



LOGIC BLOOM · NEET BIOLOGY · CLASS 11

# Plant Kingdom

Chapter 3 · Diversity in the Living World

*Algae to flowering plants, told as one story: how plants left the water. Nine drawn diagrams, a comparison table that answers most questions, and every key fact picked out in blue and red so it survives a last-minute revision.*

7 Sections

9 Diagrams

Comparison Table

Trap Alerts

Fact Sheet

---

**Logic Bloom**

logicbloom.co.in

*The simplest way to  
learn science.*

# Contents

|   |                                  |                                                  |
|---|----------------------------------|--------------------------------------------------|
| 1 | <b>How Plants Are Classified</b> | <i>and what the syllabus now expects</i>         |
| 2 | <b>Algae</b>                     | <i>three classes, told by pigment</i>            |
| 3 | <b>Life Cycles</b>               | <i>haplontic, diplontic, and the middle case</i> |
| 4 | <b>Bryophytes</b>                | <i>the amphibians of the plant world</i>         |
| 5 | <b>Pteridophytes</b>             | <i>the first plants with plumbing</i>            |
| 6 | <b>Gymnosperms</b>               | <i>seeds, but left uncovered</i>                 |
| 7 | <b>Angiosperms</b>               | <i>the seed gets a cover</i>                     |
| ★ | <b>One-Page Fact Sheet</b>       | <i>every formula for revision day</i>            |



## Read This First

- This chapter is worth about **3 percent** of NEET, based on the last ten years of papers.
- It is almost pure recall. So the marks go to whoever revises the comparisons, not to whoever reads the most.
- Throughout these notes, **blue marks a defining feature** and **red marks a trap or a first appearance**.
- The single most useful page is the comparison table in Section 6. Learn that and most questions fall.



TRAP ALERT

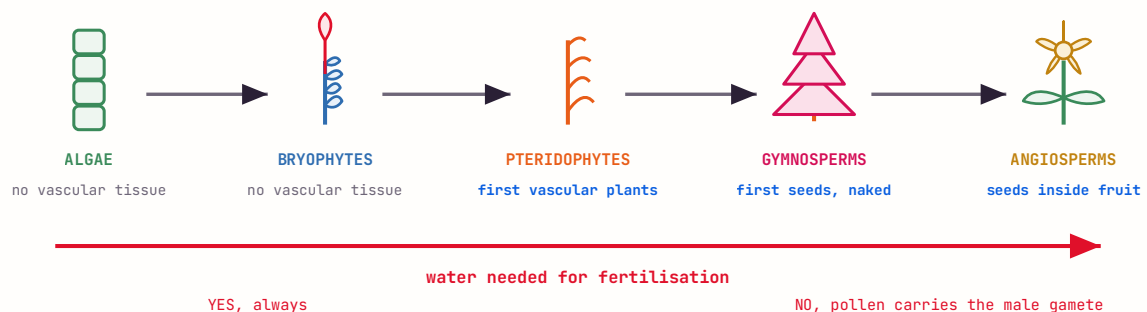
### A NOTE ON THE RATIONALISED NCERT

- NCERT trimmed some content from this chapter in the rationalised edition.
- These notes are built on the core that every edition keeps: the five groups, their features, and the life cycles.
- If your school follows an older book, check the classification section at the front against your current edition.
- When in doubt, the current NCERT is the syllabus. Nothing else is.

# How Plants Are Classified

- Early systems used only a few easy characters, such as habit. These are called **artificial** systems.
- **Natural** systems use many characters together, including internal structure.
- **Phylogenetic** systems group plants by how closely they are related by descent.
- Three modern aids: **numerical taxonomy** gives each character a number and lets a computer weigh them, **cytotaxonomy** uses chromosome data, and **chemotaxonomy** uses chemical constituents.

## FIVE GROUPS, ONE DIRECTION OF TRAVEL



*The five groups in the order they appear. Each step solves one more problem of living on land.*

## THE ONE STORY THAT TIES THE CHAPTER TOGETHER

- Plants began in water, where sperm could simply swim to the egg.
- Moving onto land created two problems: **support** and **water for fertilisation**.
- Vascular tissue solved support, and it arrives with the pteridophytes.
- Pollen solved the water problem, and it arrives with the **gymnosperms**.
- Read every group as an answer to one of those two problems.



THINK IT  
THROUGH

## 2 Algae

- Simple, mostly aquatic plants. The body is a **thallus**, with no true root, stem or leaf.
- Reproduction can be vegetative (fragmentation), asexual (spores) or sexual.
- Sexual reproduction runs from **isogamous** (both gametes alike) to **anisogamous** (different sizes) to **oogamous** (large still egg, small motile sperm).
- Economic value: about half of all photosynthesis on Earth, plus agar, algin and carrageenan.

### THE THREE ALGAL CLASSES: PIGMENT DECIDES THE COLOUR

| CHLOROPHYCEAE (green)                                                             | PHAEOPHYCEAE (brown)                                                              | RHODOPHYCEAE (red)                                                                  |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|  |  |  |
| pigment <b>chlorophyll a, b</b>                                                   | pigment <b>chl a, c + fucoxanthin</b>                                             | pigment <b>chl a, d + r-phycoerythrin</b>                                           |
| stored food <b>starch</b>                                                         | stored food <b>mannitol, laminarin</b>                                            | stored food <b>floridean starch</b>                                                 |
| cell wall <b>cellulose</b>                                                        | cell wall <b>cellulose + algin</b>                                                | cell wall <b>cellulose + pectin</b>                                                 |
| flagella <b>2 to 8, equal</b>                                                     | flagella <b>2, unequal, lateral</b>                                               | flagella <b>ABSENT</b>                                                              |
| <i>Chlamydomonas, Volvox, Ulothrix</i>                                            | <i>Laminaria, Fucus, Sargassum</i>                                                | <i>Polysiphonia, Gelidium</i>                                                       |

The three classes side by side. Pigment sets the colour, and the stored food is the fact most often asked.

### THE FOUR FACTS EXAMINERS ASK FROM THIS TABLE

- Red algae have NO flagella** at any stage. That single fact appears again and again.
- Stored food: green stores **starch**, brown stores **mannitol and laminarin**, red stores **floridean starch**.
- Fucoxanthin** makes brown algae brown. **r-phycoerythrin** makes red algae red.
- Brown algae have two unequal flagella, attached at the **side**, not at the tip.



TRAP ALERT



▶ PLAY

### ALGAE ALL BLURRING TOGETHER?

Sort them by pigment and watch the colours separate.

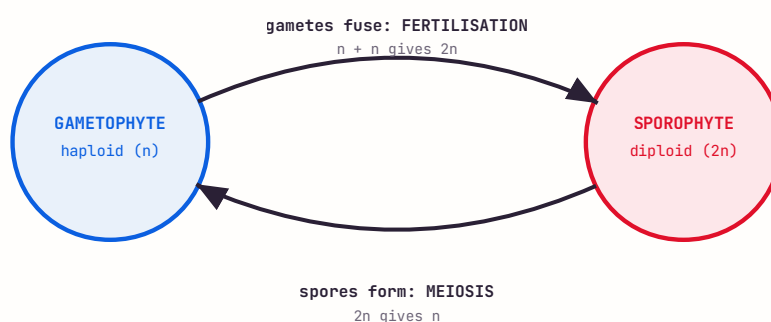
The classification game deals you an alga and asks for its class, pigment and food store. Three rounds and the table sticks. [logicbloom.co.in/download](https://logicbloom.co.in/download) · Free to start.



SCAN

- Every plant alternates between two bodies: a haploid **gametophyte** and a diploid **sporophyte**.
- **Fertilisation** joins two gametes and doubles the number, giving  $2n$ .
- **Meiosis** makes spores and halves it again, giving  $n$ .
- Which of the two bodies dominates is what separates the groups.

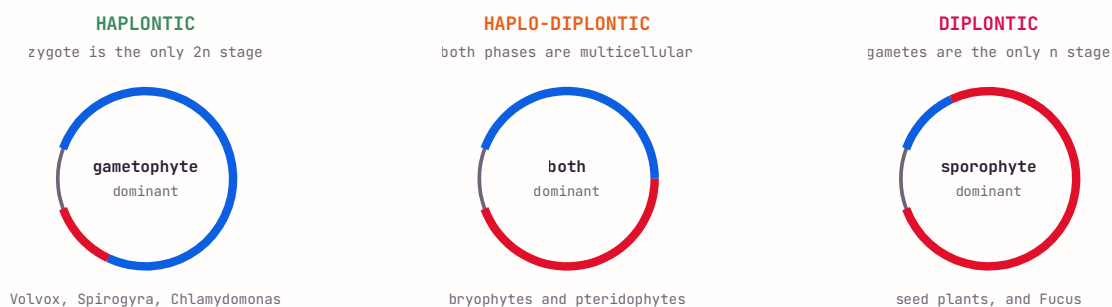
#### ALTERNATION OF GENERATIONS: THE ENGINE OF EVERY PLANT LIFE CYCLE



Fertilisation doubles the number. Meiosis halves it. The cycle simply repeats.

*The whole cycle in one picture. Fertilisation doubles, meiosis halves, and it repeats.*

#### THREE LIFE CYCLES. BLUE IS HAPLOID ( $n$ ), RED IS DIPLOID ( $2n$ )



Moving right, the diploid sporophyte takes over more and more of the life cycle.

*Three patterns. Moving right, the diploid sporophyte takes over more of the life cycle.*



THINK IT  
THROUGH

#### HOW TO ANSWER ANY LIFE CYCLE QUESTION

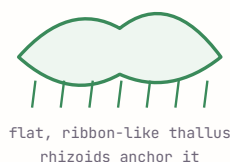
- Ask one thing: which body is the **bigger, longer-lived** one?
- If the gametophyte wins, it is **haplontic** (algae) or **haplo-diplontic** (bryophytes).
- If the sporophyte wins, it is **haplo-diplontic** (pteridophytes) or **diplontic** (seed plants).
- **Fucus is the exception:** a brown alga with a diplontic cycle, like a seed plant.

## Bryophytes

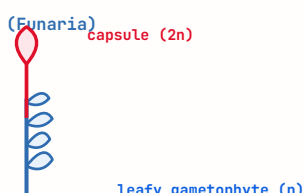
- Mosses and liverworts. They live on land but still depend on water, which is why they are called the amphibians of the plant world.
- The plant body is the **gametophyte**. It has no true roots, stems or leaves.
- **No vascular tissue at all**, so they stay small and grow in damp, shady places.
- The **sporophyte** is smaller, and it stays attached to the gametophyte and draws food from it.

### BRYOPHYTES: THE AMPHIBIANS OF THE PLANT WORLD

LIVERWORT (*Marchantia*)



MOSS (*Funaria*)



upright, with tiny leaf-like structures

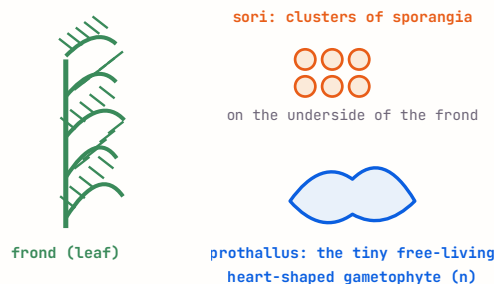
The **GAMETOPHYTE** is the main plant. The sporophyte is smaller and stays attached to it, drawing nourishment from it. Water is still needed to carry the sperm to the egg.  
**No true roots, stems or leaves, and no vascular tissue.**

*A liverwort spreads flat. A moss stands upright. In both, the green plant you see is the gametophyte.*

- Liverworts reproduce asexually by **gemmae**, held in cup-shaped gemma cups.
- The moss sporophyte has three parts: foot, seta and capsule.
- Ecological value: they are the first to colonise bare rock, and they slow soil erosion.
- **Sphagnum** (peat moss) is used as packing material for sending live plant material.

- Ferns and their relatives. These are the **first plants with vascular tissue**, so xylem and phloem appear here.
- They have true **roots, stems and leaves**, which bryophytes never had.
- The **sporophyte** is now the main plant. This is the big switch in the chapter.
- The gametophyte is a small, free-living, heart-shaped **prothallus**.

## PTERIDOPHYTES: THE FIRST PLANTS WITH PLUMBING



### WHAT IS NEW HERE

true roots, stem and leaves  
xylem and phloem appear  
sporophyte is now DOMINANT  
gametophyte is small and free  
still needs water for sperm  
spores, but no seeds yet

*The fern you recognise is the sporophyte. The gametophyte is the tiny separate prothallus.*

- Spores are made in **sporangia**, which are grouped into **sori** under the leaf.
- **Homosporous** means one kind of spore. **Heterosporous** means two kinds, large and small.
- **Selaginella and Salvinia are heterosporous**, and that is the fact most often asked.
- Heterospory is important because it is the first step towards the seed habit.

### WATER IS STILL THE LIMIT

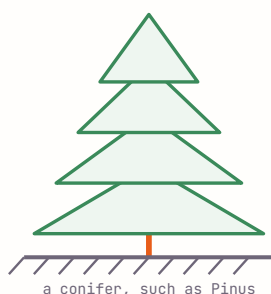
- Pteridophytes solved support, but not reproduction.
- The sperm still has to **swim** to the egg, so a film of water is essential.
- This is why ferns still grow in cool, damp, shady places despite having plumbing.
- The next group solves exactly this problem.



TRAP ALERT

- The **first seed plants**. The seed is the big idea: a young plant packed with food inside a coat.
- **Gymno** means naked and **sperma** means seed. The seeds sit exposed on the cone scales, with no fruit wall around them.
- There is no ovary, so there can be no true fruit.
- Pollen is carried by **wind**, so **no water is needed** for fertilisation. This finally frees plants from damp places.

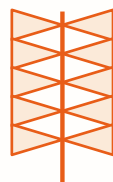
## GYMNOSPERMS: SEEDS, BUT LEFT UNCOVERED



male cone  
tiny, makes pollen



female cone  
seeds sit naked on the scales



## KEY POINTS

- naked seeds, no fruit wall
- no ovary, so no true fruit
- pollen is carried by WIND
- no water needed for fertilisation
- xylem has no vessels
- phloem has no companion cells
- mostly needle leaves, thick cuticle

*Male cones make pollen. Female cones carry the naked seeds. Wind does the rest.*

- Usually tall trees with a thick, woody stem. Leaves are often needle-like with a thick cuticle, which cuts water loss.
- **Xylem has no vessels** and **phloem has no companion cells**. This is a favourite one-mark question.
- They are heterosporous: microspores give pollen, megaspores stay in the ovule.
- Examples: **Pinus**, **Cycas**, **Ginkgo**, and **Cedrus**.

### ONE TABLE THAT ANSWERS MOST PLANT KINGDOM QUESTIONS

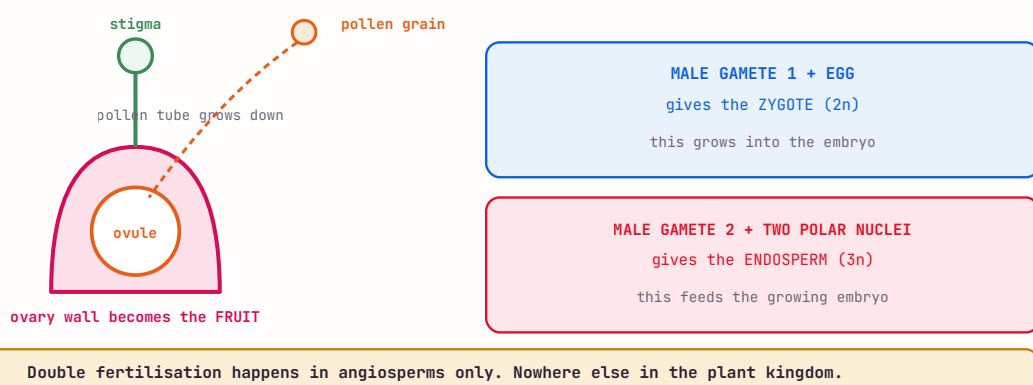
| FEATURE               | ALGAE       | BRYOPHYTES      | PTERIDOPHYTES   | GYMNOSPERMS    |
|-----------------------|-------------|-----------------|-----------------|----------------|
| Vascular tissue       | absent      | absent          | PRESENT         | present        |
| Dominant phase        | gametophyte | gametophyte     | sporophyte      | sporophyte     |
| True roots            | absent      | absent          | present         | present        |
| Water for fertilising | yes         | yes             | yes             | NO             |
| Seeds                 | absent      | absent          | absent          | PRESENT, naked |
| Life cycle            | haplontic   | haplo-diplontic | haplo-diplontic | diplontic      |

Red marks the first appearance of a feature. That is where the questions cluster.

One table for the whole chapter. Red marks where a feature first appears, which is where questions cluster.

- The flowering plants. The seed is now **enclosed** inside a fruit, which is what the name means.
- The flower is the reproductive structure. The ovary ripens into the fruit.
- They are split into **dicots** (two cotyledons, net-veined leaves, tap root) and **monocots** (one cotyledon, parallel veins, fibrous root).
- They range from the tiny **Wolffia** to the giant **Eucalyptus**.

#### ANGIOSPERMS: THE SEED GETS A COVER, AND FERTILISATION HAPPENS TWICE



*Two fusions happen, not one. That is double fertilisation, and it is unique to this group.*

#### DOUBLE FERTILISATION, AND THE NUMBERS THAT GO WITH IT

- One male gamete fuses with the egg to give the **zygote,  $2n$** , which becomes the embryo.
- The other fuses with two polar nuclei to give the **endosperm,  $3n$** , which feeds the embryo.
- **$3n$  is the number to remember.** Answering  $2n$  for the endosperm is the standard slip.
- This double event happens in angiosperms only, nowhere else in the plant kingdom.



TRAP ALERT

# ★ Plant Kingdom • Fact Sheet

Every formula for revision day. Print this page alone.

## ALGAE, GREEN

### Chlorophyll a and b

Starch. Cellulose wall.  
Chlamydomonas, Volvox,  
Ulothrix.

## ALGAE, BROWN

### Fucoxanthin gives the colour

Mannitol and laminarin.  
2 unequal lateral flagella.

## ALGAE, RED

### r-phycoerythrin

Floridean starch.  
NO flagella at any stage.

## LIFE CYCLES

### Haplontic: algae

Haplo-diplontic: bryo, pterido  
Diplontic: seed plants, Fucus.

## BRYOPHYTES

### Gametophyte dominant

No vascular tissue, no true roots  
Sporophyte attached to it.

## BRYOPHYTE PARTS

### Sporophyte: foot, seta, capsule

Gemmae in gemma cups  
Sphagnum gives peat.

## PTERIDOPHYTES

### First VASCULAR plants

Sporophyte dominant  
Prothallus is the gametophyte.

## HETEROSPORY

### Two spore sizes

Selaginella and Salvinia  
First step to the seed.

## GYMNOSPERMS

### Naked seeds, no ovary, no fruit

Wind pollinated, no water needed  
Pinus, Cycas, Ginkgo, Cedrus.

## GYMNOSPERM TISSUE

### Xylem has NO vessels

Phloem has NO companion cells  
Needle leaves, thick cuticle.

## ANGIOSPERMS

### Seed enclosed in a fruit

Dicot: 2 cotyledons, net veins  
Monocot: 1, parallel veins.

## DOUBLE FERTILISATION

### Gamete + egg = zygote (2n)

Gamete + 2 polar nuclei = 3n  
Angiosperms ONLY.



# Logic Bloom

---

*The simplest way to learn science.*

logicbloom.co.in



★ PLANT GROUPS STILL RUNNING TOGETHER?

## Play it. Then **practice it.**

Open Plant Kingdom in the Logic Bloom app. Sort the algae by pigment, walk a life cycle from spore to spore, then drill the comparison table until every row is automatic. Free to start.

SCAN → PLAY · READ · PRACTICE