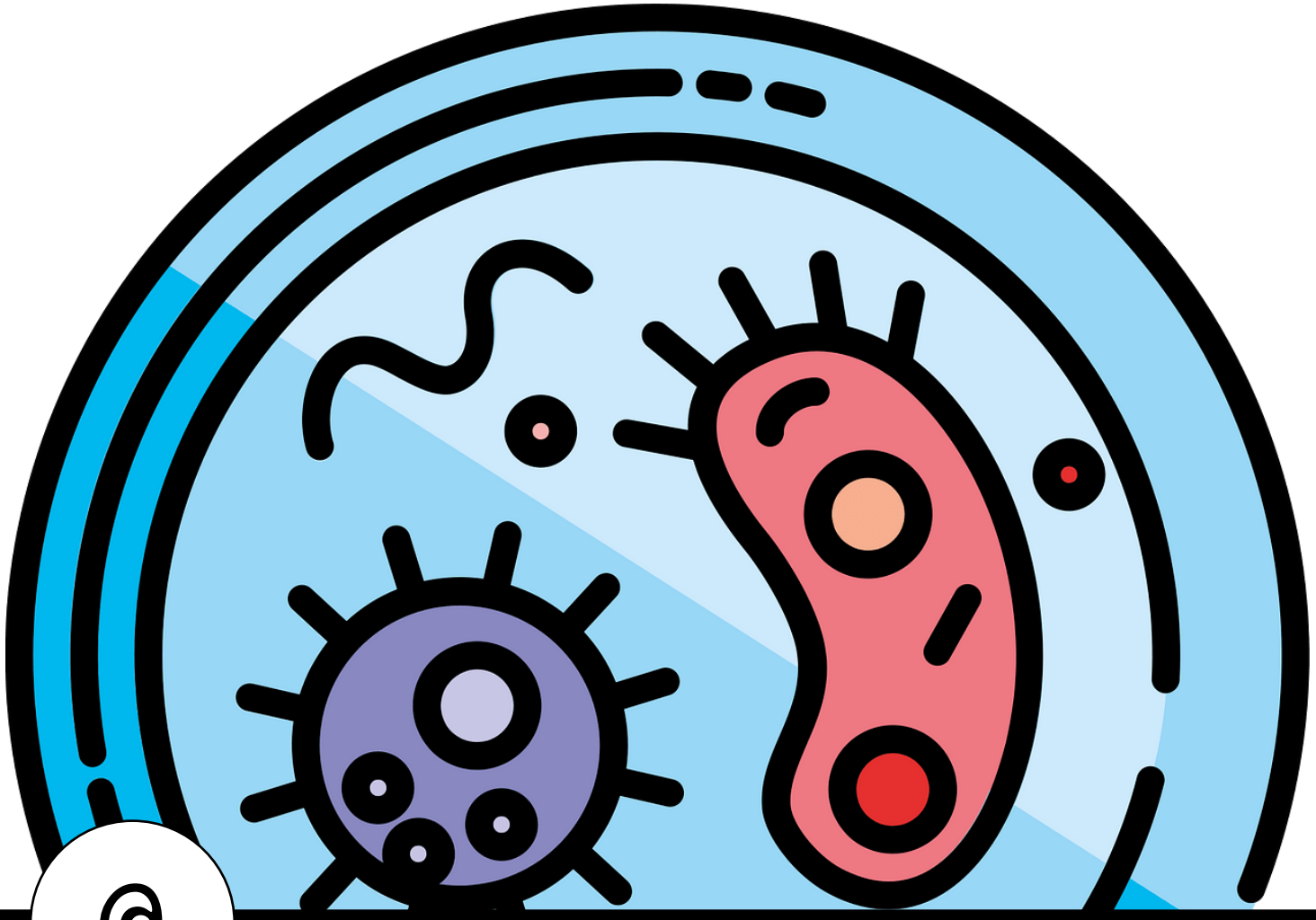
Biology

11

Chapter- 1. Living World



1. Why are living organisms classified?

Answer:
Living organisms are classified because there is a vast variety of plants, animals, and microorganisms on Earth, each differing in size, shape, habitat, and characteristics. To avoid confusion and make the study of organisms easier, scientists classify them based on observable traits. This classification helps in the identification, naming (nomenclature), and understanding of relationships between different species. It also simplifies the process of grouping new species and learning about their similarities and differences.

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

Answer:
Classification systems change frequently because scientific discoveries are constantly evolving. New species of plants, animals, and microorganisms are regularly discovered, requiring updates to the existing classification systems. Initially, classification was based on simple features like habitat or external morphology, but over time, it has expanded to include genetic, embryological, and biochemical data. As our understanding of evolutionary relationships deepens, these systems must be revised to accurately reflect the diversity and complexity of life on Earth.

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

Answer:
To classify people that we meet often, various criteria can be used such as:

- **Gender**: Identifying whether they are male or female.
- **Appearance**: Classifying based on physical traits like skin colour or height.
- **Behaviour and Personality**: Observing how they interact with others.
- **Occupation or Education**: Sorting people based on their profession or educational background.
- **Hobbies and Interests**: Grouping them by their favourite activities. These criteria help us understand and differentiate between individuals we frequently encounter.

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

Answer:
Identifying individuals and populations allows us to understand various characteristics, such as:

- **Sex**: Recognizing male and female distinctions.
- **Physical Traits**: Observing skin colour and other appearance-related features.
- **Cultural Background**: Understanding native places, mother tongues, and food habits.

- **Social Aspects**: Acknowledging religion and caste.

This identification helps us recognize similarities and differences among individuals of the same species or different species, facilitating the classification of organisms based on these traits.

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

- Mangifera Indica
- Mangifera indica

Answer:
The correct scientific name of the mango is **Mangifera indica**. In the binomial system of nomenclature:

- The genus name (**Mangifera**) starts with a capital letter.
- The species name (**indica**) is written in lowercase. Both names should be italicized or underlined to denote their scientific status.

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

Answer:
A taxon is a taxonomic unit in the biological classification system, representing a group of organisms classified as a unit. It serves as a rank within the hierarchy of biological classification. The major hierarchical levels include:

- **Kingdom**: Animalia
- **Phylum/Division**: Chordata (for animals) / Angiospermae (for plants)
- **Class**: Mammalia (for mammals) / Aves (for birds)
- **Order**: Primata (for primates) / Sapindales (for some flowering plants)
- **Family**: Hominidae (for great apes) / Anacardiaceae (for cashews and mangoes)
- **Genus**: Homo (for humans) / Mangifera (for mangoes)
- **Species**: Homo sapiens (for humans) / Mangifera indica (for mangoes)

For instance, within the taxonomic hierarchy, **Animalia** represents the kingdom, **Chordata** represents the phylum, **Mammalia** is the class, **Primata** is the order, **Hominidae** is the family, **Homo** is the genus, and **Homo sapiens** is the species.

Taxa at different levels exhibit varying degrees of relatedness, with organisms at lower ranks (like genus or species) being more closely related than those at higher ranks (like order or family).

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

Thus, both (a) and (c) can be considered correct in the context of the sequences provided, as they align with the broader classification system. However, option (b) is incorrect because the species should be followed by the genus.

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:
The term "species" holds a pivotal role in biological classification and is generally regarded as the lowest taxonomic category. It is defined as a natural population of individuals or a group of populations that resemble one another in essential morphological and reproductive characteristics, allowing them to interbreed freely and produce fertile offspring. A species is also recognized as a genetically distinct and reproductively isolated natural population. According to Mayr (1964), a species is "a group of actually or potentially interbreeding populations that are reproductively isolated from other such groups."

1. **In Higher Plants and Animals:**
    - In the context of higher plants and animals, the definition of species primarily hinges on the ability to interbreed. This means that individuals within a species can mate and produce fertile offspring, which is a key criterion for defining species in these organisms.
2. **In Bacteria:**
    - In contrast, the concept of species in bacteria diverges significantly due to their asexual reproduction. Traditional interbreeding does not apply, as bacteria primarily reproduce by binary fission. Instead, methods such as conjugation, transformation, and transduction, which are sometimes considered forms of genetic exchange, do not equate to true interbreeding. Thus, classification of bacterial species often relies on various criteria, including molecular homology, biochemical properties, ecological roles, and morphological traits.

In summary, while the traditional definition of species based on reproductive isolation and interbreeding is applicable to higher plants and animals, bacteria require a more nuanced approach, considering alternative criteria due to their unique reproductive strategies.

9. Define and understand the following terms

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

Answer:
(i) **Phylum**: The primary division of the kingdom, encompassing one or more related classes of organisms. In plants, this category is referred to as 'division.'

(ii) **Class**: A taxonomic group that includes one or more related orders. For instance, the class **Mammalia** contains orders like **Primata** (humans) and **Carnivora** (lions, tigers).

(iii) **Family**: A group containing one or more related genera. For example, the family **Hominidae** includes apes, monkeys, and humans.

(iv) **Order**: A taxonomic group made up of one or more families. An example is the order **Carnivora**, which comprises several families.

(v) **Genus**: A classification of closely related species. For instance, the genus **Solanum** includes various species like **nigrum** and **tuberosum**.

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

Answer:
A key is a taxonomic aid that assists in identifying plants and animals based on their similarities and differences. It typically presents contrasting characters in pairs called couplets, allowing users to make choices between two opposite options. Each statement in the key is referred to as a lead.

Keys are analytical tools that require separate sets for different taxonomic categories, such as family, genus, and species. They are primarily based on stable and reliable characteristics, enabling rapid preliminary identification of unknown organisms. This initial identification can be further confirmed by comparing it with detailed descriptions of the taxa.

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

Answer:
Taxonomical hierarchy is the classification of organisms into a structured sequence of categories, ranging from the broadest group (kingdom) to the most specific (species). The number of shared characteristics typically decreases as you move up the hierarchy. The classification was first introduced by Linnaeus.

Here’s the taxonomical hierarchy for a plant (wheat) and an animal (housefly):

Taxonomic Categories	**Wheat**	**Housefly**
Kingdom	Plantae	Animalia
Division	Angiospermae	Chordata
Class	Monocotyledonae	Insecta
Order	Poales	Diptera
Family	Poaceae	Muscidae
Genus	Triticum	Musca
Species	aestivum	domestica