

## ZOOLOGY III ANIMAL FORM AND FUNCTION-I (A COMPARATIVE PERSPECTIVE)

CREDIT HOURS: 3

### Objectives:

The course aims to teach the students about:

- a. Animals diversity adapted in different ways for their functions through modifications in body parts.
- b. The diversity in integumentary, skeletal, muscular, nervous and sensory, endocrine, circulatory, respiratory, nutritive,
- c. Organ systems, their specialization and coordination with each other and constantly changing internal and external environment, inside and outside the animal's body.
- d. The basic structure of each system that determines its particular function.

### 1. Protection, Support, and Movement

Protection: the integumentary system of invertebrates and vertebrates; movement and support: the skeletal system of invertebrates and vertebrates; movement: non-muscular movement; an introduction to animal muscles; the muscular system of invertebrates and vertebrates.

#### Communication I: Nerves

Neurons: structure and function; neuron communication: introductory accounts of resting membrane potential, action potential (nerve impulse) and transmission of the action potential between cells; invertebrate and vertebrate nervous systems: the spinal cord, spinal nerves, the brain, cranial nerves and the autonomic nervous system.

#### Communication II: Senses

Sensory reception: baroreceptors, chemoreceptors, georeceptors, hygroreceptors, phonoreceptors, photoreceptors, proprioceptors, tactile receptors, and thermoreceptors of invertebrates; lateral-line system and electrical sensing, lateral-line system and mechanoreception, hearing and equilibrium in air, hearing and equilibrium in water, skin sensors of damaging stimuli, skin sensors of heat and cold, skin sensors of mechanical stimuli, sonar, smell, taste and vision in vertebrates.

#### Communication III: The Endocrine System and Chemical

##### Messengers

Chemical messengers: hormones chemistry; and their feedback systems; mechanisms of hormone action; some hormones of porifera, cnidarians, platyhelminthes, nemertean, nematodes, molluscs, annelids, arthropods, and echinoderms invertebrates; an overview of the vertebrate endocrine system; endocrine systems of vertebrates, endocrine systems of birds and mammals.

#### Circulation, Immunity, and Gas Exchange

Internal transport and circulatory systems in invertebrates: characteristics of invertebrate coelomic fluid, hemolymph, and blood cells; transport systems in vertebrates; characteristics of vertebrate blood, blood cells and vessels; the hearts and circulatory systems of bony fishes, amphibians, reptiles, birds and mammals; the human heart: blood pressure and the lymphatic system; immunity: nonspecific defenses,

the immune response; gas exchange: respiratory surfaces; invertebrate and vertebrate respiratory systems: cutaneous exchange, gills, lungs, and lung ventilation; human respiratory system: gas transport.

### Animal Behaviour

Four approaches to animal behaviour; proximate and ultimate causes; anthropomorphism; development of behavior; learning; control of behavior; communication; behavioral ecology; social behavior.

### Evolution: A Historical Perspective

Pre-Darwinian theories of change; Lamarck: an early proponent of evolution; early development of Darwin's ideas of evolution and evidences; the theory of evolution by natural selection; evolutionary thought after Darwin; biogeography.

### Evolution and Gene Frequencies

The modern synthesis: a closer look; the Hardy-Weinberg theorem; evolutionary mechanisms: population size, genetic drift, natural selection, gene flow, mutation, and balanced polymorphism; species and speciation; rates of evolution; molecular evolution; mosaic evolution.

### Evaluation Criteria

Examination	Type	Marks
Internal Examination	Sessional Work	15%
	Mid-Semester	25%
External Examination	Final Semester	60%

### Recommended Books:

Campbell, N. A. (2002). *Biology* (6<sup>th</sup> ed). Menlo Park, California: Benjamin/Cummings Publishing Company, Inc.

Hickman, C. P. & Kats, H. L. (2000). *Laboratory studies in integrated principles of zoology*. Singapore: McGraw Hill.

Hickman, C.P., Roberts, L.S., & Larson, A. (2004). *Integrated principles of zoology* (12<sup>th</sup> ed) (International). Singapore: McGraw Hill.

Kent, G. C. & Miller, S. (2001). *Comparative anatomy of vertebrates*. New York: McGraw Hill.

Miller, S. A. (2002). *General zoology laboratory manual* (5<sup>th</sup> ed) (International). Singapore: McGraw Hill.

Miller, S. A., & Harley, J. B. (2000). *Zoology* (6<sup>th</sup> ed) (International). Singapore: McGraw Hill.

Pechenik, J. A. (2000). *Biology of invertebrates*, (5<sup>th</sup> ed) (International). Singapore: McGraw Hill.

## Zoology Lab-III

**Credit Hour: 01**

### Practicals

1. Study of insect chitin, fish scale, amphibian skin, reptilian scales, feathers and mammalian skin.
2. Study and notes of skeleton of *Labeo*, *Rana tigrina*, *Varanus*, fowl and rabbit.  
*Note: Exercises of notes on the adaptations of skeletons to their function must be done.*
3. Earthworm or leech; cockroach, freshwater mussel, *Channa* or *Catla catla* or *Labeo* or any other local fish, frog, pigeon and rat or mouse and rabbits are representative animals for study in dissections.
4. Study of models or preserved brains of representative animals and notes on adaptations.
5. Study of nervous system of earthworm and a fish.
6. Study of endocrine system in an insect and a rabbit.
7. Study of different types of blood cells in blood smear of rabbit.
8. Study of heart, principal arteries and veins in a representative vertebrate (dissection of representative fish/mammals).
9. Study of respiratory system in cockroach or locust and a vertebrate representative (Model).

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- Hickman, C. P. & Kats, H. L. (2000). *Laboratory studies in integrated principles of zoology*. Singapore: McGraw Hill.
- Hickman, C.P., Roberts, L.S., & Larson, A. (2004). *Integrated principles of zoology* (12<sup>th</sup> ed) (International). Singapore: McGraw Hill.
- Kent, G. C. & Miller, S. (2001). *Comparative anatomy of vertebrates*. New York: McGraw Hill.
- Miller, S. A. (2002). *General zoology laboratory manual* (5<sup>th</sup> ed) (International). Singapore: McGraw Hill.
- Miller, S. A., & Harley, J. B. (2000). *Zoology* (6<sup>th</sup> ed) (International). Singapore: McGraw Hill.
- Pechenik, J. A. (2000). *Biology of invertebrates*, (5<sup>th</sup> ed) (International). Singapore: McGraw Hill.