



# Sh. L. N. Hindu College, Rohtak (Haryana)

## Course Plan

Department of Zoology

Program: BSc Medical

### LIFE AND DIVERSITY OF ANNELIDA TO HEMICHORDATA (2.1)

#### SCHEME

<b>Course Name</b>	<b>LIFE AND DIVERSITY OF ANNELIDA TO HEMICHORDATA</b>	<b>Course Type</b>	<b>Theory</b>
<b>Course Code</b>	<b>2.1</b>	<b>Class</b>	BSc Medical (Zoology) IISem.
<b>Instruction Delivery</b>	Per week Lectures: 5, Tutorial:1, Practical:4 Total No. Classes Per Sem: 85(L), 63(T), - 25 (Practical ) Assessment in Weightage: Sessional (20%), End Term Exams (80%)		
<b>Course Coordinator</b>	Dr Pinky Deswal	<b>Course Instructors</b>	Theory: Dr Pinky Deswal Practical:Dr Pinky Deswal

#### COURSE OVERVIEW

The paper explores the diverse realms of invertebrate biology, delving into the intricate structures and behaviors of various phyla. It encompasses the systematic study of Annelida, Arthropoda, Mollusca, Echinodermata, and Hemichordata, unraveling their general characters, classifications, and economic significance. Students engage in detailed examinations, including type studies on Pheretima, Periplaneta, Pila, and Asteries, enhancing their understanding of metamerism, larval forms, and unique anatomical features. The course not only fosters a profound appreciation for invertebrate biodiversity but also equips students with analytical skills crucial for ecological and evolutionary studies.

#### PREREQUISITE

Physiology (structural and functional organization of animal body),  
Ecology (Relationship between organism and environment) and  
Evolution (How species change over time).

#### COURSE OBJECTIVE

The goal of this course is to familiarize students with fundamental concepts in the study of invertebrates life. It aims to cultivate a clear understanding of key ideas such as the classification and characteristics of different animal phyla, the ecological and economic importance of various species, and the evolutionary significance of morphological features. The course will equip students with essential skills to analyze and appreciate the diversity of the animal kingdom, fostering effective engagement with concepts in zoological sciences.



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### COURSE OUTCOMES (COs)

After the completion of the course, the student will be able to:

CO No.	Course Outcomes
1	Define the general characters and classification of Annelida, Arthropoda, Mollusca, Echinodermata, and Hemichordata. KL1
2	Explain the economic importance and biodiversity of invertebrates, highlighting key contributions to ecosystems and human activities. KL2
3	Demonstrate the application of classification principles by identifying and categorizing organisms within each phylum. KL3
4	Analyze the metamerism in Annelida, trochophore larva in Mollusca, and Aristotle's Lantern in Echinodermata to understand their evolutionary significance. KL4
5	Develop a comparative study, contrasting the respiratory systems and locomotor adaptations across Annelida, Arthropoda, Mollusca, Echinodermata, and Hemichordata. KL5
6	Assess and evaluate the ecological impact of a specific organism from each phylum on its environment, considering both positive and negative aspects. KL6

### COURSE CONTENT

Content
Phylum - Annelida: i) General characters and classification up to order level ii) Biodiversity and economic importance of Annelida iii) Type study - Pheretima (Earthworm) iv) Metamerism in Annelida v) Trochophore larva: Affinities, evolutionary significance Phylum - Arthropoda: i) General characters and classification up to order level ii) Biodiversity and economic importance of insects iii) Type study – Periplaneta Phylum - Mollusca: i) General characters and classification up to order level ii) Biodiversity and economic importance iii) Type study - Pila iv) Torsion and detorsion in gastropoda v) Respiration and foot Phylum - Echinodermata: i) General characters and classification up to order level



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ii) Biodiversity and economic importance

iii) Type Study -Asteries (Sea Star)

iv) Echinoderm larvae

v) Aristotle's Lantern

Phylum – Hemichordata:

Type study: Balanoglossus

### LESSON PLAN (THEORY AND TUTORIAL CLASSES)

L. No	Topic to be Delivered	Tutorial Plan	Unit
1	<b>Annelida</b> :General characters and classification up to order level	MCQ test on characters , economic importance and classification -Annelids	1
2	Biodiversity of Annelida		
3	Economic importance of Annelida		
4	Type study - <i>Pheretima</i> (Earthworm)-Digestive	Diagram test – all the systems	
5	Type study - <i>Pheretima</i> (Earthworm): Respiratory		

6	Type study - <i>Pheretima</i> (Earthworm): Circulatory	Diagram test – all the three systems	1
7	Type study - <i>Pheretima</i> (Earthworm): Reproductive		
8	Type study - <i>Pheretima</i> (Earthworm):Sense organs		
9	Type study - <i>Pheretima</i> (Earthworm): Excretory		
10	Type study - <i>Pheretima</i> -	MCQ test of Metamerism	
11	Metamerism in Annelida		
12	Metamerism in Annelida		
13	Trochophore larva:Affinities,	Test of full unit – 8 marks question	
14	Trochophore larva: evolutionary significance		



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15	<b>Arthropoda</b> :General characters and classification up to order level	MCQ test of characters, classification, biodiversity and economic importance	2
16	Biodiversity of insects		
17	Economic importance of insects		
18	Type study – <i>Periplaneta</i>	Diagrammatic and explanation test of systems	
19	Type study – <i>Periplaneta</i>		
20	Type study – <i>Periplaneta</i>		
21	Type study – <i>Periplaneta</i>		
22	Type study – <i>Periplaneta</i>		
23	Type study – <i>Periplaneta</i>	Diagrammatic and explanation test of systems	
24	Type study – <i>Periplaneta</i>		
25	Type study – <i>Periplaneta</i>		
26	<b>Molluscs:</b> General characters	MCQ test of the following test	3
27	Classification up to order level		
28	Biodiversity		
29	Economic importance		
30	Type study - <i>Pila</i>		
31	Type study - <i>Pila</i>	Diagrammatic and explanation test	3
32	Type study - <i>Pila</i>		
33	Type study - <i>Pila</i>		
34	Type study - <i>Pila</i>	Diagrammatic and explanation test	
35	Type study - <i>Pila</i>		
36	Type study - <i>Pila</i>		
37	Type study - <i>Pila</i>		
38	Type study - <i>Pila</i>		
39	Type study - <i>Pila</i>		
40	Type study - <i>Pila</i>		
41	Type study - <i>Pila</i>		
45	Torsion and detorsion in gastropoda		
46	Respiration and foot		
47	<b>Echinodermata:</b> General characters and classification up to order level	Diagrammatic and explanation test of systems	4
48	Biodiversity		
49	Economic importance		
50	Type Study - <i>Asteries</i> (Sea Star)		
51	Type Study - <i>Asteries</i> (Sea Star)		
52	Type Study - <i>Asteries</i> (Sea Star)		
53	Type Study - <i>Asteries</i> (Sea Star)		



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54	Type Study - <i>Asteries</i> (Sea Star)	Diagrammatic and explanation test of systems	4
55	Type Study - <i>Asteries</i> (Sea Star)		
56	Type Study - <i>Asteries</i> (Sea Star)		
57	Type Study - <i>Asteries</i> (Sea Star)		
58	Echinoderm larvae		
59	Aristotle's Lantern		
60	<b>Hemichordata:</b> Type study: <i>Balanoglossus</i>	Diagrammatic and explanation test of systems	
61	Type study: <i>Balanoglossus</i>		
62	Type study: <i>Balanoglossus</i>		
63	Type study: <i>Balanoglossus</i>		

### Text Book

R.L. Kotpal, Modern Text Book of Zoology: Invertebrates -Animal Diversity , Rastogi Publications.

### Reference Books

- E.O. Wilson. The Diversity of Life (The College Edition), W.W. Northern & Co.
- The diversity of living organisms, author: Richard Stephen Kent Barnes
- Brusca, R.C., Moore, W. and Shuster, S.M. (2016) Invertebrates. Sunderland, Massachusetts U.S.A.: Sinauer Associates, Inc., Publishers.
- Moore, J. and Overhill, R. (2006) An introduction to the invertebrates. Cambridge: Cambridge University Press.

### Web/Links for e-content

- <https://quizlet.com/138901563/invertebrate-comparison-chart-flash-cards/>
- <https://www.britannica.com/animal/invertebrate>
- [youtube.com/playlist?list=PLQInTldJs0ZQExTCjWSXXkCdfSvpjT5cO](https://youtube.com/playlist?list=PLQInTldJs0ZQExTCjWSXXkCdfSvpjT5cO)
- <https://www.uou.ac.in/sites/default/files/slm/MSCZO-501.pdf>



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### PRACTICE QUESTIONS (QUESTION BANK)

1. What are the general characteristics of the phylum Annelida?	2. List and explain the orders within the phylum Annelida.
3. Discuss the economic importance of Annelida with examples.	4. Describe the metamerism in Annelida and its significance.
5. Explain the evolutionary significance of the trochophore larva in Annelida.	6. Provide an overview of the general characters of the phylum Arthropoda.
7. Classify Arthropoda up to the order level and provide examples for each.	8. Discuss the biodiversity and economic importance of insects.
9. Conduct a type study on Periplaneta and highlight its unique features.	10. How do arthropods exhibit adaptations to diverse habitats?
11. Outline the general characters of the phylum Mollusca.	12. Classify Mollusca up to the order level and provide examples for each.
13. Explore the biodiversity and economic importance of Mollusca.	14. Conduct a type study on Pila and describe its anatomy and behavior.
15. Explain the concepts of torsion and detorsion in Gastropoda.	16. Summarize the general characters of the phylum Echinodermata.
17. Classify Echinodermata up to the order level and provide examples for each.	18. Discuss the biodiversity and economic importance of Echinodermata.
19. Conduct a type study on Asterias (Sea Star) and highlight its features.	20. Explain the structure and function of Aristotle's Lantern in echinoderms.
21. Provide an overview of the general characters of the phylum Hemichordata.	22. Discuss the ecological significance of organisms within Hemichordata.
23. Conduct a type study on Balanoglossus and describe its anatomy.	24. How does Hemichordata differ from other invertebrate phyla studied?
25. Compare and contrast the metamerism in Annelida with segmentation in other phyla.	26. Discuss the ecological roles of insects in different ecosystems.
27. Explain the process of torsion and its adaptive significance in Gastropoda.	28. Compare the respiratory mechanisms in different classes of Mollusca.
29. How does Aristotle's Lantern contribute to the feeding habits of echinoderms?	30. Analyze the evolutionary significance of trochophore larva in Annelida.
31. Compare the evolutionary adaptations of arthropods and annelids to terrestrial habitats.	32. Discuss the evolutionary trends observed in different classes of Mollusca.
33. Explain how echinoderm larvae contribute to the life cycle of echinoderms.	34. Highlight the evolutionary aspects of the feeding structure Aristotle's Lantern.
35. How can the study of Annelida contribute to soil fertility in agriculture?	36. Discuss the role of insects in pollination and its impact on ecosystems.
37. Analyze the economic importance of mollusks in the food industry.	38. Evaluate the ecological significance of sea stars (Asterias) in marine ecosystems.
39. How can knowledge of Hemichordata contribute to environmental conservation?	40. Compare the respiratory systems of insects and mollusks.
41. Contrast the feeding mechanisms of	42. Compare the locomotion in Annelida and



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earthworms and cockroaches.	Arthropoda.
43. Analyze the structural differences between the foot of a snail (Mollusca) and the foot of an earthworm (Annelida).	44. Compare the larval forms in Annelida and Echinodermata.
45. Explain how earthworms contribute to soil structure and nutrient cycling.	46. Discuss the role of insects in the decomposition of organic matter.
47. Explore the ecological relationships between mollusks and their habitats.	48. How do sea stars (Asterias) influence the diversity of marine ecosystems?
49. Discuss the ecological implications of habitat preferences in Hemichordata.	50. Evaluate the impact of anthropogenic activities on the biodiversity of the studied invertebrate phyla.

### B.Sc.-Semester II PRACTICAL

**(A) Classification up to orders with ecological note and economic importance of the following group of animals:**

1. Annelida Specimens: Pheretima, Heteronereis, Polynoe, Aphrodite, Chaetopterus, Arenicola, Tubifex and Pontobdella.
2. Arthropoda Specimens: Peripatus, Palaemon (Prawn), Lobster, Cancer (crab), Sacculina, Eupagurus (hermit crab), Lepas, Balanus, Cyclops, Daphnia, Lepisma, Periplaneta (cockroach), Schistocerca (locust), Poeciloceris (ak-hopper), Gryllus (cricket), Mantis (praying mantis), Cicada, Forficula (earwig), Dragon fly, termite queen, bug, moth, beetle, Polistes (wasp), Apis (honey bee), Bombyx (silk moth), Cimex (bedbug), Pediculus (body louse). Millipedes, Scolopendra (centipedes), Palamnaeus (scorpion), Aranea (spider), Limulus (king crab).
3. Mollusca Specimens: Mytilus, Ostrea, Cardium, Pholas, Solen (razor fish), Pecten, Haliotis, Patella, Aplysia, Doris, Limax, Loligo, Sepia, Octopus, Nautilus (complete and T.S.), Chiton and Dentalium.
4. Echinodermata Specimens: Asterias, Echinus, Cucumara, Ophiothrix, Antedon and Asterothyton.
5. Hemichordata Balanoglossus

**(B) Study of the following permanent stained preparations:**

1. T.S. Pheretima (pharyngeal and typhlosolar regions), Setae, septal nephridia and spermathecae of Pheretima.
2. Trachea and mouthparts of cockroach.
3. Statocyst of Palaemon.
4. Glochidium larva of Anodonta; radula and osphradium of Pila.
5. T.S. Star fish (arm)
6. T.S. Balanoglossus (through various regions).





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### (C) Demonstration by C. D.:

1. Mouth parts and trachea of Periplanata (cockroach)
Radula of Pila; Pedicellariae of Asterias.
2. Setae of earthworm
and mouth parts of Honey bee
House fly and cockroach

### (D) Preparation of models of the different systems of the following animals:

1. Earthworm: Digestive
reproductive and nervous systems.
2. Grasshopper/ cockroach: Digestive
reproductive and nervous systems.
3. Pila: Pallial complex
digestive and nervous systems

### (E) Cell biology and Genetics:

1. Salivary gland and polytene chromosomes of Drosophila/Chironomus.
2. Numericals based on three point test cross

### (F) Project:

1. Survey- Diversity of particular family/taxa in your surrounding area
2. Vermicomposting: Earthworm rearing and economics of the project
3. Evolutionary significance of larvae belonging to different group of invertebrates