YAKEEN NEET 2.0

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Biological Classification

BOTANY | Lecture: 01

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Oldest Classification

- It is a NON-SCIETIFIC classification
- Based on USES of organisms
  - ① Food : Crops, pulses, vegetables, milk, meat, eggs....
  - ② Clothing : Silk, cotton, jute, flex ....
  - ③ Shelter : Teak wood, Sal wood, Shisham wood ...
  - ④ Security : Dog ....
  - ⑤ Transport : Horse, ox, bull ....
  - ⑥ Others : Medicines, gums, resins, spices etc....

NOTE :
- 1st NON-SCIENTIFIC classification was done on the BASIS of USES of organisms

BIOLOGICAL CLASSIFICATION
(Life/living)
⇓
Here, organisms are grouped into convinient categories BASED ON some easily observable characters

- FIRST SCIENTIFIC CLASSIFATION

⇓

Given by Aristotle

⬇

He classified all organism on Earth into plants & animals

on the basis of MORPHOLOGY

1. Herb (शाक)
2. Shrub/bush (झाड़ी)
3. Tree (पेड़)

on the basis of ⊕nce or ⊖nce of RED-BLOOD

1. Enaima : Humans (Reb blood ⊕nt)
2. Anaima (Red blood ⊖nt) : Cockroach

⇓

Absent

NOTE: This system has a lot of drawbacks like bacteria, mycoplasma etc. can't be kept in any category

2-Kingdom System

- Given by Carolus Linnaeus

On the basis of ⊕nce or ⊖nce of CELLWALL the organisms are kept in 2 kingdoms

→ cellwall ⊕nt

PLANTAE : Archaebacteria, Eubacteria, Chlorella, Chlamydomonas, Fungi, Algae, Bryophyte, Pteridophyte, Gymnosperms, Angiosperms, Mycoplasma (PPLO), LICHEN (Cellwall ⊖nt)

LICHEN → Fungi + Algae

→ Cellwall ⊖nt

ANIMALIA : Protozoa, Amoeba, Paramecium, insects, Earthworm, monkey, Human

- There were many drawbacks of 2-kingdom system:

① It kept Prokaryotes & Eukaryotes together
- Prokaryotes → Bacteria, Mycoplasma
- Eukaryotes → Angiosperm

② It kept unicellular & multicellular organisms together
- unicellular → Bacteria, Chlamydomonas
- multicellular → Spirogyra, advanced plants

③ It kept Heterotrophic & autotrophic organisms together
- Heterotrophic → Fungi, Most Bacteria
- autotrophic → Plants

④ It kept Mycoplasma in PLANTAE
(cellwall⊖nt) (cellwall⊕nt)

⑤ LICHEN was introduced into plantae as a separate organism
- LICHEN → Algae + Fungi

- ∵ There are a lot of demerits of this system:
∴ we need some system with BETTER CRITERIA
- BETTER CRITERIA → Nature of cell wall, cell str., body organisation, mode of Nutrition, reproduction etc.

NOTE: In various classification systems, 2 kingdoms i.e., PLANTAE & ANIMALIA are constant ∵ they are easy to identify

NOTE: If criteria for classification changes, organisms can also change their category

3 and 4-Kingdom System

- Given by HAECKEL
- Introduced kingdom PROTISTA

⇓

Contains unicellular, eukaryotic organisms

- Given by COPELAND
- Introduced kingdom MONERA

⇓

Contains unicellular PROKARYOTIC organisms

NOTE: Protista was introduced earlier than MONERA

5-Kingdom System

- Given by R.H. Whittaker (1969)
- 5 main criteria are used

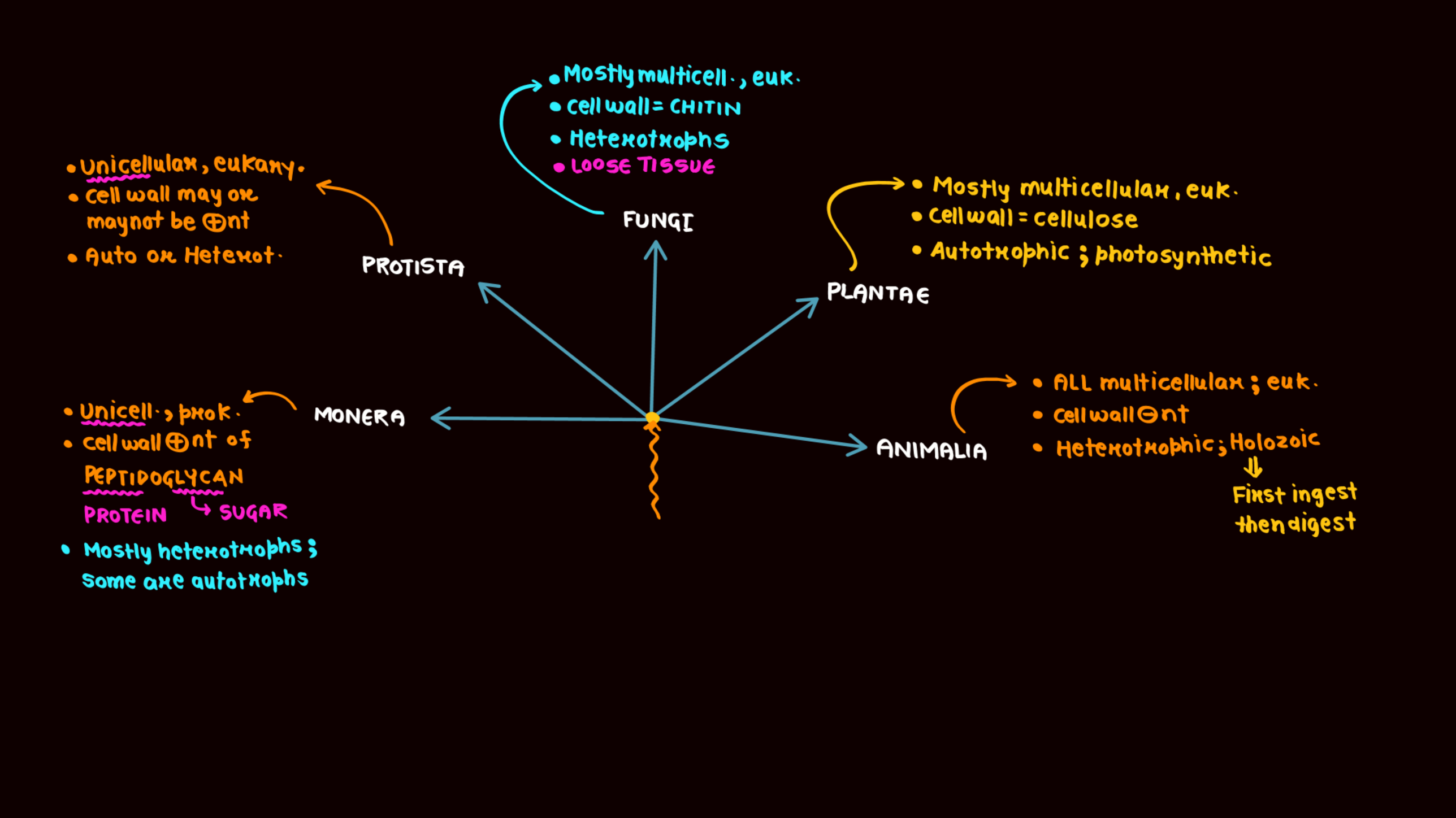
1. Cell Type: Prokaryotic & Eukaryotes
2. Body organisation: Unicellular & multicell. organisms
3. * Mode of Nutrition: Autotrophs & Heterotrophs
4. Mode of Reproduction
5. Phylogenetic/evolutionary relationships

NOTE:

Chlorella, Chlamydomonas (cell wall ⊕nt) i.e., Plants earlier

Amoeba, Paramecium (cell wall ⊖nt) i.e., Animals earlier

Now they all are in PROTISTA ∵ They are unicell., Eukaryotes


• Mostly multicell., euk.
• cell wall = CHITIN
• Heterotrophs
• LOOSE TISSUE
FUNGI
• Unicellular, eukary.
• Cell wall may or maynot be ⊕nt
• Auto or Heterot.
PROTISTA
• Mostly multicellular, euk.
• Cell wall = cellulose
• Autotrophic ; photosynthetic
PLANTAE
• Unicell., prok.
• Cell wall ⊕nt of PEPTIDOGLYCAN
PROTEIN
SUGAR
• Mostly heterotrophs ; some are autotrophs
MONERA
• ALL multicellular ; euk.
• Cell wall ⊖nt
• Heterotrophic ; Holozoic
⇓
First ingest then digest
ANIMALIA

6-Kingdom System

- Given by Carl Woese
- also called 3-domain system

MONERA
Basis of 16S rRNA Sequence

① ARCHAE BACTERIA → DOMAIN ARCHEA ①

② EUBACTERIA → DOMAIN EUBACTERIA ②

③ PROTISTA

④ FUNGI

⑤ PLANTAE

⑥ ANIMALIA

③ DOMAIN EUKARYA

NOTE : Domain is a BIGGER TAXA than kingdom

: Kingdom

: Domains

Table 2.1

Characters	Five Kingdoms				
	Monera	**Protista**	**Fungi**	**Plantae**	**Animalia**
Cell type	Prokaryotic	Eukaryotic	Eukaryotic	Eukaryotic	Eukaryotic
Cell wall	Noncellulosic (Polysaccharide + amino acid)	Present in some	Present with chitin	Present (cellulose)	Absent
Nuclear membrane	Absent	Present	Present	Present	Present
Body organisation	Cellular	Cellular	Multiceullar/ loose tissue	Tissue/ organ	Tissue/organ/ organ system
Mode of nutrition	Autotrophic (chemosynthetic and photosynthetic) and Heterotrophic (saprophytic/parasitic)	Autotrophic (Photosynthetic) and Heterotrophic	Heterotrophic (Saprophytic/ Parasitic)	Autotrophic (Photosynthetic)	Heterotrophic (Holozoic/ Saprophytic etc.)

Some

most

NCERT LINE by LINE

Since the dawn of civilisation, there have been many attempts to classify living organisms. It was done instinctively not using criteria that were scientific but borne out of a need to use organisms for our own use – for food, shelter and clothing. Aristotle was the earliest to attempt a more scientific basis for classification. He used simple morphological characters to classify plants into trees, shrubs and herbs. He also divided animals into two groups, those which had red blood and those that did not.

CRITICAL POINTS

1 Who was the earliest to attempt a scientific basis for classification?

(A) R.H. Whittaker
(B) Linnaeus
(C) Aristotle
(D) Bentham and Hooker

2 ___P____ used ____Q____ characters to classify plants into trees, shrubs & herbs.

(A) P = Aristotle, Q = Anatomical
(B) P = Whittaker, Q = Morphological
(C) P = Aristotle, Q = Morphological
(D) P = Whittaker, Q = Anatomical

3 Animals with red blood were name enaima by

(A) Theophrastus
(B) Linnaeus
(C) Aristotle
(D) Haeckel

NCERT LINE by LINE

In Linnaeus' time a **Two Kingdom** system of classification with **Plantae** and **Animalia** kingdoms was developed that included all plants and animals respectively. This system did not distinguish between the eukaryotes and prokaryotes, unicellular and multicellular organisms and photosynthetic (green algae) and non-photosynthetic (fungi) organisms. Classification of organisms into plants and animals was easily done and was easy to understand, but, a large number of organisms did not fall into either category. Hence the two kingdom classification used for a long time was found inadequate. Besides, gross morphology a need was also felt for including other characteristics like cell structure, nature of wall, mode of nutrition, habitat, methods of reproduction, evolutionary relationships, etc. Classification systems for the living organisms have hence, undergone several changes over the time. Though plant and animal kingdoms have been a constant under all different systems, the understanding of what groups/organisms be included under these kingdoms have been changing; the number and nature of other kingdoms have also been understood differently by different scientists over the time.

CRITICAL POINTS

4 Earlier classifications included bacteria, fungi, mosses, gymnosperms and angiosperms under plants on the basis of

(A) Nutrition

(B) Cell type

(C) Presence of cell-wall

(D) Body organisation

5 Which of the following pairs is incorrectly matched?

(A) Fungi → Saprophytic/parasitic mode of nutrition.

(B) Monera → Nuclear membrane is present.

(C) Plantae → Cell-wall is made up of cellulose.

(D) Animalia → Cell-wall is absent.

NCERT LINE by LINE

R.H. Whittaker (1969) proposed a **Five Kingdom Classification.** The kingdoms defined by him were named **Monera, Protista, Fungi, Plantae** and **Animalia.** The main criteria for classification used by him include cell structure, body organisation, mode of nutrition, reproduction and phylogenetic relationships. Table 2.1 gives a comparative account of different characteristics of the five kingdoms.

The three-domain system has also been proposed that divides the Kingdom Monera into two domains, leaving the remaining eukaryotic kingdoms in the third domain and thereby a six kingdom classification. You will learn about this system in detail at higher classes.

Let us look at this five kingdom classification to understand the issues and considerations that influenced the classification system. Earlier classification systems included bacteria, blue green algae, fungi, mosses, ferns, gymnosperms and the angiosperms under 'Plants'. The character that unified this whole kingdom was that all the organisms included had a cell wall in their cells. This placed together groups which widely differed in other characteristics. It brought together the prokaryotic bacteria and the blue green algae (cyanobacteria) with other groups which were eukaryotic. It also grouped together the unicellular organisms and the multicellular ones, say, for example, *Chlamydomonas* and *Spirogyra* were placed together under algae. The classification did not differentiate between the heterotrophic group – fungi, and the autotrophic green plants, though they also showed a characteristic difference in their walls composition – the fungi had chitin

CRITICAL POINTS

6 Five kingdom system of classification was given by..... in .....

(A) Whittaker, 1822

(B) Aristotle, 1969

(C) Aristotle, 1822

(D) Whittaker, 1969

7 X & Y organisms belong to different kingdoms – A and B respectively. Identify A & B on the basis of following features?

	Feature	A	B
I	Cell type	Eukaryotic	Eukaryotic
II	Body organisation	Cellular	Multicellular
III	Cell wall	Usually absent	Present
IV	Mode of Nutrition	Autotrophic Heterotrophic	Heterotrophic

(A) A = Protista, B = Plantae

(B) A = Monera, B = Animalia

(C) A = Protista, B = Fungi

(D) A = Protista, B = Animalia

NCERT LINE by LINE

in their walls while the green plants had a cellulosic cell wall. When such characteristics were considered, the fungi were placed in a separate kingdom – Kingdom Fungi. All prokaryotic organisms were grouped together under Kingdom Monera and the unicellular eukaryotic organisms were placed in Kingdom Protista. Kingdom Protista has brought together *Chlamydomonas*, *Chlorella* (earlier placed in Algae within Plants and both having cell walls) with *Paramoecium* and *Amoeba* (which were earlier placed in the animal kingdom which lack cell wall). It has put together organisms which, in earlier classifications, were placed in different kingdoms. This happened because the criteria for classification changed. This kind of changes will take place in future too depending on the improvement in our understanding of characteristics and evolutionary relationships. Over time, an attempt has been made to evolve a classification system which reflects not only the morphological, physiological and reproductive similarities, but is also phylogenetic, i.e., is based on evolutionary relationships.*

In this chapter we will study characteristics of Kingdoms Monera, Protista and Fungi of the Whittaker system of classification. The Kingdoms Plantae and Animalia, commonly referred to as plant and animal kingdoms, respectively, will be dealt separately in chapters 3 and 4.

CRITICAL POINTS

8 According to classification given by $R.H$ Whittaker, which one of the following organism has been shifted from Kingdom Plantae to Kingdom Protista?

(A) *Chlamydomonas* (B) *Paramoecium* ✗

(C) *Amoeba* ✗ (D) *Entamoeba* ✗

9 Fill in the blanks and choose the correct option w.r.t. Whittaker's five kingdom classification:

Kingdoms → Characters ↓	Monera	Fungi	Plantae
Cell wall	A	Present (without cellulose)	B
Body organisation	Cellular	C	D

(A) A - Polysaccharide and amino acid
C - Multicellular/Loose tissue

(B) B - Present in some
D - Tissue/Organ/Organ system

(C) A - Present (Noncellulosic)
B - Absent

(D) C - Cellular/Organ system
D - Tissue/Organ

NCERT LINE by LINE

Characters	Five Kingdoms				
	Monera	**Protista**	**Fungi**	**Plantae**	**Animalia**
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CRITICAL POINTS

10 How many kingdoms in five kingdom classification system have Eukaryotic organisims?

(A) 1 (B) 2

(C) 3 (D) 4 ✓

11 In five kingdom classification system:

(a) Eukaryotes are confined to three kingdoms only. ✗

(b) Organisms with heterotrophic mode of nutrition are confined to two kingdoms only. ✗

(c) Organisms with cellular body organisation are confined to kingdom Monera only. ✗

(d) Organisms with cell wall are found in kingdom Protista and Plantae only. ✗

Select the incorrect statements.

(A) Only (a) and (b)

(B) Only (a) and (c)

(C) Only (b), (c) and (d)

(D) All (a), (b), (c) and (d) ✓

Punchayat

with Vipu Sir

Active Recall

Home Work

Solve **OBJECTIVE NCERT PUNCH TOPIC WISE QUESTIONS**

Revise concepts from Botany MED EASY Book or from Class Notes

Module Questions
Aarabh: 4, 11
Prarambh: 2, 4, 5, 6, 7, 9, 10, 11, 12, 13
Prabal: 1, 2
Parikshit: 6, 19, 20
PYQs: 24, 28


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