

1.0 : Introduction :

Q.1. Explain the characteristics of living organisms.

Ans: Characteristics of living organisms are as follows:

i. Growth:

All living organisms exhibit growth.

In living organisms growth is from inside, whereas in non-living organisms growth occurs due to accumulation of material on the surface.

ii. Reproduction:

Organisms reproduce asexually or sexually and produce their own kind.

iii. Metabolism:

Various biochemical reactions occur inside all living organisms.

The sum total of all the reactions occurring in the body of an organism is called metabolism.

iv. Cellular organization:

Cell is the basic unit of life.

All living organisms show cellular organization.

v. Ability to sense and respond:

All living organisms have ability to respond to the stimulus.

Consciousness, is thus, one of the characteristics of living organisms.

Q.2. Why growth and reproduction cannot be the defining characteristics of living organisms?

Ans: i Growth is also exhibited by non-living objects.

It is by accumulation of material on the surface. Thus, it cannot be taken as the defining property of living organisms.

ii. Living organisms like mules, sterile worker bees, infertile human couples, etc. cannot reproduce.

Thus, reproduction also cannot be the defining character of living organisms.

1.1 : Diversity in living organisms :

Q.3. Explain diversity in living organisms.

Ans: i. There are various types of living organisms existing on the earth, ranging from unicellular microscopic organisms to large multicellular plants and animals.

ii. Some of them are prokaryotic in nature, while some are eukaryotes.

iii. There are about 5 - 30 million species of plants and animals on earth.

iv. They exhibit a great deal of variation in shape, size, structure, mode of nutrition, mode of reproduction, etc.

v. They live or grow in different climatic conditions.

Q.4. Why are living organisms classified?

Ans: Living organisms are classified due to following reasons:

i. Study of fossils

ii. Study of organisms of different areas

iii. For easy identification

iv. Grouping based on the similarities and differences

v. Evolution of various taxon, etc.

1.2 : Systematics : Taxonomy, Taxonomic hierarchy and Binomial nomenclature :

Q.5. Define the terms:

- i. **Systematics**
- ii. **Taxonomy**

Ans: i. Systematics:

It is the scientific study of similarities and differences among different kinds of organisms and it also includes their identification, nomenclature and classification.

ii. Taxonomy:

It is a branch of biology which deals with the nomenclature, collection, identification, description and classification of plants and animals.

Q.6. What are the objectives of systematics?

Ans: The objectives of systematics are as follows:

- i. To know various kinds of plants and animals on the earth with their names, affinities, geographical distribution, habit, characters and economic importance.
- ii. To have an accurate reference system for all organisms which enables the scientists to work on them.
- iii. To show diversities in organisms and their phylogenetic (evolutionary) relationship.
- iv. To give scientific name to every organism.

Q.7. Define the term: classification.

Ans: Classification: It is the arrangement of organisms or groups of organisms into distinct categories in accordance with a particular and well established plan.

Q.8. Who coined the term 'classification'?

Ans: The term 'classification' was coined by A.P. de Candolle.

Q.9. Why is there a need for classification?

Ans:

- i. There are large number of organisms on the earth, with various shape size, structure, habit, habitat, nutrition, etc. It becomes very difficult to study characteristics of all these organisms without arranging them in a proper group. Classification helps to explain unity in diversity.
- ii. Scientific names are given to all organisms in classification. These names are universal.
- iii. Classification reveals the relationship among various groups of organisms.
- iv. Classification places an organism along with those which have common characteristics.

Q.10. Why are classification systems changing every now and then?

Ans:

- i. The organisms are classified on the basis of characteristics.
- ii. Earliest classification was based on the uses of various organisms.
- iii. But nowadays, humans are interested in knowing more about different kinds of organisms and their diversities and relationships.
- iv. Since there is change in them evolving with time thus, classification systems are changing every now and then.

Q.11. Which are the three domains of life?

Ans: Three domains of life are:

- i. Archaea
- ii. Bacteria
- iii. Eukarya

Q.12. Who developed the three domain system?

Ans: Carl Woese developed the three domain system.

Q.13. How was three domain system developed?

Ans:

- i. Three domain system is a system for classifying living organisms.
- ii. From many years, organisms are classified into five kingdom system.
- iii. As scientists studied more about organisms, the classification system also got changed.

- iv. It became possible due to genetic engineering to analyze relationships between organisms.
- v. The three domain system is primarily based on differences in ribosomal RNA structure of different groups of organisms.
- vi. Three domain system classified organisms into three main domains as Archaea, Bacteria and Eukarya.
- vii. In three domain system, domain Archaea include ancient bacteria, domain Bacteria include true bacteria and domain Eukarya include all eukaryotes belonging to kingdom protista, fungi, plantae and animalia.

Q.14. What is the main aim of taxonomic study?

Ans: The main aim of taxonomic study is to assign each organism an appropriate place in a systematic framework of classification.

Q.15. Define taxonomic hierarchy.

Ans: Taxonomic hierarchy:

The manner of scientific grouping of different taxonomic categories in a descending order on the basis of their ranks or positions in classification is called taxonomic hierarchy.

Q.16. Define the terms:

- i. **Taxon**
- ii. **Category**

Ans: i. Taxon:

Taxon is a group of living organisms which is used to represent a concrete unit of classification.

ii. Category:

Category is a rank or level in the hierarchical classification of organisms.

Q.17. Who coined the term taxon?

Ans: H.J. Lam (1948) coined the term taxon.

Q.18. Name the highest and the lowest category in the hierarchy of categories.

Ans: Kingdom is the highest category, whereas species is the lowest category in the hierarchy of categories.

Q.19. Write a short note on concept of species.

Ans: Concept of species:

- i. Morphological concept of species was given by Carolus Linnaeus.
According to him, species is the group of organisms which resemble each other in most of the morphological characters.
- ii. Biological concept of species was given by Darwin.
According to him, species is a group of organisms that can interbreed under natural conditions.
- iii. Modern concept of biological species was given by Ernst Mayr.
According to him, species is a group of actually or potentially interbreeding natural population of closely resembling organisms.

Q.20. Describe the hierarchy of taxonomic categories.

OR

Define the following terms:

- i. **Species**
- ii. **Genus**
- iii. **Family**
- iv. **Order**
- v. **Sub-class**
- vi. **Class**
- vii. **Division / Phylum**
- viii. **Sub kingdom**
- ix. **Kingdom**

Ans: i. Species:

It is the basic unit in the system of classification.

Members of a species show all the similar characters and are able to breed among themselves.

For example, all the plants of potato (*Solanum tuberosum*) are grouped under the species *tuberosum*.

ii. Genus :

It is a group of closely related species, which resemble one another in certain characters.

For e.g. *rosa sinensis*, *esculentus*, etc. are different species under the genus *Hibiscus*.

A genus may be either monotypic (having single species) or polytypic (having many species).

iii. Family:

A family represents a group of closely related genera.

The genera like Hibiscus, Malva, Sida, Gossypium, Abutilon, etc. belong to the family Malvaceae.

iv. Order:

It is a group of closely related families which resemble in major characters.

For e.g. Families Malvaceae, Tiliaceae, Sterculiaceae, etc. belong to the order Malvales.

They show axile placentation in ovary.

v. Sub-class:

It is a group of closely related orders having certain similarities.

For e.g. Order Malvales, Ranales, Parietales, etc. have free petals and hence grouped under the subclass Polypetalae.

vi. Class:

It is a group of related sub-classes.

For e.g. Class Dicotyledonae includes sub-classes as Polypetalae and Gamopetalae.

vii. Division! Phylum:

The division is a category composed of related classes.

For e.g. Division Angiospermae includes two classes: Dicotyledonae and Monocotyledonae.

In animal classification, instead of division, the category Phylum is used.

viii. Sub-kingdom:

It is composed of different divisions having certain similarities.

For e.g. The divisions Angiospermae and Gymnospermae forms the sub-kingdom Phanerogams or Spermatophyta (all seed producing plants).

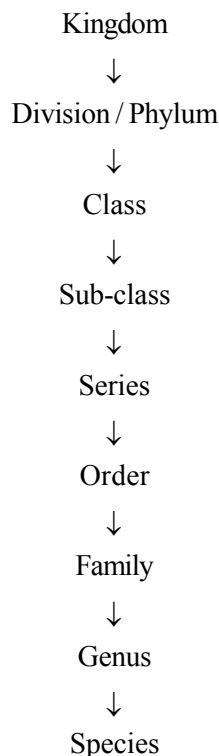
ix. Kingdom:

It is the highest taxonomic category composed of different sub kingdoms.

For e.g. Sub-kingdom Phanerogams and Cryptogams, form the plant kingdom or Plantae which includes all the plants, while all animals are included in kingdom Animalia.

Q.21. Mention the various units of classification in descending manner.

Ans:



Q.22. Define nomenclature.

Ans: Nomenclature: The art of giving name to the organism is called nomenclature.

Q.23. Define a taxon. Give some examples of taxa at different hierarchical levels.

Ans: Taxon is a group of living organisms which is used to represent a concrete unit of classification.

e.g. The genus *Thespesia* is a taxon.

The family *Malvaceae* is a taxon.

The species *Panthera* is a taxon.

Q.24. Write the classification of China rose.

Ans: Kingdom : Plantae
Division: Angiospermae
Class: Dicotyledonae
Sub class: Polypetalae
Series: Thalamiflorae
Order: Malvales
Family: Malvaceae
Genus: Hibiscus
Species: *rosa sinensis*

Q.25. Give the classification of man.

Ans: Kingdom: Animalia
Sub kingdom: Eumetazoa
Phylum: Chordata
Sub phylum: Vertebrata
Class: Mammalia
Sub class: Eutheria
Order: Primates
Family: Hominidae
Genus: Homo
Species: *sapiens*

Q.26. Give the classification of Cobra.

Ans: The classification of Cobra is as follows:

Kingdom: Animalia
Division / Phylum: Chordata
Class: Reptilia
Sub-class: Diapsida
Order: Squamata
Family: Elapidae
Genus: *Naja*
Species: *naja*

Q.27. What are the major purposes of nomenclature?

Ans: The major purposes of nomenclature are:

- i. Communication
- ii. Indicating relationship

Q.28. What is meant by vernacular name?

Ans: Vernacular names are the names which are given to organisms in a particular region and language by local people.

Q.29. Give the advantages of vernacular names.

Ans: Advantages of vernacular names:

- i. In different parts of the world, vernacular names help in identifying all plants and animals by different

common names.

- ii. The local or vernacular names are short and familiar.
- iii. These names are easy to follow.

Q.30. Write the disadvantages of vernacular names.

Ans: Disadvantages of vernacular names:

- i. Vernacular names do not indicate the necessary information about the organism.
- ii. It does not indicate proper relationship of the organisms.
- iii. Vernacular names are not universal. e.g. Ipomoea batatas is recognised by various names like Sweet potato (in English); Shakarkand (in Hindi); Meetha Alu (in Assamese and Bengali); Kandmul (in Telugu); Ratalu (in Marathi) and Jenasu (in Kannada), etc.
- iv. Local names are different and confusing.
- v. Single vernacular names are used for several species.
- vi. Vernacular names may be misleading. e.g. Starfish, Jelly fish and Silver fish are not fishes at all.

Q.31. Why it is said that vernacular names create confusion?

Ans: i. Vernacular names are not universal.

- ii. Same organisms are known by different names in different states.
- iii. For example, Ipomoea batatas is recognised by various names like Sweet potato (in English); Shakarkand (in Hindi); Meetha Alu (in Assamese and Bengali); Kandmul (in Telugu); Ratalu (in Marathi) and Jenasu (in Kannada), etc.
- iv. Also, single vernacular names are used for several species.
- v. The name 'lily' is used to describe many bulbous flowering plants like - waterlily, spider lily, etc. Thus, vernacular names create confusion.

Q.32. Define binomial nomenclature.

Ans: Binomial nomenclature: A system of nomenclature of plants and animals in which the scientific name consists of two words or parts or epithets is called binomial nomenclature.

Q.33. What is binomial nomenclature? Explain it with a suitable example. Give its advantages.

Ans: A system of nomenclature of plants and animals in which the scientific name consists of two words or parts or epithets is called binomial nomenclature.

This system of nomenclature was developed by Carolus Linnaeus.

Linnaeus gave certain principles for this nomenclature in his book "Species Plantarum".

He is regarded as the 'Father of Taxonomy'.

Rules of binomial nomenclature:

- i. The name of the plant or animal is composed of two Latin or Greek words.
- ii. Generic name is a simple noun which should come first and always begin with a capital letter.
- iii. Specific name is the descriptive adjective which should come later and begin with a small letter.
- iv. The names should be based on some special characters of the organism.
- v. Usually the name of the author, who has named and described a plant or animal, is also written in full or abbreviated form after the scientific name. e.g. *Mangifera indica* L, where L stands for Linnaeus.
- vi. The generic and specific name must be underlined separately if hand written or in italics when printed.
- vii. The generic as well as specific name should not have less than three letters and more than thirteen letters.
- viii. In order to avoid confusion, repetition of same generic name in different kingdoms is not allowed. However, the species name can be repeated. e.g. *Mangifera indica* (Mango), *Azadirachta indica* (Neem).

Advantages of binomial nomenclature:

- i. The binomials are simple, meaningful and precise.
- ii. They are standard since they do not change from place to place.
- iii. These names avoid confusion and uncertainty created by local or vernacular names.

- iv. The organisms are known by the same name throughout the world.
- v. The binomials are easy to understand and remember due to the rhyming.
- vi. It indicates phylogeny (evolutionary history) of organisms.
- vii. It helps to understand inter-relationship between organisms.

Q.34. What is the need of binomial system of nomenclature?

- Ans:** i. Before the introduction of binomial nomenclature, an organism was given different local names which created a lot of confusion.
- ii. To avoid this confusion and to make the scientific names simpler and easier to remember, binomial system of nomenclature was introduced.

Q.35. Who proposed binomial system of nomenclature?

Ans: Swedish naturalist Carolus Linnaeus proposed binomial system of nomenclature.

Q.36. Who was Carolus Linnaeus?

Ans: Carolus Linnaeus was a Swedish naturalist who introduced the binomial system of nomenclature in his book 'Species Plantarum' published in 1753.

Q.37. Which are the two languages used in binomial nomenclature?

Ans: Latin or Greek.

Additional information

Q.38. Why, was binomial system of nomenclature useful and easier than polynomial system? Give example.

Ans: In polynomial system of nomenclature, scientific name was made up of many words, which were difficult to remember and understand. e.g. Polynomial name of *Sida acuta* was *Chrysophyllum folios ovalis supreme glabris parallel striatis subtus tomentosa sonitidis*.
Whereas binomial system made the names easier and meaningful.

Q.39. Give Reason "Scientific names are universal".

- Ans:** i. Scientific (Biological) names are definite, descriptive and indicate general relationship. Moreover, these names have been derived from Latin or Greek languages.
- ii. Both these languages are ancient and hence there is little chance of change in meaning of their words or spellings.
- iii. Binomial nomenclature system which gives scientific name to plants and animals, follows certain rules for naming which make them universal.

Q.40. What is citation?

Ans: Mention of author's name after the species name is called citation.

Q.41. What does the letter 'L' indicate in *Mangifera indica* L.?

Ans: The letter 'L' in *Mangifera indica* indicates the name of author, i.e. Linnaeus.

Q.42. What are synonyms?

Ans: When a single species is described by different names by different authors, then these names are called synonyms.

1.3 : Five kingdom system of classification :

Q43. Who introduced the two kingdom system of classification?

Ans: The two kingdom system of classification of organisms was introduced by Carl Linnaeus.

Q.44. Which two kingdoms of organisms did the two kingdom system of classification recognize?

Ans: According to two kingdom system of classification, there were two kingdoms of organisms - Plantae and Animalia.

Q45. What was the drawback of two kingdom system of classification?

Ans: Two kingdom system was found inadequate for classification of some organisms like bacteria, fungi,

Euglena, etc.

Q.46. Who suggested the third kingdom Protista?

Ans: Haeckel suggested the third kingdom Protista.

Q.47. Who suggested five kingdom system of classification?

Ans: R.H. Whittaker suggested five kingdom system of classification.

Q.48. What are the criteria used by Whittaker for the five kingdom classification? Also, mention the five, kingdoms.

Ans: Five kingdom system of classification shows the phylogenetic relationship among the organisms.

The criteria used by Whittaker for his system were:

i. Cell organization:

The organism is either prokaryotic or eukaryotic.

ii. Body organization:

The organism is either unicellular or multicellular.

iii. Mode of nutrition:

The organism is either autotrophic or heterotrophic.

iv. Life style:

The organism may be a producer, consumer or decomposer.

The five kingdoms are:

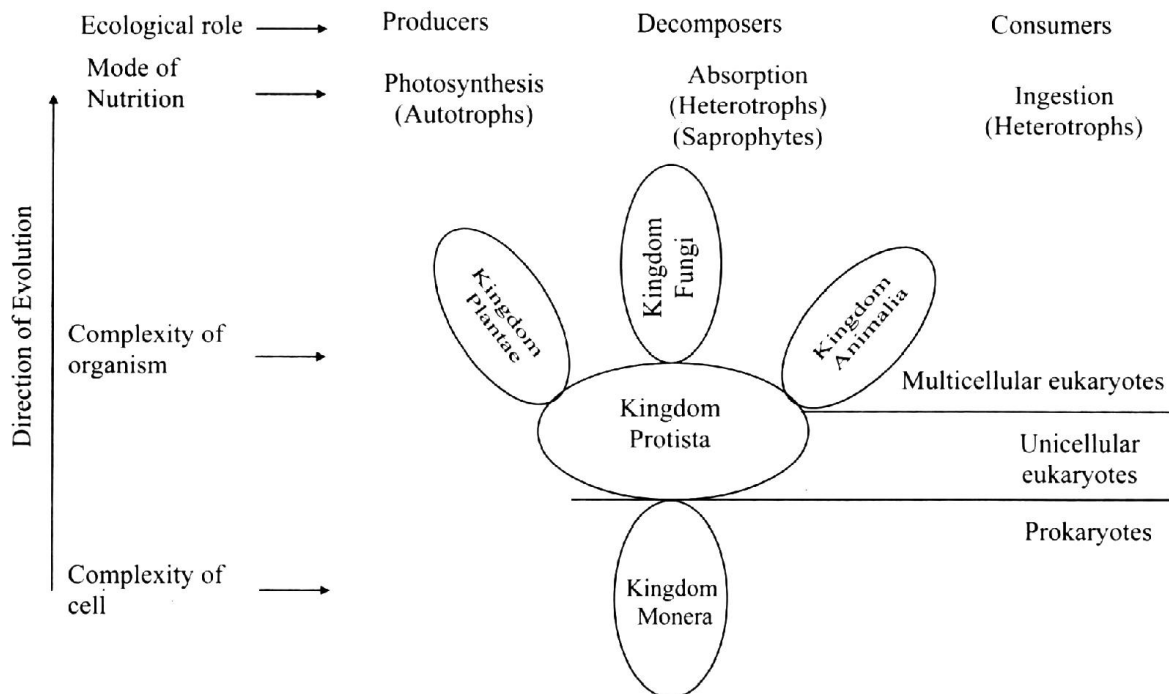
- Kingdom Monera
- Kingdom Protista
- Kingdom Fungi
- Kingdom Plantae
- Kingdom Animalia

Q.49. Which organisms are called prokaryotic?

Ans: Organisms having a primitive type of nucleus (nucleoid) are called prokaryotic.

Q.50. Give the diagrammatic representation of five kingdom system of classification.

Ans:



Diagrammatic representation of the five kingdom system of classification

Q.51. Give the characteristics of Kingdom Monera with examples.

Ans: General characteristics of Kingdom Monera:

- i. **Size:** The organisms included in this kingdom are microscopic, unicellular and prokaryotic.
- ii. **Nucleus:** The organisms possess a primitive (prokaryotic) type of nucleus, i.e. nucleus is without nuclear envelope, nucleolus, nucleoplasm, histone proteins and true chromosomes. Such nucleus is also called as nucleoid.
- iii. **Cell wall:** The cell wall is composed of peptidoglycan.
- iv. **Membrane bound cell organelles:** The cells do not possess membrane-bound cell organelles like chloroplasts, mitochondria, etc.
- v. **Locomotion:** The organisms are either motile or non-motile. The locomotion is due to gliding movements or due to flagella.
- vi. **Nutrition:** The organisms may be autotrophic, heterotrophic, parasitic or saprophytic in nutrition. The autotrophs are either photoautotrophs or chemoautotrophs.
- vii. **Reproduction:** The mode of reproduction in Monera is asexual, either by fission or budding.

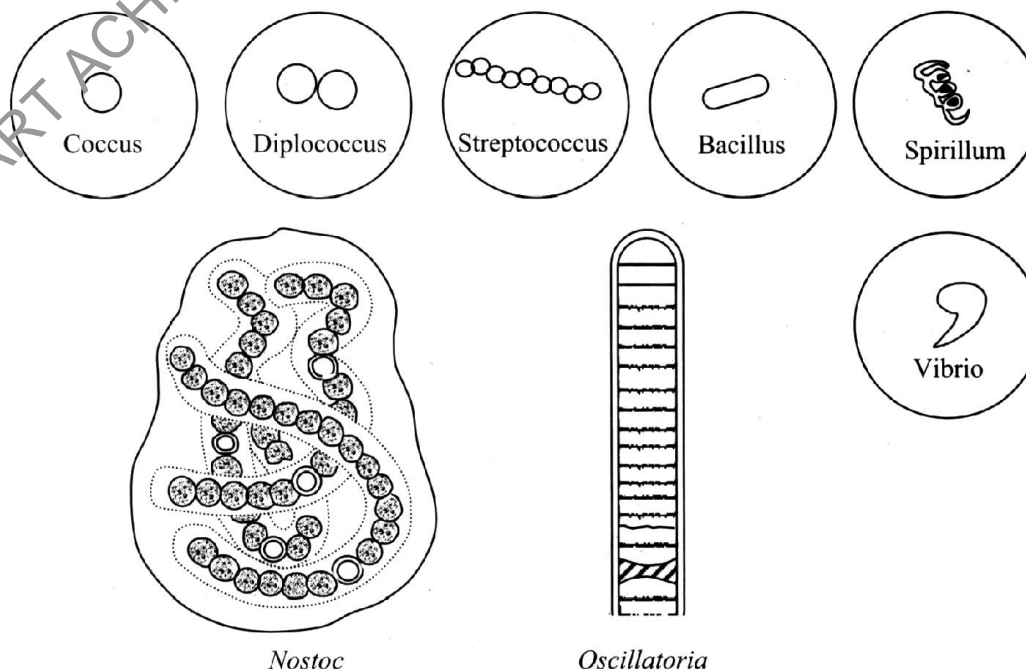
Examples:

Arohaebacteria. e.g. Methanobacillus, Thiobacillus, etc.

Eubacteria. e.g. Rhizobium, Clostridium, etc.

Cyanobacteria. e.g. Nostoc, Anabaena, etc.

Actinomycetes. e.g. Streptomyces, Mycobacterium, etc.



Kingdom Monera (Eubacteria, Cyanobacteria)

Q.52. Unicellular prokaryotic organisms are included in which kingdom?

Ans: Unicellular prokaryotic organisms are included in Kingdom Monera.

Q.53. Which kingdom forms a link between prokaryotes and complex eukaryotes?

Ans: Kingdom Protista forms a link between prokaryotes and complex eukaryotes.

Q.54. In which kingdom are unicellular eukaryotes included?

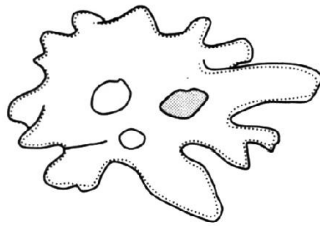
Ans: All unicellular eukaryotes are included in kingdom Protista.

Q.55. Give the general characters of Kingdom Protista with examples.

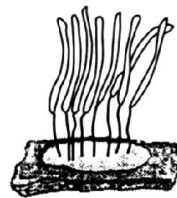
Ans: General characters of Kingdom Protista:

- i. **Type of organisms:** The protists are unicellular and eukaryotic organisms.

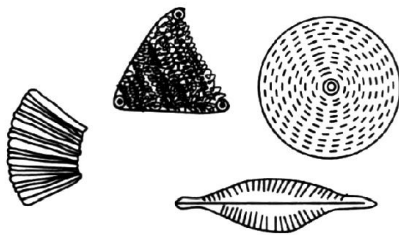
- ii. **Habitat:** They are mostly aquatic, some are terrestrial also.
- iii. **Cell wall:** They are with or without cell wall. Cell wall, when present is composed of cellulose.
- iv. **Membrane bound cell organelles:** They contain membrane bound cell organelles such as mitochondria, chloroplasts, ER, Golgi complex, etc.
- v. **Nucleus:** The nucleus is well organized, i.e. with nuclear envelope, nucleoplasm, nucleolus and linear DNA with histone proteins.
- vi. **Locomotion:** They are either motile or non-motile. The locomotory organs are cilia, flagella and pseudopodia.
- vii. **Nutrition:** They show photosynthetic, holozoic, saprophytic and parasitic mode of nutrition. They store reserve food material in the form of glycogen, starch and fat.
- viii. **Reproduction:** They reproduce by asexual or sexual method. Asexual reproduction occurs by budding, binary fission, etc., while sexual reproduction is without the formation of embryo. Zygote directly develops into young individual.
- ix. **Types:** Protists are of different types:
 - a. **Plant like protists (Photosynthetic protists):** They are autotrophic (photosynthetic), have cellulosic cell wall and store reserve food as starch. e.g. Dinoflagellates, Diatoms.
 - b. **Animal like protists (Consumer protists):** These are heterotrophic, lack cell wall and store reserve food as glycogen. e.g. Amoeba, Paramoecium.
 - c. **Fungi like protists (Consumer decomposer protists):** They are saprophytic and lack cell wall. e.g. Slime moulds.
 - d. **Euglenoids:** Primarily, these are photosynthetic aquatic organisms, however they behave as heterotrophs in the absence of light e.g. Euglena
- x. Kingdom Protista is a link between prokaryotic kingdom Monera and complex eukaryotic kingdoms - Plantae, Fungi and Animalia.



Amoeba



Fruiting bodies of slime mold



Forms of Diatoms



Plasmodial slime molds

Q.56. Write a short note on 'plant like protists'.

- Ans:**
- i. Plant like protists are autotrophic (photosynthetic), have cellulosic cell wall and store reserve food as starch e.g. dinoflagellates, diatoms and desmids.
 - ii. These protists are together grouped as chrysophytes.
 - iii. Cell wall of diatoms composed of two overlapping halves resembling a soap case.
 - iv. The remains of their cell walls is called diatomaceous earth which is used in chromatography, filtration and polishing.
 - v. Plant like Protists are chief producer of aquatic environment.

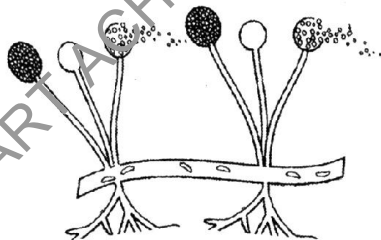
Q.57. What is the nature of cell walls in diatoms?

Ans: The cell wall of diatoms are composed of two overlapping halves made up of silica resembling a soap case.

Q.58. Give the general characters of Kingdom Fungi with examples.

Ans: General characters of Kingdom Fungi:

- i. **Type of organisms:** It is a unique kingdom of heterotrophic organisms, showing extracellular, digestion. The organisms are multicellular and filamentous.
 - ii. **Nucleus:** The cells may be multinucleate or uninucleate.
 - iii. **Body:** Multicellular organisms consist of a body called mycelium in which a number of thread or fibre-like structures called hyphae are present. The hyphae may be with septa (septate) or without septa (aseptate). The non-septate multinucleated hyphae are called coenocytic hyphae.
 - iv. **Cell wall:** The cell wall in fungi is composed of chitin or fungal cellulose or both.
 - v. **Cell organelles:** The fungi contain well organized membrane bound cell organelles except the chloroplasts.
 - vi. **Nutrition:** The fungi exhibit heterotrophic mode of nutrition and most of the members are saprophytes and absorb food which is decomposed (digested) outside. Some are parasites, predators or symbiotic.
 - vii. **Reproduction:** Fungi exhibit vegetative, asexual and sexual mode of reproduction.
- Examples:** Mucor, Rhizopus, Penicillium, Agaricus, etc.



Rhizopus



Penicillium



Agaricus

Q.59. What are coenocytic hyphae?

Ans: In the organisms of kingdom fungi, non-septate, multinucleated hyphae are present which are known as coenocytic hyphae.

Q.60. Explain how fungi exhibit heteromorph mode of nutrition?

- Ans:**
- i. Most of the members of kingdom fungi are saprophytes.
 - ii. They absorb food which is decomposed (digested) outside.
 - iii. Some are parasites or predators and some are symbiotic.
 - iv. In fungi, chloroplast is absent, thus they cannot synthesize their own food by photosynthesis. Due to this, fungi exhibit heteromorph mode of nutrition.

Q.61. Classify the kingdom fungi, giving examples of each class.

Ans: Kingdom Fungi is classified into four classes as follows:

- i. **Phycomycetes:**
Members of this class are commonly called as algal fungi and consist of coenocytic hyphae. They grow well in moist and damp places on decaying organic matter. Reproduction takes place by endogenous spores which are produced inside sporangia. e.g. Mucor, Rhizopus, Albugo (parasitic phycomycetes).
- ii. **Ascomycetes:**
These are commonly called as sac fungi and are multicellular. Thallus is made up of branched septate hyphae. Reproduction takes place by endogenous sexual spores called ascospores in sac-like structure called asci.

Asexual reproduction takes place by spores called conidia which are produced at the tip of hyphae called conidiophores.

e.g. Aspergillus, Penicillium, Neurospora, yeast (unicellular ascomycetes).

iii. Basidiomycetes:

These are commonly called as club fungi.

They have branched septate hyphae.

Vegetative reproduction takes place by fragmentation.

Two vegetative cells or somatic cells fuse to form a dikaryotic mycelium which gives rise to basidia or fruiting body called basidiocarp.

Basidiocarp contains many basidia which produce sexual spores called basidiospores.

e.g. Agaricus, Ustilago, Puccinia, etc.

iv. Deuteromycetes:

It is a group of fungi which are known to reproduce only asexually.

They are commonly called imperfect fungi.

When their sexual reproduction is discovered, they are transferred to the respective groups.

They are mainly decomposers, while few are parasitic.

e.g. Alternaria, Colletotrichum, Trichophyton, etc.

Q.62. Write the general characters of kingdom plantae with examples.

Ans: General characters of Kingdom Plantae:

- i. Types:** They are multicellular eukaryotic organisms and mostly autotrophic organisms.
- ii. Cell wall:** The cell wall is composed of true cellulose and pectic compounds.
- iii. Nutrition:** The members possess photosynthetic pigments and the members of plantae are the main producers as well as provide food directly or indirectly to all living organisms.
Reserve food material is in the form of starch.
- iv. Locomotion:** The plants show sedentary nature.
- v. Vascular tissues:** Vascular tissues are absent in the lower plants (Algae and Bryophytes), but present in higher plants (Pteridophytes, Gymnosperms and Angiosperms).
- vi. Transpiration:** In higher plants, cuticle, stomata, etc., are present to check the rate of transpiration.
- vii. Reproduction:** The plants reproduce by vegetative, asexual and sexual methods. Vegetative reproduction occurs with the help of vegetative parts (stem, roots, etc), asexual reproduction occurs with the help of spores, while sexual reproduction takes place with the help of gametes.

Examples:

Algae	e.g. Spirogyra, Chara, etc.
Bryophytes	e.g. Riccia, Funaria, etc.
Pteridophytes	e.g. Lycopodium, Nephrolepis, etc.
Gymnosperms	e.g. Cycas, Pinus, etc.
Angiosperms	e.g. Sunflower, Jowar, etc.

Q.63. Mention the plants in which vascular tissues are present.

Ans: Vascular tissues are present in Pteridophytes, Gymnosperms and Angiosperms.

Q.64. On what basis are fungi separated from Plantae? .

Ans: Fungi are separated from plantae based on their saprophytic mode of nutrition.

Q.65. Write the general characters of Kingdom Animalia with examples.

Ans: General characters of Kingdom Animalia:

- i. Types:** The organisms are multicellular and eukaryotic.
- ii. Habitat:** The organisms may be aquatic, terrestrial, amphibious or aerial in habitat.
- iii. Cell wall:** The organisms do not possess cell wall, plastids and central vacuole.
- iv. Locomotion:** Majority of the animals are motile. However, few like sponges are sedentary.
- v. Sense organs:** They possess sense organs, nervous system and respond to stimuli by exhibiting certain behaviour.

vi. Reproduction: They mostly reproduce sexually by producing gametes, while some can reproduce asexually.

vii. Nutrition: They are heterotrophic, mostly holozoic sometimes parasitic.
They are consumers of various levels (Primary, Secondary, Tertiary, etc)

Examples:

Acoelomates (Without body cavity)	e.g. Hydra, Jelly fish
Pseudocoelomates (With false body cavity)	e.g. Planaria, Liver fluke, Tapeworm
Coelomates (With true body cavity)	e.g. Earthworm, Crab, Sepia, Shark, Frog, etc.

Q.66. Which mode of nutrition is observed in Kingdom Animalia?

Ans: Holozoic mode of nutrition is observed in Kingdom Animalia.

Q.67. Which kingdom exceeds all other kingdoms in diversity?

Ans: Animalia.

Q.68. State the various advantages of five kingdom system of classification.

- Ans:**
- All groups of organisms get proper place and taxonomic status.
 - Prokaryotes are separated from eukaryotes.
 - The fungi are separated from Plantae on the basis of their saprophytic mode of nutrition.
 - During redistribution, the original sub-divisions of old two-kingdom system are not disturbed.
 - It is a superior system of classification as it is based on complexity of cell structure, mode of nutrition and body organization.
 - Organisms with doubtful placement like Euglena are given proper place in five kingdom classification.

Q.69. State the disadvantages of five kingdom system of classification.

- Ans:**
- Viruses do not find any place in five-kingdom system of classification.
 - Both photosynthetic and non-photosynthetic organisms, as well as those with or without cell wall were included under kingdom protista; Hence, it is difficult to imagine them together.

1.4. Lichens :

Q.70. Who was the first to use the word lichen?

Ans: Theophrastus was the first to use the word lichen.

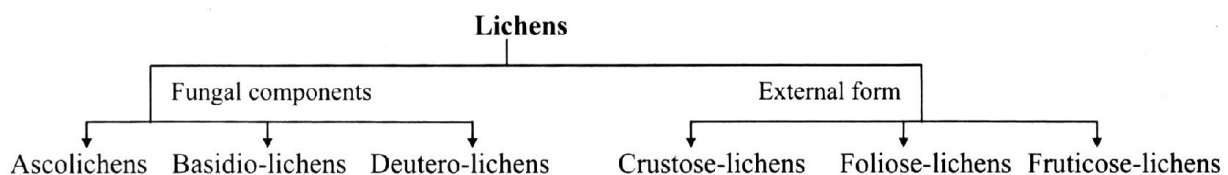
Q.71. What are lichens? Describe its different types.

Ans: Lichen is an association of an alga and fungus. It is the best example of symbiosis or mutualism. The lichens are slow growing, long living organisms in wide variety of places ranging from sea shore to arctic and antarctic regions.

The algal component of lichen is called phycobiont and fungal component is called mycobiont. Algae prepares the food and supplies it to the fungal component, while fungal component gives protection to algae.

Types:

The lichens are classified as follows:



a. Based on fungal components:

i. Ascolichens:

In this category, the fungal partner belongs to Ascomycetes group of fungi.

ii. Basidiolichens:

Here, the fungal partner belongs to Basidiomycetes group of fungi.

iii. Deuterolichens:

In this category, the fungal partner belongs to Deuteromycetes group of fungi.
These are sterile lichens producing no spores.

b. Based on their forms:

i. Crustose lichen:

These lichens show crust-like growth.
Thallus is very small, flat, irregularly lobed and inconspicuous in growth.
These lichens grow on rocks and bark of the trees.
e.g. Graphis, Lecanora, Haematomma, etc.

ii. Foliose lichen:

These lichens grow on trees in the hilly regions.
The thallus is like a dry forked leaf.
Thallus is flat, irregularly lobed with distinct upper and lower side.
It is attached to the substratum by rhizines, which are produced from lower side of the thallus.
e.g. Parmelia, Collema, Peltigera

iii. Fruticose lichen:

These lichens are seen on the branches of trees hanging down.
They are cylindrical, well branched and pendulous, with hair-like outgrowths.
They remain attached to the substratum by basal mucilagenous disc.
e.g. Usnea, Cladonia, Alectoria, etc.

Q.72. Give the economic importance of lichens.

Ans: Economic importance of lichens:

i. Lichen as food and fodder:

Many species of lichens are used as food by animals including man. Lichens contain a substance lichenin which is similar to carbohydrate making them edible. e.g. Lecanora esculenta in Israel and Umbilicaria esculenta in Japan. Parmelia is used in curry powder in India. Lichens like Cladonia, Citraria, Evernia, Parmelia are used as fodder as they form 'a favourite food for reindeers and cattles.

ii. Lichens in medicine:

Lichens contain usnic acid due to which they are used in medicines. Usnea and Cladonia species are used as an antibiotic against Gram positive bacteria.
Species like Lobaria, Citraria are useful in respiratory disease like T.B., Peltigera is useful in hydrophobia, Parmelia is used in treatment of epilepsy, whereas Usnea is used in urinary disease.
Some lichens are also used in medicine due to their anticarcinogenic property.

iii. Industrial use of lichens:

- Lichens are used in various dyes for colouring fabrics.
- Species like Rocella and Lasallia are used in preparation of litmus paper which is acid-base indicator.
- In Sweden and Russia, lichens are used for production of alcohol.
- Orcein is a biological stain obtained from *Orchrolechia androgyna* and *O. tortaria*
- Some lichens are also used in tanning process in leather industry.
- Evernia and Ramalina are the sources of essential oils which are used in preparation of soaps and other cosmetics.

Q.73. Give the ecological importance of lichens.

Ans: Ecological importance of lichens:

- Lichens are the pioneers of vegetation, occurring on rocks.
- Lichens are the first plants to settle on barren rocks.
- Rhizoids of lichen secrete organic acids such as carbonic acids and oxalic acids due to which rocks get broken and soil formation takes place. This process is called pedogenesis.
- Such soils create favourable conditions for bryophytes and other higher plants to grow.

Q.74. What are phycobiont and mycobiont in lichen?

OR

What do the term phycobiont and mycobiont signify?

Ans: The algal component of lichen is called phycobiont, belonging to Chlorophyceae and Cyanophyceae. The fungal component is called mycobiont, and belongs to Ascomycetes and rarely Basidiomycetes or Deuteromycetes.

Q.75. Why lichens do not grow near the cities?

Ans: Lichens are sensitive to air pollution, thus they do not grow near the cities.

Q.76. Which are the types of lichens commonly called as leafy lichens and shrubby lichens?

Ans: Foliose lichens are commonly called as leafy lichens, whereas fruticose lichens are known as shrubby lichens.

Q.77. Which types of association is exhibited by lichens?

Ans: Lichens show symbiotic association between algae and fungi.

1.5 : Viruses and Virodis :

Q.78. Define viruses.

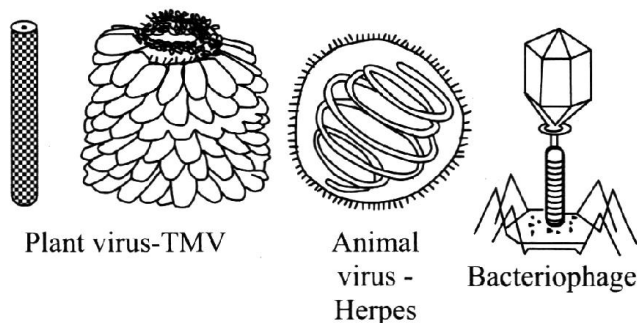
Ans: Viruses are acellular, highly infectious micro-organisms which are considered to be on the threshold of life.

Q.79. Give the general characters of viruses.

- Ans:**
- i. Viruses are acellular, highly infectious, ultramicroscopic micro-organisms.
 - ii. Their size ranges from 10 nm to 2000 nm.
 - iii. Viruses do not perform metabolic activities like eating, respiration, growth.
 - iv. Viruses are obligate parasites. They multiply only within the living host cells.
 - v. Viruses possess the capacity to transmit the disease from diseased to healthy individuals.
 - vi. Viruses possess their own genetic material in the form of either DNA or RNA, but never both.
 - vii. Viruses can be crystallized and can be stored for long period.
 - viii. Viruses do not show activity outside the body of host.
 - ix. Viruses do not possess their own metabolic machinery, they make use of the ribosomes of the host cells for the synthesis of protein during reproduction.
 - x. Most of the viruses are highly resistant to germicides and extremes of physical conditions.
 - xi. Viruses exhibit mutations.
 - xii. Viruses cannot be cultured on artificial nutrient medium.
 - xiii. Viruses are host specific.

Q.80. Describe the types of viruses and give their economic importance.

Ans: Depending upon the host, viruses are classified into three types as:



- i. Plant virus
- ii. Animal virus
- iii. Bacterial virus (Bacteriophage)
- i. **Plant virus:** Generally, they are rod shaped or cylindrical with helical symmetry having single' stranded

RNA (ss-RNA) or double stranded RNA (ds-RNA) as genetic material. It causes disease to various plants. e.g. Tobacco Mosaic Virus (TMV).

- ii. **Animal virus:** Generally, they are polyhedral in shape with radial symmetry having either DNA or RNA as genetic material. It causes disease to majority of animals including human beings. e.g. Influenza virus.
- iii. **Bacteriophage:** They are tadpole shaped. They infect bacteria and are called as bacteriophage. Bacteriophages were discovered by Twort. DNA is the genetic material. Its body consists of head, neck, collar and tail.

Economic importance of viruses:

Viruses cause various types of diseases to plants and animals including man.

The diseases caused by viruses to plants and animals are as follows:

No.	Plant viral diseases	Animal viral diseases
i.	Little leaf of Brinjal	Common cold
ii.	Yellow vein mosaic of lady's finger	Influenza
iii.	Potato leaf roll	Small pox
iv.	Leaf curl of papaya	Mumps
v.	Bunchy top of banana	Measles
vi.	Grassy shoot of sugarcane	Poliomyelitis
vii.	Tobacco mosaic disease.	Swine flu
viii.	-	Yellow fever
ix.	-	AIDS

The disease caused to human beings are as follows:

- | | | | |
|----------------|------------------|--------------|------------|
| i. influenza | ii. dengue | iii. herpes | iv. rabies |
| v. chicken pox | vi. yellow fever | vii. measles | viii. AIDS |
| ix. mumps | x. small pox | | |

Q.81. What are the common symptoms shown by plants due to viral infection?

Ans: Common symptoms shown by plants due to viral infection are as follows:

- | | |
|-----------------------|---|
| i. Local lesions | ii. Clearing of veins |
| iii. Mosaic formation | iv. Chlorosis |
| v. Necrosis | vi. Sturiting and premature defoliation |
| vii. Ring spotting | |

Q.82. List out the viruses and diseases caused by viruses to animals.

Ans:

No.	Disease	Virus
i.	Common cold	Rhino virus
ii.	Influenza	Orthomyxo virus
iii.	Small pox	Variola virus
iv.	Mumps	Paramyxo virus (<i>Myxovirus parotiditis</i>)
v.	Measles	Morbilli virus
vi.	Poliomyelitis	Polio viruses
vii.	Yellow fever	Flavi virus
viii.	Swine flu	H1 N1 virus
ix.	AIDS	Retro virus / HIV

Q.83. Are viruses living or non living? Discuss.

OR

Viruses show both living and non - living characteristics. Explain.

Ans: Viruses show both living and non - living characteristics as follows:

i. Living characteristics of viruses:

- Viruses are obligate parasites like other living obligate parasites.
- Viruses also possess nucleic acids and proteins like any other living organisms.
- Viruses reproduce their own kind like other living organisms.
- Viruses transmit their hereditary characters from one generation to the other as other living organisms do.

ii. Non-living characteristics of viruses:

- Viruses can be crystallized like any other chemical substance.
- Viruses do not carry out metabolic activities.
- Viruses become inactive outside the host cells.

Q.84. Who demonstrated tobacco mosaic disease to be infectious?

Ans: Adolf Mayer demonstrated the tobacco mosaic disease to be infectious.

Q.85. What was the observation made by Mayer about TMV ?

Ans: Mayer-observed that when the juice from tobacco plants infected with the Tobacco Mosaic Virus (TMV) was injected into healthy plants, the plants showed symptoms of mosaic disease.

Q.86. Who gave the term virus?

Ans: Louis Pasteur gave the term virus.

Q.87. What was the Ivanowski's contribution for study of TMV?

Ans: Ivanowski prepared an extract of infected tobacco plant and showed that this extract could infect healthy plants even after it was passed through filter that retains bacteria. Thus, Ivanowski confirmed the observation of Mayer about TMV.

Q.88. Who referred virus as 'contagium vivum fluidum' ?

Ans: M. W. Beijerinck referred virus as 'contagium vivum fluidum.'

Q.89. Who discovered viroids?

Ans: Theodor Diener discovered viroids.

Q.90. Write a note on viroids.

Ans: Viroids:

- Viroids are mainly plant pathogens. They were first discovered and named by Theodor Diener.
- Viroids are very small, single stranded circular RNA which are without any protein coat.
- Viroids do not show dormant phase.
- The first viroid discovered was PSTV (Potato spindle tuber viroid) which causes a disease in potato.
- Viroids are capable of dispersing into the environment and producing diseases.
- Viroids are known to cause atleast eleven plant diseases. These diseases include citrus exocortis, Chrysanthemum stunt; cucumber bale fruit, etc.

Q.91. Write the difference between virus and viroid.

OR

How are viroids different from viruses?

Ans: i. Viroids are $\frac{1}{10}$ th of size of the smallest virus.

- ii. Virus has protein coat around the genetic material, whereas viroids consist of single stranded RNA without protein coat.

Additional information

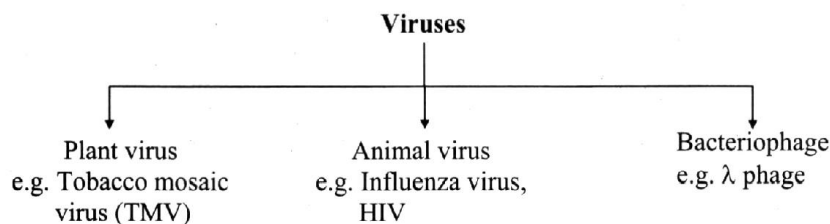
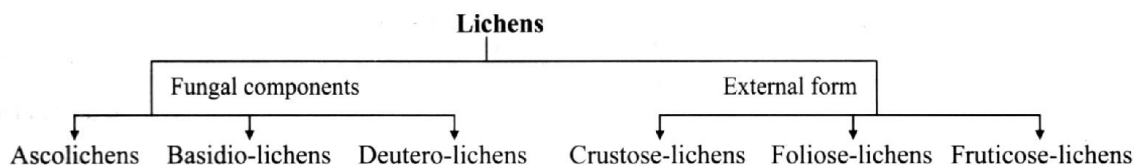
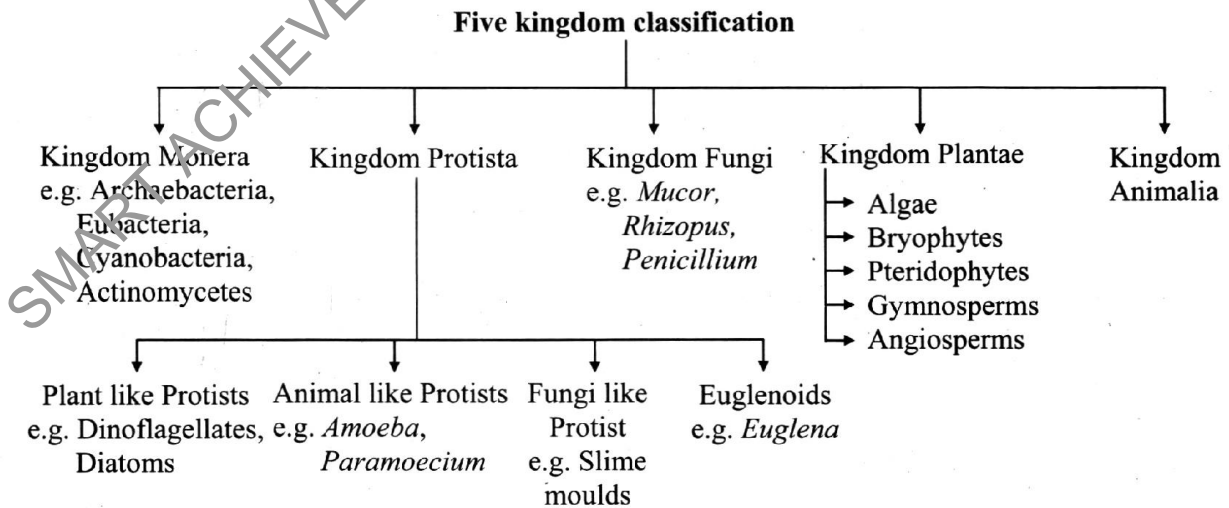
Q.92. What are virions?

Ans: Virions are virus particles that are inert carriers of the genome and are assembled inside cells. They do not grow and divide. Virions are more complex structures with two or more layers of protein, with nucleoprotein innermost.

Additional Theory Questions

- Q.1. Describe the different taxonomic categories used in the classification of organisms. Refer Q.20.
- Q.2. Illustrate the taxonomical hierarchy with suitable examples of a plant and an animal. Refer Q.24 and 25.
- Q.3. Why was the binomial system of nomenclature introduced? Refer Q.34.
- Q.4. Give the salient features of Kingdom Protista with examples. Refer Q.55.
- Q.5. Write a short note on classification of lichens on the basis of fungal components. Refer Q.71.(a)
- Q.6. Describe the types of lichens on the basis of their thallus organization. Refer Q.71. (b)
- Q.7. Give any two industrial uses of lichens. Refer Q.72. (iii)
- Q.8. Give a brief account of viruses with respect to their structure and nature of genetic material. Also name four common viral diseases. Refer Q.73, 79 and 80.

Quick Review :



• **Scientists and their contribution**

No.	Scientist	Contribution	Year
i.	Carolus Linnaeus	Proposed 2-kingdom system of classification. First to establish hierarchy of taxonomic categories. Coined the term 'systematics'. Introduced the concept of Binomial Nomenclature, gave morphological concept of species.	1770-1773
ii.	Theophrastus	Father of Botany, classified all plants on the basis of form and texture into trees, shrubs, undershrubs and herbs in his book "Historia Plantarum" First to use the word "Lichen."	370-285 B.C.
iii.	H.J. Lam	Coined the term 'taxon'.	1948
iv.	Charles Darwin	Explained origin of species through natural selection, gave biological concept of species.	1809-1882
v.	Sir Julian Huxley	Introduced the term "New systematics" or biosystematics (system of classification based on evolutionary as well as genetic relationship amongst organisms besides morphology)	-
vi.	Ernst Mayr	Gave modern concept of species	1964
vii.	R.H. Whittaker	Proposed 5-kingdom system of classification.	1969
viii.	Louis Pasteur	Gave the term "virus". Created the first vaccine for rabies and anthrax.	1822-1895
ix.	M.W. Beijerinck	Referred virus as 'Contagium vivum fluidum'. (contagious living fluid)	1898
x.	D. J. Ivanowski	First to discover the filterable nature of virus which remains infectious even after filtering through finest filter.	-
xi.	W.M. Stanley	First to crystallize the virus. TMV was the first virus to be crystallized.	1935
xii.	Adolf Mayer	First to describe the tobacco mosaic disease that could be transferred between plants.	1886
xiii.	A.P. de Candolle	Coined the term "Classification."	-
xiv.	Theodor Diener	Discovered viroids	-
xv.	F.W. Twort	Discoverer of Bacteriophages.	1915

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Multiple Choice Question's

- _____ is the defining property of living organisms.
 - reproduction
 - consciousness
 - self replication
 - growth
- Evolutionary history of a particular group of organisms is called
 - Ontogeny
 - Phylogeny.
 - Taxonomy
 - Palynology
- The term 'classification' was coined by
 - Theophrastus
 - A.P. de Candolle
 - Aristotle
 - Linnaeus
- The main purpose of classification of organisms is to
 - study geography
 - locate animals
 - establish relationships
 - study keys to plant's evolution
- Kingdom Protista, Fungi, Plantae and Animalia are included under domain
 - Eukarya
 - Archaea
 - Bacteria
 - Cyanobacteria
- A taxonomic group of any rank is called
 - grade
 - category
 - variety
 - taxon
- Biological concept of species was given by
 - Stanley
 - Hershey and chase
 - Darwin
 - Adolf Mayer
- Modern concepts of species was given by
 - Charles Darwin
 - Carolus Linnaeus
 - Ernst Mayer
 - H.L.Lam
- One of the following has correct descending sequence hierarchy
 - class, division, order, family
 - division, class, order, family
 - order, family, class, division
 - family, order, class, division
- In *Solanum tuberosum*, *Solanum* represents
 - Family
 - Genus
 - Order
 - Species
- Which among the following is an order?
 - Malvales
 - Polypetalae
 - Angiospermae
 - Hibiscus
- The basic unit of classification is
 - genus
 - species
 - kingdom
 - family
- A taxonomic group of closely related genera is known as
 - species
 - order
 - family
 - class
- Group of individuals which resemble closely in structure as well as functions is called
 - genus
 - species
 - family
 - order
- Highest category of taxonomy is
 - species
 - class
 - order
 - kingdom
- Binomial nomenclature was published in
 - Systema Naturae
 - Genera Plantarum
 - Species Plantarum
 - Historia Plantarum
- The first botanist who started giving scientific names to organisms is
 - Linnaeus
 - R.H. Whittaker
 - Hutchinson
 - Bentham and Hooker
- The scientific names are given in
 - Latin
 - Sanskrit
 - English
 - Hindi
- In Binomial nomenclature, every organism has
 - two names, one Latin, other common
 - two names, one scientific, other common
 - two names by two scientists
 - one scientific name with two words, a generic and specific
- International Code of Binomial nomenclature applies to
 - viruses
 - plants
 - animals
 - both b) and c)
- Identify the correct scientific name of Mango.
 - Mangifera Indica*
 - Mangifera indica*
 - mangifera indica*
 - Mangifera indica*
- Which one of the following do not find place in five-kingdom system of classification?
 - bacteria
 - lichen
 - cyanobacteria
 - viruses
- Three kingdom system was proposed by
 - Haeckel
 - Whittaker
 - Aristotle
 - Mayer
- Primitive type of nucleus possessed by Kingdom Monera is known as
 - nucleoid
 - viriod
 - pro chromosome
 - both a) and b)
- Which organism belongs to Kingdom Monera?
 - Cyanobacteria
 - Mushroom
 - Euglena
 - Moss
- In five kingdom classification, unicellular prokaryotes are included in kingdom
 - Protista
 - Fungi
 - Monera
 - Animalia
- _____ is an example of plant like protists.
 - Dinoflagellates
 - Ustilago
 - Mucor
 - Nostoc
- Diatoms belong to the kingdom
 - Monera
 - Protista
 - Plantae
 - Fungi

29. In five kingdom system of classification, the kingdom which includes diatoms, slime moulds and protozoa is
 a) Monera b) Protista
 c) Fungi d) Plantae
30. According to the five kingdom classification, all unicellular organisms are included under
 a) Kingdom Protista b) Kingdom Monera
 c) Kingdom Fungi d) Kingdom Plantae
31. Which of the following is consumer decomposer protist?
 a) Paramecium b) Diatoms
 c) Slime moulds d) Euglena
32. The mode of nutrition in fungi is
 a) autotrophic b) parasitic
 c) saprophytic d) both b) and c)
33. The body of a fungus is known as
 a) hypha b) mycelium
 c) rhizoid d) fruiting body
34. The fungi differ from plants in their mode of nutrition. They are
 a) autotrophic b) diazotrophic
 c) absorptive d) ingestive
35. Agaricus belongs to class
 a) Deuteromycetes b) Phycomycetes
 c) Basidiomycetes d) Ascomycetes
36. Fruiting body in basidiomycetes is
 a) Basidia b) Ascocarp
 c) Basidiocarp d) Conidia
37. The cell wall of a plant cell is composed of
 a) true cellulose b) lipoproteins
 c) chitin d) lipids only
38. All holozoic organisms are included in Kingdom
 a) Plantae b) Fungi
 c) Protista d) Animalia
39. Whittaker failed to give any place to which of the following in his classification?
 a) Cyanobacteria b) Slime moulds
 c) Virus d) Bacteria
40. Which pair is mismatched?
 a) Prokaryote-viruses b) Protista-Paramecium
 c) Plantae- mosses d) Animalia-arthropods
41. Lichen is an association of
 a) algae and fungi b) bacteria and fungi
 c) algae and moss d) monocot and fungi
42. Lichen which shows crust-like growth is called
 a) foliose lichen b) crustose lichen
 c) fruticose lichen d) none of these
43. In perfumery, the lichen species used are of
 a) Cladonia b) Evernia
 c) Usnea d) Parmelia
44. The fungal component of a lichen is called
 a) phycobiont b) photobiont
 c) mycobiont d) symbiont
45. Out of the following, which is used to prepare litmus paper?
 a) Graphis b) Rocella
 c) Usnea d) Parmelia
46. Acid obtained from lichen is
 a) Acetic acid b) Usnic acid
 c) Sulphuric acid d) Hydrochloric acid
47. Plant virus have genetic material
 a) DNA
 b) RNA
 c) both RNA and DNA
 d) either DNA or RNA
48. Who was the first to obtain Viruses in crystalline form?
 a) Beijerinck b) Stanley
 c) Mayer d) Ivanowski
49. Common symptoms due to viral infection include
 a) necrosis b) local lesions
 c) clearing of veins d) all of these
50. Viroids are those
 a) having genetic material DNA
 b) having genetic material RNA, surrounded by protein coat
 c) having genetic material DNA, surrounded by protein coat
 d) having genetic material RNA, not surrounded by protein coat
51. The first viroid discovered was
 a) Polio virus
 b) Myxo virus
 c) Potato spindle tuber viroid
 d) Animal viroid

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Answer Keys

1. b)	2. b)	3. b)	4. c)	5. a)	6. d)	7. c)	8. c)	9. b)	10. b)
11. a)	12. b)	13. c)	14. b)	15. d)	16. c)	17. a)	18. a)	19. d)	20. d)
21. b)	22. d)	23. a)	24. a)	25. a)	26. c)	27. a)	28. b)	29. b)	30. a)
31. c)	32. d)	33. b)	34. c)	35. c)	36. c)	37. a)	38. d)	39. c)	40. a)
41. a)	42. b)	43. b)	44. c)	45. b)	46. b)	47. b)	48. b)	49. d)	50. d)
51. c)									

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