THE VILLAGE
INTERNATIONAL SCHOOL
"We Nurture Dreams"

AIM HIGH, TOGETHER WE FLY

CHAPTER 7
EVOLUTION – QB 1

1. Name the scientist who disproved spontaneous generation theory.
   Ans. Louis Pasteur disproved the theory of spontaneous generation.
2. What did Louis Pasteur's experiment on 'killed yeast' demonstrate? Name the theory that got disproved on the basis of his experiment.
   Ans. Louis Pasteur demonstrated that life comes only from pre-existing life. The theory of spontaneous generation was disproved on the basis of his experiment.
3. . When does a species become founders to cause founder effect?
   Ans. When the change in the alleles frequency is so different in the new sample of population that they become a different species, the original drifted population becomes founder.
4. Write the hypothetical proposals put forth by Oparin and Haldane. OR State two postulates of Oparin and Haldane with reference to origin of life.
   Ans. Oparin and Haldane proposed that life originated from pre-existing non-organic molecules and the diverse organic molecules were formed from these inorganic constituents by chemical evolution i.e., formation of life was preceded by chemical evolution.
5. Life originated from earth's inorganic atmosphere in past but not today. Suggest two reason.
   Ans. (i) Presence of free oxygen in present day atmosphere. (ii) Very high temperatures.
6. How can you suggest that biochemistry gives evidence for organic evolution?
   Ans. In the same species or group of organisms, similar type of proteins are found, thus supporting organic evolution.
7. State the significance of the study of fossils in evolution.
   Ans. Fossils represent extinct organisms. They show life forms restricted to certain geological time spans existing in the past. Show ancestry of present day organisms are connecting links between two groups of organisms.
8. Identity the examples of convergent evolution from the following: (i) Flippers of penguins and dolphins (ii) Eyes of octopus and mammals (iii) Vertebrate brains
   Ans. (i) Flippers of penguins and dolphins (ii) Eyes of octopus and mammals
9. Mention one example each from plants and animals exhibiting divergent evolution.
   Ans. Thorn of Bougainvillea and tendrils of Cucurbita, forelimbs of whales, bats, cheetah and humans (all mammals)/vertebrate hearts/vertebrates brains. (Any one)
10. 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.
    Ans. (i) Vertebrate hearts (ii) Thorns in Bougainvillea and tendrils of Cucurbita.
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?

Ans. Wings of a bird and a bat perform the same function of flying despite their structural dissimilarity. This infers that they are analogous organs. It can be inferred that it is of convergent evolution.

12. "Sweet potato tubers and potato tubers are the result of convergent evolution." Justify the statement.
Ans. Sweet potato tuber is a modified root whereas potato tuber is a modified stem. These are anatomically different structures but perform the same function of food storage. Therefore, they are the result of convergent evolution.

13. Comment on the similarity between the wing of a cockroach and the wing of a bird. What do you infer from the above, with reference to evolution?
Ans. They are similar in function. Thus we infer that these organs are analogous which has resulted in convergent evolution.

14. Comment on the similarity between the flippers of dolphins and penguins, with reference to evolution.
Ans. Similarity between the flippers of dolphins and penguins is that they perform similar functions though structurally different. Thus, they are analogous organs. These are the result of convergent evolution.

15. Why are analogous structures a result of convergent evolution?
Ans. Analogous structures are not anatomically similar, i.e., they do not have common ancestors and evolve for similar function in the same habitat. Therefore, they are said to be a result of convergent evolution.

16. Mention the type of evolution that has brought the similarity as seen in potato tuber and sweet potato.
Ans. Convergent evolution

17. When we say "survival of the fittest", does it mean that (a) those which are fit only survive, or (b) those that survive are called fit. Comment.
Ans. Those individuals which survive and reproduce in their respective environment are called fit.

18. State a reason for the increased population of dark coloured moths coinciding with the loss of lichens (on tree barks) during industrialisation period in England.
Ans. Natural selection or survival of fittest as nature selected the moths which could match with black surroundings due to soot deposition.

19. According to deVries what is saltation?
Ans. According to de Vries, saltation is single step (large) mutation.

20. According to Hardy-Weinberg's principle, the allele frequency of a population remains constant. How do you interpret the change of frequency of alleles in a population?
Ans. Change of frequency of alleles in a population will result in natural selection leading to the evolution.

21. If the frequency of one allele is 'p' and for another, it is 'q' for one gene, what will be the formula to calculate allele frequency in future generations according to Hardy–Weinberg genetic equilibrium?
Ans. $(p+q)\ 2 = p2 + 2pq + q2 = 1$

22. What does Hardy-Weinberg equation $p2 + 2pq + q2 = 1$ convey?

Ans. Hardy–Weinberg equation conveys genetic equilibrium, i.e., sum total of all allelic frequencies is 1.

23. What is founder effect?
Ans. Sometimes the change in allele frequency is so different in the new sample of population that they become a different species. The original drifted population becomes founder and the effect is called founder effect

24. Name the common ancestor of the great apes and man.
Ans. Dryopithecus/Ramapithecus

25. State the significance of biochemical similarities amongst diverse organism in evolution.
Ans. Biochemical similarities indicate evolution from common or shared ancestry.

26. State the significance of Coelacanth in evolution.
Ans. It is an ancestor of amphibians.

27. Write the probable differences in eating habits of Homo habilis and Homo erectus.
Ans. Homo habilis did not eat meat. They were vegetarian. Homo erectus ate meat. They were meat eater.

28. Write the names of the following: (a) A 15 mya primate that was ape-like (b) A 2 mya primate that lived in East African grasslands
Ans. (a) Dryopithecus (b) Australopithecine/Homo habilis.

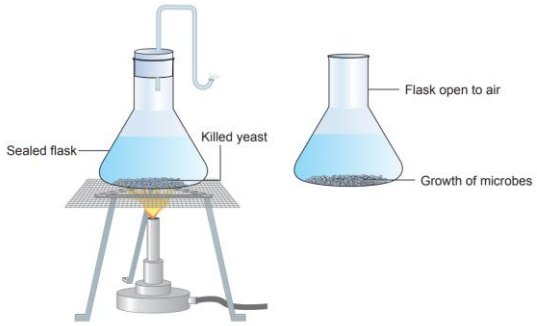
29. Rearrange the human activities mentioned below as per the order in which they developed after the modern Homo sapiens came into existence during ice age: (i) Human settlement (ii) Prehistoric cave art (iii) Agriculture
Ans. The order of activities is as follows: (i) Pre-historic cave art (ii) Agriculture (iii) Human Settlement

30. Coelacanth was caught in South Africa. State the significance of discovery of Coelacanth in the evolutionary history of vertebrates.
Ans. Coelacanth evolved as first amphibian (lived on both land and water). It is an ancestor of modern day frogs and salamanders.

31. By what Latin name the first hominid was known?
Ans. Homo habilis

32. Among Ramapithecus, Australopithecous and Homo habilis, who probably did not eat meat?
Ans. Homo habilis

33. Describe the experiment that helped Louis Pasteur to dismiss the theory of spontaneous generation of life.
Ans. Two pre-sterilised flasks with killed yeast were taken. One of the flask was sealed, and the other was open to air. Differential growth of life were observed in the two flasks. Life was found only in the open flask.



34. Protein synthesis machinery revolves around RNA but in the course of evolution it was replaced by DNA. Justify.
Ans. Since RNA was unstable and prone to mutations, DNA evolved from RNA with chemical modifications that makes it more stable. DNA has double stranded nature and has complementary strands. These further resist changes by evolving a process of repair.

35. Write the Oparin and Haldane's hypothesis about the origin of life on Earth. How does meteorite analysis favour this hypothesis?
Ans. The hypothesis stated that life originated from pre-existing non-living organic molecules (e.g., RNA, protein, etc.). When the meteorites were analysed, it was observed that presence of similar compounds was confirmed which conclude that similar process is going on elsewhere in the space.

36. Mention the contribution of S.L. Miller's experiments on Origin of Life.
Ans. S.L. Miller created an environment in laboratory similar to the one that existed before life originated. In a closed flask containing CH4, H2, NH3 and water vapour at 800°C, electric discharge was created. The conditions were similar to those in primitive atmosphere. After a week, they observed presence of amino acids and complex molecules like sugars, nitrogen bases, pigments and fats in the flask. This provided experimental evidence for the theory of chemical origin.

37. Convergent evolution and divergent evolution are the two concepts explaining organic evolution. Explain each one with the help of an example. OR Differentiate between divergent and convergent evolution. Give one examples of each.
Ans. Convergent evolution: When more than one adaptive radiation appeared to have occurred in an isolated geographical area and two or more groups of unrelated animals resemble each other for similar mode of life or habitat, it is called convergent evolution, e.g., Australian marsupials, placental mammals.
Divergent evolution: In some animals, the same structures developed along different directions due to adaptations to different needs. This is known as divergent evolution. For example, forelimbs of whales, bats, cheetah and human perform different functions but have similar anatomical structure with similar bones arranged in similar segments.

38. Explain convergent evolution with the help of two examples.
Ans. Different structures evolved similarly due to same functions. This is called convergent evolution. Examples: (i) Wings of butterfly and birds. (ii) Sweet potato (root modification) and potato (stem modification).

39. Explain divergent evolution with two examples.
Ans. Some structures developed along different directions due to adaptations to different needs performing different functions. This is called divergent evolution. Examples: (i) Forelimbs of whales, bat, cheetah and humans have similar pattern of bones. (ii) Thorns of Bougainvillea and tendrils of Cucurbita are modifications of stem.

40. 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
Ans. (i) and (iv) exhibit divergent evolution. There pairs have similar anatomical structure or origin but perform different functions.

41. .(a) Select the homologous structures from the combinations given below: (i) Forelimbs of whales and bats (ii) Tuber of potato and sweet potato (iii) Eyes of octopus and mammals (iv) Thorns of Bougainvillea and tendrils of Cucurbita (b) State the kind of evolution they represent.
Ans. (a) (i) Forelimbs of whales and bats. (iv) Thorns of Bougainvillea and tendrils of Cucurbita. (b) Divergent evolution.

42. How do homologous organs represent divergent evolution? Explain with the help of a suitable example.
Ans. Organs with similar structure or same origin developed along different directions due to adaptation or different needs, to perform different functions are called homologous organs. For example, the fore limbs of some animals (Vertebrates) like whales, bats, cheetah and human have similar anatomical structure (i.e., humerus, radius, ulna, carpals, metacarpals and phalanges) develop differently to meet different need and to perform different functions.

43. Select the analogous structures from the combinations given below: (i) Forelimbs of whales and bats (ii) Eyes of octopus and mammals (iii) Tuber of sweet potato and potato (iv) Thorns of Bougainvillea and tendrils of Cucurbita. (b) State the kind of evolution they represent.
Ans. (a) (ii) and (iii) are analogous structures. (b) Convergent evolution.

44. Identify the following pairs as homologous or analogous organs: (i) Sweet potato and potato (ii) Eye of octopus and eye of mammals (iii) Thorns of Bougainvillea and tendrils of Cucurbits (iv) Forelimbs of Bat and Whale
Ans. (i) and (ii) are analogous organs. (iii) and (iv) are homologous organs.

45. Branching descent and natural selection are the two key concepts of Darwinian theory of evolution. Explain each concept with the help of a suitable example.
Ans. Branching descent: Different species descending from the common ancestor get adapted in different habitats, e.g., Darwin’s finches—varieties of finches arose from grain eaters; Australian marsupials evolved from common marsupial. Natural selection: It is a process in which heritable variations enable better survival of the species to reproduce in large number, e.g., white moth surviving before the industrial revolution and black moth surviving after

industrial revolution; long-necked giraffe survived the evolution process; DDT-resistant mosquitoes survive.

46. Why are the wings of butterfly and birds said to be analogous organs? Name the type of evolution of which the analogous organs are a result of.
Ans. Wings of butterfly and birds are not anatomically similar structures though they perform similar functions. Hence, they are called analogous structures. Analogous organs result from convergent evolution.

47. What do you infer from the resemblance between flying squirrel and flying phalanger with reference to their evolution?
Ans. Evolution of marsupial mammals has resulted in flying phalanger through adaptive radiation. Evolution of placental mammals has led to the evolution of a flying squirrel (independently). The resemblance between the two proves convergent evolution.

48. "Post-industrialisation, the population of melanised moth increased in England at the expense of white-winged moths." Provide explanations. OR Explain the increase in the numbers of melanic (dark winged) moths in the urban areas of post-industrialisation period in England. OR In England, during the post-industrialised period, the count of melanic moths increased in urban areas but remained low in rural areas. Explain.
Ans. Pre-industrialisation period had more white winged moth against grey lichens on tree trunks. During industrialisation large amount of soot and smoke deposited on tree trunks, making the bark dark. Against the dark background white moths could easily be preyed upon. Melanised moth could camouflage against dark bark. This natural selection increased their number.

49. Explain the interpretation of Charles Darwin when he observed a variety of small black birds on Galapagos Islands.
Ans. In Galapagos Islands, the small black birds amazed Darwin and he later called them finches. He realised that there were many varieties of finches in the same island. All the varieties evolved on the island itself. This process of evolution was called adaptive radiation, According to Darwin this evolution was based on available resources, food and space. There is survival of the fittest.

50. Anthropogenic action can hasten the evolution. Explain with the help of a suitable example.
Ans. Excessive use of herbicides, pesticides, etc., has only resulted in selection of resistant varieties in a much lesser time scale which is equally true for microbes against which we employ antibiotics or drugs against eukaryotic organisms/cells. As a result of which resistant organisms/cells are appearing in a time scale of months or years and not centuries. For example, when DDT was used for the first time, maximum mosquitoes died but few survived due to variation in the population. These mosquitoes showed resistance to DDT and survived to reproduce successfully in the presence of DDT and gradually such mosquito population became DDT resistant, following natural selection.

51. According to the Darwinian theory, the rate of appearance of new forms is linked to their life cycles. Explain.

Ans. Microbes have a very short life cycle and divide fast. They can produce millions of organisms within few hours. Thus, it is easy to see variant population in less span of time. On the other hand, higher organisms have a long time span and the variations are not visible in a short time.

52. What does the following equation represent? Explain. $p2 + 2pq + q2 = 1$

Ans. The equation represents Hardy-Weinberg's Principle which states that allele frequencies in a population are stable and are constant from generation to generation. 1 represents stable allelic frequency indicating no evolution occurring. p represents frequency of homozygous dominant (AA), 2 pq represents frequency of heterozygous (Aa) and q represents frequency of homozygous recessive (aa).

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