

Question 1.  
State the two principal outcomes of the experiments conducted by Louis Pasteur on origin of life. (Delhi 2019)  
Answer:  
Louis Pasteur’s experiments demonstrated that life comes only from pre-existing life. He showed that in swan-neck pre-sterilised flasks, life did not evolved from ‘killed yeast’ while in another flask open to air, new living organisms arose from ‘killed yeast.’

Question 2.  
State two postulates of Oparin and Haldane’s theory with reference to the origin of life. (All India 2017)  
Answer:  
Oparin and Haldane proposed the following postulates with reference to origin of life.

* The first form of life came from pre-existing non-living organic molecules.
* The conditions on earth favouring chemical evolution were high temperature, volcanic storms and reducing atmosphere.

Question 3.  
Write the hypothetical proposals put forth by Oparin and Haldane. (Foreign 2015)  
Answer:  
Oparin and Haldane proposed the theory of chemical evolution. According to them, life originated from pre-existing non-living organic molecules and the formation of life was preceded by chemical evolution.

Question 4.  
Why are analogous structures a result of convergent evolution? (All India 2014)  
Answer:  
When two species have structures that are similar in function but differ in origin and anatomy, they are called analogous structures. These structures develop in different species which move from different areas to a common habitat where they adapt themselves accordingly, therefore it is called convergent evolution.

Question 5.  
Name the type of evolution that has resulted in the development of structures like wings of butterfly and bird. What are such structures called? (Delhi 2014C)  
Answer:  
Convergent evolution has resulted in the development of structures like wings of butterfly and birds. Such structures are called analogous organs.

Question 6.  
Write the term used for resemblance of varieties of placental mammals to corresponding marsupials in Australia. (Delhi 2013C)  
Answer:  
Adaptive radiation occurring through parallel evolution results in the resemblance of placental mammals to marsupials in Australia.

Question 7.  
Identify the examples of convergent evolution from the following  
(i) Flippers of penguins and dolphins  
(ii) Eyes of Octopus and mammals  
(iii) Vertebrate brains (Delhi 2013)  
Answer:  
(i) and (ii) are the examples of analogous organs representing convergent evolution.  
Vertebrate brains are the example of divergent evolution.

Question 8.  
Identify the examples of homologous structures from the following  
(i) Vertebrate hearts  
(ii) Thorns in Bougainvillea and tendrils of Cucurbita.  
(iii) Food storage organs in sweet potato and potato. (Delhi 2013)  
Answer:  
Homologous organs are derived through divergent evolution thus, indicating common ancestry.  
Examples of homology are  
(i) Vertebrate heart and brain.  
(ii) In plants, thorns and tendrils of Bougainvillea and Cucurbita represent homology.  
On the other hand, food storage organs, i.e. tubers in sweet potato and potato are analogous organs.

Question 9.  
State the significance of the study of fossils in evolution. (Delhi 2012)  
Answer:  
Fossils help us to know the morphological details of the organisms that were present in the past and relate them to the organisms of the present for better understanding the process of evolution. We can also trace the time at which the particular organism existed.

Question 10.  
State the significance of biochemical similarities among diverse organisms in evolution. (Delhi 2012)  
Answer:  
Similarities in biochemicals such as DNA, help in deriving the line of evolution. Organisms with more similar DNA sequences are considered close relatives that might have evolved from the same ancestor.

Question 11.  
Write the similarity between the wing of a butterfly and the wing of a bat. What do you infer from the above, with reference to evolution? (Delhi 2012)  
Or  
Comment on the similarity between the wings of a cockroach and the wings of a bird. What do you infer from the above, with reference to evolution? (All india 2012)  
Or  
Comment on the similarity between the flippers of dolphin and penguins, with reference to evolution. (Foreign 2012)  
Answer:  
Similarity between the wings of butterfly and bat or cockroach and bird or flippers of dolphin and penguins is that they perform similar functions but they are dissimilar in their basic structure and development.  
They are thus, analogous organs. With reference to evolution, it can be inferred that these are formed as a result of convergent evolution.

Question 12.  
Name the scientist who disproved spontaneous generation theory. (Delhi 2010)  
Answer:  
Louis Pasteur disproved the spontaneous generation theory through his swan-neck flask experiment. Refer to Answer No. 1.

Question 13.  
(i) Identify the following pairs as homologous or analogous organs  
(a) Sweet potato and potato.  
(b) Eye of Octopus and eye of mammals.  
(c) Thorns of Bougainvillea and tendrils of Cucurbita.  
(d) Forelimbs of bat and whale.  
(ii) State the kind of evolution they represent. (All India 2015)  
Or  
(i) Select the homologous structures from the combinations given below  
(a) Forelimbs of whale and bat  
(b) Tuber of potato and sweet potato  
(c) Eyes of Octopus and mammals.  
(d) Thorns of Bougainvillea and tendrils of Cucurbita.  
(ii) State the kind of evolution they represent. (All India 2015)  
Or  
Select two pairs from the following which exhibit divergent evolution. Give reasons for your answer.  
(i) Forelimbs of cheetah and mammals.  
(ii) Flippers of dolphins and penguins.  
(iii) Wings of butterflies and birds.  
(iv) Forelimbs of whales and mammals. (All India 2015)  
Or  
Write about the ancestry and evolution of bat, horse and human on the basis of a comparative study of their forelimbs. What are these limbs categorised as? (Delhi 2013C)  
Answer:  
(i) The given pairs are identified as  
(a) Analogous organs.  
(b) Analogous organs.  
(c) Homologous organs.  
(d) Homologous organs.  
(ii) (c) and (d) represent divergent evolution while (a) and (b) represent convergent evolution.  
Or  
(i) (a) Forelimbs of whales and bats and (d) thorns of Bougainvillea and tendrils of Curcubita are homologous organs.  
(ii) Both these structures represent divergent evolution, i.e. sharing common ancestry, organs with same fundamental structure but different functions.  
Or  
Divergent evolution is represented by (i) and (ii).  
Or  
All mammals, i.e. whales, cheetah, bat and human share similarities in the pattern of bones of forelimbs. These forelimbs though perform different functions but have similar anatomical structure, i.e. all of them have humerus, radius, ulna, carpals, metacarpals and phalanges in their forelimbs.

Hence, the same structure is developed along different directions due to the adaptations to different needs in these animals. This is called divergent evolution and these structures are homologous.

Question 14.  
Explain with the help of an example the type of evolution homology is based on. (Delhi 2015C)  
Or  
Divergent evolution leads to homologous structures. Explain with the help of an example. (All India 2011C)  
Answer:  
Divergent evolution is a process, where the same structure develops along different directions in different organisms due to adaptations to different needs. Divergent evolution leads to the development of homologous structures, as they all have similar anatomical structure and origin, but perform different functions.

Examples, the thorn of Bougainvillea and tendrils of Cucurbita are homologous organs as both of them are modified axillary buds, which perform different functions.

Question 15.  
(i) Explain adaptive radiation with the help of suitable example.  
(ii) Cite an example where more than one adaptive radiation have occurred in an isolated geographical area.  
Name the type of evolution your example depicts and state why is it so named? (All India 2014)  
Answer:  
(i) The process of evolution of different species in a given geographical area starting from a point and literally radiating to other areas or habitat is called adaptive radiation, e.g. alterations in beaks of finches on Galapagos Islands.

(ii) An example where more than one adaptive radiation have occur in an isolated geographical area is Australian marsupials, where a number of different marsupials evolved from an ancestral stock but within the isolated Australian island and all of them got adapted to different habitats, e.g. Tasmanian wolf (marsupial) and placental wolf (placental  
mammals).

The above cited example depicts convergent evolution as these marsupials show development of similar adaptive functional structures in unrelated groups of organisms.

Question 16.  
What was proposed by Oparin and Haldane on origin of life? How did SL Miller’s experiment support their proposal? (Foreign 2014)  
Or  
Mention the contribution of SL Miller’s experiment to origin of life. (Delhi 2010)  
Answer:  
Oparin and Haldane proposed that life originated on earth spontaneously from non-living matter, i.e. organic molecules.

SL Miller conducted an experiment, which provided experimental evidence for chemical evolution. He created conditions similar to primitive atmosphere, in the laboratory such as high temperature, reducing atmosphere consisting of CH4, NH3, etc. When he created an electric discharge in the flask containing all the above stated components at 800°C, organic molecules, e.g. amino acids were formed. Results indicated that the first non-cellular forms of life were created about 3 billion years ago. This also supports the hypothesis that life could have originated from organic matter.

Question 17.  
List the two main propositions of Oparin and Haldane. (All India 2013)  
Answer:  
Two main propositions of Oparin and Haldane were

* The primitive atmosphere was reducing, i.e. free oxygen was absent.
* There was high temperature, high methane, ammonia and hydrogen gas in the atmosphere.

Question 18.  
How do palaeontological evidences support evolution of organisms on earth? (All India 2013C)  
Answer:  
Palaeontology is the study of past life based on fossil records. The study of fossils reveals the type of life forms occurring in the past and highlights the course of evolution of living organisms. The distribution of fossils in the sedimentary rocks of different ages fully supports the concept of evolution. It shows that structure of wing became more and more complex as we proceed from earliest to recent times. From the fossil records it has been concluded that evolution has taken place from the simple to complex forms in a gradual manner.

Question 19.  
Write the Oparin and Haldane’s hypothesis about the origin of life on earth. How does meteorite analysis favour this hypothesis? (All India 2013)  
Answer:  
Oparin-Haldane theory states that origin of life is the result of a long series of physiochemical changes, brought about first by chemical evolution and then by biological evolution.

Analysis of meteorites also revealed the presence of similar compounds as found in the primitive atmosphere, indicating the occurrence of similar processes elsewhere in space.

Question 20.  
Convergent evolution leads to analogous structures. Explain with the help of an example. (All India 2011C)  
Answer:  
Convergent evolution is a process of evolution, where anatomically dissimilar structures in different organisms perform similar functions. It leads to the formation of analogous structures in different groups of organisms as they perform similar function, but are anatomically different.

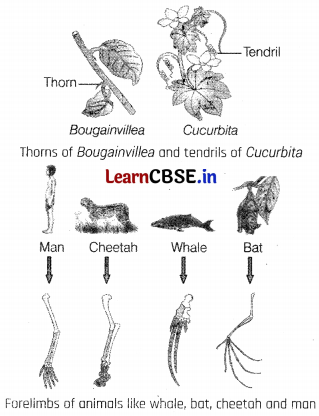
Examples, potato (stem modification) and sweet potato (root modification), flippers of penguins and dolphins.

Question 21.  
Why are wings of butterfly and birds said to be analogous organs? Name the type of evolution the analogous organs are a result of. (Foreign 2010)  
Answer:  
Refer to Answer No. 11.

Question 22.  
(i) Differentiate between analogous and homologous structures.  
(ii) Select and write analogous structures from the list given below.  
(a) Wings of butterfly and birds  
(b) Vertebrate hearts  
(c) Tendrils of Bougainvillea and Cucurbita  
(d) Tubers of sweet potato and potato. (2018)  
Answer:  
(i) Differences between analogous structure and homologous structure are as follows

|  |  |
| --- | --- |
| Analogous structures | Homologous structures |
| These have different basic plan and origin. | These have similar basic plan and origin. |
| These are adapted to perform same functions. | These are adapted to perform different functions. |
| These confirm convergent evolution, e.g. eye of Octopus and man. | These confirm divergent evolution, e.g. limbs of man and whale. |

(ii) Analogous organs  
(a) Wings of butterfly and birds.  
(b) Tubers of sweet potato and potato.

Question 23.  
How do homologous organs represent divergent evolution? Explain with the help of a suitable example. (Delhi 2016)  
Answer:  
Homologous organs as divergent evolution: Homology is the relation among the organs of different groups of organisms, that show similarity in the basic structure and embryonic development, but have different functions. Homology in organs indicates common ancestry. It is based on divergent evolution. When due to different needs, some structures develop differently, the condition is called divergent evolution. This results in the formation of homologous organs. Examples of homology in plants and animals are as follows  


Question 24.  
Differentiate between homology and analogy. Give one example of each. (All India 2016)  
Or  
Differentiate between divergent and convergent evolution. Give one example of each. (Outside Delhi 2016)  
Answer:  
Differences between homology and analogy are as follows

|  |  |
| --- | --- |
| Homology/Divergent evolution | Analogy/Convergent evolution |
| Homology is based on divergent evolution. | Analogy is based on convergent evolution. |
| Structures are anatomically similar but functionally different. | Structures are anatomically different but functionally similar. |
| e.g. in animals, forelimbs of whales, bats and cheetah. In plants, thorns of Bougainvillea and tendrils of Cucurbita. | e.g. in animals, wings of butterfly and birds. In plants, tubers of sweet potato and potato. |

Question 25.  
Describe the experiment that helped Louis Pasteur to dismiss the theory of spontaneous generation of life. (Delhi 2016C)  
Answer:  
Theory of spontaneous generation states that the life originate;! from dead, decaying or rolling matters like storm, dead animals, etc.  
Louis Pasteur rejected the theory of spontaneous generation and demonstrated that life had evoived from pre-existing life. In his experiment, he kept killed yeast cells in presterilised flask and in another flask open into air. The life did not evolved in the former, but new living organisms evolved in the another flask.

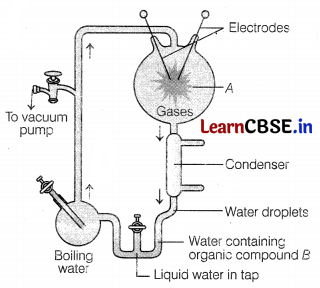
Question 26.  
Explain convergent evolution with the help of two examples. (Foreign 2015)  
Answer:  
Refer to Answer No. 20.

Question 27.  
Explain adaptive radiation with the help of a suitable example. (Delhi 2015)  
Or  
What do you infer from the resemblance between flying squirrel and flying phalanger with reference to their evolution. Delhi 2015,2015C Or Explain adaptive radiation and  
convergent evolution by taking example of some of Australian marsupials and Australian placental mammals. Foreign 2010 Or Australian marsupials and placental mammals are suitable examples of adaptive radiation and convergent evolution. Explain by giving reasons. All Indio 2010C  
Answer:  
Adaptive radiation is the process of evolution of different species in a given geographical area starting from a point and radiating to other habitats.  
Darwin went to Galapagos Island and observed that there were many varieties of finches in the same island. All the varieties evolved on the island itself. Darwin suggested that after originating from a common ancestral seed eating stock, the finches must have radiated to different geographical areas and undergone adaptive changes in their beaks, thus enabling some to become insectivorous while the other remained herbivore and ate seeds.  
Or  
Many Australian marsupials, each different from the other, e.g. kangaroo, sugar glider, etc., evolved from a common ancestral stock, but all within the Australian Island continent. When more than one adaptive radiation occur in an isolated geographical area, it can be called as convergent evolution. Australian placental mammals also show adaptive radiation in evolving into varieties of such placental mammals, each one of which appears similar to a corresponding marsupial, e.g. placental wolf and Tasmanian wolf, anteater and numbat, flying squirrel and flying phalanger, etc.

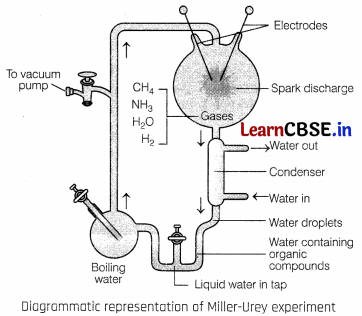
Question 28.  
Explain the interpretation of Charles Darwin who observed a variety of small black birds on Galapagos Islands. (Delhi 2015)  
Answer:  
(i) Darwin found the variations in the beaks of small black birds on Galapagos Island due to their adaptation to different food habits.

Darwin explained  
(a) All the varieties must have evolved within the same island itself. The original finches were seed-eating. From them, some arose with altered beaks as insectivorous and some as vegetarian finches.  
(b) This process of evolution of different species in a given geographical area starting from a point and radiating to other habitats is called adaptive radiation.

Question 29.  
How does the study of fossils support evolution? Explain. (Delhi 2015C)  
Answer:  
Refer to Answer No. 18.

Question 30.  
Given below is a diagrammatic representation of the experimental setup used by SL Miller for his experiment.  
  
(i) Write the names of different gases contained and the conditions set for the reaction in the flask A.  
(ii) State the type of organic molecule he collected in the water at B.  
(iii) Write the conclusion he arrived at. (Delhi 2013C, Foreign 2011)  
Answer:  
(i) Gases were methane, ammonia, hydrogen and water vapour. In ‘A’ flask electric discharge was created using electrodes.  
(ii) The organic molecules collected in water at ‘B’ were amino acids.  
(iii) He concluded that life could have come from pre-existing non-living organic molecules and their formation was preceded by chemical evolution.

Question 31.  
State the theory of biogenesis. How does Miller’s experiment support this theory? (Delhi 2012)  
Or  
State the views of Oparin and Haldane on evolution. How does SL Miller’s experiment support their views? (Delhi 2011C)  
Answer:  
The theory of biogenesis was proposed by Oparin and Haldane. It states that life could have come from pre-existing non-living organic molecules (e.g. RNA, protein, etc.) and the formation of life forms was preceded by chemical evolution, i.e. formation of diverse organic molecules from inorganic constituents.

In 1953, Urey and Miller conducted an experiment to prove this theory. They created the conditions of primitive earth, i.e. high temperature, volcanic storms, reducing atmosphere containingCH4, NH3, etc., at laboratory scale. They then stimulated electric discharge in a closed flask containing CH4,H2, NH3 and water vapour at 800°C. They observed the formation of amino acids.  
  
In similar experiments, they observed the formation of sugars, nitrogen bases, pigments and fats. These small organic molecules are the building blocks for proteins and other components. Hence, this experiment supported that life has came from pre-existing non-living organic molecules.

Question 32.  
Convergent evolution and divergent evolution are the two concepts explaining organic evolution. Explain each one with the help of an example. (Foreign 2011; Delhi 2010)  
Answer:  
Refer to Answer No. 14 and 20.

Question 33.  
Anthropogenic actions hasten evolution. Explain with the help of suitable example. (Foreign 2010)  
Answer:  
Human activities, i.e. anthropogenic actions are found to enhance evolution.  
For example,  
(i) Excessive use of DDT as a fertiliser in crops resulted in the evolution of DDT resistant mosquitoes.

* When DDT was used first time, many mosquitoes died, but few survived.
* Survived mosquitoes showed resistance to DDT and reproduced even in the presence of DDT.
* Offsprings produced by these mosquitoes were also resistant to DDT.
* Hence, DDT is not effective on mosquito population today.

(ii) Similarly, evolution of antibiotic resistant microbes has occurred due to the overuse of antibiotics.

Question 34.  
(i) Differentiate between analogy and homology giving one example each of plant and. animal, respectively.  
(ii) How are they considered as an evidence in support of evolution? (All India 2016)  
Answer:  
(i) Refer to Answer No. 24.  
(ii) Homology and analogy show the similarities and differences among the organisms of today and those existed years ago. These evidences come from the comparative study of external and internal structure.

These can be determined by the following types Homology in organs indicates common ancestry. It is based on divergent evolution. When due to different needs, some morphologically similar structures develop differently, to perform different functions, the condition is called divergent evolution. This results in the formation of homologous organs.  
Analogy had developed due to the convergent evolution where different structures evolved for the same function and have morphologically dissimilar structures. These are called analogous organs.

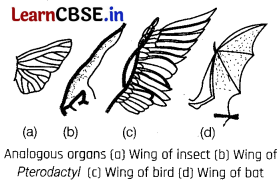
Question 35.  
(i) List any four evidences of evolution, (ii) Explain, any one of the evidences that helps to understand, the concept of evolution. (Delhi 2016C)  
Answer:  
(i) Evidences of evolution are derived from

* Palaeontology (Fossils)
* Comparative anatomy and morphology, i.e. homology and analogy
* Biochemical/Physiology
* Biogeography
* Embryology

(ii) Comparative anatomy and morphological evidences show the similarities and differences among the organisms of today and those that existed years ago.

The evidences come from comparative study of external and internal structure.  
I. (a) The organs with same structural design and origin, but different functions are called homologous organs.  
Examples are forelimbs of some animals like whales, bats and cheetah have similar anatomical structure, such as humerus, radius, ulna, carpals, metacarpals and phalanges.  
(b) Homology in organ indicates common ancestry.  
(c) Other examples of homology are vertebrate heart or brain. In plants also, thorns and tendrils of Bougainvillea and Cucurbita represent homology.  
(d) Homology is based on divergent evolution. The same structures developed along different directions due to adaptations to different needs. The condition is called divergent evolution.

II. (a) Organs which are anatomically different, but functionally similar are called analogous organs.  
For example, wings of butterfly and birds. In both, wings perform same function, but they have different origin and structure.  
(b) Analogy refers to a situation exactly opposite to homology.  
(c) Analogous organs are a result of convergent evolution. It is the evolution in which different structures evolve for same function and hence, have similarity. It can be said that above organisms had different structures, but they came in the same environment and evolved to perform same function.  
(d) Other examples of analogy are eyes of Octopus and mammals; flippers of penguins and dolphins.

In plants, syveet potato (root modification) and potato (stem modification) are analogous organs.  


Question 36.  
(i) How does the study of fossils help to understand evolution?  
(ii) How did SL Miller provide an experimental evidence in favour of Oparin and Haldane’s hypothesis? Explain. (Delhi 2016C)  
Answer:  
(i) The fossils are the remains of past organisms preserved in sedimentary rocks.  
Palaeontology is the study of fossils.

* Rocks form sediments and a cross-section of earth’s crust indicate the arrangement of sediments one over the other during the long history of earth.
* Different aged rock sediments contain fossils of different life forms, who died during the formation of the particular sediment.  
  Fossils which were present in a specific area explain the presence of that organism in that area only.
* Some organisms appear similar to modern organisms. They represent extinct organisms like dinosaurs.
* A study of fossils in different sedimentary layers indicates the geological period in which they existed.  
  Fossils which are obtained from old rocks are of simple type, while which were obtained from new rocks are of complex type.
* The study showed that life forms varied over time and certain life forms are restricted to certain geological time scale. Hence, new forms of life have evolved at different times in the history of earth. Thus, palaeontological evidences help in detailed study of progress of evolution from old to new forms.

(ii) Refer to Answer No. 31.

Question 37.  
According to the Hardy-Weinberg principle, the allele frequency of a population remains constant. How do you interpret the change of frequency of alleles in a population? (All India 2019)  
Answer:  
According to Hardy-Weinberg principle, the change in frequency of alleles in a population shows the extent of evolutionary change.

Question 38.  
Coelacanth was caught in South Africa. State the significance of discovery of Coelacanth in the evolutionary history of vertebrates. (All India 2019)  
Or  
State the significance of Coelacanth in evolution. (Delhi 2012)  
Or  
Coelacanth was caught in 1938 in South Africa. Why is it very significant in the evolutionary history of vertebrates? (All India 2010C)  
Answer:  
The discovery of Coelacanth (lobefins), the first amphibian is significant as it proved that amphibians have evolved from fish-like organisms. Lobefins were the ancestors of modern day frogs and salamanders.

Question 39.  
How did Charles Darwin express fitness ? (Delhi 2019)  
Or  
What is ‘fitness of an individual’ according to Darwin? (Delhi 2017)  
Answer:  
According to Darwin, fitness of an individual is the ability of an organism to reproduce successfully and leave a large number of progenies under a particular set of selection pressures.

Question 40.  
Write the names of the following:  
(i) A 15 mya primate that was ape-like  
(ii) A 2 mya primate that lived in East African grasslands. (2018)  
Answer:  
(i) Dryopithecus (ii) Australopithecus

Question 41.  
What role does an individual organism play as per Darwin’s theory of natural selection? (Delhi 2017)  
Answer:  
According to the Darwin’s theory of natural selection, the role of an individual organism is to pass on the necessary variations, changes or mutations from present generation to the next generation, that has been selected by the nature.

Question 42.  
Write the probable differences in eating habits of Homo habilis and Homo erectus. (Foreign 2016)  
Answer:  
The probable differences in eating habit of Homo habilis and Homo erectus are as follows  
Homo habilis They did not eat meat.  
Homo erectus They probably ate meat.

Question 43.  
According to Hugo de Vries what is saltation? (All India 2016)  
Or  
What is ‘Saltation’ according to Hugo de Vries? (Delhi 2014)  
Answer:  
Mutation theory of Hugo de Vries states that the evolution occurs due to single-step large mutations occurring in a population. This is called saltation and it leads to new species formation or speciation.

Question 44.  
State a reason for the increased population of dark coloured moths coinciding with the loss of lichens (on tree bark) during industrialisation period in England. (Delhi 2015)  
Answer:  
The increase in dark population of moths was due to industrial melanism.  
After industrialisation, dark-winged moths became more than white-winged moths. This is because tree trunks covered by lichens became dark due to the air pollution during industrialisation. White-winged moths fail to camouflage and thus, decreased in number, whereas dark-winged moths were able to escape predation.

Question 45.  
Write the basis of origin of variations in organisms as described by Hugo de Vries. (All India 2013C)  
Answer:  
Mutations are the basis of origin of variations in an organism according to Hugo de Vries.

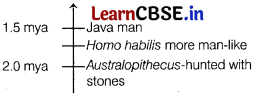
Question 46.  
Name the common ancestor of the great apes and man. (All India 2011)  
Answer:  
Dryopithecus is the common ancestor of great apes and man.

Question 47.  
Mention how is mutation theory of Hugo de Vries different from Darwin’s theory of natural selection. (Foreign 2011)  
Answer:  
Hugo de Vries theory It states that evolution occurs due to single step large mutations called saltation, whereas Darwin’s theory states that the speciation occurs gradually through a number of generations, with the accumulation of minor variations.

Question 48.  
List the two characteristics of mutation that help in explaining evolution. (Delhi 2011c)  
Answer:  
According to mutation theory of evolution

1. Mutation are random, inheritable and appear in all conceivable directions.
2. Same type of mutations can appear in number of individuals of a species.

Question 49.  
When does a species become founder to cause founder effect? (Foreign 2010).  
Answer:  
Founders effect occurs due to the change in allele frequency of a population. When the change in the allele frequency is very different in the new sample of population, so that they become a different species. The original drifted population becomes founder and the effect is called founder effect.

Question 50.  
  
Study the ladder of human evolution given above and answer the following questions.  
(i) Where did Australopithecus evolve?  
(ii) Write the scientific name of Java man. (Delhi 2010C)  
Answer:  
(i) Australopithecus evolved in East African grasslands.  
(ii) Java man -Homo erectus.

Question 51.  
How would the gene flow or genetic drift affect the population in which either of them happen to take place ? (Delhi 2019)  
Answer:  
If gene flow or genetic drift takes place in a population, the effect would be

* Gene flow/Gene migration Due to migration, new genes or alleles are added to the population and are lost from the old population thus, changing the frequencies of alleles in both populations. When migration occurs multiple times it is termed as gene flow.
* Genetic drift Changes occurring in allele frequencies by chance is called genetic drift. Due to changes in allele frequency in new population, some different species are formed. This is called founder effect and the original population is called founder.

Question 52.  
With the help of an algebraic equation, how did Hardy-Weinberg explain that in a given population the frequency of occurrence of alleles of a gene is supposed to remain the same through generations ? (2018)  
Answer:  
Hardy-Weinberg’s principle states that allele frequencies in a population are stable. They remain constant from generation to generation. The gene pool also remains constant. This is called genetic equilibrium.

Thus, according to this principle, the sum total of all the allelic frequencies in a population is always 1. Suppose in a diploid individual, p and q represent the frequency of allele A and allele a, respectively. The probability that an allele A with a frequency of P appears on both the chromosomes of a diploid organism in the p². Similarly of aa is q², of Aa is 2pq. Hence, p² + 2pq + q² = 1.

The difference measured in the expected values of frequencies, indicates the extent of evolutionary change.

Question 53.  
Mention the evolutionary significance of the following organisms:  
(i) Shrews  
(ii) Lobefins  
(iii) Homo habilis  
(iv) Homo erectus (Delhi 2017)  
Answer:  
The evolutionary significance of the given organisms are as follows  
(i) Shrews They are the first mammals. These were long tailed, insectivorous, squirrel-like organisms. They gave rise to primitive primates. For example, leones and tarsiers at the beginning of the Palaeocene era.  
(ii) Lobefisns They are the first amphibians. Modem day frogs and salamanders have evolved from them.  
(iii) Homo habilis The first human-like primates who lived in Africa about 2 million years ago. They had brain capacity of 700 cc. They are also called as handy man as they were first and the most skillful tool makers.  
(iv) Homo erectus They appeared after Homo habilis, about 1.7 million years ago. They had large brain capacities, i.e. 800-1100 cc and were omnivores.

Question 54.  
Name the first human-like hominid. Mention his food habit and brain capacity. (All India 2015C)  
Answer:  
Homo habilis were the first human-like hominid. They probably did not consume meat and their brain capacity was about 650-850cc.

Question 55.  
Explain how natural selection operates in nature by taking an example of white-winged and dark-winged moths of England. (All India 2014C)  
Answer:  
In England, prior to industrialisation, the tree trunks were covered with white lichens hence, white moths tould survive and were protected from predators due to white colour. On the other hand, black moths (a dark-winged moths) could be easily identified due to their dark colour and declined in number due to predation.

However, as industrialisation progressed, the lichens were replaced by soot and dust particles and dark coloured moths were benefitted due to camouflage, while white-winged moths could be easily eaten up by the predators being easily identifiable. Thus, only the dark-winged moths who were able to fit and survive, i.e. adapted well in conditions, reproduced well in nature. Thus, natural selection operates in nature by selecting the fittest characters of organisms.

Question 56.  
Rearrange the following in increasing order of evolution  
Gnetales; Ferns; Zosterophyllum; Ginkgo. (2014C)  
Answer:  
The increasing order of evolution in plants is as follows: Zcsterophyllum – Ferns – Ginkgo – Gnetales

Question 57.  
Name the ancestors of a man based on the features given below.  
(i) Human-like, meat-eater with 900 cc brain, lived in Java.  
(ii) More human-like with brain size 1400 cc, lived in Central Asia, used hides and buried their dead.  
(iii) Human-like, vegetarian, with brain capacity between 650-800 cc.  
(iv) Man-like primate, that existed about 15 my a. Fossils found in Tanzania. (All India 2013C)  
Answer:  
(i) Homo erectus  
(ii) Homo sapienes neanderthalensis  
(iii) Homo habilis  
(iv) Ramapithecus

Question 58.  
Explain the phenomenon of evolution by natural selection as supported by the variations observed in white-winged and dark-winged moth populations in England between 1850-1920. (All India 2019)  
Answer:  
Refer to Answer No. 19.

Question 59.  
(i) Write two differences between Homo erectus and Homo habilis.  
(ii) Rearrange the following from early to late geological periods:  
Carboniferous, Silurian, Jurassic. (Delhi 2019)  
Answer:  
(i) Differences between Homo erectus and Homo habilis are

|  |  |
| --- | --- |
| Homo erectus | Homo habilis |
| Origin period is 1.5 mva | Origin period is 1.2-1.5 mya |
| Brain capacity 900 cc meat eater, Fossils found in Java. | First human like beings, brain capacity 650-800 cc. herbivorous and fossils found in Hast Africa. |

(ii) The correct sequence from early to late geological period is Silurian → Carboniferous → rassic.

Question 60.  
How can Hardy-Weinberg equilibrium be affected? Explain giving three reasons. (2018C)  
Or  
Giving three reasons, write how Hardy-Weinberg equilibrium can be affected. (Delhi 2014C)  
Answer:  
Factors which affect Hardy-Weinberg equilibrium are (Any three)

* Gene migration Due to migration, new genes or alleles are added to the population and are lost from the old population thus, changing the frequencies of population. Migration when happens multiple times, is termed as gene flow.
* Genetic drift Changes occurring in frequencies by chance are called genetic drift. Due to changes in allele frequency in new population, some different species are formed. This is called founder effect and the original population is called founder.
* Mutations These occur randomly and at a very slow rate. They lead to new phenotypes and due to considerable genetic variations, speciation occurs.
* Recombination During gainetogenesis, crossing over between homologous chromosomes leads to new combinations of genes. It occurs during meiosis.

Question 61.  
Write the characteristics of Ramapithecus, Dryopithecus and Neanderthal man. (All India 2017)  
Answer:  
Characteristics of Ramapithecus

* Ramapithecus survived about 14-15 million years ago during late Miocene to Pliocene.
* Ramapithecus walked erect on its hindlegs.
* They were similar to ape, which lived on the tree tops, but also walked on the ground.
* They ate hard nuts and seeds like modem man. Their jaws and teeth were similar to humans.