40 Evolution

- Origin of life and its theoryes :

- Origin of life of protobiogenesis means, the origin of first life from non-livings on the earth about 3000 million years ago. Different religions have also advocated different ideas regarding the origin of life.

- **Abiogenesis** : Different living organisms evolved from mud, soil, meat, organic manure.
- **Biogenesis :** F. Reddy had proposed this principle in 17th century. According to him biogenesis means formation of new life from pre existing organisms through reproduction.
- **Meteorite Theory :** This theory believed in cosmozin, as per it for life formation cosmos came from other planets and on getting favourable conditions they develped into organisms.
- **Theory of Eternity :** As per this theory life was there when abiotic components were also present on earth in its earlier stage. This theory was not accepted by any one.
- **Theory of catatrophism :** Georges Cuvier proposed this theory. He thought that the universe has been subjected to catatropes or sudden revolution at different intervals.
- **Theory of special creation :** There were no evidences for this theory. However, Father Suarez believed that all elements were created within six days.
- **Theory of organic Evolution :** As per this theory, the world has been evolved and not been created. Non living substances have reacted to form organic compounds which developed into colloidal systems. Simple life was developed from them.
- **Oparin-Haldane Hypothesis :** Modern biologists strongly believe that life is originated in the re remote past from interaction of chemical substances. It was formulated by Haeckel, on this basis theory was develpoed by oparin and Haldane. This theory suggests that life is originated from simple inorganic substances. These substances might be transformed into a colloidal system to produce life.

(A) Chemical evolution

(1) **Origin of Earth :** It is now scientifically established that the earth was formed from the sun some 5000 millions years ago. When it was fragmented from the sun, it was a glowing fire containing a molten mass of gases and vapour of various elements. The temperature was very high about 5000°C to 6000°C. As the earth was moving away from the sun, it was getting cooled. The heavy elements like iron, nickel etc. occupied the core of the earth where as the lightest elements like helium, hydrogen, Oxygen, nitrogen carbon etc. occupied the atmosphere of the earth. The chemical changes leading to the formation of life is called chemical evolution or molecular evolution of origin of life.

(2) **Formation of water, Ammonia and Methane :** In lighest elements hydrogen was very active, It combined with nitrogen to form ammonia (NH_3) with Oxygen to form water (H_2O), and with carbon form methane (CH_4). As the temperature of the earth was high, ammonia and methane remained as gases and water as superheated streams.

$N_2 + 3H_2 \rightarrow 2NH_3$

$C+2H_2 \rightarrow CH_4$

$1/_2O_2+H_2 \rightarrow H_2O$

As years passed, the temperature of the earth came down, stream condensed into water and resulted in rain, but the rain drops were evaporated immediately, this procers was repeated for millions of years, the surface of the earth became cooled. Water gradually accumulated and this led to the formation of rivers, streams, lakes, seas and oceans. Compounds like ammonia, methane etc. were

dissolved in rain water and were accumulated in the sea. Mineral rocks also dissolved leading to the accumulation of mineral and salts in sea water. The first chemicals formed on the earth were water, ammonia and methane.

(3) **Formation of Micromolecule :** In molecular evolution the way of formation of micromolecules. amino acids, fatty acids, monosaccharides, purines, pyrimidines, adenosine monophosphate (AMP) and Adenosine diphosphate (ADP) appeared as colloidal droplets in the sea. These were distinct bodies which did not mix with the surrounding sea water. They were contents of proteins, nucleoproteins and other organic and inorganic molecules in various ratio. The surface layer of the droplet had the ability for selective absorption of susbstances from the medium.

(4) **Formation of macromolecules :** When the micromolecules were formed, they combined in various ways to form large molecules called macromolecules. This process is called polymerization.

(5) **Formation of Nucleic acid / Nucleoproteins :** The nucleic acid and proteins combined together to from nucleoproteins which are very important macromolecules to create a life.

(B) Biological evolution :

(1) Formation of coacervates : When macromolecules were formed they undergo aggregation and precipitation in the sea . Which led to the formation of organised structures called coacervates. They were distinct bodies. They contained proteins, nucleopreteins and other organic and inorganic molecules in various ratios.

(2) Formation of precells or protocells : The protocells were spherical in shape and a double - layered membrane was present around them. The protocells were heterotrophs; they obtained the energy formed by the fermentation of organic substances which were dissolved in the sea. Thus the protocells were anaerobic.

(3) Formation of precells to cells : When DNA-RNA system developed within protocells; they looked like a bacteria or virus. The DNA acquired the ability for self - duplication and protein synthesis. Gradually time passed the protocells differentiated into cells.

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(1) From how many years ago the origin of first life from non-livings on the earth ?
(A) 3000 million years (B) 3000 Trilion years (C) 300 million years (D) 30,000 million years

(2) What was the characteristic of first living organisan ?
(A) replication (B) nutrition
(C) Adaptition and Biosynthesis (D) all the above

(3) By Whom proposed the theory of biogenesis in 17^{th} centuary ?
(A) Aristotle (B) Halden (C) Cuvier (D) F. Reddy

(4) Who proposed the theory of catarophism ?
(A) Christian suarez (B) Cuvier (C) F. Reddy (D) Millor

(5) Who proposed the theory of special Creation ?
(A) Prayer (B) Aristotle (C) Christian Suarez (D) F. Reddy

(6) "The world has been evolved and not been created; Non living substances have reacted to form organic compounds which developed into colloidal systems," Find out the theory propose the above statements.
(A) Theory of organic Evolution (B) Substrate base (C) Meteority theory (D) Abiogenesis

(7) Who cleared that interaction of chemical substances initiated origin of life in the past ?
(A) Haldene (B) Operin (C) Haeckel (D) Father suarez

(8) In the beginning how much was the tempreture of the earth ?
(A) 5000^0C to 6000^0C (B) 6000^0C to 7000^0C (C) 7000^0C to 8000^0C (D) 8000^0C to 9000^0C

(9) Which elements are foumd in the core of the Earth ?

(A) Iron (B) Helium (C) Hydrogen (D) Carbon

(10) Which substance first take place in the earth envionment ?

(A) Helium (B) Hydrogen (C) Carbon (D) above three

(11) Which substance found in huge mass in primitive earth ?

(A) Carbon (B) Iron (C) Nickel (D) Phosphrous

(12) Which element is most active in primitive earth ?

(A) Iron (B) Hydrogen (C) Oxygen (D) Carbon

(13) Which compound is first formed in the earth ?

(A) H_2O (B) HCN (C) NH_2 (D) A and B

(14) Which chemical is first formed in the earth ?

(A) Ammonia (B) Methane (C) A and B both (D) None of the above

(15) Which is the step before molecular evolution ?

(A) Formation of Micromolecule (B) Origin of life

(C) Formation of Microsubstance (D) Formation of chemicals

(16) Which molecules found free in sea ?

(A) AMP (B) ADP

(C) A and B both (D) None of the above

(17) Which is macromolecule ?

(A) Polysaccharide (B) Nucleo protein (C) Proteins - lipids (D) Above three

(18) Name the phenomenon of micromolecules to macromolecules

(A) Conjugation (B) Polymerization (C) Multiple fission (D) Synthesize

(19) Which substances are found in nucleotide ?

(A) Purine (B) Sugar (C) A and B both (D) None of the above

(20) Which molecule is important to make a life ?

(A) Protein (B) Nucleoprotein (C) carbohydrates (D) Lipid

(21) By the macromolecules with the process of precipitation which structure is formed ?

(A) Microspheres (B) Micromolecule (C) Colloiddrop (D) Coacervates.

(22) Which substances have coacervates ?

(A) Proteins (B) Nucleoproteins

(C) Organic and inorgamic molecules (D) All above

(23) When DNA -RNA system developed in protocells, In which form it was ?

(A) Bacteria (B) Spherical (C) Bilayered (D) None of these

Answers : (1-A), (2-D), (3-D), (4-B), (5-C), (6-A), (7-C), (8-A), (9-A), (10-D), (11-A), (12-B), (13-A), (14- C), (15-A), (16-C), (17-D), (18-B), (19-C), (20-B), (21-D), (22-D), (23-A)

- **Urey'sand Miller's Experiment** : The origin of life by molecular evolution first proposed by Oparin and Haldane. Urey and miller in their experiment created a condition which was similar of the primitive earth. The steam was allowed to mix with vapours of ammonia, methane and hydrogen in a reaction chamber. The mixture was treated with an electric shock by electrodes, mixture was then allowed to cool in a condensor and liquified; then liquid was collected in another flask. After weeks of treatment the liquid was analysed by chromatography. The liquid contained simple organic compounds such as amino acids, hydroxy acids and alophatic acid.

- Evidences for evolution :

(1) Morphology : The sources of evidenes of evolution from morphology and comparitive anatomy are the following.

(i) **Homologous organs :** The organs which are similar in their morphology, anatomy and embryology but dissimilar in their functions are called homologous organs. The relationship between homologeus organs is called homology.

eg: The forelimbs of higher vertebrates, The thorn and tendrils of Bougainvillea and cucurbita respectively.

(ii) **Analogous organs :** The organs which are superficially similar but anatomically dissimilar doing similar functions are called analogous organs. Similarity of structures connects with similarity of function is termed analogy.

eg: wings of insects, birds and bats, fins of fishes and whales.

(iii) **Vestigial organs :** Vestigial organs are the useless and functionless degenerate structures which are functional in some other animals or in ancestors.

eg: Vermiform Appendix, Nictitating membrane, Ear muscles, wisdom teeth.

(iv) **Connecting Links** : The animals exhibiting characters of two adjacent taxonomic groups are called connecting links.

eg: Peripatus : Connecting link between Annelida and Arthro poda.

Balanoglossus : Connecting link between invertebrates and chordates.

Lung fish : Connecting link between fishes and amphibians.

Archeopterix : Connecting link between reptiles and Aves.

(2) **Embryology :** The early embryos of all vertebrates are very similar in their appearance. This will be very clear when embryos of a fish, an amphibian, a reptile, an opposum, a monkey and a man are arranged side by side.

(3) **Physiological Evidence** : The studies on physiology and biochemislry prove that the process of evolution has occured biochemically. The protoplasm which is the basic unit of life has the same quantitative and qualitative attributes in cell of living organism.

(4) **Palaeontological Evidence** : The direct evidences of the Process of evolution can be obtained by comparing fossils of the organisms that lived in the part with the organisms living today. The fossils are the written documents of evolution.

e.g. Available fossils of mesozoic era of different dinasaurs, were large-sized Lizards, that can be proved.

(24) Who proposed molecular evolution of life ?

(A) Oparin (B) Haldane (C) A and B both (D) None of the above

(25) In which year Urey and Miller and his student proved molecular evolution ?

(A) 1947 (B) 1948 (C) 1951 (D) 1953

(26) Which method of anylysis of experiment by Urey and Miller ?

(A) Chromotography (B) Staining Method (C) Isolation method (D) None of the above

(27) In plant kingdom, sequence of evolution is according to which plants division ?

(A) Thallophyta (B) Bryophyta (C) Pteridophyta (D) All above

(28) Which group is first developed with well developed nucleus in animal kingdom ?

(A) Archeae (B) Protista (C) Monera (D) Eukaryota

(29) Which type of animals are evolved after protista ?

(A) Multicellular (B) Without tissue (C) A and B both (D) None of the above

(30) In which class monkey, ape and man include ?

(A) Aquatic (B) Mammals (C) Aves (D) Reptiles

(31) Which living organisms evolved first during evolutionary order ?

(A) Amphibians (B) Marine´ (C) reptiles (D) Vertebrates

(32) Which word is proper for the similarity in their morphology anatomy and embryology ?

(A) Analogous (B) Vertigeal (C) Homologous organs (D) None of above

(33) Example of Homologous organs.

(A) Wings of insects, birds and bats (B) The thorn and tendrili of bougainvillea and cucurbita

(C) The forelimbs of higher vertebrates (D) B and C both

(34) The organs which are superficially similar but anatomically dissimilar doing similar functions are called ..... .

(A) Analogous organs (B) Homologous organs (C) Vestigial organs (D) none of above

(35) Which of the following example of analogous organs ?

(A) Vermiform Appendix, (B) Nictitating membrane and ear muscles

(C) The thorn and tendrils of Bougainvillea and cucurbita (D) A and B both

Answers : (24-C), (25-D), (26-A), (27-D), (19-C), (20-B), (21-D), (22-D), (23-A), (24-C), (25-D), (26-A), (27-D), (28-B), (29-C), (30-B), (31-B), (32-C), (33-D), (34-A), (35-B)

(36) The useless and functionless degenerate structures which were functional in some other animals or in ancestors are called ..... .

(A) Homologous organ (B) Analogous organ (C) Vestigial organ (D) None of the above

(37) Which example is vestigial organ ?

(A) Vemiform appendix (B) Nictitating membare (C) Ear muscles (D) above all three

(38) The animals exhibiting characters of two adjacent taxonomic groups are called .....

(A) Vestigial organs (B) Analogous organs (C) Connecting link (D) Homologous organs

(39) Connecting link of peripatus X ..... and Y .....

(A) X = Annelida Y = Arthropoda (B) X = Amphibians Y = Annelida

(C) X = Fishes Y = Amphibians (D) X = Chordates Y = Fishes

(40) Which two groups are connected by lungfish.

(A) Annelida and Arthropoda (B) Invertebrate and chordates

(C) Reptiles and fishes (D) Fishes and amphibian

(41) Connecting link of Balanoglossus X = ... and Y = ...

(A) X = Fishes Y = Amphibians (B) X = Annelida Y = Arthropoda

(C) X = Invertebrates Y = Chordates (D) X = Reptiles Y = Chordates

(42) Which animal is conncting between Reptiles and Aves

(A) Balanoglossus (B) Archeopterix (C) Peripatus (D) Lung fish

(43) Available fossils of Mesozoic era of different dinosaurs were large sized Lizards, That can be proved by which evidence ?

(A) Embryology (B) Physiologial evidence (C) Palaeontological Evidence (D) None of the above

Answer : (36-C), (37-D), (38-C), (39-A), (40-D), (41-C), (42-B), (43-C)

- **Adaptive Radiation :**

Organisms depend on the environment for their survival. Environmental factors are not stable. They are changing time to time and place to place. Hence organisms also adjust themselves to the changes of the environment in which they live. This adjustment of the organisms to their environment is called adaptation. When organisms of the same group occupy different environ ments or habitats, They develop different Kinds of adaptations. Hence organisms of the same group show different adaptation in different habitats and this is called adaptive radiation. The law of adaptive radiation was proposed by osborn.

- Adaptive radiation is nothing but divergence or divergent evolution. It is caused by following.
- (1) Need for food (ii) Need for safety (iii) Need for better breeding grounds (iv) Migration to a new habitat (v) Absence of enemies (vi) Isolation etc. Adaptive radiation is broadly classified into three types:
- **Local Adaptive Branching** : It refers to the development of diversification in a largely distributed population. eg: In Africa, two distinct types of Rhinoceres are found.

(i) One is grazing which lives in openland areas and (ii) second is a browsing type which lives in wooded areas.

(ii) **Continental Adaptive Radiation** : It refers to the evolutionary lines occurring in organisms of particular classes living in a continent.

eg: Australian marsupials, Each marsupial differs from other

(iii) **Contemporareous Radiation** : It refers to the adaptive radiations in the great zoo-geo graphic division of the world.

Darwin during his journey went to Galapagos islands. There he observed diversity in small black birds (finches), later this bird is known as Darwin finches. He observed that these were many varieties of finches in the same island. He conjectured that the varieties evolved on the island itself from the original seed - eating finch. Modifications in the beaks of finches according to the habitat and the avaibility of food. Modifications in the beaks of finches developed according to the habitat and the availability of food.

- **Biological Evolution :** The Sequential evolution of an organism is a result of adaptation as per the requirement. With respect to this different theories were proposed. It abstracts are as follows.
- **Lamarckism :** Lamarckism is also referred as “Inheritance of acquired characters’. The main aspects of the principle were as under.

(1) Organisms and their organs are constantly increasing in size

(2) Development of organs is induced and maintained under environmental pressure.

(3) Those organs which are constantly used they also develop constantly. Unused organs become defunct gradually or degenerate.

(4) Those characters which organism acquires in this way are inherited to their offsprings. Thus, the development of a charaeters increases or decreases generation to generation

- **Drawbacks of Lamarckism** :
- The first point is in cases of horse and elephant it is true. But in case of flowering plants it is not true.
- The second point is also not true. eg: The neck of an Giraffe cannot be made longer as per its wish, more over organs cannot be moulded as per of organism wish
- The third point oppears partially true. Muscles can be developed by constant use loss of limbs, due to disuse in snakes or weak eyesight in cave-dwellers can be quoted as other examples. But eyes of a voraceous reader do not become larger or brighter. The heart which beats through out life does not become bigger.

It is also difficult ot accept that acquired characters get inherited. Hence, Lamarkirm is not accepted.

- **Darwinism :** The theory of 'Natural selection' Proposed by Darwin is the prime one to explain evolution of living world. It was proposed in 1859 in his book title 'Origin of species by means of Natural selection'. New species originate only from a pre existing one. Darwinism is based on the following main aspects.
- **Large Population** : The reproduetive rate in all organism is high, if all the offsprings survive the Population growth will be unimaginable. If all organisms reproduce and produce a large number of offsprinsg the world will be flooded by them. This does not happen. The population of all species, generally remains the same from generation to generation. Diseases, lack of food and other natural factors are responsible for this.
- **Struggle for Existense or for survival** : If the resources are limited and the number of organisms dependent on them is unlimited. it is obvious that all organisms can not get sufficient resources. Thus a competition for resources amongst organisms of one species becomes inevitable. Such competition can also be with organisms of another species, if their, requirements are identical. Thus organisms have to compete for survival, growth and reproduetion.
- **Natural selection or survival of the fittest** : It is quite obvious that when organisms compete for specific resource, some may get it and others may not get it or may get in enough quantity. some may fail or success which depends on the nature. Those who succeed will live longer and reproduce Thus, their hereditary characters will survive in the next generation.
- **Variations** : All individual of a species are not alike. These differences in characters amongst individuals of a species are called variations. Those organisms which can use their environment in the best way succeed and those cannot do so fail. This phenomenon is called survival of the fittest. In due course of time, the degree of variations increases so that the organisms become totally isolated from their parents and constitute a new species.
- **Limitatious of Darwinism :** The greatest draw back of Darwinism is that it does not explain the origin of variations; it characters are hereditary; for which genes are responsible If we can explain the mechanism of inheritance, we can explain the variations in offsprings and their conservation over generations.
- **De Veries theory** : De vries theory, is also called ' Theory of mutation.'
- New characters, ie new variations in characters appear spontaneously. Such a sudden variation is called mutation.
- Once formed, a mutation becomes permanent. This would mean that it will appear constantly once it is formed.
- Mutation occurs simultaneously in a large number of organisms. This occurs frequently. Thus, Chances of natural setection improve.
- Mutation does not occur in a specific direction. Mutation creates many variations.
- De veries does not believe that evolution is a gradual process.
- **Modern concept of Evolution** : According to the modern concept, there are five basic factors involved in the process of biological evolution. These are (i) Gene mutations (ii) Changes in chromosome structures and number (iii) Genetic recombination (iv) Natural selection and (v) Reproductive isolation.

Besides these, there two accessory processes (i) migration of individuals from one population to another and (ii) Hybrization between races, species and related genera, are responsible for biological evolution.

Some important worker like Dobzhansky; R.A Fisher, J.B.S. Haldane, sewall wright, mayr and G.L. Stebbins gave their contribution to the modern synthetic theory.

- **Mechanism of Evolution** : Natural selection, adaptation to habitat, and mutation are the major and sequencial factors for mechaninsm of evolution.

(44) For the survival, living organisms depend on ..... .

(A) water (B) environment (C) gene (D) all above

(45) Adaptive Radiation is nothing but divergence or divergent evolution is caused by ..... .

(A) Need for food (B) Isolation (C) Absence of enemies (D) all above three

(46) How many types of adaptive radiation ?

(A) Three (B) Five (C) Four (D) Six

(47) In which bird Darwin observed diversity

(A) Black bird (B) White bird (C) Redbird (D) Yellow bird

(48) De vries theory is also called

(A) Isolation (B) Survival of fittest (C) Theory of mutation (D) Variation

(49) How many factors involved in the process of modern concept of biological evolution ?

(A) 4 (B) 3 (C) 5 (D) 6

(50) The differences in characters amongst individuals of a species are called .....

(A) Natural selection (B) Variation (C) Struggle for existence (D) Recombinant of gene

Answers : (44-B), (45-D), (46-A), (47-A), (48-C), (49-C), (50-B)

- **Law of Hardy-Weinberg** : They laid the foundation for the development of population genetics. A clear understanding of Hardy - Weinbery law gains through knowledge of gene pool gene frequencey.

(i) **Genepool** : The sum total of genes present in a Mendelian population means gene pool.

(ii) **Gene frequency** : The ratio of a gene in a gene pool or in a population is called gene frequency.

When the gene frequency of one allele is known, the frequency of ther allele in the population can be calculated by applying a simple formula. If the gene frequency of M-allele is p and that of m-allele is q. Then p+q = 1. When q is known, p can be calculated, p = 1-q; similarly, when p is known q can be calculated; q = 1 - p; for example p is 0.6. Then q = 1 - p = 1 – 0.6 = 0.4.

Practical Application of the law : This formula can be appried to any population to find out the frequency of genes, Let us apply this formula to a hamster population containing equal number of M and m genes.

The Freqvency of m gene in population is = 50 % = 1/2

So. $q = 1/2 = 0.5$

$(p + q)^2 = p^2 + 2pq + q^2$

$= (0.5)^2 + 2(0.5)(0.5) + (0.5)^2$

$= 0.25 + 0.5 + 0.25$

= 25 %, MM + 5.0 % Mm + 25 % mm

Importante : This law states that the gene frequencies in a large population, remain constant generation after generation when there is no selection and mutation. In small population this equilibrium cannot be maintained.

- When the population is in equilibrium there is no possibility of change and hence the rate of evolution is zero. Evolution occurs only when this equilibrium is upset.

- **Gene flow** : Animals are not static. They have the tendency to migrate. When an animal migrate and comes in contact with another population, it mates with the immate of the population. Thus the genes of one population or transferred in to another population. This is called geneflow. If genes are carried to a population, where these genes previously did not exist, this event of geneflow can be very important source of genetic variation.
- **Genetic Drift**: Genetic drift is an evolutionary force in small population. This matter was described by Sewall wright 1931. Hence it is called Sewall wright effect. According to Hardyweinberg law in a large population the gene frequency remains constant from generation to generation when there is no selection and mutation. But in small populartion, the gene frequerncies are found to fluctuate purely by chance This change in the frequency of gene purely by chance is called geneti drift. The effect of genetic drift is insignificant in large population. But in small population it has a significant effect. As result of this, in small population, some gene may be reduced in frequency or even lost by chance and other may be increased in frequency by chance.
- **Brief account of Evolution :** Earth originated about 500 millions years ago.
- Life in the first form of cell, originated about 3000 millions years ago, some of these cells had the ability to release O_2.
- About 500 million years ago invertebrate were originated.
- sea weeds and few plants existed probably about 320 millions years ago. Fishes originated 360 millions, amphibians 325 million, Reptiles 250 million, Mammals 165 million and First man originated before 2 million years ago.
- The account of biological evolution and age of different animals will be still more clear if the time of the origin of life is placed to a 12 hours scale. If it is imagined that life originated at 12.00 midnight, then fishes appeared at 8.00 pm. amphibians at 8.30 p.m, reptiles appeared at 9.00 pm, mammals appeared at 10.00 p.m. and man appeared at 1159 pm

  Scale :

  1 second = 52, 000 yrs, / minute = 3,25,000 yrs 1 hour = 187,5000 yrs.

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(51) How many million year ago life have originated ?

(A) 5000 (B) 3000 (C) 4000 (D) 4500

(52) How many millions year ago sea weeds are few plants existed ?

(A) 120 (B) 400 (C) 220 (D) 320

(53) The origin of life is compared to a ..... scale

(A) 13 hours (B) 10 hours(C) 12 hours (D) 14 hours

(54) At what time fishes are appeared

(A) 9:00 PM (B) 8:00 PM (C) 8:00 AM (D) 8:05 PM

(55) In geological clock, 1 miniute is equal to how many years ?

(A) 3,25,000 (B) 52,000 (C) 1,87,000 (D) None of all above

(56) In which year Handy-weinberg law was proposed ?

(A) 1908 (B) 1907 (C) 1808 (D) 1900

(57) What is the importance of Hardy-weinberg law ?

(A) Evolution (B) Gene pool (C) genetics (D) genetic variation

(58) The sum total of genes present in a mendelian popolation is called ..... .

(A) gene pool (B) gene frequency (C) genetic variation (D) Genetics.

(59) How many years ago the earth was originted ?

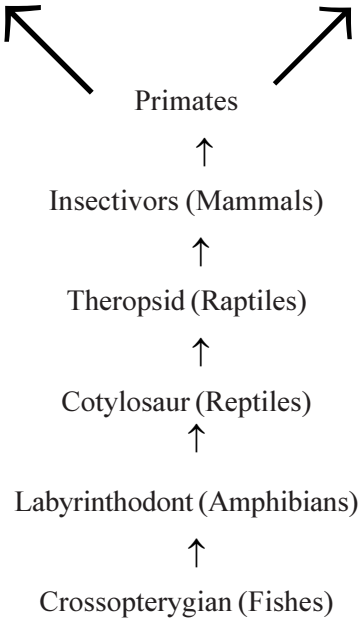
(A) 6000 (B) 5500 (C) 5000 (D) 6500

Answers : 51 (B), 52 (D) 53 (C), 54 (B), 55 (A), 56 (A), 57 (A), 58 (A), 59 (C)

- Origin and Evolution of Man : About 480 million years ago our distant ancestors of our order lived in fresh water ponds in the form of crossopterygian fishes. The other ancestors inthe path of primates evolution are as under.

Prosimians **Anthropoids**

[Tree shrew, Lemur, Lorise etc] [Gibbon, Orangutan, Chimpanzee, Gorilla] Monkeys and man]



- **Human Euolutionary Trends:** Like other animals, human evolution exhibits directional Progressive changes, which are summurised below:

  The change of arboreal life into terrestrial life is the most important evolutionary trend, Loss of opposite toes from hind limbs, Development of erect posture, Development of bipedal locomotion, The development of chin, Increase in the size of brain development of intelligence, Disappearance of simian shelf, Use of fore limbs for non-locomotory purposes, etc.

- **Fossil Record of Man's Evolution:** The gradual evolution of man from ape is fully supported by available fossils.

(1) **Propliopithecus** : It was an ape-like primate. But in the possession of short arms, it resembled man. It lived, about 30 million years ago.

(2) **Aegytopithecus** : It is similar to proplipithecus; but it is more identical to apes than propliopithecus. It is believed that it was ancestral of the Dryopithecus. Another view did not support this.

(3) **Dryopithecus** : It is a group of apes that lived in miocene period, about 20 million years ago. It decended from Aegytopithecus or propliopithecus. It's forelimbs were shorter than hindlimbs. In this respect, it is belived that it is the distant ancestor of man. It is also ancestor of modern apes like chimpanzee and Gorilla.

(4) **Oreopithecus** : In the structure of teeth, small face of and erect walking, it resembles to man, but having long forelimbs it resembles to apes. Straus (1963) and simpson (1963) Suggest that man and oreopithecus have parallel evolution and hence it is not ancestral to man.

(5) **Ramapithecus** : It lived 12 to 14 millons years ago Late miocone and early pliocene. The denitition is more identical to dentition of man. Fossils of Ramapithecus was collected from India and Africa.

(6) **Kenyapithecus** : It is closely related to Ramapithecus.Its fossil is collected from East Africa.

(7) **Australopithecus** : It was 2 to 5 millions years old. The characters of Australopithecus like man and ape.

Man like charactes : Erect posture, Bipedal locomotion, Dentition is like that of man.

Apelike characters : The teeth were larger than modernman, Absence of chin, the eye brow ridges projected over the eyes.

(8) **Homoerectus** : Their fossils were collected from java so it is called Java man. Other fossils were collected from peking in china so, it was commonly called peking man. The Java man and peking man are similar. They lived about 5,00,000 years ago. It forms connecting link between Aurtralopithecus and Homo sapiens (Modern man).

Characters : They had upright bipedal locomotion, They were slightly taller than Austrolopithecus. The face was chinless. They used fire and variety of tools, They inhabited caves. They were hunters.

(9) **Homo sapiens** : Homo sapiens were descended from Homoerectus. Number of fossils are known as below.

(i) **Neanderthal man** : The fossils were collected form the Neanderthal valley of Germany. They existed about 75,000 years ago and became extinct by 25,000 years ago.

Characters : Their eyebrow ridges were heavy and protruding. They have no chin.Their teeth were large. They prepared their tools much more skillfully than the pre-previous men. Their cranial capacity was about 1400cc.

(ii) **Rhodesian man**: The fossils were collected from Rhodesia the cranial capacity was about 1300 CC.

(iii) **Cro-Magnon man** : These were the men who lived in Europe during the last 30,000 years. They possessed almost all characteristics of modern man.

(iv) **Modernman** : The successors of cro-Magnon man, which originated about 8000 years ago attempted for food production from plants and domestication of animals led them towards present day civilization. The cranial capacity of mordern man is 1450 CC.

Man classified different races according to appearance, characters and zoo-geographical distribution.

Main Man subspecies : Caucasiod race, Negroid race Mongoloid race, American race, Indian race. and Australian race.

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(60) How many million years ago our distant ancestors of our order lived in fresh water pond in the form of crossopterygian fishes ?

(A) 470 million years (B) 500 million years (C) 480 million years (D) 400 million years

(61) How many years ago propliopithecus was lived ?

(A) 30 million (B) 32 million (C) 35 million (D) 40 million

(62) Aegyptopithecus is similar to ..... .

(A) Dryopithecus (B) Oreopithecus (C) Propilopithecus (D) Ramapithecus

(63) From where the fossils of Ramapithecus found ?

(A) India and srilanka (B) India and Africa (C) Pakistan and srilanka

(D) America and Africa.

(64) Whos closely related with kenyapithecus ?

(A) Australopithecus (B) Oreopithecus (C) Ramapithecus (D) Dryopithecus

(65) Which characters of Australopithecus is like man

(A) Erect posture (B) inhabited in cave (C) Absence of chin (D) Hunter

(66) How many years ago the java man and peking man was lived ?

(A) 5,00,000 years (B) 3,00,000 years (C) 5,50,000 years (D) 4,00,000 years

(67) From whom Homo sapiens were descended ?

(A) Ramapithecus (B) Kenyapithecus (C) Australopithecus (D) Homo erectus

(68) How many years ago the fossils of Neanderthal man found ?

(A) 75,000 years (B) 70,000 years (C) 76,000 years (D) 60,000 years

(69) From where the fossils of Rhodesion man collected ?

(A) Valley of Germany (B) Rhodesia (C) Australia (D) Iran

(70) When the successors of cro-magnon man originated ?

(A) 7000 year (B) 9000 year (C) 8000 year (D) 8800 year

(71) What is the cranial capacity of modern man ?

(A) 1450CC (B) 1400CC (C) 1500CC (D) 1550CC

(72) How many races of human are found ?

(A) Five (B) Four (C) Six (D) seven

(73) Which is main races of human ?

(A) Erectus (B) Caucasoid (C) Homo sapien (D) Australopithecus

(74) When Neanderthalman extinct ?

(A) 30,000 years ago (B) 35,000 years ago (C) 25,500 years ago (D)25,000 years ago

(75) Which group was decended from aegyptopithecus or propliopithecus ?

(A) Ramapithecus (B) Australopithecus (C) Dryopithecus (D) Oreopithecus

(76) Straus and simpson suggest that X and Y have parallel evolution ?

(A) X = man, Y = Oreopithecus (B) X = Kenyapithecus, Y = Oreopithecus

(C) X = man, Y = Australopithecus (D) X = man, Y = dryopithecus.

(77) What is the cranial capacity of Neanderthalman Rhodisian man and modern man respectively ?

(A) 1450, 1300CC, 1400CC (B) 1400CC, 1300CC, 1450CC

(C) 1300CC, 1400CC, 1450CC (D) 1450CC, 1400CC, 1300CC

Answers : (60-C), (61-A), (62-B), (63-C), (64-C), (65-A), (66-A), (67-D), (68-A), (69-A), (70-C), (71-A), (72- A), (73-B), (74-D), (75-C), (76-A), (77-B)

- **A - Assertion R - Reason**

Answer the following questions, by choosing the appropriate option.

(A) A and R both are true and R is a explanation of A.

(B) A and R both are true and R is not a explanation of A.

(C) A is true and R is false

(D) A is false and R is true

(78) Assertion A : After the formation of macromolecules they undergo aggregation and precipitation in the sea

Reason R : The formation of organ structures called coacervates.

(A) (B) (C) (D)

(79) Assertion A : At the end of longtime complicated living organism developed

Reasin R : According to requirement of living organism they change their body organisation.

(A) (B) (C) (D)

(80) Assertion A : Primitive earth have huge mass of hydrogen, Nitrogen, carbon, and oxygen

Reason R : Among them Nitrogen is most active

(A) (B) (C) (D)

(81) Assertion A : Marine invertebrate animals originated

Reason R : Protista originated having developed nucleous.

(A) (B) (C) (D)

(82) Assertion A : If population is in equilibrium

Reason R : The rate of evolution is zero

(A) (B) (C) (D)

(83) Assertion A : Lamarkism is acceptable

Reason R : It is difficult to accept that acquired characters get inherited.

(A) (B) (C) (D)

(84) Assertion A : Mutations occurs simultaneously in a large number of organisms

Reason R : Thus chances of natural setection improve

(A) (B) (C) (D)

(85) Assertion A : The protocells obtained the energy formed by fermentation of organic substance

Reason R : In primitive atamosphere lack of free oxygen.

(A) (B) (C) (D)

(86) Assertion A : Protocell were heterotrophic

Reason R : Protocell were anerobic

(A) (B) (C) (D)

(87) Assertion A : DDT nearly uneffective against moquitoes

Reason R : Continuous consumption of DDT, DDT sensible gene resistance gene become mutant.

(A) (B) (C) (D)

Answers : (78-B), (79-A), (80-C), (81-D), (82-A), (83-D), (84-A), (85-A), (86-B), (87-A)

● Match the column and find out the correct option trom following.

(88)

Collumn I	**Collumn II**	
(i) Genefic drift	(p) The gene frequencies are found to fluctuate purely by chance	(A) (i-q) (ii-r) (iii-p) (iv-s)
(ii) Gene flow		(B) (i-r) (ii-s) (iii-q) (iv-p)
(iii) Gene frequency	(q) The genes of one population are transferred in to another population	(C) (i-p) (ii-q) (iii-r) (iv-s)
		(D) (i-s) (ii-p) (iii-r) (iv-q)
(iv) Gene pool	(r) The ratio of a gene in a gene pool	
	(s) The sum total of genes present in a mendelian population.	

(89) **Collumn I** **Collumn II** (Connecting link)

(i) Peripatus	(p) Invertebrate and chordates	(A) (i-r) (ii-s) (iii-q) (iv-p)
(ii) Balanoglossus	(q) Fishes and Amphibians	(B) (i-p) (ii-r) (iii-q) (iv-s)
(iii) Lung fish	(r) Annelida and Arthropoda	(C) (i-r) (ii-q) (iii-p) (iv-s)
(iv) Archeopterix	(s) Reptiles and Aves	(D) (i-r) (ii-p) (iii-q) (iv-s)

(90) **Collumn I** **Collumn II**

(i) F.Reddy	(p) Theory of catatrophism	(A) (i-p) (ii-s) (iii-r) (iv-q)
(ii) Qvier	(q) Theory of mutation	(B) (i-r) (ii-p) (iii-s) (iv-q)
(iii) S wright	(r) Biogenesis	(C) (i-s) (ii-r) (iii-p) (iv-q)
(iv) De vries	(s) Modern concept of Evolution	(D) (i-q) (ii-r) (iii-p) (iv-s)

(91) **Collumn I** **Collumn II**

(i) Ramapithecus	(p) Java	(A) (i-p) (ii-s) (iii-q) (iv-r)
(ii) Kenya pithecus	(q) Germany	(B) (i-r) (ii-p) (iii-q) (iv-s)
(iii) Homo erectus	(r) India and Africa	(C) (i-r) (ii-s) (iii-p) (iv-q)
(iv) Neanderthal man	(s) East Africa.	(D) (i-q) (ii-r) (iii-s) (iv-p)

Answers : (88-C), (89-D), (90-B), (91-C)

- **True-Flase (T - F)**

Given sentence are true or flase choose appropriate answer.

(92) (i) Coacervates is a free molecules.

(ii) Protocells were heterotrophs.

(iii) Oparin considered the coacervates as the sole living molecules.

(iv) The protocells in course of time differentiated in to cells.

(A) TFTT (B) TTTT (C) FTFT (D) FTTT

(93) According to Lamarkism

(i) Organisms and their organs are constantly increasing in size

(ii) Development of organs is supress under enviornment pressure

(iii) Unused organs become defunct gradually

(iv) These characters which organism acquires in this way are inherited to their of spring.

(A) TFTT (B) TTFT (C) TFTF (D) TFTT

(94) (i) The earth was formed from the sun some 5000 billions year ago.

(ii) The temperature was 3000^{o}C to 4000^{o}C when earth was formed.

(iii) The heavy elements occupied the core of the earth.

(iv) Life originted only from lightest elements

(A) TFTT (B) FTTF (C) FTFF (D) FFTT

(95) (i) Analogous organs : insects, birds

(ii) Vestigial organs : Vermiform Appendix wisdom teeth

(iii) Homologous organs : Man, bird, whale

(iv) Connecting Link : Fishes and Reptiles

(A) TFFT (B) TTFF (C) TTTF (D) TTTT

(96) According to gene flow

(i) Animal have the tendency to migrate

(ii) Animal not mating with the inmate of the population.

(iii) The gene of one population are not transferred in to another population.

(iv) The event of gene flow can be very important source of genetic variation

(A) TFTT (B) TFFT (C) FFFT (D) TTFT

(97) According to Genetic Drift

(i) In a large population the gene frequency remains constant from generation to generation when there is selection.

(ii) In small population the gene frequencies are found to stable purely by chance.

(iii) The effect of genetic drift is significant in large population.

(iv) In small population some gene may be increased in frequency

(A) FTFT (B) TFTF (C) FFFT (D) FFFF

(98) (i) The earth was formed some 5000 millon years ago.

(ii) Life originatel about 3000 millions years ago.

(iii) Invertebrate originated about 500 millions years ago

(iv) Sea weed originated about 320 million years ago.

(A) TTFF (B) TTFF (C) TFTT (D) TTTT

(99) Texom and originated in million years.

(i) Fishes - 500 Millon years ago (ii) Amphibian 400 Millon years ago

(iii) Reptiles - 250 Millon years ago (iv) Mammals 165 million years ago

(A) TTFF (B) FFTT (C) TFTF (D) FTFT

(100) According to characters of Homo erectus

(i) They were slightly taller than australopithecus

(ii) The face was chinless

(iii) They prepared their tools much more skillfully than the preprevious men

(iv) They inhabited in caves.

(A) TTFT (B) TFFT (C) FFTT (D) TFTF

(101) According to characters of Neanderthalman

(i) They had chin

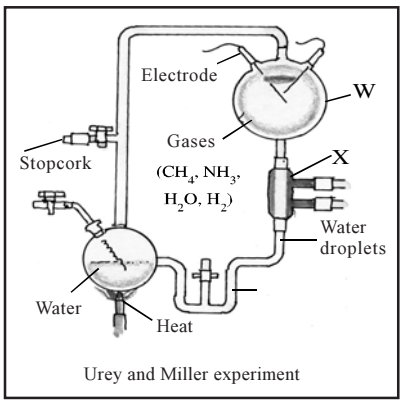
(ii) Their teeth were large

(iii) The cranial capacity was about 1300 C.C.

(iv) Their eyebrow ridges were heavy and protruding

(A) FTFF (B) TTFT (C) TFTF (D) FTFT

Answers : (92-B), (93-A), (94-D), (95-C), (96-B), (97-D), (98-D), (99-B), (100-A), (101-D)



Urey and Miller experiment

(102) Identify the nane of W and X

(A) W - Reaction chamber X - Stopcork (B) W - Condenser X : - Reaction Chamber

(C) W Reaction chamber X : Condensor (D) W condensor X : Stopcork

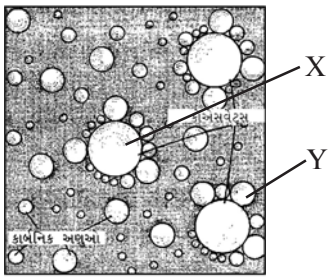
(103) Give the function of W

(A) To Separate the substanee of mixture

(B) To help the mixture cold

(C) Path for addition of mixture

(D) The mixture was treated with an electric shock.



Coacervates

(104) Indicate part x in given diagram, which type of absorbing capacity, occur for substances of surface medium ?

(A) impermeable (B) Permeable (C) Selectivly permeable (D) Non selectively

(105) What is the chemical nature of 'X' organic molecule

(A) Organic molecule (B) Nucleo protein (C) Proteins (D) alll above three

(106) Give the name indicate y

(A) Organic molecule (B) Protocells (C) inorganic molecule (D) Molecular particles


Y


X

(107) Give the name of X and Y

(A) X - Archeopterix Y - Balanoglssus (B) X - Balanoglossus Y = Peripatus

(C) X - Peripatus Y -Balanoglossus (D) X - Balanoglossus Y = Archeopterix

(108) Give, the name of connecting link of X and Y

(A) X - fishes and Amphibians Y - invertebratesand chordates

(B) X - Annelida and Arthropoda Y - invertebrates and chordates

(C) X - Invertibrates and chordeaes Y - Annelida and Arthropoda

(D) X - Annelida and Arthropoda Y = fishes and Amphibiam

Answers : 102 (C), 103 (D), 104 (C), 105 (D), 106 (A), 107 (B), 108 (B)

● **NEET Questions :**

(109) Random reproduction remains balanced Which of the following undirectional method brings genetic fluctuation ?

(A) Migration (B) Genetic drift (C) Mutation (D) Selection

(110) Random genetic drifts in a population are a result of

(A) Small size of population (B) Major genetic differences in individuals

(C) Interspecific hybridization (D) Slower rate of mutation

(111) Which type of evidences shows that Human being is more related to chimpanzee than man like apes ?

(A) Evidences of DNA of only sex chromosomes

(B) Comparison of chromosomes. - according to Morphology.

(C) Fossils, only mitochondria and DNA and evidences of fossils.

(D) Sex chromosomes, autosomes and DNA taken up from mitochondria

(Hint): Sex chromosomes, Autosomes and mitochondrial DNA shows genomic limitations. Chromosomal morphology is onesided.

(112) Which of the following is accurate method to decide fossil dating ?

(A) Carbon - dating method (B) Potassium - Argon method

(C) Electron - spin resonence method. (D) Uranium - Lead method.

(Hint): For Fossil dating electron spin resonence method is very appropriate method.

(113) There are two opposing opinions regarding the evolotion of modern man. According to one Homo erectus is the ancestor of the modern man, Based on genetic differences, The origin of modern man is African. Based on the DNA studies, what do the differences indicate ?

(A) More differences in Asia as compared to Africa

(B) More differences in Africa as compared to Asia

(C) Similar differences in Africa and Asia.

(D) No differences in Africa, only differences are seen in Asia.

(Hint): According to Neo-Darwinism, Variation is the main cause of evolution.

(114) De- Vris Organic evolution theory of mutation was given after research on ..... ?

(A) Pisum sativum (B) Drosophila melanogaster (C)Oenothera lamarckiana (D) Alicia rosa

(Hint): Pisum sativum - Mendel

Drosophila melanogaster - T.H. Morgan)

(115) Evolutionary History of living being is known as

(A) History of ancestors (B) Fossil study (C) Ontology (D) Phylogeny

(Hint): Study of fossils is known as palaentology.

Ontology is study of embryonic development.

Phylogeny is history of living being evolution.

(116) Which of the following is not living fossil ?

(A) Sphenodon. (B) Archeopterix (C) Peripatus (D) King crab

(Hint): Archeopterix fossil are obtained from meoszoic basins. They were connecting links between reptiles and Aves.

(117) When species of two different geneology found together as a result of the event known as ..... adaptation.

(A) Homology (B) Mutation (C) Analogy (D) Variation

(118) Which of the following is a correct statement ?

(A) There is no evidence of gills during the embryonic development of mammals.

(B) All plant and animal cells are totipotent.

(C) Ontogeny recapitulates phylogeny.

(D) Stem cells are special cells.

(Hint): Ontogeny recapitulates phylogeny.

(119) What is common amongst parrot, platypus and knagaroo ?

(A) Teethless jaws (B) Active tail at the posterior end.

(C) Similar egg cell (ovum) (D) Homeothermy.

(Hint) :Only birds and mammals are homeotherms.

(120) Which of the following is the result of geographic isolation ?

(A) Checks speciation (B) Speciation due to reproductive isolation

(C) Random formation of new species (D) No differences in the separated organisms.

(121) Which of the following birds has reptilian ancestors ?

(A) Scales on forelimbs. (B) Four chambered heart

(C) Presence of crop and gizzard in the digestive canal (D) Calcareous Eggs.

(Hint): Calcareous eggs and scales on the hind limbs indicate reptilian ancestors

(122) The thorns on Bougainvilea stem and the tendrils on cucurbita are examples of ..... .

(A) Analogous organ (B) Homologous (C) Vestigeal organ (D) Regression

(Hint): Thorns of Bougainvillea. and tendrils of cucurbita are homologous organs.

(123) Which is the most important factor for the evolution of modern man from his ancestors ?

(A) Erect posture (B) Narrowing of jaws (C) Bifocal three dimensional vision.

(D) Increase in cranial eapacity.

(Hint): Increase in brain capacity is the main factor for the evolution of modren man.

(124) In a given region; the evolution of species from a point to different geographic regions, is called as

(A) Contemporareous Radiation (B) Natural selection (C) Radiation (D) Divergent evolution.

(Hint): The process of speciation is a given region from a point to different biogeographic regions is contemporaneous radiation process. For Example : Darwin's Finches, Australian Marsupials.

Answers : (109-B), (110-A), (111-D), (112-A), (113-A), (114-C), (115-D), (116-B), (117-C), (118-C), (119-D), (120-B), (121-D), (122-B), (123-D), (124-A)

Origin of Life

Theories of origin of unitvers

Nebular Hypotbesis

It was propsed by Kant-Leplace according to which earth originated about 4.5-5 billion years ago from a gaseous cloud solar nebula.

Big bang Theory

According to this theory of Abbe Lemaitre univers formed by a big bang (thermonuclear expansion) of a dense entilty.

Chemical Theory of orogin of lice

- Oparin- Haldane's of chemical origin theory is most widely accepted theory of origin of life. It involves some basic stpes that are :
- **Formation of inorganic molecules**
- From the gases present in early earth's atmosphere.
- **Formation of simple organic compounds**
- From the inorganic compounds formed in previous step.
- Spontaneous formation of complex organic molecules
- Simple organic molecules combined to from large organic complex biomolecules like starch, proteins, fatty acids.
- **Spontaenous formation of molecular aggregates, concervates, eobionts and first living cell**
- Complex organic compounds synthesized on primise earth grouned togeths spontaneously and due to intermolecular attraction formed large colloidal aggregates called coacervates or Micropheres which tuned into eobionts (controlled by nucleic acids). These developed cel membrane and formed first living cells or prokayotes.

Eukaryotes (Unicellular)

Evolution

(Latin evolvere-to unroll) Multicellular organisms evolved from tiny eukayryotic unicellular ones.

Evidence of evolution

Morphological and anatomical

Comparaive studies of morphology and anatomy, homology of organisms provide evolutionary proofs, e.g. vestigial organs, atavism etc.

Embryological

Comparative study of embryonic development of various organisms shows various similarities and resemblance to embryos of lower organisms indicating evolution (Biogenetic law of Haeckel)

Pateontological

Paleontology is the study of fossils (preserved remains of dead organisms). It provides most direst and reliable evidence of evolution.

Connecting Back

Connecting links are living organisms with characteristics intermediate between two groups, e.g., Euglena (link between plants and animals)

Molecular and phystological

various physiological processes, cellular structure, biochemistry, genetic composition, etc. also provide evolutioonary evidence e.g., blood plasma proteins.

Theories of evolutions

Lamark's Theory

It says that "The changes in structure or function of any organ are acquired during the lifetime of an individual by use of disuse of that organ and are inherited" causing evolution.

Darwain's Theory

It says that variation occur in organisms and useful amoung them are selected by nature (i.e., natural selection) and get accumulated in the organism. This leads to evolution.

Mutation Theory

This theory put forward by Hugo de Vries says that evolution is a discontinuous, saltatory process that occurs due to sudden inheritable variations.

Modern Synthetic Theory

According to it five factor : genetic variations, heredity, natural selection, reproductive isolation and speciation lead to evolution

Mechanism of evolution

Evolution starts with generation of variations, Variations in a population may occur by mutations, genetic drift, gene migration, hybridization, etc. Out of these variations inheritable variations undergo natural selection and the individual with highest survival value in the present environmental conditions evolve.

Human evolution

All human beings present today belong to a simple species Homo sapines which has evolved bipedal locomotion high cranial capacity, opposable thumbs and etc. dominates in today's life forms.