Biology

(Chapter – 1) (The Living World)
(Class – XI)
Exercises

Question 1:
Why are living organisms classified?

🍃 Answer 1:
A large variety of plants, animals, and microbes are found on earth. All these living organisms differ in size, shape, colour, habitat, and many other characteristics. As there are millions of living organisms on earth, studying each of them is impossible. Therefore, scientists have devised mechanisms to classify all living organisms. These methods of classification are based on rules and principles that allow identification, nomenclature, and finally classification of an organism.

For example, based on certain principles, once an organism is identified as an insect, it will be given a scientific name and then grouped with other similar organisms. Thus, various groups or taxon include organisms based on their similarity and differences.

Therefore, the biological classification helps in revealing the relationship between various organisms. It also helps in making study of organisms easy and organized.

Question 2:
Why are the classification systems changing every now and then?

🍃 Answer 2:
Millions of plants, animals, and microorganisms are found on earth. Many of these have been identified by the scientists while many new species are still being discovered around the world. Therefore, to classify these newly discovered species, new systems of classification have to be devised every now and then. This creates the requirement to change the existing systems of classification.

Question 3:
What different criteria would you choose to classify people that you meet often?

🍃 Answer 3:
To classify a class of forty students, let us start the classification on the basis of sexes of the students. This classification will result in the formation of two major groups- boys and girls.

Each of these two groups can be further classified on the basis of the names of the students falling in these groups.

Since it is possible that more than one student can have a particular name, these names can be further divided based on the surnames.

Since there is still some chance that more than one student can have the same surname, the final level of classification will be based on the roll numbers of each student.

Question 4:
What do we learn from identification of individuals and populations?

Answer 4:
The knowledge of characteristics of an individual or its entire population helps in the identification of similarities and dissimilarities among the individuals of same kind or between different types of organisms. It helps the scientists to classify organisms in various categories.

Question 5:
Given below is the scientific name of Mango. Identify the correctly written name.
Mangifera Indica
Mangifera indica

Answer 5:
In binomial system of nomenclature, the generic name of a species always starts with a capital letter whereas the specific name starts with a small letter. Therefore, the correct scientific name of Mango is *Mangifera indica.*

Question 6:
Define a taxon. Give some examples of taxa at different hierarchical levels.

Answer 6:
Each unit or category of classification is termed as a taxon. It represents a rank. For example, the basic level of classification is species, followed by genus, family, order, class, phylum or division, in ascending order. The highest level of classification is known as kingdom.

Question 7:
Can you identify the correct sequence of taxonomical categories?
(a) Species → Order → Phylum → Kingdom
(b) Genus → Species → Order → Kingdom
(c) Species → Genus → Order → Phylum

Answer 7:
The correct hierarchical arrangement of taxonomic categories in ascending order is
Species → Genus → Family → Order → Class → Phylum → Kingdom

Therefore, both (a) and (c) represent correct sequences of taxonomic categories. In sequence (b), species should be followed by genus. Therefore, it does not represent the correct sequence.

Question 8:

Try to collect all the currently accepted meanings for the word 'species'. Discuss with your teacher the meaning of species in case of higher plants and animals on one hand and bacteria on the other hand.

Answer 8:

In biological terms, species is the basic taxonomical rank. It can be defined as a group of similar organisms that are capable of interbreeding under natural conditions to produce fertile offspring.

Therefore, a group of similar individuals that are respectively isolated form a species. Species can also be defined as group of individuals that share the same gene pool.

Question 9:

Define and understand the following terms:

(i) Phylum   **(ii)** Class   **(iii)** Family   **(iv)** Order   **(v)** Genus

Answer 9:

(i) Phylum

Phylum is the primary division of kingdom. It includes one or more related classes of animals. In plants, instead of phylum, the term 'division' is used.

(ii) Class

Class is a taxonomic group consisting of one or more related orders. For example, the class, Mammalia, includes many orders.

(iii) Family

Family is a taxonomic group containing one or more related genera. In plants, families are categorized on the basis of vegetative and reproductive features.

(iv) Order

Order is a taxonomic group containing one or more families. For example, the order, carnivore, includes many families.

(v) Genus

Genus is a taxonomic group including closely related species. For example, the genus, *Solanum*, includes many species such as *nigrum*, *melongena*, *tuberosum*, etc.

Question 10:

How is a key helpful in the identification and classification of an organism?

Answer 10:

Key is another taxonomical aid used for identification of plants and animals based on the similarities and dissimilarities. The keys are based on the contrasting characters generally in a pair called couplet. It represents the choice made between two opposite options. This results in acceptance of only one and rejection of the other. Each statement in the key is called a lead. Separate taxonomic keys are required for each taxonomic category such as family, genus and species for identification purposes. Keys are generally analytical in nature.

Flora, manuals, monographs and catalogues are some other means of recording descriptions. They also help in correct identification. Flora contains the actual account of habitat and distribution of plants of a given area. These provide the index to the plant species found in a particular area. Manuals are useful in providing information for identification of names of species found in an area. Monographs contain information on any one taxon.

Question 11:

Illustrate the taxonomical hierarchy with suitable examples of a plant and an animal.

Answer 11:

The arrangement of various taxa in a hierarchical order is called taxonomic hierarchy.
In this hierarchy, species is present at the lowest level whereas kingdom is present at the highest level.
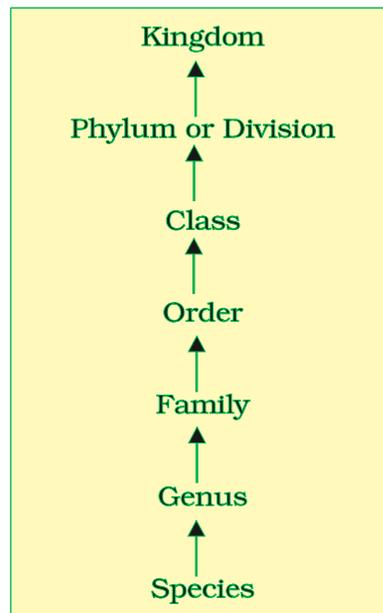
Classification of a plant

As an example, let us classify *Solanum melongena* (Brinjal).

Kingdom   – Plantae
Division   – Angiospermae
Class   – Dicotyledonae
Order   – Solanales
Family   – Solanaceae
Genus   – *Solanum*
Species   – *melongena*

Classification of an animal

As an example, let us classify *Columba livia* (Blue rock Dove).

Kingdom   – Animalia
Phylum   – Chordata
Class   – Aves
Order   – Columbiformes
Family   – Columbidae
Genus   – *Columba*
Species   – *livia*

Long Answer Type Question

Q. 1. Define taxonomy. Briefly explain the processes in Taxonomy.

Ans. The process of classification of all living organisms on the basis of their characteristics is called taxonomy.

The processes carried out in taxonomy are as follows:

(i) The organism has to be described for its all morphological, anatomical, physiological and behavioural properties. It is called as characterisation.

(ii) On the basis of its characters, it is decided whether it is similar or different to any known group of taxa. It is called identification.

(iii) Based on similar characteristics, it is then placed in a known taxa. It is called classification.

(iv) When the organism is placed in the right taxa, the last step is to determine its name. This is called as nomenclature.

Q. 2. Why biological classification is useful?

Ans. Biological classification is very useful as it serves the following purposes:

(i) It makes the identification of organisms very clear and easy.

(ii) The study of these organisms is convenient.

(iii) The study of few representatives from each group enables us to have a broad idea of the life of the whole group.

(iv) It helps to interpret the poor visible structure of the fossil organisms.

(v) It helps to understand the evolutionary trends in various groups of organisms.

Q. 3. What are the guidelines for naming of organisms?

Ans. The guidelines for naming of organisms are:

(i) Each organism is provided a scientific name, consisting of two words, generic and specific.

(ii) The generic name is followed by the specific name. e.g., *Homo sapiens.*

(iii) The generic name begins with capital letter while specific name begins with small letter.

(iv) These names were taken from Latin and Greek languages.

(v) The names were printed in italics to indicate their Latin origin.

(vi) No two generic names in any kingdom can be the same, but the specific names can be repeated as they qualify generic name. e.g, *Mangifera indica* (Mango) and *Tamarindus indica* (Tamarind), here indica means 'of India'.

Q.4. Why were most of the earlier botanists and zoologists chiefly taxonomists?

Ans. (i) The earlier botanists and zoologists who wanted to study plants and animals faced great difficulty in their systematic study, because it is not possible for a person to know and remember about every plant or an animal individually. Moreover, different species of plants and animals were known by different names in different parts of the world.

(ii) These two things created great difficulties. In order to overcome these difficulties all the earlier biologists tried to classify them into various groups, though in the beginning the attempts to classify them were not on scientific lines. But all were same on the fact that classification and proper study of organisms were not possible. To overcome this all the earlier biologists tried to classify living things.

Q. 5. Who proposed Binomial system of nomenclature? Give scientific name of mango.

OR

What is the binomial system of nomenclature? Who proposed this system? Give the scientific name of Mango.

Ans. Binomial system of Nomenclature:

(i) Naming of plants and animals with two words one generic and the other specific name is called binomial system of nomenclature.

(ii) Carolus Linnaeus introduced this scientific system to name a species.

(iii) He gave two names to a species: One is generic name while the other is specific name.

(iv) This system of naming species by Linnaeus is called binomial system of nomenclature.

(v) Example *Homo sapiens* is the scientific name of modern man. The generic name is *Homo* while the specific name is *sapiens* and name of the discoverer is Linnaeus. (Linn) or the name of the author to describer. Mostly generic names are Latin.

(vi) Linnaeus explained this system in his work Systema Naturae (published in the year 1758).

(vii) Carolus Linnaeus is called Father of Taxonomy or classification.

Scientific name of Mango: *Mangifera* indica. Generic name is *Mangifera*, the specific name is indica.

Q. 6. What are the major divisions of classifications? Classify man. [KVS 2008]

Ans. Major Division of Classification:

(i) Kingdom: It is the highest category in the classification. There are two kingdoms: plantae and Animalia.

(ii) Phylum: A group of closely related classes having certain common characters.

(iii) Class: A group of closely related orders having certain common characters.

(iv) Order: A group of closely related families having certain common characters.

(v) Family: A group of closely related genera having certain common characters.

(vi) Genus: A group of closely related species having certain common characters.

(vii) Species: Individuals having certain common character plus some characters of their own.

Classification of Man:
Kingdom: Animalia
Phylum: Chordate
Class: Mammalia
Order: Primates
Family: Hominidae
Genus: *Homo*
Species: *sapiens*

Q. 7. What are museums? Name some animals and plants which are preserved in museum.

Ans. Museums: Museums are "collection of dead preserved plants and animals for study and reference".

(i) It helps in gathering the first hand information about the habitat, soil and organisms of the area.

(ii) The museum preserves plants like algae, fungi, mosses, and ferns, parts of gymnosperms as they cannot be kept in the herbaria.

(iii) Animals specimens are fixed in chemical solution. They are preserved for longer duration. The specimens are identified and labelled. They are stored and a catalogue is prepared for future reference. Its objective is to record information and preserve specimens for taxonomic studies.

(iv) Animals like snakes, fishes, mollusca, insects and others are preserved in museums.

Q. 8. What are zoological parks? Write its significance also.

Ans. Zoological Parks: "It is a place where wild animals are kept in the natural environment" under human control.

(i) It is also called Zoo or Zoological Garden.

(ii) According to WZCS, they acts as conservation centers. They help us to know about the wild animals, their food habits, behavior etc.

(iii) People especially the children enjoy the visit by children enjoy the visit by seeing a variety of animals.

(iv) A scientific purpose of the zoo is to breed the animals (which otherwise are facing threat to their natural habitat).

(v) The information regarding common and scientific names is displayed in the zoological gardens.

(vi) Some zoological parks are Delhi Zoological Park located near Old Fort in Delhi and Alipore Zoological Gardens, Kolkata.

Q.9. What do you understand by herbarium? How it is prepared?

Ans. Herbarium is "a collection of plant specimens which have been dried and pressed and arranged in the sequence of an accepted classifications". It forms a store house for future use. The preparation of Herbarium involves following steps:

(i) Collection of Specimens: It is a field work. For collection one has to get information about the area, habitat, season and the time of collection.
There is a requirement of digger for digging roots, scissors for cutting twigs, knife for woody twigs and a pole with a hook for collection.

(ii) Drying and Pressing: After collection, the plants are dried up by keeping them between the folds of old newspapers. The plants, after drying, are pressed up by a set of two broad straps.

(iii) Mounting: The dried specimens are pasted on the herbarium sheets of standard size (29 x 41 cm). The specimens are fixed on the sheets by applying glue or adhesive.
The specimens are sprayed with fungicides like 0.1% solution of mercuric chloride and pesticides like DDT, naphthalene to check fungal growth and infestations.

(iv) Labelling: Labelling should be done with mounting. It should bear the botanical name, family, locality, data of collection with the habit of the plant specimen and the collector's name.

(v) Storage: The sheets are arranged according to classification. They are stored in disinfected metallic cupboards. The information about the collected specimens is compiled and published in the form of a book.

Short Answer Questions – I

Q. 1. Mention the mode of reproduction found in the following organisms:
(i) Bacteria (ii) *Planaria* (iii) *Hydra* (iv) Fungi.

Ans.   (i) Bacteria: Fission (Cell division)
(ii) Planaria: Regeneration
(iii) Hydra: Budding
(iv) Fungi: Spore formation

Q. 2. Reproduction cannot be all-inclusive defining characteristic of living organisms. Comment.

Ans. Some organisms like mules, sterile worker bees, infertile human couples, etc., exhibit Characteristics of living things but they do not reproduce. Therefore reproduction cannot be an all-inclusive defining characteristic of living organisms.

Q. 3. What are the rules of binomial nomenclature? [KVS Silchar 2017]

Ans. Rules of nomenclature are as follows:

(i) Biological names are generally in Latin or derived from Latin irrespective of their origin.

(ii) The first world in a biological name represent the genus while the second component denotes the specific epithet.

(iii) The words when hand written are separately underlined, or printed in italics.

(iv) The first word denoting the genus starts with a capital letter while the specific epithet starts with a small letter.

Q. 4. What processes are basic to taxonomy?

Ans. Characterisation, identification and nomenclature are the processes which are basic to taxonomy.

Q. 5. Why was nomenclature necessary?

Ans. Plants and animals in the world are known by their local names. These local names would vary from place to place. Therefore, there was a need to standardise the naming of living organisms which is recognised all over the world. Therefore the process called nomenclature was necessary.

Q. 6. Given the scientific names of the following: Rose, Mango, Potato, Frog, Cat, Earthworm.

Ans. (i) Rose: *Rosa indica*
(ii) Mango: *Mangifera indica*
(iii) Potato: *Solanum tuberosum*
(iv) Frog: *Rana tigrina*
(v) Cat: *felis domesticus*
(vi) Earthworm – *Pheretima posthuma*

Q. 7. Define classification. Can it be separated from nomenclature?

Ans. Classification is a method by which organisms on the basis of some easily observable characteristics.

Q. 8. What do you mean by taxonomic hierarchy? Give classification of mango upto species.   [KVS – 2013]

Ans. The taxonomic hierarchy is a systematic framework in classification in which taxonomical groups are arranged in definite order, from higher to lower categories. Each category is considered as a taxonomic unit and represents a taxon.

Classification of Mango:
Kingdom: Plantae
Division: Angiospermae
Class: Dicotyledonae
Order: Sapindales
Family: Anacardiaceae
Genus: Mangifera
Species: indica

Q. 9. Distinguish between a genus and species.

Ans.

S. No.	Species	Genus
1.	It is the basic unit of taxonomy.	It is first highest category above the species level.
2.	It is a dynamic genetically distinct group of organisms	It is group of species which are closely related.

Q. 10. Give the role of botanical gardens.

Ans. Role of Botanical Gardens:
(i) They provide plant material for taxonomic studies.
(ii) Plant species are grown here for identification.
(iii) Plants are grown for research.
(iv) To maintain records of local flora.

Q. 10. Mention any two aims of zoological parks.
Ans. Aims of zoological Parks:
(i) To develop interest and awareness about wild animals in the public.
(ii) The zoos are involved in the conservation of many endangered species of wild life.

Q. 11. What are the steps involved in the Preparation of herbarium?
Ans. (i) Collection of specimens.
(ii) Drying and pressing.
(iii) Mounting of the specimens.
(iv) Labelling.
(v) storage.

Short Answer Questions – II

Q. 1. Differentiate between the following :
(i) Growth in plants and growth in animals
(ii) Growth in unicellular organisms and growth in multicellular organisms
(iii) Catabolism and anabolism.

Ans. (i)

Growth in plants	Growth in animals
Plants grow faster and continuously throughout their life span.	Animals grow slowly and after reaching certain size and age, animals stop growing.

(ii)

Growth in unicellular organisms	Growth in multicellular organisms
Growth can be observed in only $in-vitro$ cultures.	Growth can be easily observed in $in-vitro$ as well as in $in-vivo$.

(iii)

Anabolism	Catabolism
The biochemical reactions which are concerned with the synthesis of complex substances from simple substances are collectively called anabolism. E.g., photosynthesis.	The biochemical reactions which are concerned with breakdown of complex organic substances into simple substances are collectively called catabolism. E.g., respiration.

Q. 2. Distinguish between taxonomy and systematics.

Ans.

S. No.	Taxonomy	Systematics
1.	It is the study of organisms on the basis of their characteristics.	It is the study of diversity of organisms and all their comparative and evolutionary relationships.
2.	It includes morphological and anatomical features for identification.	It deals with comparative anatomy, ecology, physiology and bio-chemistry.

Q. 3. What is the correct way of writing a biological name? Explain with example.

Ans. (i) The biological name is written in two words.

(ii) The first is genus and the second represents species. They are printed in italics. Example $Pisum\ sativum$ is the scientific name of pea.

(iii) Generic name begins with a capital letter ($pisum$) and the species name begins with a small letter ($sativum$).

Q. 4. Taxonomy for a long time was considered as descriptive science. Why?

Ans. (i) Taxonomy: It is the branch of biology dealing with identification, naming and classification of the organism on the basis of some laws and principles.

(ii) It includes characterization, identification, nomenclature and classification.

(iii) The morphological characters were considered in the beginning to classify organisms.

(iv) The species was considered static and fixed entity.

Q. 5. Give example of three species each belonging to same genera.

Ans. (i) $Solanum\ tuberosum$ (potato) and $Solanum\ melongera$ (brinjal).
(ii) $Brassica\ oleracea$ (cabbage) and $Brassica\ juncea$ (mustard).
(iii) $Panthera\ leo$ (lion) and $Panthera\ tigris$ (tiger).

Q. 6. What are intermediate categories?

Ans. With the discovery of more organisms it is difficult to adjust them to traditional categories. So, the existing categories have been split by prefixing 'super' and 'sub' to the existing categories like sub-kingdom, sub-phylum, super class etc. These are referred as intermediate categories. This has also facilitated more sound and scientific placement of various taxa.

Q. 7. Write a short note on botanical garden. Name some botanical gardens.
OR
Botanical gardens are living herbaria. Comment.

Ans. (i) A botanical garden is a place for growing flowers for educational purposes for scientific workers.
(ii) It is also an inspiration for general public to create their interest in plant life.
(iii) It displays different varieties of cultivated plants, medicinal plants and other economic values.
(iv) A botanical garden also has a herbarium and a library for reference studies.
(v) They are basic sources of information about different types of plants.

Some of these gardens are as follows:
(i) Royal Botanical Garden, Kew (England)
(ii) National Botanical Garden, (Lucknow)
(iii) Indian Botanical Garden, (Kolkata)
(iv) Lloyd Botanical Garden, (Darjeeling).

Q. 8. What are taxonomic aids? Name a few taxonomic aids.

Ans. Taxonomic aids: Techniques, procedures and information collected about the species that facilitate, identification, naming and classification of organisms are called taxonomic aids. Some aids are Herbaria, Botanical gardens, zoological parks etc.

Q. 9. Describe the role of museums.

Ans. (i) These have collections of plants and animals.
(ii) These are used to deposit type specimens.
(iii) These are important centers for taxonomic studies.
(iv) These provide information about local fauna and flora as well as of other areas.

Q. 10. Name some zoological parks.

Ans. (i) Zoological park of Kruger (S. Africa).
(ii) Zoological garden of Berlin (Germany).
(iii) Zoo of Kolkata.
(iv) Aquarium of Mumbai.

Q. 11. Describe the taxonomic aids useful in identification of species.

Ans. Flora, manuals, monographs and catalogues are some of the taxonomic aids.
(i) Flora contains the useful account of habitat and distribution of plants of a given area. These provide the index to the plant species found in a particular area.
(i) Manuals are useful in providing information for the identification of names of species found in an area.
(iii) Monographs contain all the information about a particular taxon.
(iv) Catalogue is a list that enumerates all the species found in a particular area.

Q. 12. How different specimens are preserved in the museums.

Ans. In museums specimens can be preserved in the following ways:
(i) Most of the specimens are preserved in the containers or jars in preservative solutions.
(ii) Some specimens are preserved in the dried form.
(ii) Insects are preserved in insect boxes.
(iv) Larger animals like birds and mammals are usually stuffed and then preserved.
(v) Museums also have skeletons of animals as specimen.

Very Short Answer Type Questions

Q. 1. What are the twin characteristics of growth?

Ans. Increase in mass and increase in number of individuals are the twin characteristics of growth.

Q. 2. What is the difference between the growth of living and non-living things?

Ans. In non-living things growth occurs from the outer side whereas in living organisms growth is from the inner side.

Q. 3. What do you understand by the term metabolism?

Ans. The sum total of all the chemical reaction occurring in an organism is known as metabolism.

Q. 4. Give any two defining characteristics of living beings.

Ans. Metabolism and consciousness are two defining characteristics of living beings.

Q. 5. What does ICBN stand for?   [KVS-2014]

Ans. ICBN stands for International code of Botanical Nomenclature.

Q. 6. Define nomenclature.

Ans. The system of providing organism with appropriate and distinct names is called nomenclature.

Q. 7. Who is known as the father of Botany?

Ans. Theophrastus is known as the father of Botany.

Q. 8. What is the need of taxonomy?

Ans. Taxonomy makes the identification of organisms and their study more convenient.

Q. 9. What is biochemical systematics?

Ans. The classification of plants and animals on the basis of biochemical characteristics is called biochemical systematics.

Q. 10. Who introduced the term species?

Ans. John Ray.

Q. 11. Why are common names not employed in scientific studies?

Ans. Common names are used to recognise an organism in different regions of a country. Sometimes one common name is often used for several species.

Q. 12. Who wrote 'Systema Nature'?

Ans. Carolus Linnaeus in 1758.

Q. 13. What is biodiversity?

Ans. Biodiversity can be defined as the number and types of organisms present an earth.

Q. 14. Write the names of two books brought out by Linnaeus.

Ans. (i) Species Plantarum
(ii) System Naturae

Q.15. In biological classification of animals, write the name of 'family' and 'order' to which man belong.   [DDE Practice paper]

Ans. Family: Hominidae
Order: Primata

Q. 16. Genus $panthera$ includes leo, pardus, tigris etc. What does leo, pardus and tigris refer to?   [KVS Mumbai- 2016]

Ans. They refers to the species of genus $Panthera$.

Q. 17. What is hierarchy of categories?

Ans. It is defined as sequence of categories in a decreasing or increasing order from kingdom to species and vice versa. Kingdom is the highest rank followed by division, Class, Order, Family, Genus and Species.

Q. 18. What is the basic unit of classification?

Ans. Species is the unit of classification.

Q. 19. What is the difference between monotypic and polytypic genus?

Ans. When genus consist of only one existing species it is called a monotypic genus and when it consist of many species it is said to be as polytypic genus.

Q. 20. How are monographs different from manuals?   [DDE 2017]

Ans. Monograph contain information on any one taxon whereas manuals provide information for identification of name of species in an area.

Q. 21. What are the taxonomic aids or tools?

Ans. Tools or aids used in the identification of plants and animals are called as Taxonomic Aids. Herbaria, zoological parks, zoos, manual, botanical gardens, keys etc. are taxonomic aids.

Q.22. How many zoological parks occur in India?

Ans. Above three hundred.

Q. 23. Where was the first zoological museum started?

Ans. In Kolkata (Calcutta).

Q.24. Which is the largest herbarium of the world?

Ans. Royal Botanical Garden at kew (England).

Q. 25. Name the largest Herbaria of India.

Ans. Central National Herbarium, Kolkata.

Q. 26. How are insects kept in museums?

Ans. The collected insects are killed and pinned. Then they placed in an insect box.