

Written as per the revised syllabus prescribed by the Maharashtra State Board
of Secondary and Higher Secondary Education, Pune.

STD. XI Sci.

Perfect Biology

Salient Features

- Exhaustive coverage of syllabus in Question Answer Format.
- Covers answers to all Textual Questions and relevant NCERT Questions.
- Quick Review for instant revision and summary of the chapter.
- Exercise, Multiple Choice Questions and Topic test at the end of each chapter for effective preparation.
- Important inclusions: NCERT Corner and Apply Your Knowledge.

Printed at: **Dainik Saamana**, Navi Mumbai

© Target Publications Pvt. Ltd.

No part of this book may be reproduced or transmitted in any form or by any means, C.D. ROM/Audio Video Cassettes or electronic, mechanical including photocopying; recording or by any information storage and retrieval system without permission in writing from the Publisher.

P.O. No. 62965

10160_11781_JUP

Preface

In the case of good books, the point is not how many of them you can get through, but rather how many can get through to you.

“**Std. XI Sci. : PERFECT BIOLOGY**” is a treasure house of knowledge that’d not only prepare you to face the conspicuous Std. XI final exam but also equip you up on parallel ground to face the prospective NEET exam. This book is specifically aimed at Maharashtra Board students. The content of the book is framed in accordance with Maharashtra State board syllabus splattered with additional snippets of information from the NCERT syllabus. This lethal combination of apt material from both the boards makes it the ultimate reference material for Std. XI.

This book has been developed on certain key features as detailed below:

- **Question and Answer** format of the book provides students with appropriate answers for all textual questions.
- **National Council Of Educational Research And Training (NCERT)** questions based on Maharashtra State board syllabus have been provided along with solutions for a better grasp of the concept and preparing the students on a competitive level.
- **NCERT Corner, Do You Know** and **Notes** cover additional bits of relevant information on each topic.
- **Apply Your Knowledge** covers the questions to strengthen the students’ conceptual understanding.
- **Quick Review** section facilitate instant revision.
- **Exercise** helps the students to gain insight on the various levels of theory questions.
- **Multiple Choice Questions** and **Topic Test** assess the students on their range of preparation and the amount of knowledge of each topic.

The journey to create a complete book is strewn with triumphs, failures and near misses. If you think we’ve nearly missed something or want to applaud us for our triumphs, we’d love to hear from you.

Please write to us on : mail@targetpublications.org

A book affects eternity; one can never tell where its influence stops.

Best of luck to all the aspirants!

Yours faithfully,
Publisher

Contents

No.	Topic Name	Page No.
1	Diversity in Organisms	1
2	Kingdom Plantae	22
3	Biochemistry of Cell	40
4	Cell Division	59
5	Morphology of Flowering Plants	75
6	Plant Water Relations and Mineral Nutrition	125
7	Plant Growth and Development	155
8	Kingdom Animalia	174
9	Organization of Cell	201
10	Study of Animal Tissues	226
11	Study of Animal Type	249
12	Human Nutrition	265
13	Human Respiration	284
14	Human Skeleton and Locomotion	301

Note: All the Textual questions are represented by * mark.

All NCERT questions are represented by # mark.

01 Diversity in Organisms

Syllabus

1.0	Introduction	1.3	Five kingdom system of classification
1.1	Diversity in living organisms	1.4	Lichens
1.2	Systematics: Taxonomy, Taxonomic hierarchy and Binomial nomenclature	1.5	Viruses and Viroids

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.

Note

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.



NCERT Corner

• Reproduction can not be the defining characteristic of living organisms

- i. In unicellular organisms growth is equivalent to increase in number of cells or mass. For example, in unicellular algae or amoeba reproduction is synonymous with growth i.e. increase in number of cells.
- ii. The fungi, filamentous algae, protonema of mosses multiply by fragmentation.
- iii. Thus, reproduction cannot be considered as on all inclusive defining characteristic of living organisms.

1.1 Diversity in living organisms

Note

- 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.*

#Q.2. 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.3. 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.

NCERT Corner

• Systematics

- i. The word systematics is derived from the Latin word 'Systema'. It means the systematic arrangement of organisms.
- ii. Linnaeus used *Systema Naturae* as the title of his publication.
- iii. Systematics considers evolutionary relationships between organisms.

Q.4. 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.5. Define the term classification. Why is it necessary?

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

Need for classification:

- 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.

Note

- i. *The organisms are classified on the basis of characteristics.*
- ii. *Earliest classification was based on the uses of various organisms.*
- iii. *But now a days, 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.6. Which are the three domains of life?

Ans: Three domains of life are Archaea, Bacteria, Eukarya.

Q.7. Who developed the three domain system?

Ans: Carl Woese developed the three domain system.

Q.8. 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.9. 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.10. 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.11. 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 hierarchial classification of organisms.

**Q.12. Who coined the term taxon?**

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

Q.13. 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.14. 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 sub-class 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.

NCERT Corner

- i. As we go higher from species to kingdom, the number of common characteristics goes on decreasing.
- ii. Lower the taxa, more common are the characteristics of members. Higher the category, greater is the difficulty of determining the relationship to other taxa at the same level. This makes classification more complex.



Q.15. Mention the various units of classification in descending manner.

Ans: Kingdom
 Division / Phylum
 Class
 Sub-class
 Series
 Order
 Family
 Genus
 Species

***Q.16. Define nomenclature.**

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

#Q.17. 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.18. Write the classification of: i. China Rose. ii. Man iii. Cobra

Ans:

	China Rose	Man	Cobra
Kingdom	Plantae	Animalia	Animalia
Sub-kingdom	–	Eumetazoa	–
Division / Phylum	Angiospermae	Chordata	Chordata
Sub phylum	–	Vertebrata	–
Class	Dicotyledonae	Mammalia	Reptilia
Sub class	Polypetalae	Eutheria	Diapsida
Series	Thalamiflorae	–	–
Order	Malvales	Primates	Squamata
Family	Malvaceae	Hominidae	Elapidae
Genus	<i>Hibiscus</i>	<i>Homo</i>	<i>Naja</i>
Species	<i>rosa sinensis</i>	<i>sapiens</i>	<i>naja</i>

NCERT Corner

• Organisms with their Taxonomic Categories

Common Name	Biological Name	Genus	Family	Order	Class	Phylum/ Division
Man	<i>Homo sapiens</i>	<i>Homo</i>	Hominidae	Primata	Mammalia	Chordata
Housefly	<i>Musca domestica</i>	<i>Musca</i>	Muscidae	Diptera	Insecta	Arthropoda
Mango	<i>Mangifera indica</i>	<i>Mangifera</i>	Anacardiaceae	Sapindales	Dicotyledonae	Angiospermae
Wheat	<i>Triticum aestivum</i>	<i>Triticum</i>	Poaceae	Poales	Monocotyledonae	Angiospermae

***Q.19. 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.20. Give the advantages and disadvantages 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.

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.21. 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.22. 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.23. Who proposed binomial system of nomenclature?**

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



Q.24. 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 follis ovalis supreme glabris parallel striatis subtus tomento sonitidis*.

Whereas binomial system made the names easier and meaningful.

Q.25. Give Reason “Scientific names are universal”.

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

Q.26. What is citation? Give one example.

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

For e.g. *Mangifera indica* L. The letter ‘L’ in *Mangifera indica* indicates the name of author, i.e. Linnaeus.

1.3 Five kingdom system of classification

Q.27. Who introduced the two kingdom system of classification?

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

Q.28. 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.

Q.29. 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.30. Who suggested the third kingdom Protista?

Ans: Haeckel suggested the third kingdom Protista.

Q.31. Who suggested five kingdom system of classification?

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

Q.32. 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:

- Cell organization:** The organism is either prokaryotic or eukaryotic.
- Body organization:** The organism is either unicellular or multicellular.
- Mode of nutrition:** The organism is either autotrophic or heterotrophic.
- Life style:** The organism may be a producer, consumer or decomposer.

The five kingdoms are:

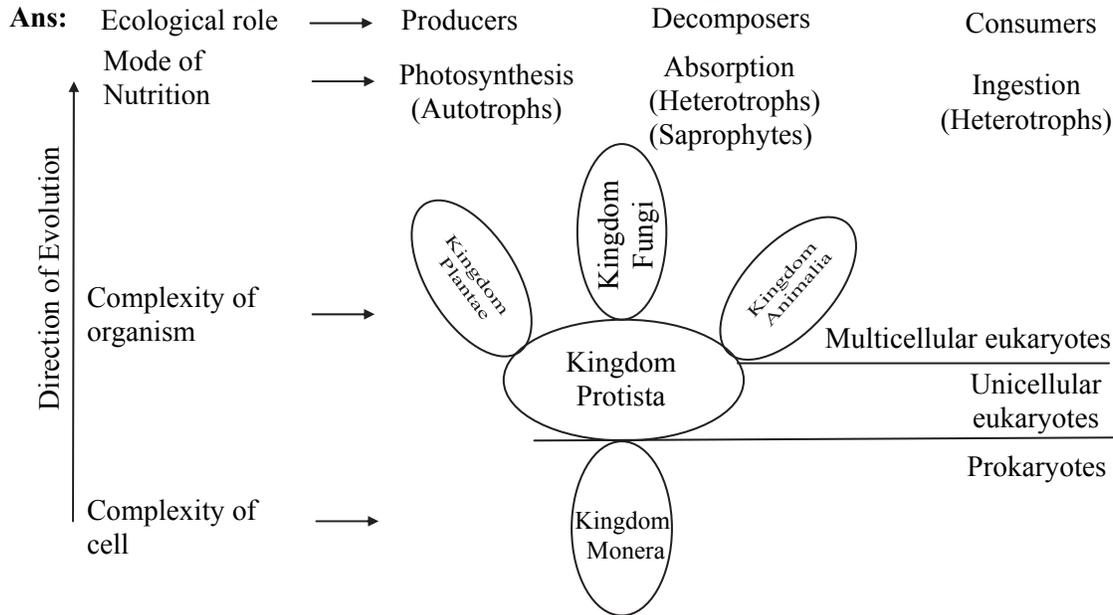
- | | | |
|--------------------|---------------------|------------------|
| a. Kingdom Monera | b. Kingdom Protista | c. Kingdom Fungi |
| d. Kingdom Plantae | e. Kingdom Animalia | |

Q.33. Which organisms are called prokaryotic?

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



***Q.34. Give the diagrammatic representation of five kingdom system of classification.**



Diagrammatic representation of the five kingdom system of classification

***Q.35. Give the general characters of Kingdom Monera with examples.**

Ans: General characteristics of Kingdom Monera:

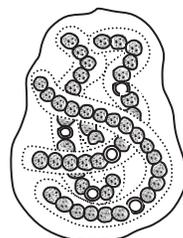
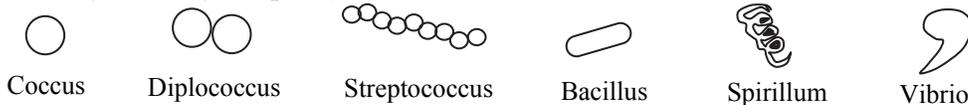
- i. **Size:** The organisms included in this kingdom are microscopic, unicellular and prokaryotic.
- ii. **Nucleus:** The organisms possess a primitive (prokaryotic) type of nucleus, i.e. nucleus is without nuclear envelope, nucleolus, nucleoplasm, histone proteins and true chromosomes. Such nucleus 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: Archaeobacteria. e.g. *Methanobacillus*, *Thiobacillus*, etc.

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

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

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



Nostoc



Oscillatoria

Kingdom Monera (Eubacteria, Cyanobacteria)