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Class: 12
Subject: Biology
Topic: Evolution
No. of Questions: 25

Q1. Why the wings of a butterfly and of a bat are called analogous?

Sol. Wings of a butterfly and of a bat are used for flying in the air, but they are very different in structure. The superficial similarity in them is due to adaptation to flying. Both have evolved from separate ancestral population as a means of more efficient mode of locomotion.

Q2. "Sweet potato tubers and potato tubers are the result of convergent evolution." Justify the statement.

Sol. **Convergent Evolution:** It can be described as the process where some diverse organisms individually develop the traits which are similar in function, for example sweet potato tubers and potato tubers. Both of them are underground fleshy structures which perform the functions of storage of food and vegetative reproduction but both are different in origin.

Q3. What is genetic drift?

Sol. The elimination of the genes of certain traits when a section of a population migrates or dies of natural calamity. It alters the gene frequency of the remaining population.

Q4. Explain why D.D.T. has now become ineffective against mosquitoes.

Sol. Originally only D.D.T.- resistant mosquitoes could survive and reproduce. Their resistant genotype, in due course of time, spread to almost the entire population. This made D.D.T. ineffective against mosquitoes.

Q5. When and from which source the mammals and the primates originated?

Sol. The mammals originated in the Jurassic period from the cynodont reptiles. The primates arose in the early Tertiary period (Palaeocene epoch) from the terrestrial shrew-like insectivores.

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Q6. Write down 4 important resemblances between apes and humans.

Sol. (i) Large head, mobile neck, short trunk with broad chest, long limbs:

(ii) Large, highly convoluted brain:

(iii) Well developed facial muscles to express emotions: and

(iv) Lack of tail.

Q7. Name the fossil modern man and living modern man. How do they differ in cranial capacity.

Sol. Homo sapiens fossils–the fossil modern man or Cro–Magnon man with cranial capacity of 1650 cm^3; Homo sapiens sapiens–the living modern man with cranial capacity of 1200–1600 cm^3

Q8. Name the main stages in human evolution in order of their appearance.

Sol. Ramapithecus, Australopithecus, Homo habilis, Homo erectus, Homo sapiens fossilis and Homo sapiens sapiens.

Q9. What advantages man got over other primates by having erect posture and large brain.

Sol. Erect posture increased height which provided greater range of vision for life in open savannah. Large brain increased intelligence and provided proper coordination of movements.

Q10. Name the curvatures in the human spine, Give their advantage.

Sol. Cervical, thoracic, lumbar and sacral. The curves help to maintain balance and make walking erect on two legs much easier.

Q11. What is divergent evolution? Explain taking an example of plants.

Sol. Divergent evolution means that the same structure developed along different directions due to adaptation to different need. The differently developed structures are homologous.

In plants, thorn of Bougainvillea and tendrils of Cucurbita are homologous organs. These developed from common ancestral structure in different directions due to adaptation to different needs.

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Q12. How do Darwin's finches illustrate adaptive radiation?

Sol. Charles Darwin, during his visit to Galapagos islands, found that closely related passerine birds called Darwin's finches differed primarily in body size, feather colour and bill shape as adaptation to types of food available on islands. All these species evolved in different directions from common ancestral form and adapted to new invaded habitats and to modes of life necessary there. This phenomenon is called adaptive radiation.

Q13. Did aquatic life forms get fossilized? If yes, where do we come across such fossils?

Sol. Yes; we come across such fossils in sedimentary rocks which, due to geological uphevals, came up and formed mountains.

Q14. What are we referring to when we say 'simple organisms' or complex organisms'?

Sol. The terms 'simple organisms' and 'complex organisms' are referred to when we talk about evolutionary history of an organism. A simple organism is considered to be primitive if it has simple structural and functional organization. On the other hand, a complex organism under reference is considered to be more evolved form having complex structural and functional organization. These complex organisms are believed to have arisen from simpler forms in the course of evolution.

Q15. How do we compute the age of a fossil or a rock?

Sol. Age of fossil or rock is computed by absolute dating method involving either Uranium-Lead technique or carbon (C^{14}) dating technique or Potassium – Argon technique.

Q16. What is founder effect?

Sol. When a small group of people, (called founders), leave their homes to find a new settlement, the population of in a new settlement may have different genotype frequencies from that of the parent population. Formation of a different genotype in new settlement is called the founder effect.

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Q17. List the two main propositions of Oparin and Haldane.

Sol. Oparin and Haldane stated that (i) life originated from pre-existing non-living organic molecules e.g. RNA, Protein etc. (ii) The conditions on earth favouring chemical evolution were having high temperature, volcanic storms, reducing atmosphere containing CH_4, NH_3, etc.

Q18. Write the Oparin and Haldane's hypothesis about the orgin of life on Earth. How does meteorite analysis favour this hypothesis?

Sol. Oparin and Haldane's hypothesis remains unconfirmed as a possible amino acids, but not in the form of organic proteins. Meteorite analysis favour the Oparin-Haldane's hypothesis and achieved widespread recognition and their bubbles similar in structure to those found withing the Murchison meteorite.

Q19. Make a list of the theories put forward for the origin of life.

Sol. 1.Theory of special creation, 2. Theory of spontaneous generation. 3. Theory of catastrophism. 4. Interplanetary theory 5. Theory of Eternity of life 6. Modern or chemical theory or naturalistic theory.

Q20. What is atavism?

Sol. Atavism is the reappearance of a certain ancestral, not parental, structure which has either completely disappeared or greatly reduced.

Q21. Evolution is

(a) progressive development of a race
(b) history and development of race along with variations
(c) history of race
(d) development of race.

Sol. (b): The term evolution was coined by Herbert Spencer, an English philosopher which means unrolling or unfolding of nature that brings about an orderly change from one form or condition to another resulting in descendents becoming different from ancestors. Thus, it is history and development of race along with variations.

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Q22. "Continuity of germplasm" theory was given by

(a) De Vries
(b) Weismann
(c) Darwin
(d) Lamarck.

Sol. (b): August Weismann put forward the theory of continuity of germplasm. According to Weismann, the characters influencing the germ cells are only inherited. There is a continuity of germplasm (protoplasm of germ cells) but the somatoplasm (protoplasm of somatic cells) is not transmitted to the next generation hence it does not carry characters to next generation.

Weismann cut off the tails of rats for more than 20 generations and allowed them to breed, but tailless rats were never born. De vries gave mutation theory. Theory of Natural selection was given by Darwin and Lamarck gave the first theory of evolution, Lamarckism.

Q23. Theory of inheritance of acquired characters was given by

(a) Wallace
(b) Lamarck
(c) Darwin
(d) De Vries.

Sol. (b): One of the first attempts to explain the mechanism of evolution was made by Jean Baptiste de Lamarck. His theory of evolution is known as Lamarckism in which he explained inheritance of acquired characters which states that whatever an individual acquires characters in its life time due to internal vital force, effect of environment, new needs and use and disuse of organs, they are inherited to the next generations. The process continues. After several generations, the variations are accumulated upto such extent that they give rise to new species.

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Q24. 'Origin' of Species' was written by

(a) Oparin
(b) Weismann
(c) Lamarck
(d) Darwin.

Sol. (d): Darwin published his observations and conclusions regarding evolution in the book "Origin of Species" in 1859. Darwin's this book became very popular and changed people's thinking about organic evolution.

Q25. Which was absent in the atmosphere at the time of origin of life?

(a) NH_3
(b) H_2
(c) O_2
(d) CH_4.

Sol. (c): Hydrogen atoms were most numerous and most reactive in primitive atmosphere. First hydrogen atoms combined with all oxygen atoms to form water and leaving no free oxygen. Thus primitive atmosphere was reducing atmosphere (without free oxygen) unlike the present oxidising atmosphere (with free oxygen).