

# Evolution and diversity of organisms

# Competency Levels - 7

- 3.1.1 Uses the theories of origin of life and natural selection to analyze the process of evolution of life
- 3.2.1 Constructs hierarchy of taxa on scientific basis
- 3.2.2 Explores the diversity of organisms within Domain Bacteria
- 3.2.3 Explores the diversity of organisms within the Kingdom Protista.
- 3.2.4 Explores the diversity of organisms within the Kingdom Plantae
- 3.2.5 Explores the diversity of organisms within the Kingdom Fungi.
- 3.2.6 Explores the diversity of organisms within the Kingdom Animalia
- 3.2.7 Uses the characteristic features to study organisms belonging to Phylum Chordata

# Contents: Competency Level 3.1.1 (Page 13)

- Origin of life on earth
  - Conditions for life on earth
- Geological **eons and** eras of evolution
- **Eons: Hadean, Archaean, Proterozoic, Phanerozoic**
- **Eras**
  - ~~Archaean~~
  - Paleozoic
  - Mesozoic
  - Cenozoic
- Evolution of biological diversity
  - Biochemical evolution
  - Protocell
  - Origin of photosynthetic organisms
  - Origin of Eukaryotes
  - Diversification of eukaryotes

# Contents: Competency Level 1 – Contd.

- **Theories of evolution**
  - Theory of Lamarck
  - Darwin – Wallace theory
  - Theory of natural selection
  - Neo-Darwinism

# Learning outcomes for competency level 3.1.1. (Page 13)

Student should be able to:

- describe the conditions on earth before life
- Describe the evolution of biological diversity since the biochemical evolution
- State major events of four major geological eons and the evolution of biodiversity through different eons and eras
- explain theory of Lamarck and theory of natural selection
- relate theory of Neo-Darwinism to natural selection
- accept the importance of evolution for sustaining life in accordance with changing environment

# Origin of life on earth

- Conditions on early Earth made the origin of life possible
- Experiments simulating possible early atmospheres have produced organic molecules from inorganic precursors. Amino acids, lipids, sugars, and nitrogenous bases have also been found in meteorites.
- Amino acids and RNA nucleotides polymerize when dripped onto hot sand, clay, or rock. Organic compounds can spontaneously assemble into **protocells**, membrane-bounded droplets that have some properties of cells.
- The first genetic material may have self-replicating, catalytic RNA. Early protocells containing such RNA would have increased through natural selection.

- **Protocell:** An abiotic precursor of a living cell that had a membrane-like structure and that maintained an internal chemistry different from that of its surroundings.

# Eons

- Hadean eon: approximately 4,600 -3850 million years ago
- Archaean eon: approximately 3850 – 2500 million years ago
- Proterozoic eon: 2500 – 542 million years ago
- Phanerozoic eon: From 542 million years to date
- First three eons lasted about 4 billion years. The Phanerozoic eon, roughly the lasted about half billion years. This eon encompasses most of the time that animals have existed on Earth.
- It is divided into three eras:
  - Paleozoic: 542 -251 million years ago.
  - Mesozoic: 251 – 65.5 million years ago,
  - Cenozoic : From 65.5 million years ago to date

# What happened during these eons and eras

## **Hadean eon**

- Origin of Earth

## **Archaean eon**

- Concentration of atmospheric oxygen begins to increase
- Oldest fossils of cells (prokaryotes) appear
- Oldest known rocks on Earth's surface

## **Proterozoic eon**

- Diverse algae and soft-bodied invertebrate animals appear
- Oldest fossils of eukaryotic cells appear

## **Paleozoic era**

- Marine algae abundant; colonization of land by diverse fungi, plants, and animals
- Diversification of bony fishes
- First tetrapods and insects appear
- Amphibians dominant
- Origin and radiation of reptiles;
- Origin of most present-day groups of insects
- Sudden increase in diversity of many animal phyla (Cambrian explosion)
- Extinction of many marine and terrestrial organisms
- Extensive forests of vascular plants
- First seed plants appear
- Diversification of early vascular plants

## **Mesozoic era**

- Flowering plants (angiosperms) appeared and diversified;
- Dinosaurs evolved, radiated and became abundant. But during the latter part, many groups of organisms, including dinosaurs, became extinct
- Cone-bearing plants (gymnosperms) dominated
- Origin of mammals

## Cenozoic era

- Major radiation of mammals, birds, and pollinating insects
- Dominance of angiosperm increased and their radiation continued
- Origins of many primate groups
- Appearance of bipedal human ancestors
- Origin of genus *Homo*

# Some Guidelines:

- Use the recommended text.
- Prepare a new set of notes paying attention to the contents as well as intended learning outcomes. Some are high level ILOs.
- Give local examples to show the characters – Specimens, pictures can be used.
- Do not give a table with characters.
- Improve the enthusiasm of children to learn Biology; Learn diversity of living organisms.
- Make learning interesting using practical work