

ZOO102 – PRINCIPLES OF ANIMAL LIFE

MID TERM MOST IMPORTANT QUESTIONS

1. What is isomerism? Write its example regarding carbohydrates.

Isomerism is the phenomenon in which more than one compounds have the same chemical formula but different structural formula. Such compounds are called isomers. All disaccharides are isomers of each other. For example, glucose, galactose and fructose all have the same molecular formula $C_6H_{12}O_6$.

2. Define renewable and non-renewable resources.

Natural resource can be divided into two main types: Renewable resources and Non-renewable resources.

Renewable resources: are those resources which are constantly available. After using they are reasonably replaced or recovered e.g., water, sunlight, air and biomass.

Non-Renewable Resources: are those which once exhausted are no more available. They are not replaced or recovered e.g., oil, gas and minerals.

3. Explain structure of DNA.

DNA (Deoxyribonucleic acid) is a double-stranded molecule that carries the genetic instructions necessary for the development, functioning, and reproduction of all known living organisms. It consists of a long chain of nucleotides, which are the building blocks of DNA. The structure of DNA is often described as a double helix, resembling a twisted ladder or spiral staircase.

The key components of DNA are:

1. **Nucleotides:** These are the building blocks of DNA. Each nucleotide consists of three parts: a sugar molecule called deoxyribose, a phosphate group, and one of four nitrogenous bases—adenine (A), thymine (T), cytosine (C), or guanine (G).
2. **Base Pairing:** The nucleotides on each strand of DNA pair up with each other based on their complementary bases. Adenine (A) always pairs with thymine (T), and cytosine (C) always pairs with guanine (G). This pairing is known as base pairing.
3. **Double Helix:** The two DNA strands are twisted around each other to form a double helix structure. The sugar-phosphate backbones of the two strands run in opposite directions, with one strand oriented in the 5' to 3' direction and the other in the 3' to 5'

direction. The bases of each strand project inward and form hydrogen bonds with the complementary bases on the opposite strand, holding the two strands together.

4. **Antiparallel Strands:** The two strands of DNA are oriented in opposite directions. One strand runs in the 5' to 3' direction, while the other runs in the 3' to 5' direction. This antiparallel arrangement is important for base pairing and the overall stability of the DNA molecule.
5. **Hydrogen Bonds:** The nitrogenous bases of DNA are held together by hydrogen bonds. Adenine forms two hydrogen bonds with thymine, and cytosine forms three hydrogen bonds with guanine. These hydrogen bonds provide stability to the double helix structure.

The structure of DNA allows for the replication and transmission of genetic information. During DNA replication, the two strands of the double helix separate, and each strand serves as a template for the synthesis of a new complementary strand. This process ensures the faithful transmission of genetic information from one generation to the next.

4. Write importance of nucleotides.

Nucleotides are important because they:

1. Form the building blocks of DNA and RNA, the genetic material of organisms.
2. Carry the genetic code that determines an organism's traits.
3. Serve as the primary energy currency in cells (ATP).
4. Act as signaling molecules in cell communication pathways.
5. Participate in enzymatic reactions and metabolic pathways.
6. Regulate gene expression and protein production.
7. Contribute to cell structure and membrane integrity.

5. What is Inductive reasoning and deductive reasoning?

Inductive reasoning moves from specific instances to a generalized conclusion, while deductive reasoning moves from general principles to specific conclusions. Inductive reasoning is probabilistic, while deductive reasoning is based on logical rules and guarantees certainty if the premises are true.

6. Enlist four nucleotides.

On the basis of nitrogen bases, there are four types of nucleotides. Adenine, Guanine, Cytosine, Thymine/Uracil. In DNA, thymine is replaced by Uracil.

7. What are Dependent variables and Control variables?

The dependent variable is the variable in an experiment or study that is being measured or observed. It is the outcome or response variable that is expected to change as a result of manipulating or changing the independent variable.

Control variables, on the other hand, are the variables that are kept constant or unchanged throughout the experiment or study. They are used to minimize the effects of potential confounding factors and ensure that any observed changes in the dependent variable can be attributed to the independent variable being tested.

In short, the dependent variable is what you measure or observe, while control variables are the factors you keep constant to isolate the effects of the independent variable.

8. Explain Theory of Evolution.

The theory of evolution, proposed by Charles Darwin, is a scientific explanation for the diversity of life on Earth. It states that all species, including humans, have descended from a common ancestor through a process called natural selection.

According to the theory, individuals within a population exhibit variations in traits. Some of these variations provide a survival advantage in a given environment, allowing individuals with those traits to survive and reproduce more successfully. This leads to the passing on of beneficial traits to the next generation.

Over time, these accumulated changes can result in the emergence of new species. The process of evolution is driven by various factors, including genetic mutations, genetic recombination during reproduction, and environmental pressures.

The theory of evolution is supported by extensive scientific evidence from various fields, including paleontology, genetics, and comparative anatomy. Fossil records show the existence of extinct species that bear similarities to present-day organisms, indicating a shared ancestry. Genetic studies reveal similarities in DNA sequences among different species, further supporting the idea of a common origin.

9. Write applications of Zoology.

Zoology covers the areas ranging from basic structure of animals to their industrial application. There are four major areas of with direct applications of zoology:

1. Medical Research:

In medical research the first step is the diagnosis of a disease. Many diseases are due to animals which cause and transmit them. Advancement in techniques and protocols have enabled the scientists to understand that how a person is affected by a disease and what are the underlying mechanism for specific disease. For example *Aedes* mosquitos are responsible for spread of dengue. Once the mode of action is known, the disease may be controlled by taking preventive measures and proper medication. New drugs are designed, their mode of action and effects are first studied on animal models then they are used by human.

2. Agriculture:

Study of zoology helps us to understand the life of different insects, pests, rodents, birds and mammals. Many crop pests of are the food of insects and birds. They may be used to control the pest. The phenomenon is called biocontrol. In comparison to chemical control, there is no risk of developing resistance in crop pests. Animal husbandry is the farming of animals to produce meat, milk and eggs while aquaculture is the culturing of aquatic animals and plants. Beekeeping for the production of honey and wax is called apiculture while rearing of silkworm for production of silk is called sericulture.

3. Industry

Billion dollar medical industry is based on many animal and plant products. Vaccines which typically contain weak or killed disease causing agents are used to immunize human, farm animals and pets against different disease causing agents. Antibodies are also used for passive immunity where immune system is too weak or needed not to be activated. Growth hormones are used in children with suppressed growth. Leather industry products like bags, shoes, jackets sofas and hundreds of other goods are made from hides of animals.

4. Environmental Role:

Biodiversity of an ecosystem is the total number of different species of plants and animals. Biodiversity of earth is decrease rapidly, mainly of habitat destruction by human (anthropogenic) activities. It is the knowledge of zoology which is helping to reduce the biodiversity loss by habitat protection through national parks, game reserves and other protective places. Zoo and safari parks have great aesthetic value. Animals have also an important role in controlling environmental pollution. Scavengers are the animals which keep the environment clean by eating up dead bodies of animals. Many small soil and aquatic animals remove toxic pollutants. This process is called bioremediation.

10. Explain Theory of Chemical Evolution.

According to theory of chemical evolution simple molecules were first converted into monomers of carbohydrates, proteins, lipids and nucleic acids. These monomers later joined to form polymers. All these polymers were suspended in oceans giving up a soup like consistency. Polymers later arranged to form a primitive type of cell called Protocell. This was a simple self-replicating system. It was a simple bacterium like primary heterotroph organism. As food availability became limited, natural selection acted upon these simple cells and self-replicating systems were more successful. Cells began to evolve and genetic code was established and protein synthesis mechanism was developed. Fossil record shows that life existed about 3.8 billion years ago. Eukaryotes (membrane bounded nucleus and organelles) evolved about 1.5 billion years ago.

11. What Experimental Science & Evolutionary Science.

Experimental Science

Biological science that addresses the questions of proximate causes is called experimental science. It proceeds through experiments. E.g., process of maintaining body temperature, process of cell division.

Evolutionary Science

Biological science that addresses the questions of ultimate causes is called evolutionary science. It proceeds through comparative methods E.g., comparison of hemoglobin structure of human and fish.

12. Define Kingdom.

Kingdom is the highest rank of classification. All the living organisms are distributed into five kingdoms *i.e.*, monera, protista, fungi, plantae and animalia. All the animals are included in kingdom Animalia.

13. Write four classifications of animals.

Overall sequence of hierarchy of classification of animals is as follow:

- Kingdom
- Phylum
- Class
- Order
- Family
- Genus
- Species

The smallest group of classification system is species.

i- Species

Species is a group of animals which can interbreed and produce fertile offspring. It is the group of animals with maximum similarities. e.g., dogs, cats, horses and elephants.

ii- Genus

Closely related species form a genus. Genus name starts with a capital letter and italicized e.g., *Panthera*. *Paranthera* is genus of five living wild cats i.e., lion, tiger, jaguar, leopard and snow leopard.

iii- Family

Closely related genera form a family. e.g., Felidae and Hominidae.

iv- Order

Closely related families form an order. e.g., Carnivora and Primates

v- Class

Similar orders are grouped together form a class. e.g., Amphibia, Reptilia, Aves and mammalia.

vi- Phylum

It is the principal category of classification. Classes with some common features are grouped to form a phylum. e.g., echinodermata and chordata.

vii- Kingdom

Kingdom is the highest rank of classification. All the living organisms are distributed into five kingdoms i.e., monera, protista, fungi, plantae and animalia. All the animals are included in kingdom animalia.

viii- Domain

In 1977 Carl Woese divided the cellular organisms in three domains. i.e., archaea, bacteria and eukarya.