Course: Biology-IV (6454)

Semester: Spring, 2023

Level: B.Ed. (2.5/4-Year)

ASSIGNMENT No. 1

Q.1

a. Write names of Phyla into which Kingdom Protista is classified. (20)

The Kingdom Protista is a diverse group of eukaryotic organisms that includes various unicellular, colonial, and some multicellular organisms. It is important to note that the classification of Kingdom Protista is not universally agreed upon, and the kingdom itself is often considered paraphyletic or polyphyletic.

However, traditionally, some phyla that are commonly associated with Kingdom Protista include:

Phylum Euglenozoa: This phylum includes organisms like Euglena, which are characterized by the presence of a flagellum and often possess chloroplasts.

Phylum Amoebozoa: This phylum consists of amoeba-like organisms, such as Amoeba and Entamoeba. They typically move by extending and retracting pseudopods.

Phylum Ciliophora: This phylum comprises organisms called ciliates, including Paramecium. They are characterized by the presence of numerous hair-like structures called cilia, which are involved in movement and feeding.

Phylum Apicomplexa: This phylum includes parasitic organisms such as Plasmodium, which causes malaria. They possess complex structures at their apical end, which are involved in host cell penetration.

Phylum Diatoms: Diatoms are unicellular algae that belong to the phylum Bacillariophyta. They have a unique cell wall made of silica and are abundant in aquatic environments.

Phylum Dinoflagellata: This phylum consists of organisms called dinoflagellates, which are characterized by the presence of two flagella and are commonly found in marine environments. Some dinoflagellates are photosynthetic, while others are heterotrophic.

It's important to recognize that our understanding of the classification of protists is constantly evolving as scientific research provides new insights into their relationships and genetic diversity. As a result, the classification and grouping of protists into phyla may vary based on different taxonomic schemes and advancements in molecular techniques.

b. Write salient features of phylum Sarcomastigophora.

The phylum Sarcomastigophora, also known as Sarcomastigophora, is a group of protists that encompasses a diverse range of organisms. However, it's worth noting that the classification and grouping of organisms within this phylum are not universally agreed upon. The phylum Sarcomastigophora is often considered polyphyletic, meaning it includes organisms that do not share a common ancestor.

Nevertheless, here are some general characteristics and features associated with the phylum Sarcomastigophora:

Presence of Flagella or Pseudopods: Sarcomastigophorans typically possess locomotory structures such as flagella or pseudopods (temporary extensions of the cell). These structures aid in movement and allow the organisms to navigate through their environments.

Diverse Lifestyles: The organisms within Sarcomastigophora exhibit a wide range of lifestyles. They can be free-living or parasitic, and they inhabit various habitats, including freshwater, marine environments, soil, and the bodies of other organisms.

Varied Nutritional Modes: Sarcomastigophorans exhibit diverse nutritional modes. Some are autotrophic, capable of photosynthesis to produce their own food using chloroplasts. Others are heterotrophic, obtaining nutrients by engulfing food particles or by parasitizing other organisms.

Morphological Diversity: The members of Sarcomastigophora display considerable morphological diversity. Some organisms have simple, unicellular structures, while others form colonies or possess complex multicellular bodies.

Reproduction: Sarcomastigophorans reproduce both sexually and asexually. Asexual reproduction may occur through binary fission, budding, or multiple fission. Sexual reproduction, when present, involves the fusion of gametes to form zygotes.

Examples: The phylum Sarcomastigophora includes various protists, such as amoebas, flagellates, and certain parasitic organisms like trypanosomes and Leishmania species.

It's important to note that the classification and understanding of the phylum Sarcomastigophora are subject to ongoing research and reevaluation. As our knowledge of protist diversity and genetic relationships advances, the classification and characterization of Sarcomastigophora may change.

Q.2

What is concept of origin of multicellularity? Also describe animals' origin. (20)

The concept of the origin of multicellularity refers to the evolutionary process through which single-celled organisms gave rise to complex, multicellular organisms. Multicellularity is the state in which an organism is composed of multiple cells that work together in a coordinated manner.

The exact origins of multicellularity are not fully understood, but there are several hypotheses and theories proposed by scientists. One widely accepted hypothesis is the colonial theory, which suggests that multicellularity evolved from colonies of unicellular organisms. According to this theory, individual cells within a colony started to specialize and assume different functions, leading to a division of labor and eventually the formation of different cell types within the organism.

Another hypothesis is the syncytial theory, which suggests that multicellularity originated from a single cell that replicated its DNA but did not undergo cell division.

Instead, the replicated nuclei remained within the same cell, resulting in a multinucleated organism. Over time, the nuclei within the cell became functionally specialized, leading to the emergence of different cell types.

A third hypothesis is the symbiotic theory, which proposes that multicellularity arose from the symbiotic association of different unicellular organisms. According to this theory, cells that were previously independent started to live and cooperate together, eventually becoming interdependent and forming a multicellular organism.

It's important to note that these hypotheses are not mutually exclusive, and the actual origin of multicellularity likely involved a combination of different mechanisms. The transition from unicellularity to multicellularity was a major evolutionary event that allowed for the development of complex life forms and the diversification of life on Earth.

animals' origin.

The origin of animals, also known as the emergence of animal life or the transition to multicellularity, is a topic of scientific investigation and debate. Animals are multicellular organisms that belong to the kingdom Animalia. The exact origins of animals are still a subject of active research, but scientists have made significant progress in understanding this complex process.

The earliest evidence of animal life dates back to the Ediacaran period, which occurred approximately 635 to 541 million years ago. During this time, the fossil record reveals the presence of enigmatic organisms such as the Ediacaran biota, which were soft-bodied and often lacked clear anatomical features. These organisms are thought to

represent some of the earliest multicellular animals, although their exact relationships to modern animal groups remain uncertain.

The emergence of animals is believed to have been a result of several key evolutionary innovations. One crucial step was the transition from single-celled organisms to multicellular ones. This transition likely involved various mechanisms, such as the evolution of cell adhesion molecules that allowed cells to stick together, the development of mechanisms for cell differentiation and specialization, and the establishment of cell-to-cell communication systems.

Another significant milestone in animal evolution was the development of complex body plans and tissue types. This involved the evolution of different germ layers during embryonic development, which gave rise to distinct tissues and organs within the animal body. The evolution of symmetry, body cavities, and various other anatomical features also played important roles in shaping the diversity of animal body plans.

The exact sequence of events and the relationships among early animal lineages are still areas of active research and ongoing debate. However, based on molecular studies and comparisons of animal genomes, scientists have proposed several hypotheses about the relationships among major animal groups. These hypotheses include the radial symmetry-based classification of animals, where early animal lineages diverged into radial symmetric organisms (such as cnidarians) and bilaterally symmetric organisms (such as flatworms, arthropods, and vertebrates).

Overall, the origin of animals is a complex and fascinating field of study that involves understanding the evolutionary processes and genetic mechanisms that led to the emergence of the diverse animal kingdom we see today.

Q.3

Give a detailed account on Body wall, nervous system, excretory system and reproduction in sub-class Eucestoda. (20)

The subclass Eucestoda belongs to the class Cestoda, which includes the tapeworms. Tapeworms are parasitic flatworms that typically inhabit the intestines of vertebrate hosts. Let's explore the characteristics of the body wall, nervous system, excretory system, and reproduction in the subclass Eucestoda.

Body Wall:

The body wall of tapeworms is composed of several layers. The outermost layer is the tegument, a specialized syncytial layer that functions in nutrient absorption and protection against host immune responses. Beneath the tegument, there is a layer of circular and longitudinal muscle fibers that provide structural support and enable movement. The innermost layer, known as the parenchyma, consists of connective tissue and is responsible for holding the internal organs in place.

Nervous System:

Tapeworms have a relatively simple nervous system. They possess a nerve ring, which is a circular concentration of nerve cells located near the scolex (the anterior end of the tapeworm). From the nerve ring, nerve cords extend longitudinally along the body. Ganglia (clusters of nerve cells) are present at intervals along the nerve cords, connecting to sensory organs and providing coordination of movements.

Excretory System:

Tapeworms lack a specialized excretory system like most other animals. Instead, they rely on simple diffusion for waste elimination. Metabolic waste products, such as

ammonia, diffuse across the body wall into the surrounding host environment. As tapeworms reside in the nutrient-rich environment of the host's intestines, this mechanism is generally sufficient for waste elimination.

Reproduction:

Tapeworms are hermaphroditic, meaning that each individual possesses both male and female reproductive organs. The reproductive structures are located in the proglottids, which are the body segments behind the scolex. Proglottids are continually produced by the neck region of the tapeworm and mature as they move away from the scolex.

Within each mature proglottid, both male and female reproductive organs are present. The male reproductive system consists of testes, which produce sperm, and seminal vesicles, which store and release sperm. The female reproductive system consists of ovaries that produce eggs, along with a specialized structure called the vitellarium, which produces yolk cells to nourish the developing embryos.

Fertilization in tapeworms occurs through self-fertilization, where the sperm released by one proglottid fertilizes the eggs of the same proglottid or neighboring proglottids within the same individual. The fertilized eggs develop into embryos within the proglottids. As the proglottid matures and reaches the end of the tapeworm's body, it detaches and is released into the host's environment through feces, allowing for potential transmission to other hosts.

It's important to note that tapeworm species within the subclass Eucestoda can exhibit variations in their reproductive strategies and life cycles. The details provided here represent a general overview of the reproductive mechanisms observed in tapeworms.

Q.4

What are some important Tapeworm Parasites of human? Write characteristics of each parasite. (20)

There are several tapeworm parasites that can infect humans.

Here are some important tapeworm parasites of humans and their characteristics:

Taenia solium (Pork Tapeworm):

Transmission: Humans become infected by ingesting undercooked pork containing larval cysts (cysticerci) of the tapeworm.

Characteristics: Taenia solium can cause two distinct conditions in humans. The adult tapeworm resides in the small intestine and can grow up to several meters in length. It has a scolex (head) equipped with hooks and suckers for attachment to the intestinal wall. The tapeworm produces proglottids containing both male and female reproductive organs.

Disease: Infection with the larval form of Taenia solium can lead to cysticercosis, where the larvae develop as cysts in various tissues of the body, including the brain, muscles, and other organs.

Taenia saginata (Beef Tapeworm):

Transmission: Humans acquire the infection by consuming undercooked beef containing larval cysts (cysticerci) of the tapeworm.

Characteristics: Taenia saginata is similar to T. solium in its adult form. It can grow several meters long, and its scolex has suckers but lacks hooks.

Disease: Infection with the larval form of Taenia saginata is not common in humans, as the larvae typically do not develop beyond the intestinal stage. However, adult worms in the intestine can cause gastrointestinal symptoms.

Diphyllobothrium latum (Fish Tapeworm):

Transmission: Humans get infected by consuming raw or undercooked freshwater fish containing the larvae (plerocercoid stage) of the tapeworm.

Characteristics: Diphyllobothrium latum is one of the largest tapeworms that can infect humans, reaching lengths of several meters. It has a scolex with bothria (grooves) for attachment.

Disease: Infection with D. latum can lead to a condition called diphyllobothriasis. The tapeworm can compete with the human host for vitamin B12, potentially causing a deficiency in the host.

Echinococcus granulosus (Dog Tapeworm):

Transmission: Humans become infected by ingesting eggs of the tapeworm, typically through contact with dog feces or contaminated food and water.

Characteristics: Echinococcus granulosus is a small tapeworm, measuring only a few millimeters in length. It has a scolex with hooks and suckers for attachment.

Disease: Infection with E. granulosus can lead to the development of cysts (hydatid cysts) primarily in the liver and lungs. These cysts can cause various symptoms and complications.

It's important to note that these tapeworm infections can be prevented through proper food handling, cooking meat thoroughly, maintaining good hygiene practices, and avoiding contact with infected animals or their feces. If you suspect a tapeworm infection, it is crucial to consult a healthcare professional for diagnosis, treatment, and management.

Q.5

Give a detailed account on general characteristics of Aschelminthes. (20)

Aschelminthes, also known as the "pseudocoelomates," is a former phylum that includes a diverse group of invertebrates. However, it is important to note that the phylum Aschelminthes is no longer considered valid in modern classification systems. The organisms previously classified under Aschelminthes have been reclassified into various phyla, such as Nematoda (roundworms), Nematomorpha (horsehair worms), and others. Nevertheless, I can provide you with a general account of the characteristics typically associated with organisms that were once classified as Aschelminthes:

1. Body Organization:

   Aschelminthes exhibited a bilaterally symmetric body organization. They had a definite head region and a distinct tail or posterior end. The body was elongated and cylindrical in shape, tapering at both ends. However, it's important to note that the body shape and structure vary among the different groups that were previously classified under Aschelminthes.
2. Body Cavity:

   Aschelminthes organisms possessed a pseudocoelom, which is a fluid-filled body cavity that lies between the endoderm and the mesoderm. The pseudocoelom is not fully lined by mesodermal tissue like a true coelom. It provides space for the internal organs, allowing for some movement and flexibility.
3. Cuticle:

   The body surface of Aschelminthes was covered by a protective cuticle. The cuticle is a non-living, flexible, and often transparent layer secreted by the underlying epidermis. It serves to protect the organism, maintain body shape, and provide resistance against desiccation.
4. Digestive System:

Aschelminthes exhibited a complete digestive system with a mouth and an anus. The mouth was located at the anterior end, while the anus was positioned at the posterior end of the body. The digestive tract was typically straight and ran the length of the organism. The complexity and specialization of the digestive system varied among different groups within Aschelminthes.

5. Reproduction:

   Aschelminthes organisms had diverse reproductive strategies, depending on the specific group. They exhibited sexual reproduction, with separate sexes (dioecious) or hermaphroditism (both male and female reproductive organs in the same individual). Some species reproduced by internal fertilization, while others reproduced externally. The development and life cycles of Aschelminthes organisms also varied widely.

6. Nervous System:

   Aschelminthes had a rudimentary nervous system that typically consisted of a simple nerve ring surrounding the pharynx (feeding structure) and a pair of longitudinal nerve cords running along the body. The nervous system allowed for basic sensory perception and motor coordination.

It's important to reiterate that the phylum Aschelminthes is no longer recognized, and the organisms previously classified under it have been reclassified into various phyla. This reclassification reflects advancements in scientific understanding and the refinement of classification based on new molecular and anatomical data.