more knowledge.

4. Mind Map:



5. Summary:

A habitat is the area where an organism or group of organisms live and breed. One habitat will be distinct from another due to its particular environmental conditions. However, habitats are not discrete, and organisms may interact with different habitats within an ecosystem.

6. Assessment through Stimulating questions/Analogy/New ideas and Concepts:

- Generating mental ideas about creating an e-content on the classification of marine habitat
- Producing the e-content.
- Differentiating the zone of marine habitat

7. FAQ's:

- 1. Infauna refers to the organisms living in _____
- a) water column b) intertidal zone c) on the sea botton d) seafloor sediment
- 2. Which of the following kind of marine organism cannot swim against strong currents?
- a) **Plankton** b) Nekton c) Benthos d) Invertebrates
- 3. Flat sediment-covered areas of deep-ocean basins are called ______
- a) continental shelf b) continental slop c) bathyal plains d) **abyssal plains**

- 4. Which ocean-floor feature extend deeper than 6000 meters?
- a) **Trenches** b) Sublittoral zone c) Euphotic zone d) Twilight zone
- 5. The bottom parts of the ocean that totally dark even during daylight hours is called the:
- a) littoral zone. b) **aphotic zone** c) epipelagic zone d) benthic zone

8. References: (Books/Periodicals/Journals)

- Bimla Singh. Marine Biotechnology and Aquaculture Development. Delhi: Vista International Publishing House. 2006.
- 2. Girish Chopra. Coastal and Marine Geography. Delhi: Common Wealth Publisher. 2012.
- 3. Gross G. Oceanography: A view of the Earth. New Jersey: Sixth edition. Prentice Hall Inc. 2008.
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- Nybakken J.W. Marine Biology An Ecological Approach. California: Addison Weslay Longman, Inc. 1997.
- 6. Olivia J. Fernando. Sea water-Properties and Dynamics. Thanjavur: Dhanesh Publications. 1999.
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- Atlas R.M. and Bartha. M. Microbial ecology- Fundamentals and Applications. California: Benjamin-Cummings. 2003.
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- 11. Moshrafuddin Ahamed and Basumatary S.K. Applied Microbiology. Chennai : MJP Publishers. 2006.
- Tait R.V. and F.A. Dipper. Elements of Marine Ecology. Great Britain: British Library Cataloguing in Publication Data. 4th edition 1998.

P. Subatt

9. Verified by Subject Expert Dr. P. Subavathy

N. Milinga Mary

Approved by HOD Dr. N. Arokiya Mary
LESSON PLAN

Objective Oriented Learning Process RBT

Programme	B.Sc.Zoology				
Semester	IV				
Subject Title	Economic Zoology				
Code	21PZOC64				
Hours	4				
Total Hours	60				
Credits	4				
Max.Marks	100				
Unit&Title	Unit:IV Importance of Aquaculture				
Name of the Faculty	Dr.Mary Baptista Janet				
T-L tools	Lecture method, Visual aid: PPT,				

PrerequisiteKnowledge:

Knowledge of v Basic Concepts of Aquatic Ecosystems (marine, freshwater, brackish water)

Micro-planning



1. Topic for Learning through evocation

Start the lesson by posing a thought-provoking question: "How do you think the world will feed its growing population, especially when it comes to protein sources, without putting more pressure on land-based farming?" Present a scenario in which ocean fish populations are declining due to overfishing and land-based farming is facing space and resource limitations. Ask students to consider alternatives for food production that don't rely solely on traditional farming or wild-caught fish. Encourage them to think about whether farming aquatic species could provide a sustainable solution. This will lead students to explore the concept of aquaculture, highlighting its role in providing a sustainable food source, promoting environmental conservation, and supporting economic growth.

1.1 TopicIntroduction:

Aquaculture, or the farming of aquatic organisms such as fish, shellfish, and algae, has become increasingly important in meeting the world's growing demand for food. With global populations expanding and wild fish stocks declining due to overfishing, aquaculture offers a sustainable and efficient way to produce protein-rich food without further depleting natural resources. It plays a critical role in global food security by providing a reliable source of nutrition, supporting economic development, and contributing to environmental conservation. Aquaculture can also help reduce pressure on wild fisheries, promote biodiversity, and foster innovative approaches to sustainable farming practices. As we explore the importance of aquaculture, we'll examine how it addresses challenges related to food supply, environmental sustainability, and the socio-economic benefits for communities worldwide.

1.2 General Objective:

To understand the importance of aquaculture in global food security, environmental sustainability, and economic development, and to explore its role in providing a sustainable source of aquatic food production.

1.3 Specific Objectives:

Enablesthestudentsto:

- •Explain the key benefits of aquaculture in terms of food security, including its role in feeding the growing global population.
- •Identify various types of aquaculture (e.g., freshwater, marine, integrated) and the species commonly farmed.
- •Discuss the environmental impact of traditional fishing practices and how aquaculture can mitigate these issues.
- 2.3:Taxonomy of objectives:

Taxonomy of Objectives				
Knowledge	The Cognitive Process Dimension			

Dimension	Remember	Understand	Apply	Analyse	Evaluate	Create
A. Factual	1					
Knowledge						
B.Conceptual		2				
Knowledge						
C.Procedural			2	4		
Knowledge						
D.MetaCognitive						2
Knowledge						

2.4:Key words:

Aquatic Farming, Sustainable Food Production, Biodiversity. **2.5:Key diagrams (if any):**



3. Discussion:

Students will engage in discussions about the impact of dehydration, overhydration, and health conditions on urine formation, and learn the real-life applications of urine analysis in diagnosing diseases.

4. Mind Map:



5. Summary:

Aquaculture, the farming of aquatic organisms such as fish, shellfish, and algae, plays a crucial role in addressing global food security challenges. As wild fish stocks decline due to overfishing and landbased farming faces limitations in space and resources, aquaculture offers a sustainable alternative for producing protein-rich food. It helps meet the growing demand for seafood and provides a reliable source of nutrition, contributing to global food security. Beyond food production, aquaculture supports economic development by creating jobs, fostering trade, and boosting local economies. It also has the potential to mitigate environmental issues caused by traditional fishing practices, such as habitat destruction and overfishing. By promoting sustainable farming techniques, like recirculating aquaculture systems (RAS), aquaculture can help protect biodiversity and minimize its environmental impact, making it a vital component of future food production systems

6. Assessment through Stimulating questions/Analogy/New ideas and Concepts:

- How can aquaculture help to address the challenges of overfishing and depletion of wild fish stocks?
- In what ways can aquaculture contribute to food security in areas with limited access to traditional agricultural land?"
- What are the environmental concerns associated with aquaculture, and how can they be minimized through sustainable practices?

7. FAQ's:

Which of the following is a common type of aquaculture?				
a) Terrestrial farming				
b) Freshwater and marine farming				
c) Desert farming				
d) Hydroponic farming				
What is one environmental concern related to aquaculture?				
a) Overgrazing of land				
b) Destruction of forests				
c) Water pollution from waste and chemicals				
d) Deforestation for fish farms				
Which of the following is a sustainable aquaculture technique that minimizes environmental				
impact?				
a) Overfishing				
b) Recirculating Aquaculture Systems (RAS)				
c) Increased pesticide use				
d) Monoculture farming				
What is the primary challenge facing global aquaculture expansion?				
a) Lack of fish species				
b) Limited technological advancements				
c) Environmental sustainability and disease management				
d) Excessive government regulation				

8. Reference

1. Santhana Kumar and Selvaraj, A.M Concepts of Aquaculture. Nagercoil: Mac ram Publications.2006.

Verified by Subject Expert

N. Milinga Mary

Approved by HOD