Evolution

- **Origin of life**

  - **Evolutionary biology** is the field of science that deals with the study of evolutionary development of life forms on earth

  - **Big-bang theory** explains the origin of the universe.

  - Scientists believed that life originated through chemical evolution.

  - Formation of biomolecules → First life form

  - **According to Oparin and Haldane,** the primitive atmosphere was reducing as it lacked oxygen. The atmosphere was rich in methane, water vapour, ammonia and carbon dioxide.

  - The temperature was high and volcanic eruptions were frequent.

  - **Urey and Miller** experimentally confirmed that formation of life was preceded by chemical evolution.

  - **Branching descent** and **natural selection** are the key concepts of **Darwin's theory.**

- **Evidences of evolution -**

  - Fossils
  - Homologous organs
  - Analogous organs
  - Vestigial organs
  - Comaprative anatomy and morphology
  - Embryological evidences
  - Molecular evidences

Adaptive Radiation

- It is the development of different species in a given geographical area from an original homogenous population.

- Example: Darwin's finches and Australian marsupials

- The slow and gradual process of change of one organism into another is known as **Organic Evolution**.

- The occurrence of evolution has been supported by various theories put forth by biologists.

- In 1809, Jean Baptiste Lamarck a French zoologist put forth the theory of inheritance of acquired characters; also known as **Lamarckism**.

- He stated that according to their need, organisms put some organs in their bodies to maximum use while some of the organs were not used. The part of the body put to maximum use will have the tendency to grow larger and stronger while the part less used will become less prominent and ultimately disappear altogether. Thus, the organisms acquired new characters. For example, giraffe have developed long necks as a result of attempts to eat leaves high up on trees.

Darwinism

- According to Darwin, evolution took place by natural selection.

- Another aspect of natural selection is the survival of the fittest, where nature selects the individuals, which are most fit, to adapt to their environment.

Hardy Weinberg Principle

- It states that the total gene and allele frequencies in a population are stable and constant from generation to generation.

- Disturbances in the gene equilibrium can result in evolution.

- **Factors affecting Hardy Weinberg equilibrium–**

    1. Gene migration or gene flow
    2. Genetic drift
    3. Mutation
    4. Gene recombination
    5. Natural selection

Natural selection causes allele frequencies of a population to change. Depending upon which traits are favoured in a population it can produce three different results.

(1) Stabilizing selection
(2) Directional selection
(3) Disruptive selection

Evolution of Plants

- Cellular life forms occurred on earth about 2000 million years ago.
- Some of these cells had the ability to produce oxygen.
- Slowly, single-celled organisms became multicellular.

Evolution of animals

- Animals evolved about 500 million years ago. The first of them to evolve were invertebrates.
- The modern fishes have probably evolved from jawless fishes, amphibians evolved into reptiles, while reptiles evolved into birds and mammals.
- During continental drift North America joined with South America, the primitive mammals suffered whereas pouched mammals of Australia survived due to lack of competition.

Evolution of man

Homo sapiens
Modern man
↑
Neanderthal man (Cranial capacity around 1400cc)
↑
Homo erectus (Cranial capacity around 900cc)
↑
Homo habilis (Cranial capacity around 650 – 800cc)
1st human-like being
↑
Australopithecus (2 mya)
↑
Dryopithecus and Ramapithecus (15 mya)
(More ape-like) (More human-like)