CUET 2024 Biology Solution SET A

1. Retrogressive Evolution: Retrogressive evolution refers to the process where an organism reverts to a simpler or less complex form over generations. This often occurs in response to environmental changes where certain features become redundant. An example is the evolution of cave-dwelling animals which lose their eyesight over generations due to the lack of light in their environment.

2. Gene Pool: The gene pool of a population includes all the genetic information carried by the members of that population. It encompasses all the alleles of every gene present. A large gene pool indicates high genetic diversity, which can enhance the survival and adaptability of a population to changing environments.

3. Australopithecines: Australopithecines are an extinct genus of hominids that are considered to be closely related to the human lineage. They lived in Africa between about 4 million and 2 million years ago. They had both human-like and ape-like characteristics, such as bipedalism and a relatively small brain size.

4. Nucleosome and Histones: A nucleosome is a fundamental unit of chromatin, consisting of a segment of DNA wound around a core of histone proteins. Specifically, it is associated with eight histone molecules, two each of H2A, H2B, H3, and H4. This structure helps in organizing the DNA into a compact form, fitting into the cell nucleus.

5. Genetic Drift: Genetic drift refers to the change in the frequency of existing alleles in a population due to random sampling of organisms. It is a mechanism of evolution that can cause significant changes in small populations over time, leading to the loss of genetic diversity.

6. Gene Migration: Gene migration, or gene flow, is the transfer of genetic material between separate populations. This occurs when individuals from one population move to another and breed, introducing new genes into the gene pool of the receiving population, thereby increasing genetic diversity.

7. Homo Erectus: Homo erectus is an extinct species of early human that lived approximately 1.9 million to 110,000 years ago. They are known for their upright posture and are believed to have been the first to use fire and complex tools. Fossils have been found in Africa, Asia, and Europe.

8. Hardy-Weinberg Equilibrium: The Hardy-Weinberg equilibrium describes a theoretical state in which a population's allele and genotype frequencies remain constant from generation to generation, provided that certain conditions are met. These conditions include no mutations, random mating, no gene flow, infinite population size, and no selection.

9. Analogous Structures: Analogous structures are body parts that serve similar functions in different species but do not share a common ancestral origin. These structures arise due to convergent evolution, where different species independently evolve similar traits as a result of having to adapt to similar environments or ecological niches.

10. Human Genome Project: The Human Genome Project was an international research initiative aimed at mapping and understanding all the genes of the human species. Key findings include that the human genome contains approximately 3.2 billion base pairs and about 20,000-25,000 genes. Less than 2% of the genome codes for proteins, and a significant portion of the genome's function remains unknown.

11. Placental Mammals and Marsupials: Placental mammals and marsupials represent two different classes of mammals with distinct reproductive strategies. Placental mammals have a complex placenta that nourishes the embryo during gestation, while marsupials give birth to

relatively undeveloped young that continue to develop in a pouch on the mother's body.

12. Types of Barriers Examples: Biological barriers that contribute to species isolation and speciation include geographical barriers (mountains, rivers), ecological barriers (different habitats), temporal barriers (different breeding seasons), behavioral barriers (different mating rituals), and mechanical barriers (incompatible reproductive structures).

13. Intestinal Perforation and Death: Intestinal perforation is a severe medical condition where a hole forms in the wall of the gastrointestinal tract, allowing the contents to leak into the abdominal cavity, which can lead to peritonitis, sepsis, and potentially death if not treated promptly.

14. Common Cold and Rhinoviruses: The common cold is primarily caused by rhinoviruses, which are a group of viruses that infect the upper respiratory tract. Symptoms typically include a runny nose, sore throat, coughing, and sneezing.

15. Lips and Fingernails Turning Blue: Cyanosis is a condition where the lips, fingernails, and other areas turn a bluish color due to a lack of oxygen in the blood. It can be caused by respiratory or cardiovascular issues that impair oxygenation.

16. Pneumonia and Salmonella: Pneumonia is an infection of the lungs typically caused by bacteria, viruses, or fungi. However, Salmonella, a bacteria commonly associated with food poisoning, can also cause a form of pneumonia, although this is rare and usually occurs in immunocompromised individuals.

17. Typhoid Fever and Widal Test: Typhoid fever is a bacterial infection caused by Salmonella typhi. The Widal test is a serological test used to diagnose typhoid fever by detecting the presence of antibodies against the bacteria in the patient's blood.

18. Smack: "Smack" is a street name for heroin, an opioid drug that is used illegally for its euphoric effects. Chemically, heroin is derived from morphine, which is extracted from the opium poppy plant.

19. Antibodies Secretion: Antibodies are secreted by plasma cells, which are a type of white blood cell derived from B lymphocytes. These antibodies play a crucial role in the immune response by identifying and neutralizing foreign substances such as bacteria and viruses.

20. Sewage Treatment and Flocs: In sewage treatment, flocs are aggregates of bacteria and particulate organic matter. These flocs form in the aeration tank during the activated sludge process and help in the removal of contaminants from the wastewater.

Question 21:

Explanation: Retrogressive evolution is a process where an organism reverts to a more primitive form. This typically involves the loss of complex features and can be seen in organisms that adapt to more simplified lifestyles or environments.

Solution: (1) Retrogressive evolution .

Question 22:

Explanation: The gene pool is the total set of genetic information contained within the individuals of a population. It includes all the different alleles of every gene present in the population.

Solution: (3) Gene pool .

Question 23:

Explanation: Australopithecines are an extinct genus of hominins that lived in Africa. They are considered to be early ancestors of modern humans and exhibited both ape-like and human-like characteristics.

Solution: (3) Australopithecines .

Question 24:

Explanation: Nucleosomes are the fundamental units of chromatin, consisting of a segment of DNA wrapped around a core of histone proteins. Each nucleosome core is associated with eight histone molecules.

Solution: (4) Eight .

Question 25:

Explanation: Dryopithecus and Ramapithecus are considered early ancestors of humans. Genetic drift and gene migration are processes that can affect allele frequencies in populations but do not directly relate to human ancestral classification.

Solution: (1) Homo erectus .

Question 26:

Explanation: Natural selection is one of the key mechanisms affecting the Hardy-Weinberg equilibrium. It alters allele frequencies by favoring the survival and reproduction of individuals with advantageous traits.

Solution: (1) Natural selection .

Question 27:

Explanation: Analogous structures result from convergent evolution, where different species evolve similar traits independently, often because they adapt to similar environments or ecological niches.

Solution: (1) Convergent evolution .

Question 28:

Explanation: The Human Genome Project revealed that the human genome consists of approximately 3164.7 million base pairs, with the average gene containing about 3000 bases. Less than 2% of the genome codes for proteins, and many discovered genes have unknown functions.

Solution: (4) (A), (C), (D), and (E) .

Question 29:

Explanation: In the rivet popper hypothesis, each 'rivet' represents a species within an ecosystem. The loss of rivets (species) can weaken the ecosystem's structure and function, potentially leading to collapse.

Solution: (1) Key species .

Question 30:

Explanation: Temperate regions have experienced glaciations, while tropical regions have remained more stable, allowing for greater biodiversity. Tropical environments offer more consistent climates and higher solar energy, contributing to higher productivity and species richness.

Solution: (3) There is more solar energy available in the tropics which contributes to higher productivity and hence, biodiversity .

Question 31:

Explanation: Primary Endosperm Nucleus results from the fusion of three haploid nuclei in flowering plants during the process of double fertilization, forming a triploid cell.

Solution: (2) Triple fusion .

Question 32:

Explanation: Mature pollen grains typically contain a vegetative (or tube) cell and a generative cell. The generative cell divides to form two sperm cells.

Solution: (3) Vegetative cell and generative cell .

Question 33:

Explanation: In humans, mammary glands are divided into 15-20 lobes, each containing alveoli where milk is produced and stored.

Solution: (4) 15-20 .

Question 34:

Explanation: Sex determination in humans is based on the combination of sex chromosomes. An egg carries an X chromosome, while a sperm can carry either an X or a Y chromosome. The combination determines the sex of the offspring.

Solution: (2) 'X' or 'Y' chromosome of sperm .

Question 35:

Explanation: The filiform apparatus guides the pollen tube into the synergid, the tapetum nourishes the pollen grain, the exine is made of sporopollenin, and the funicle attaches the ovule to the placenta.

Solution: (3) (A)-(III), (B)-(IV), (C)-(I), (D)-(II) .

Question 36:

Explanation: Pollen grains contain two types of cells at maturity: the vegetative (or tube) cell and the generative cell. The generative cell further divides to form two sperm cells during fertilization.

Solution: (3) Vegetative cell and generative cell .

Question 37:

Explanation: Apomixis is a form of asexual reproduction that does not involve fertilization. In this process, seeds are formed without the fusion of gametes, resulting in offspring that are genetically identical to the parent plant.

Solution: (4) Apomixis .

Question 38:

Explanation: Ecosystems with high species diversity are generally more resilient to disturbances. The greater variety of species allows for more stable interactions and functions within the ecosystem.

Solution: (4) It is resilient to occasional disturbances, whether natural or man-made .

Question 39:

Explanation: Endemic species are those that are found in a specific geographic area and nowhere else. The loss of an endemic species can significantly affect the stability and functioning of its ecosystem.

Solution: (2) Endemic species .

Question 40:

Explanation: The correlation between species richness and community stability was demonstrated by ecologist Robert MacArthur. He showed that ecosystems with higher biodiversity are more stable and resilient.

Solution: (1) Robert MacArthur .

Question 41:

Explanation: In temperate regions, repeated glaciations have disrupted ecosystems, whereas tropical regions have remained relatively stable, allowing for higher species diversity and greater evolutionary opportunities.

Solution: (1) Tropical environments have more .

Question 42:

Explanation: In the context of ecosystem stability, productivity, and resilience to disturbances, all species play critical roles. The removal of any species can impact the overall stability of the ecosystem.

Solution: (1) All the species are equally important in a stable community and absence of any one leads to its instability .

Question 43:

Explanation: The 'rivet popper' hypothesis suggests that each species (rivet) plays a crucial role in maintaining the integrity of an ecosystem (airplane). The loss of rivets can lead to a weakening and eventual failure of the structure.

Solution: (1) Key species .

Question 44:

Explanation: In flowering plants, the primary endosperm nucleus is formed through the process of double fertilization, which involves the fusion of one sperm cell with two polar nuclei, resulting in a triploid cell.

Solution: (2) Triple fusion .

Question 45:

Explanation: The primary endosperm nucleus in angiosperms is a triploid cell formed as a result of double fertilization, where one sperm cell fuses with two polar nuclei.

Solution: (2) Triple fusion .

Question 46:

Explanation: Apomixis is a type of asexual reproduction in plants where seeds are produced without fertilization, resulting in offspring that are genetically identical to the parent.

Solution: (4) Apomixis .

Question 47:

Explanation: Human sex determination is based on the presence of the X or Y chromosome in the sperm. The combination with the X chromosome in the egg determines the sex of the offspring.

Solution: (2) 'X' or 'Y' chromosome of sperm .

Question 48:

Explanation: The structures and their functions in plants are as follows: the filiform apparatus guides the pollen tube into the synergid, the tapetum nourishes the pollen grain, the exine is made of sporopollenin, and the funicle attaches the ovule to the placenta.

Solution: (3) (A)-(III), (B)-(IV), (C)-(I), (D)-(II) .

Question 49:

Explanation: The various hypotheses for the greater biological diversity in the tropics include more stable climates, higher productivity due to more solar energy, and greater evolutionary time due to fewer disturbances like glaciations.

Solution: (4) It is resilient to occasional disturbances, whether natural or man-made .

Question 50:

Explanation: The rivet popper hypothesis is used to illustrate the importance of each species (rivet) in maintaining the stability and integrity of an ecosystem (airplane). Loss of key species can lead to ecosystem failure.

Solution: (1) Key species .
