

Molecular Biology

19. How does molecular biology help in the study of biological evolution?

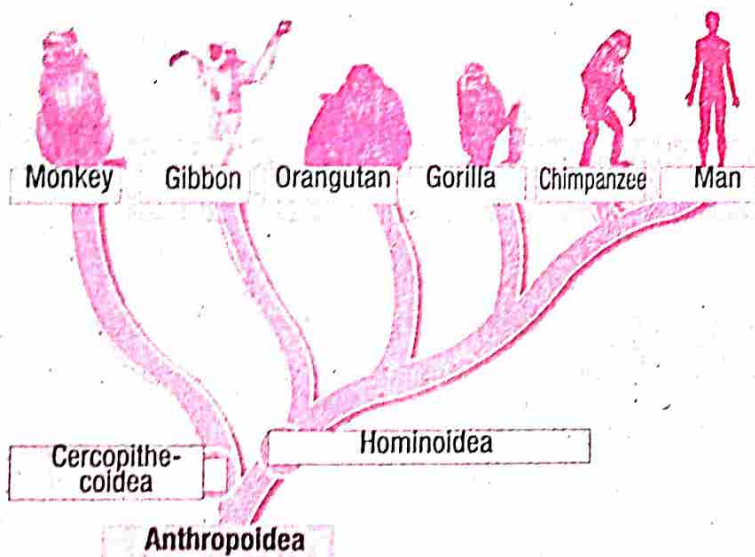
Through a comparative study of protein molecules in different species, the evolutionary relationships among organisms can be identified. This is an effective method to draw the evolution showing the branching of organisms from a common ancestor.

- Analyse the table and write inferences.

Organism	Difference from the amino acids in the β chain of haemoglobin in man
Chimpanzee	No change
Gorilla	Difference of one amino acid
Rat	Difference of 31 amino acids

- Which organism is the farthest from humans from the evolutionary point of view? Why?
Rat. There is a difference of 31 amino acids in the β chain of haemoglobin in man and rat.
- Which organism is the closest to man from the evolutionary point of view. What is the reason for this?
Chimpanzee. There is no change in amino acids in the β chain of haemoglobin in human and chimpanzee.

Evolution of Human beings



Indicators - Answers

- Which organism is the closest to human in specific characters? Chimpanzee
- How Anthropoidea, Cercopithecoidea and Hominoidea are related to each other?
The common ancestral group Anthropoidea separated into two namely Cercopithecoidea and Hominoidea.
- What are the characteristics of the organisms, which belong to the group Hominoidea?
Developed brain, freely movable hands.
- 'Man evolved from monkeys.' How would you respond to this statement?

It is not true. The group Cercopithecoidea that gave rise to the present day monkey separated very early from Anthropoidea and group Hominoidea that gave rise to man. Further, the evolution of modern man took place after passing through a number of million years.

Main stages in the history of human evolution

Ardipithecus ramidus

- Most primitive member of the human race.
- Fossils were discovered from Africa.

Australopithecus afarensis

- Slender body.
- Fossils were discovered from Africa.

Homo habilis

- Made weapons from stones and bone pieces.
- Fossils were discovered from Africa.

Homo erectus

- Thick chin and large teeth, had the ability to stand erect.
- Fossils were discovered from Africa and Asia.

Homo neanderthalensis

- Contemporary to modern man.
- Fossils were discovered from Europe and Asia.

Homo sapiens

- Modern man
- First fossils were discovered from France.

20. Which are the places from where fossils were discovered?

- Africa - Ardipithecus ramidus, Australopithecus afarensis, Homo habilis.
 - Africa, Asia - Homo erectus.
 - Europe, Asia - Homo neanderthalensis
 - France - Homo sapiens
- What are the features of modern man that differentiate him from other animals included in the historical path of human evolution?
 - Development of brain.
 - The capacity to stand on his own legs.
 - Bifocal vision that helps to look at an object.
 - The capacity to make and use tools on his own.
 - The capacity to communicate through the use of language.

21. What is mass extinction? How many extinctions have taken place so far?

History not only has stories of growth but also has tales of mass extinction. It is recorded in history that there occurred five mass extinctions till now and that biodiversity got reestablished rapidly afterwards.

LET'S ASSESS - Answers

1. b. Origin of species
2. • Eukaryotes were formed from prokaryotes.
 - From eukaryotes colonial form originated.
 - From eukaryote colonies multicellular organisms originated.
 - Thereafter through natural selection new organisms were formed.
 - Biodiversity originated.
3. It influences the same. Extinction of organisms happen through human interference. We create artificial variations through hybridization and genetic engineering.

4. 1) Fossil evidences of evolution

Primitive fossils have simple structure. Recently formed fossils have complex structure. Certain fossils are connecting links between different species. Fossil evidences justify the inference that organisms with complex structures were evolved from organisms with simple structures.

2) Evidences provided by comparative morphological studies

Anatomy of vertebrates exhibits many similarities. The

type of blood vessels, muscles, nerves etc. are similar. These similarities justify the inference of the existence of a common ancestor.

3) Biochemical and physiological evidence.

In all organism, enzymes control chemical reactions. Energy is stored in ATP molecules. Genes determine hereditary traits. Carbohydrates, proteins and fats are the basic substance in the structure of all cells. All these facts point towards a common ancestor for life forms.

4) Evidences provided by molecular biology

Through comparative study of protein molecules in different species the evolutionary relationship among organisms can be identified. There is a specific gene behind the synthesis of each protein. The study of proteins, give information about the mutation that happened in genes. Evolutionary history of different species of organisms can be made based on the time at which mutation has occurred in a particular gene.