NCERT Solutions for Class-XI Biology

Chapter-1

1. Why are living organisms classified?

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.

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

2. From very early days till now biologists use several characters for classification system. These are morphology, anatomy, cytology, physiology, ontogeny, phylogeny, reproduction, biochemistry, etc. But day by day biologists are learning something new about organisms from their fossil records and using" advanced study techniques such as molecular phylogeny, etc. So their point of view about classification keeps changing. Thus the system of classification is modified every now and then.

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

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.

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

4. The knowledge of characteristic of an individual or its whole population helps in identification of similarities and dissimilarities among the individuals of same kind or between different types of organisms. It helps us to classify the organisms in various categories depending upon these similarities and dissimilarities.

5. Given below is the scientific name of Mango. Identify the correctly written name.

Mangifera Indica
Mangifera indica

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*.

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

6. A taxonomic unit in the biological system of classification of organism is called taxon (plural taxa). For example a phylum, order, family, genus or species represents taxon. It represents a rank. For example, all the insects form a taxon. Taxon of class category for birds is Aves and taxon of Phylum category for birds is Chordata. The degree of relationship and degree of similarity varies with the rank of the taxon. Individuals of a higher rank, say Order or Family, are less closely related than those of a lower rank, such as Genus or Species.

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

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.

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.

8. Species occupies a key position in classification. It is the lowest taxonomic category. It is a natural population of individuals or group of populations which resemble one another in all essential morphological and reproductive characters so that they are able to interbreed freely and produce fertile offsprings. Each species is also called genetically distinct and reproductively isolated natural population. Mayr (1964) has defined species as "a group of actually or potentially interbreeding populations that are reproductively isolated from other such groups".

In higher plants and animals the term 'species' refers to a group of individuals that are able to interbreed freely and produce fertile offsprings. But, in case of bacteria interbreeding cannot serve as the best criteria for delimiting species because bacteria usually reproduce asexually. Conjugation, transformation and transduction, which are termed as sexual reproduction methods in bacteria, also do not correspond to true interbreeding. Thus, for bacteria many other characters such as molecular homology, biochemical, physiological, ecological and morphological characters are taken into consideration while classifying them.

9. Define and understand the following terms:
(i) Phylum (ii) Class (iii) Family (iv) Order (v) Genus

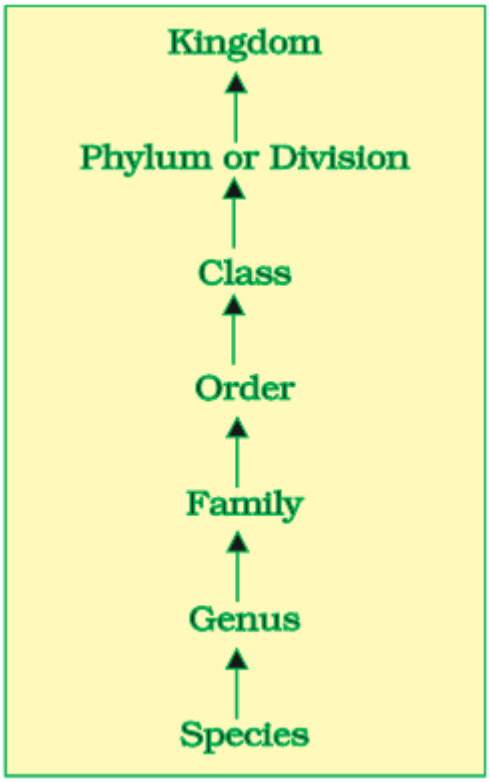
9. (i) Phylum
Phylum is the primary division of kingdom. It includes one or more related classes of animals. In plants, instead of phylum, the term 'division' is used.
(ii) Class
Class is a taxonomic group consisting of one or more related orders.
For example, the class, Mammalia, includes many orders.
(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.

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

10. 'Key is an artificial analytic device having a list of statements with dichotomic table of alternate characteristics. Taxonomic keys are aids for rapid identification of unknown plants and animals based on the similarities and dissimilarities. Keys are primarily based on stable and reliable characters. The keys are helpful in a faster preliminary identification which can bebacked up by confirmation through comparison with detailed description of the taxon provisionally identified with. Separate taxonomic keys are used for each taxonomic category like Family, Genus and Species.

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

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*