Go to the "Slide Show" shade above

Click on "Play from Beginning"

Kingdom PLANTAE

Chapters 24 & 25

WARM-UP

Distinguishing Kingdoms

What is the one major difference between viruses, bacteria, protists and fungi (related to life)?

Of bacteria, protists and fungi, which are prokaryotic and eukaryotic?

Why are fungi not considered plants?

What two types of organisms exist related to food production?

WARM-UP

Distinguishing Kingdoms

What is the one major difference between viruses, bacteria, protists and fungi (related to life)?

- Viruses are non-living; the other kingdoms are living.

Of bacteria, protists and fungi, which are prokaryotic and eukaryotic?

- Bacteria are prokaryotic (no membranes); protists and fungi are eukayotic (organelles, nuclear membrane).

Why are fungi not considered plants?

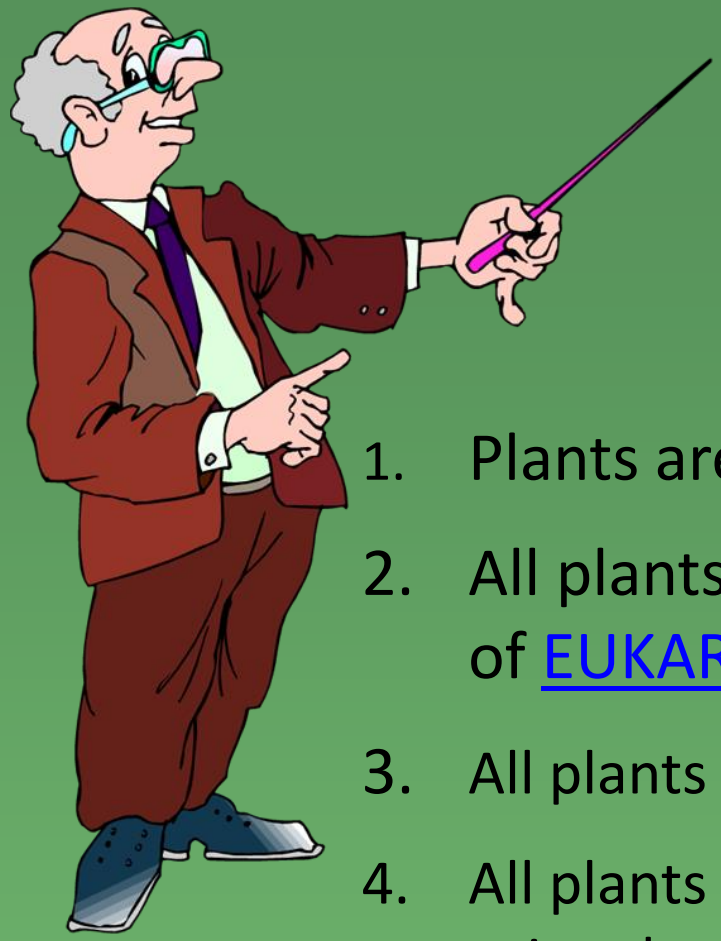
- Fungi do NOT have vascular tissue (xylem and phloem).

What two types of organisms exist related to food production?

- Heterotrophs cannot make their own food (Fungi, Animals). Consumers.
- Autotrophs can make their own food (some bacteria, protists, all plants). Producers.

WARM-UP

What is a Plant?

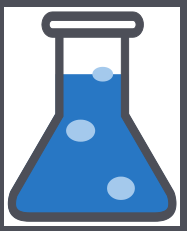


WARM-UP

What is a Plant?

1. Plants are members of the Kingdom PLANTAE.
2. All plants are MULTICELLULAR and are composed of EUKARYOTIC cells.
3. All plants have CELL WALLS composed of CELLULOSE.
4. All plants carry out PHOTOSYNTHESIS (Autotrophs) using the green pigment, chlorophyll.
5. Life Cycle exhibits Alternation of Generations.
6. Plant Embryo is protected.

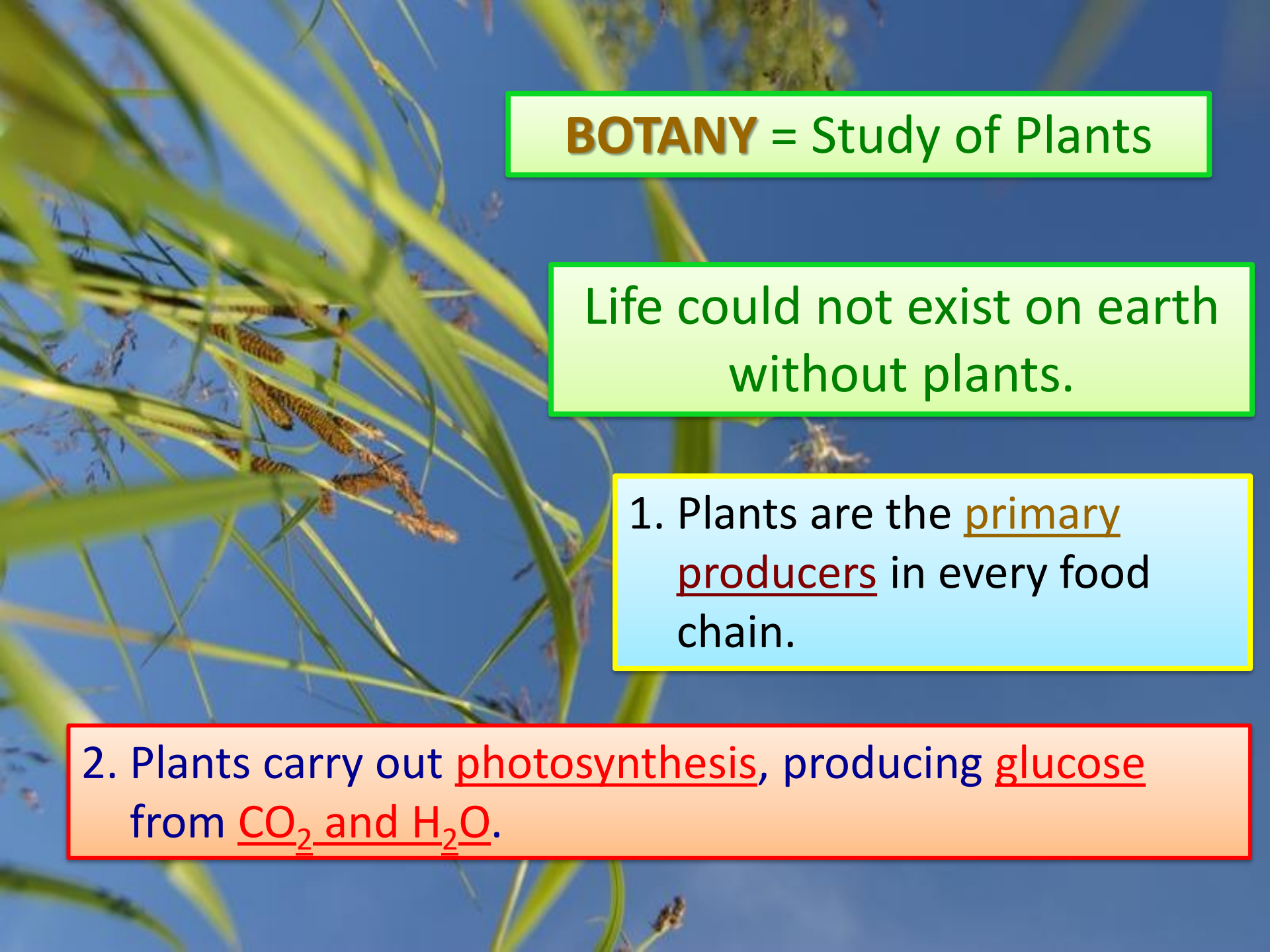
Lesson Objectives



By the end of this lesson, you should be able to:

- Explain the importance of plants and their general life cycle?
- Describe the taxonomic diversity of plants (bryophytes and tracheophytes).
- Distinguish characteristics of bryophytes (gametophytes, rhizoids, etc.) and tracheophytes (seedless, seeds, cones, flowers, cotyledons).
- Understand the basic tissues found in all tracheophytes and how plants grow.
- Learn to use a dichotomous key to identify plants (trees).

- **Science Practice:** Lab **Tree Identification – Dichotomous Key**

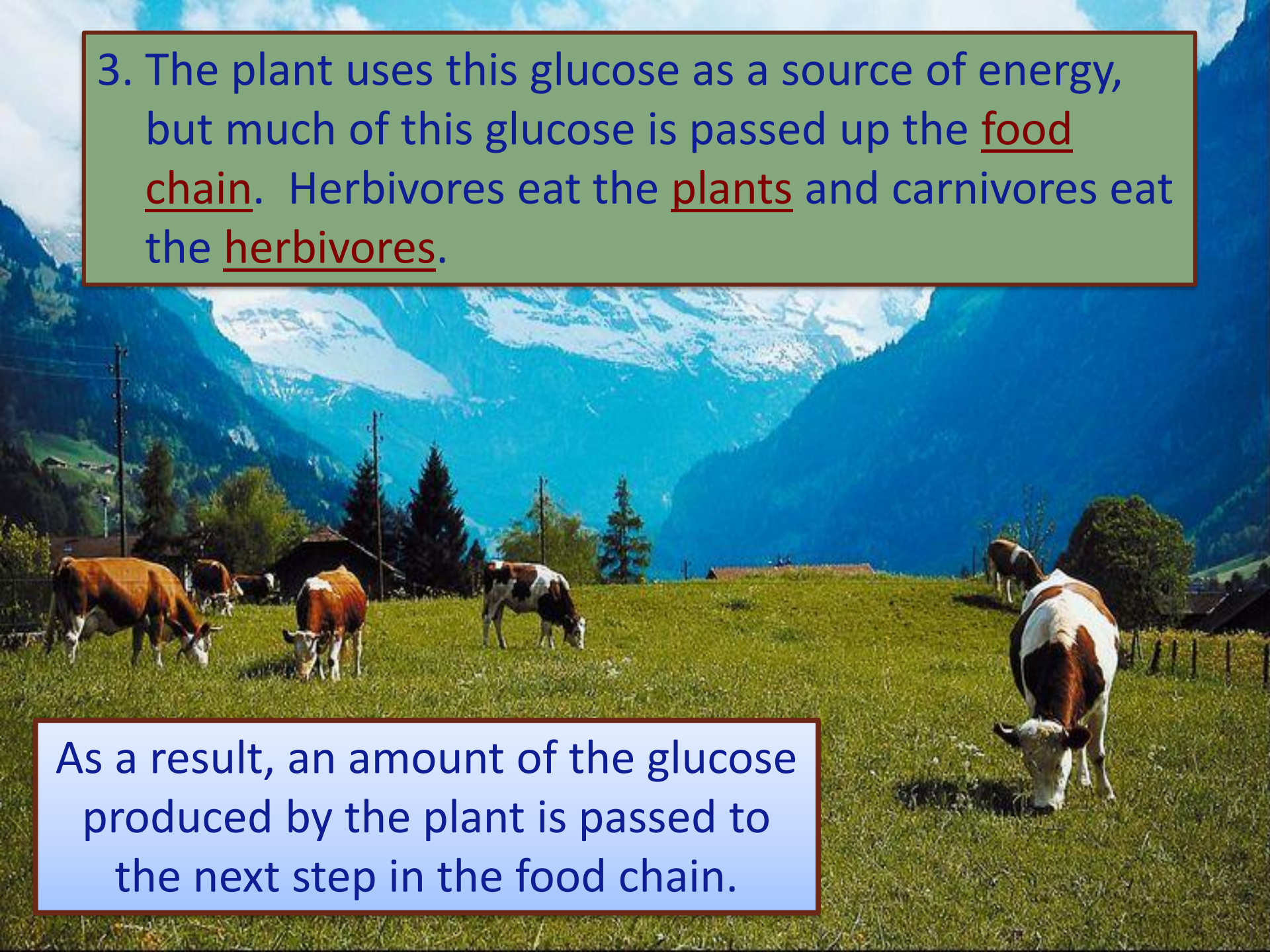


BOTANY = Study of Plants

Life could not exist on earth without plants.

1. Plants are the primary producers in every food chain.

2. Plants carry out photosynthesis, producing glucose from CO_2 and H_2O.



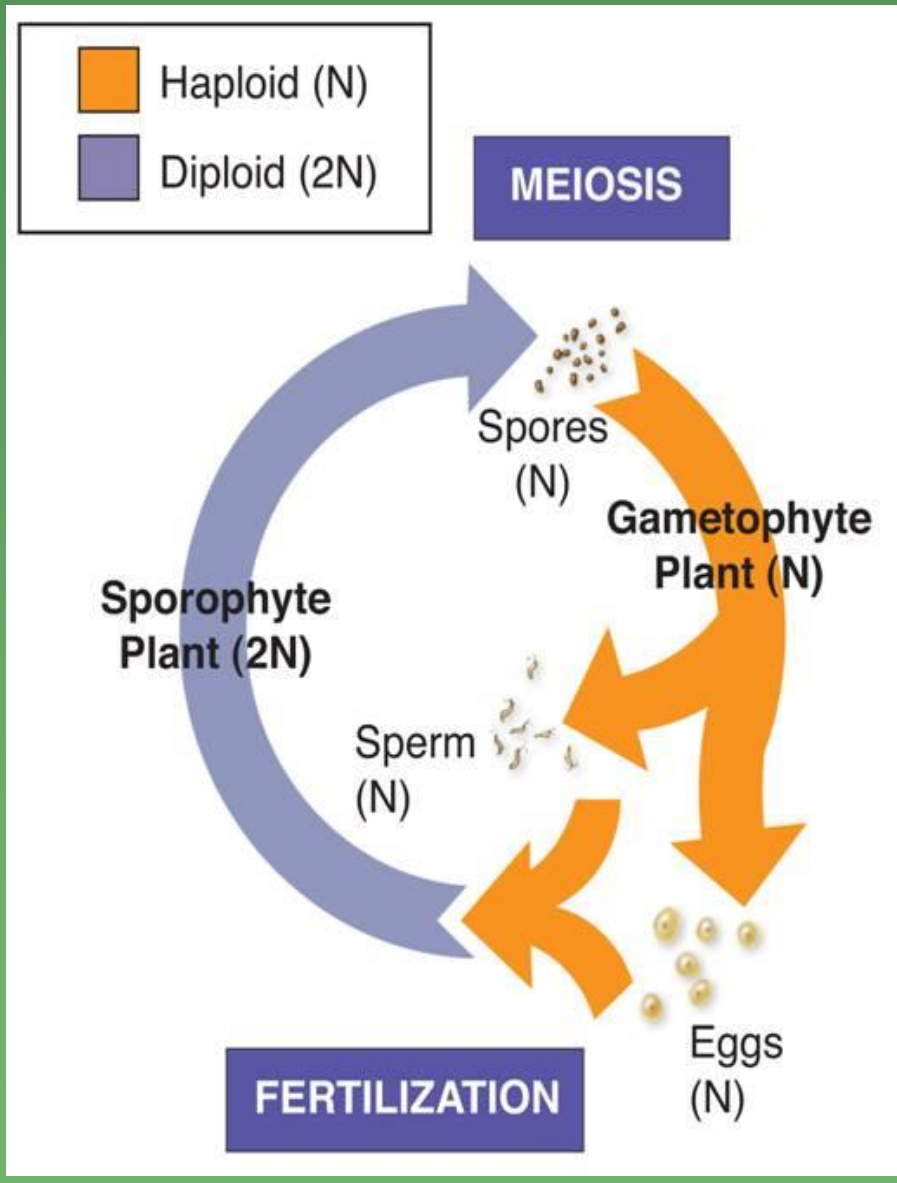
3. The plant uses this glucose as a source of energy, but much of this glucose is passed up the food chain. Herbivores eat the plants and carnivores eat the herbivores.

As a result, an amount of the glucose produced by the plant is passed to the next step in the food chain.

4. Not only do plants provide the base for food chains, they provide oxygen for animals as well as shelter and nesting sites.

Alternation of Generations

- All Plants exhibit **Alternation of Generations.**
- They have 2 different forms in which they exist:
  - **Sporophyte (spore producing) (diploid-2n)**
  - **Gametophyte (gamete-producing) (haploid-n)**



Alternation of Generations

- Diploid (2n) sporophyte stage produces haploid spores by meiosis.
- Haploid spores undergo mitosis to produce gametophyte stage.
- Gametophyte makes gametes (eggs and sperm) by mitosis.
- Fertilization: Zygote (2n) produces the new sporophyte (2n).

QUICK CHECK

1

2

3

4

5

6

7

8

9

10

Let’s summarize these details by filling in the flow chart

QUICK CHECK

Sporophyte Plant (2N)

Sporophyte plant produces spores by meiosis

Spores (1N)

Spores develop into new individuals called Gametophytes.

Gametophytes produce gametes by mitosis.

Egg (1N)

Sperm (1N)

Fertilization of gametes

Zygote 2N

The zygote develops into the sporophyte plant.

Let's summarize these details by filling in the flow chart

Plant Diversity

Creation of the Plant Kingdom

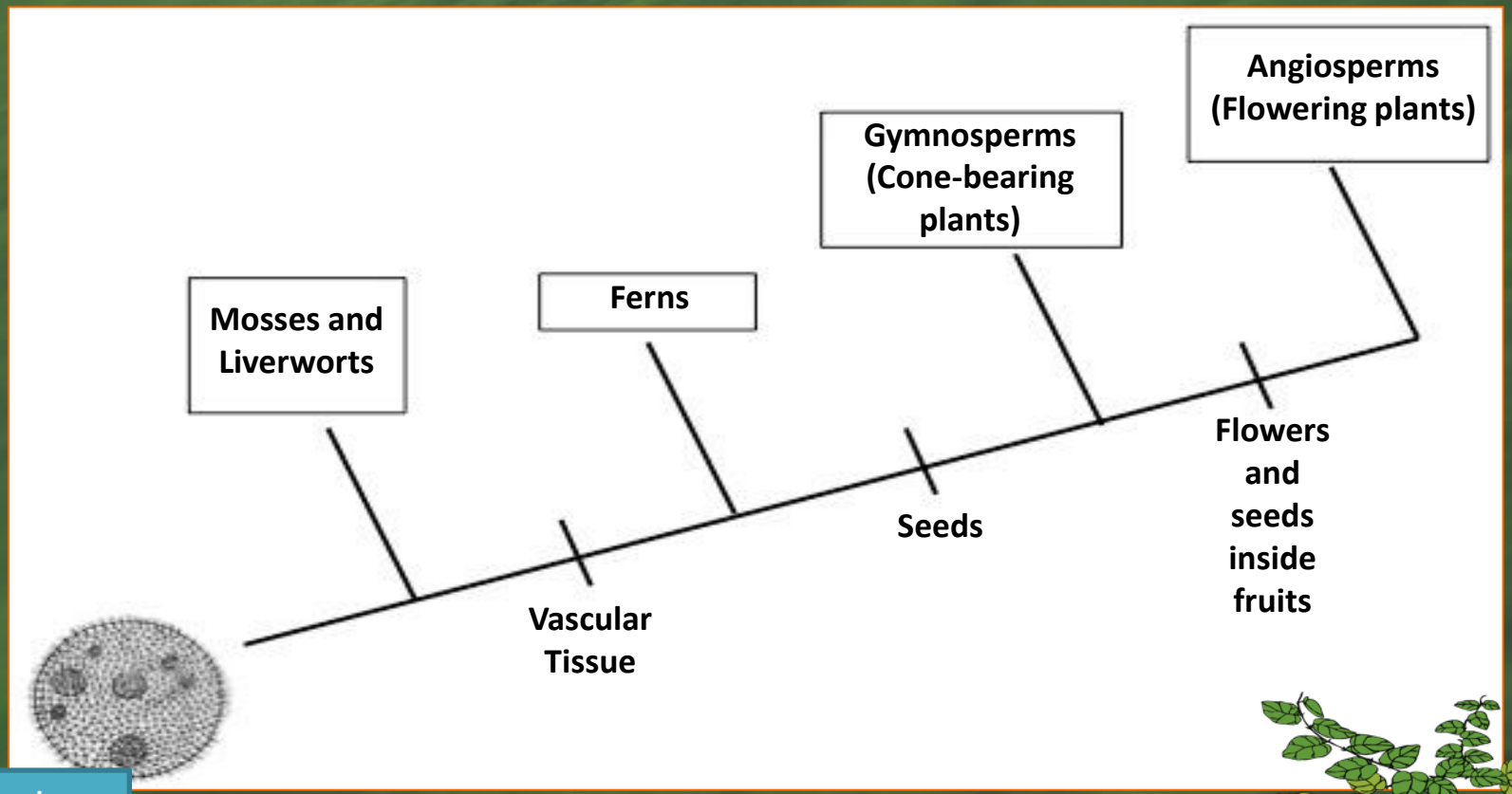
Genesis 1: 11-13

11 And God said, Let the earth
bring forth grass, the herb
yielding seed, and the fruit tree
yielding fruit after his kind, whose
seed is in itself, upon the earth:
and it was so.

12 And the earth brought forth
grass, and herb yielding seed after
his kind, and the tree yielding fruit,
whose seed was in itself, after his
kind: and God saw that it was
good.

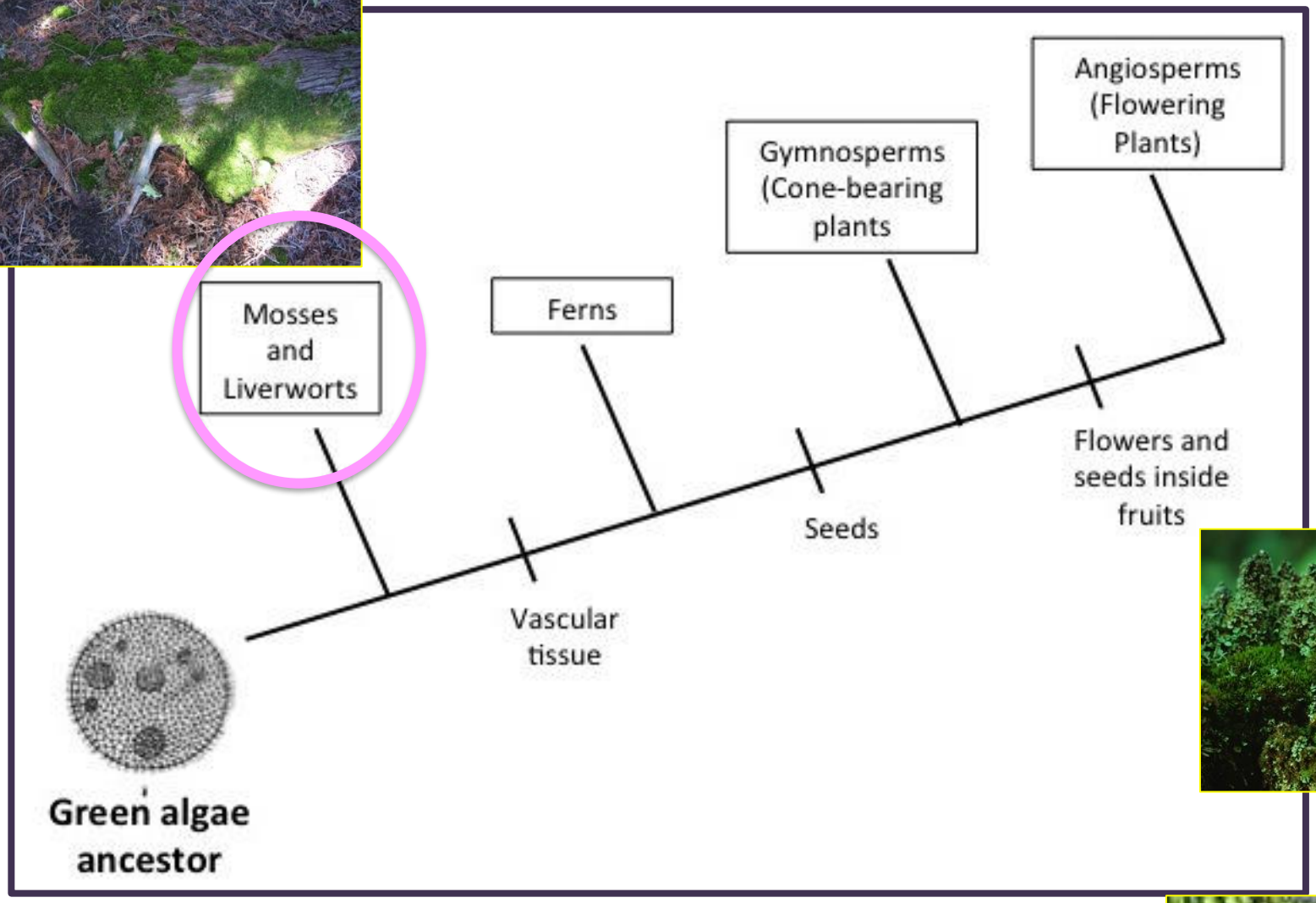
13 And the evening and the morning
were a third day."

"Ancestral" **Green (photosynthetic) Algae** are thought to have led to the evolution of 4 major groups of living land plants:



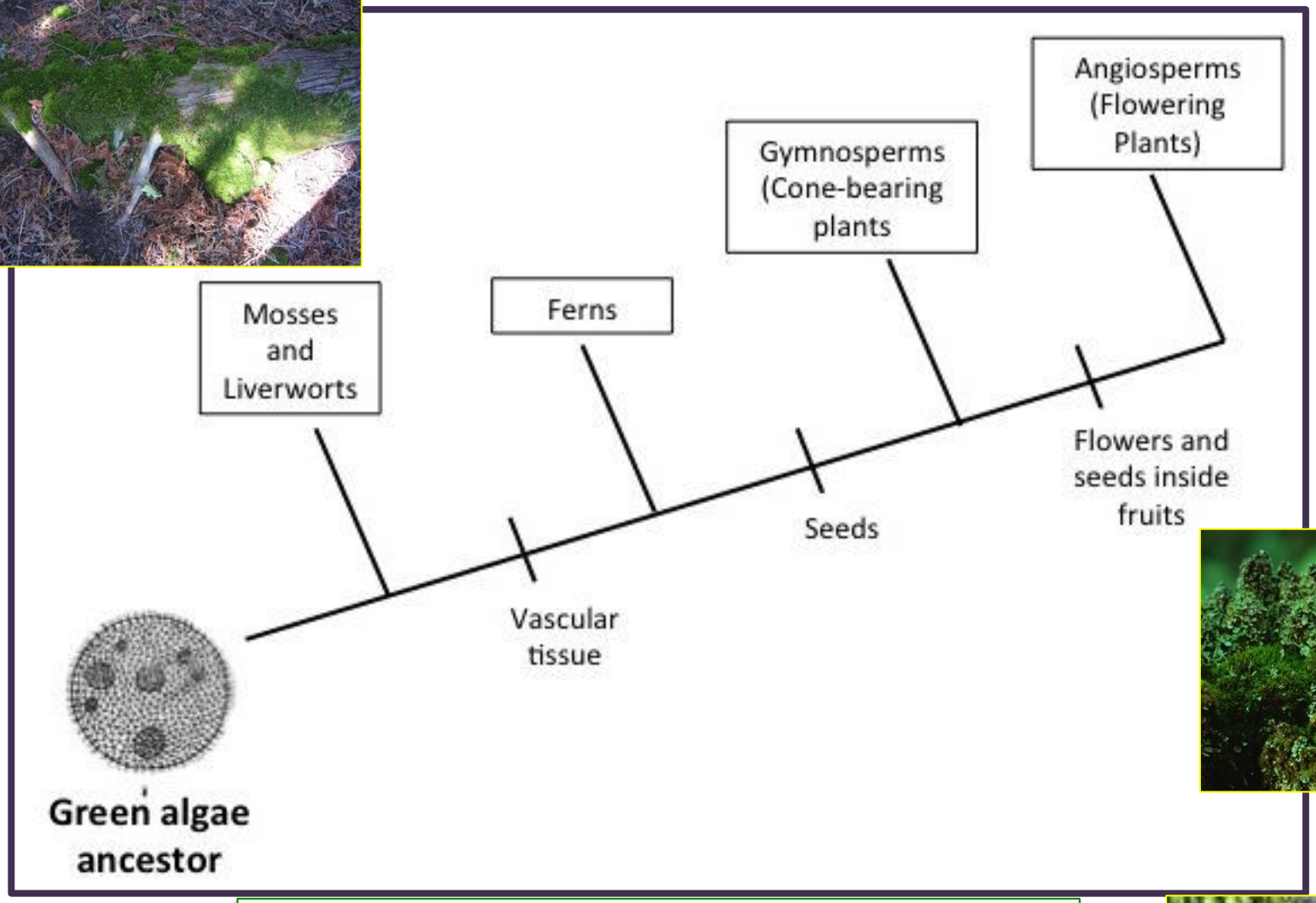
Green algae ancestor

TRY IT



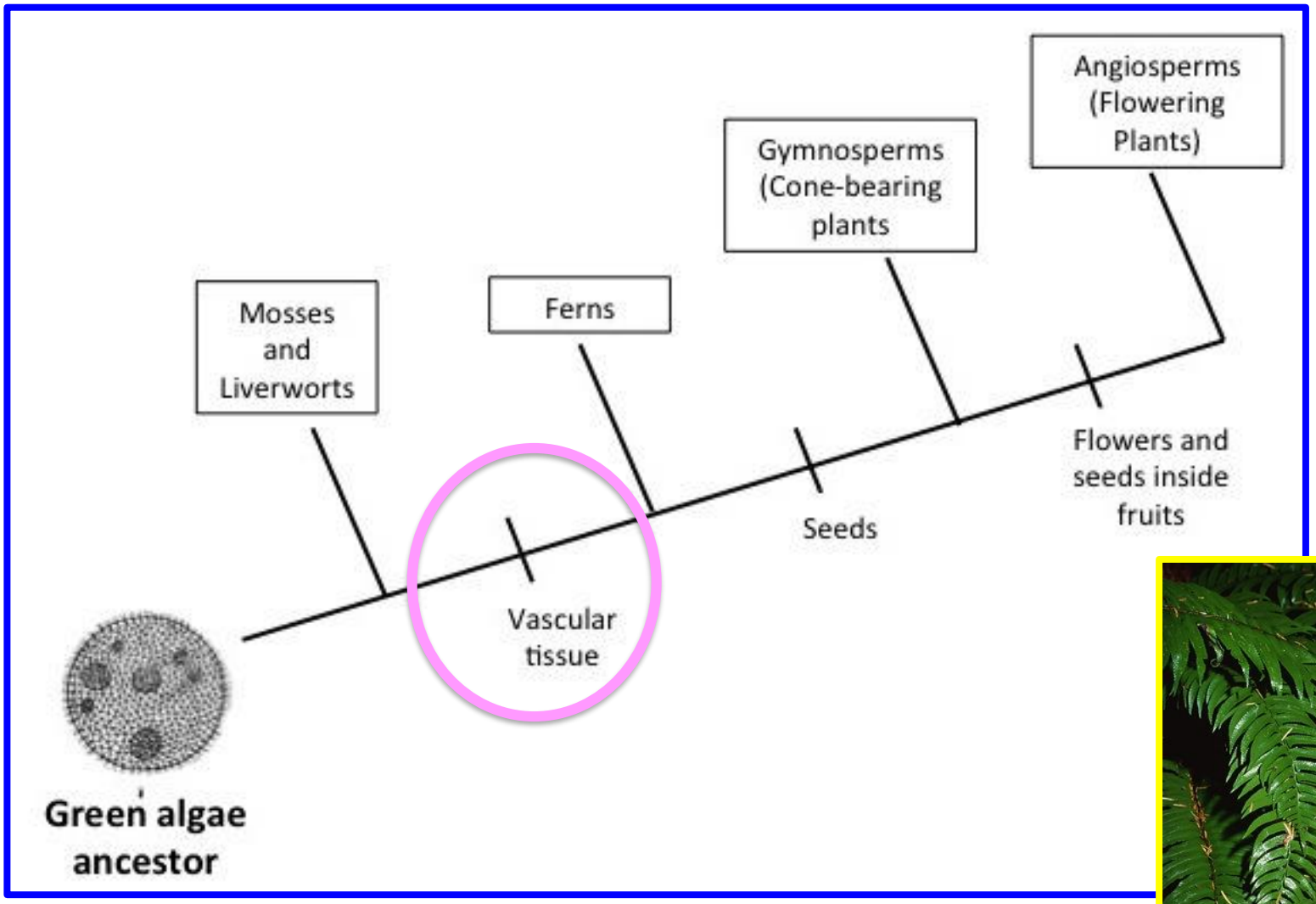
What group of plants was the first to “evolve” from the green algae ancestor (which are simplest)?

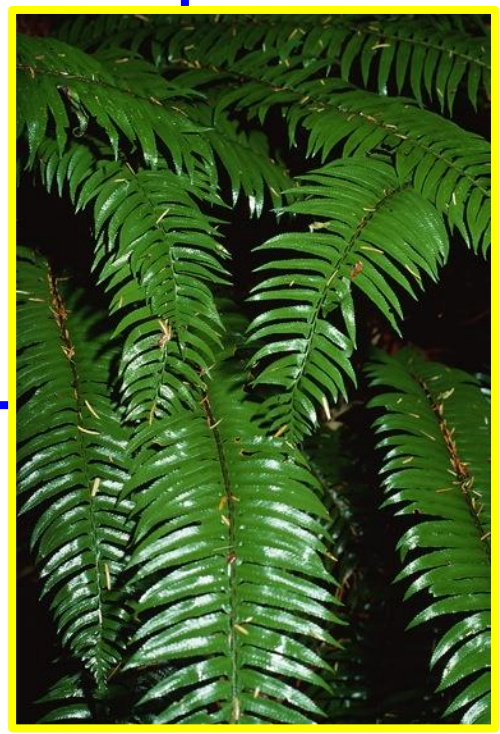
TRY IT



Do the mosses and liverworts have vascular tissue?

TRY IT

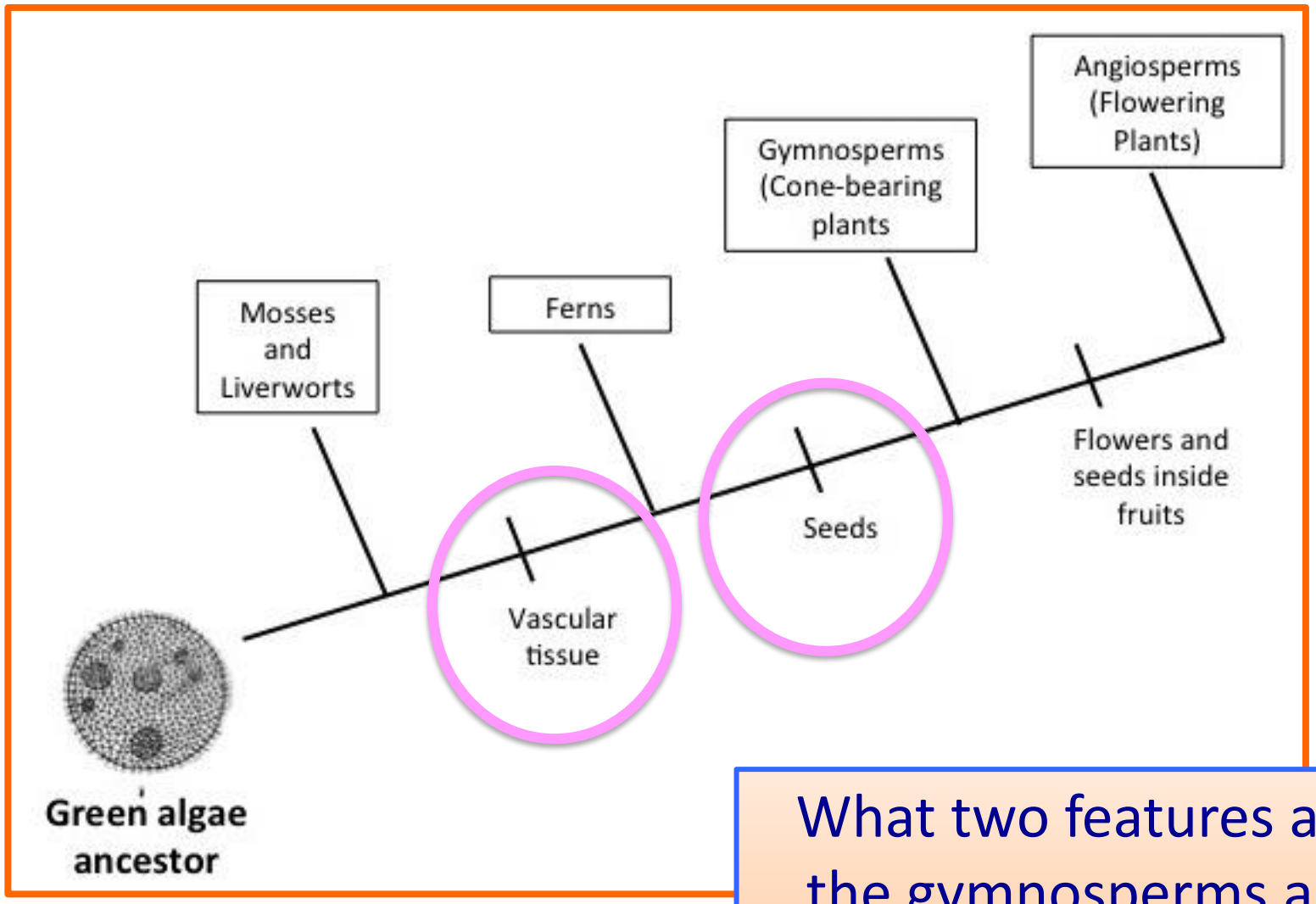




Do the ferns have vascular tissue?

Do the ferns have seeds?

TRY IT



What two features allowed the gymnosperms and the angiosperms to thrive in terrestrial environments?

TRY IT

Angiosperms (Flowering Plants)

Gymnosperms (Cone-bearing plants

Ferns

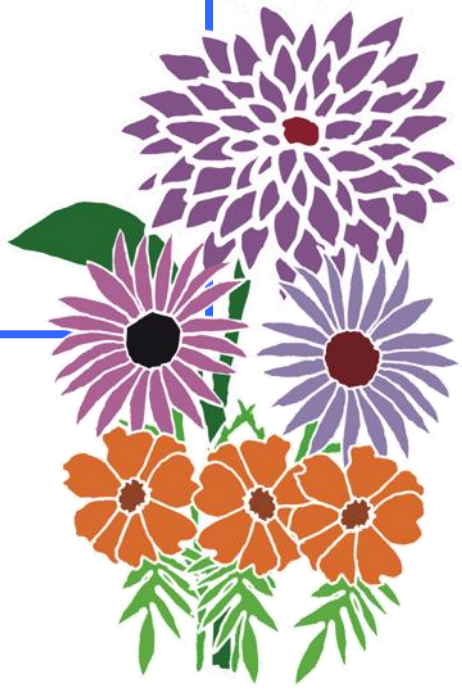
Mosses and Liverworts

Flowers and seeds inside fruits

Seeds

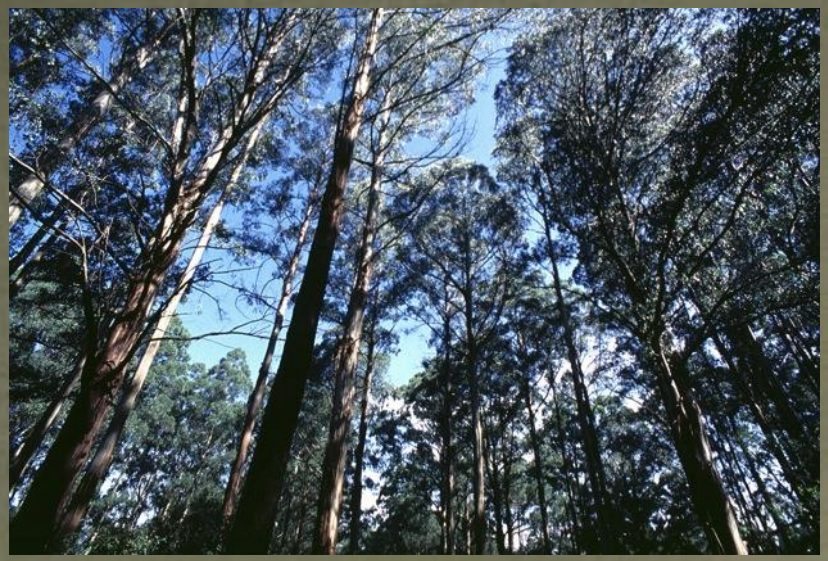
Vascular tissue

Green algae ancestor

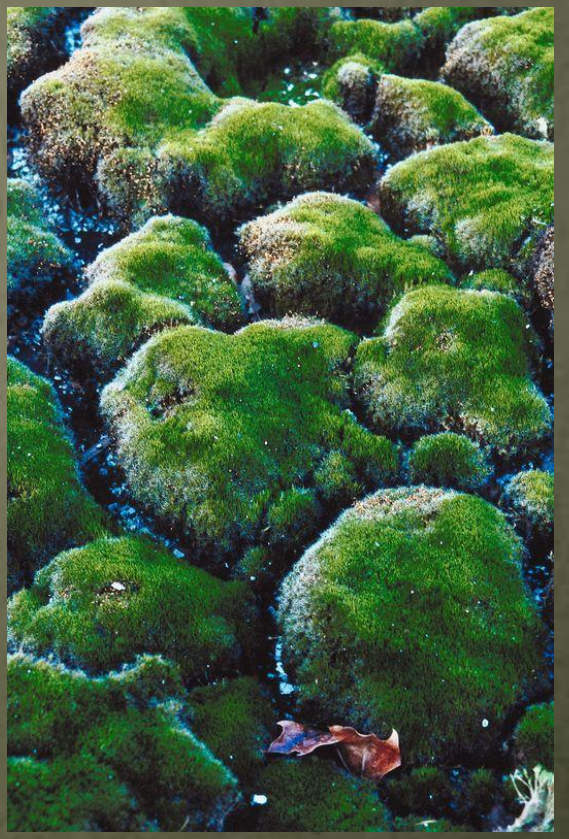


How are the angiosperms different than the gymnosperms?

Classification of Plants



All plants are either Vascular plants or Nonvascular plants.



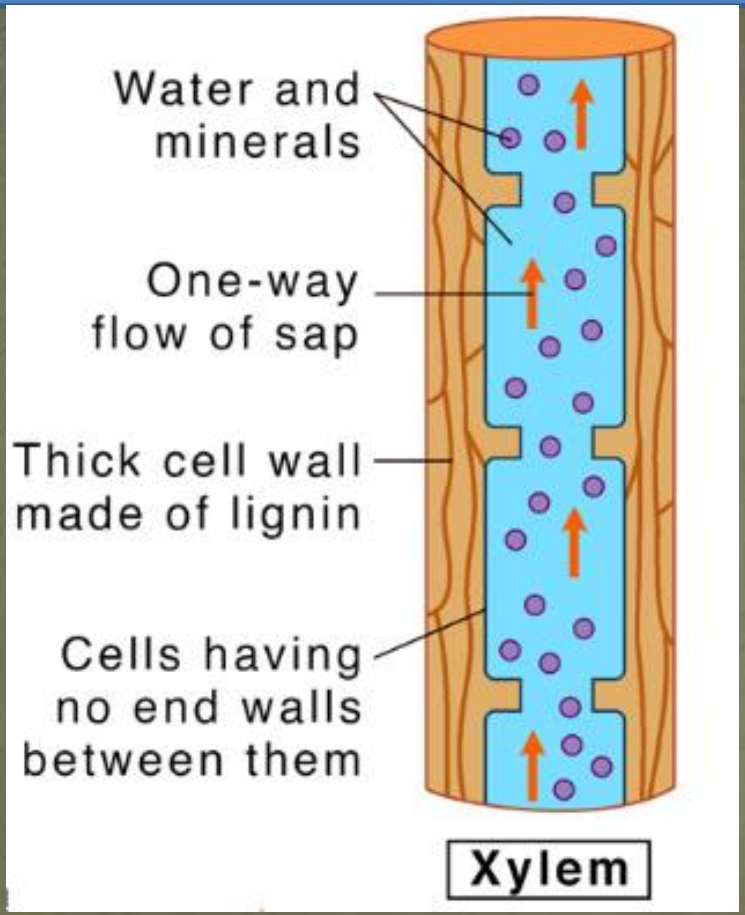
Vascular Plants have vascular tissue and Nonvascular Plants do not have vascular tissue.

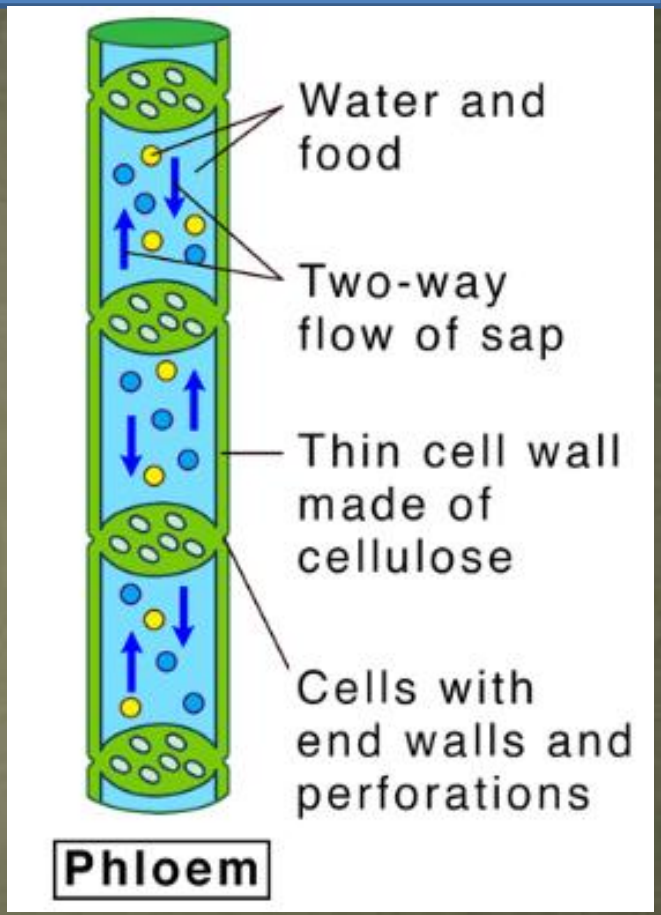
Vascular tissue is tissue that conducts food and water throughout the plant.

Classification of Plants

Xylem

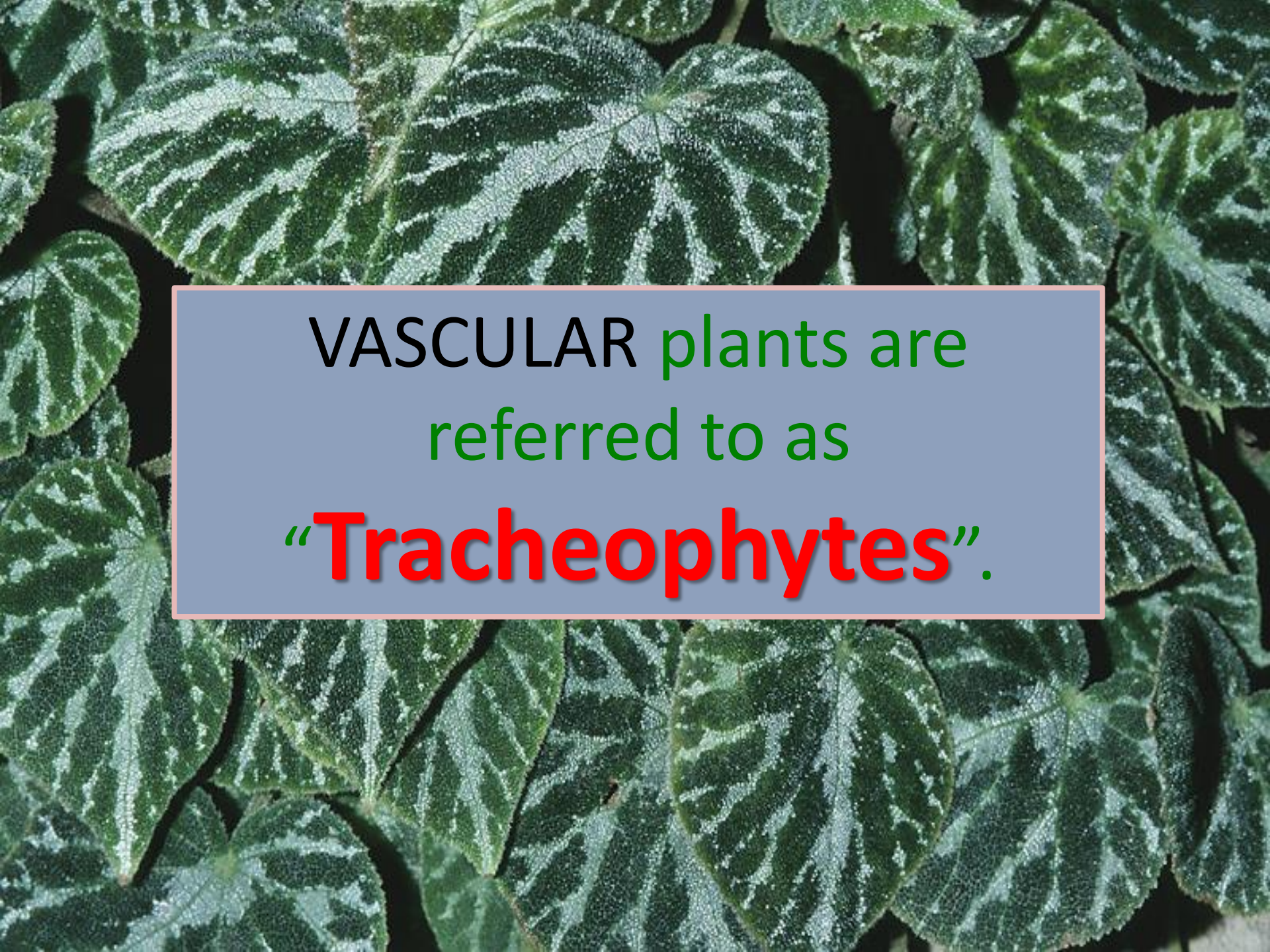
Carries water and minerals up the plant from the roots; consists of dead cells.





Phloem

Carries food (sugars) down the plant from the leaves; consists of living cells.


VASCULAR plants are
referred to as
“Tracheophytes”.

NONVASCULAR plants are referred to as

"**Bryophytes**."

They **DO NOT** have vascular tissue.

The bryophytes include **Mosses** and **Liverworts**.

Tracheophytes (Vascular Plants) are further subdivided into "Seed Plants" and "Seedless Plants".

The seedless plants do not produce seeds.
Seedless plants include the **Ferns**.

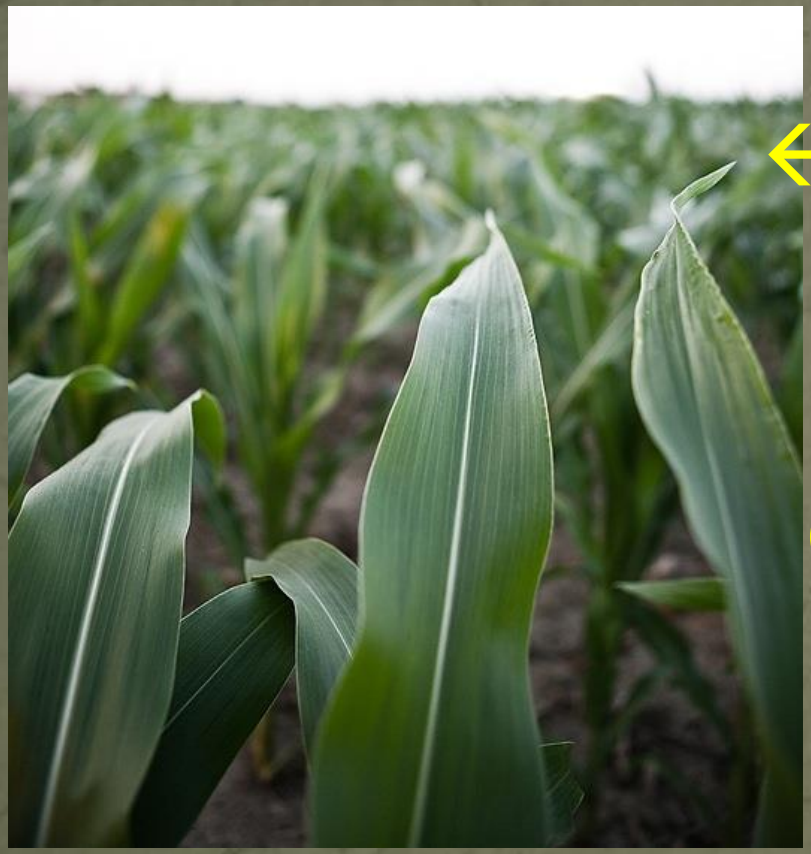
The seed plants do produce seeds.

The Seed Plants are divided into:
Angiosperms and Gymnosperms

Angiosperms are the Flowering Plants.

Gymnosperms are the Cone-bearing Plants.

The **Angiosperms** are divided into: **Monocots** and **Dicots**

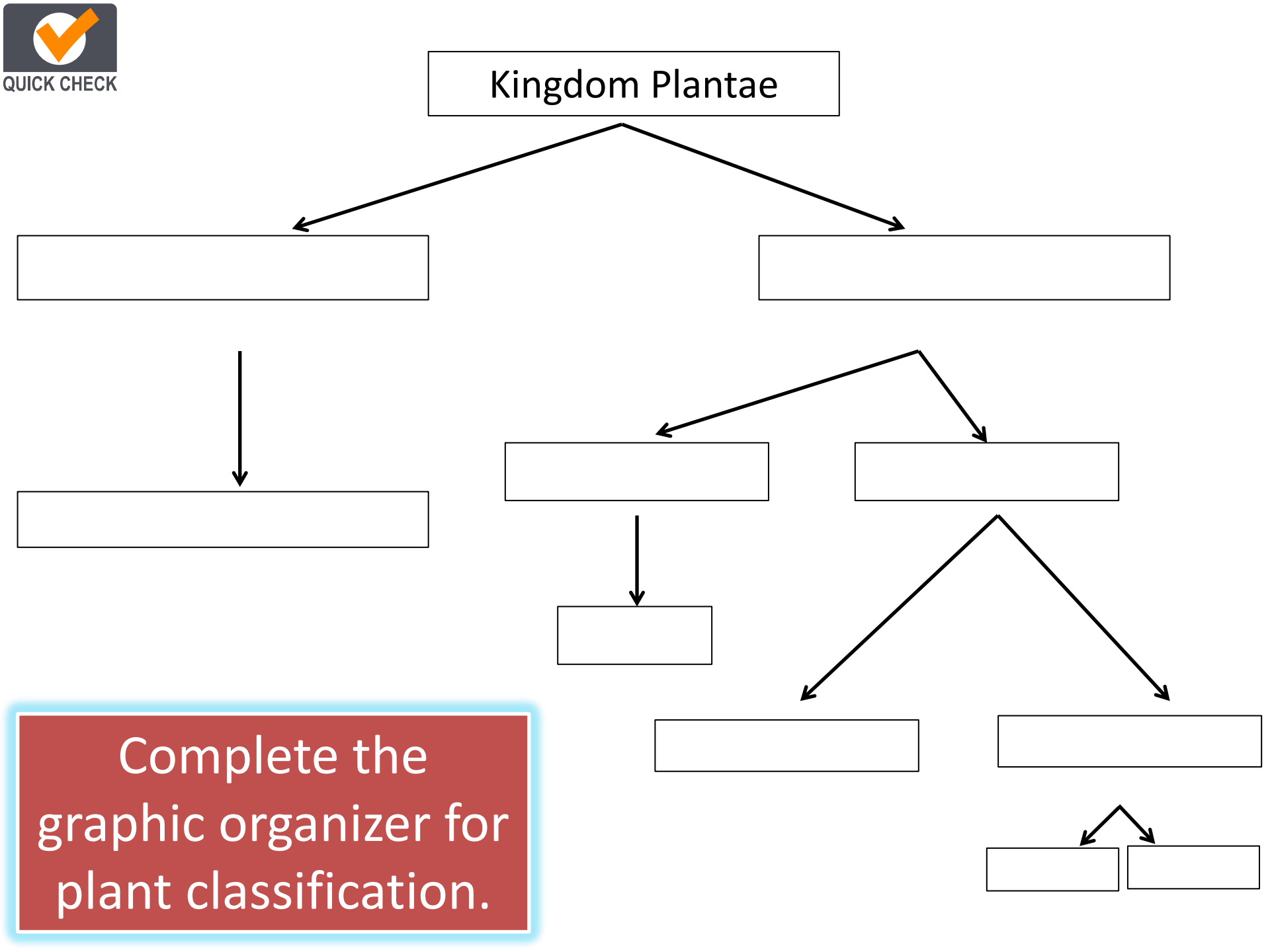


← Corn is a **Monocot.**

Oak trees are **Dicots.** →

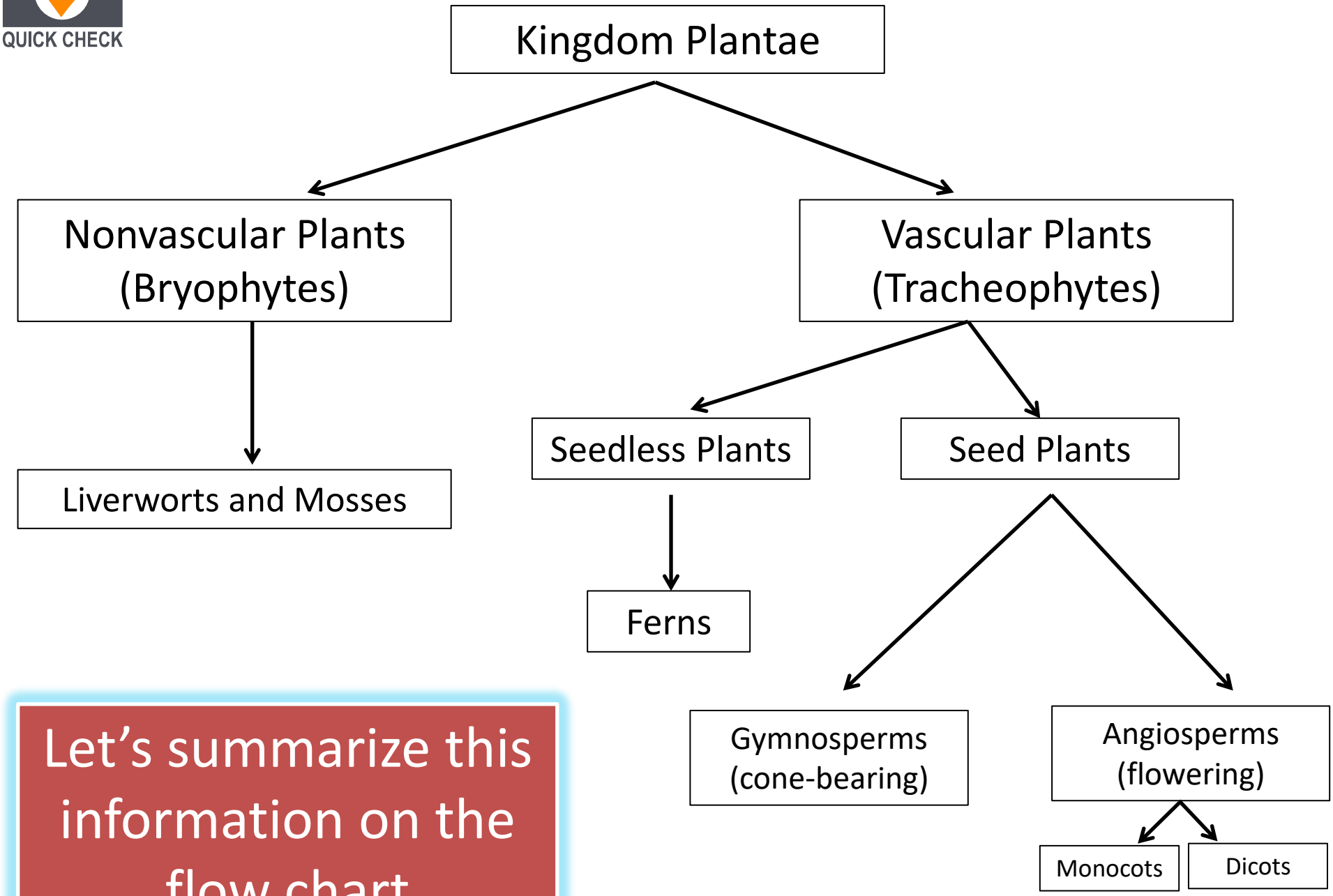
The differences between monocot and dicots will be discussed later in the Unit.

QUICK CHECK



Complete the graphic organizer for plant classification.

QUICK CHECK



Let's summarize this information on the flow chart

BRYOPHYTES…

- Bryophytes are **Nonvascular Plants**.
- This means they have **no…**

  … vascular tissue (xylem or phloem).
- These plants can draw up water by osmosis only a few centimeters above the ground.
- This prevents them from growing very big.
- Have Life Cycles dominated by **Gametophytes.**

Bryophytes include…..

Liverworts

Hornworts

Mosses

- Bryophytes produce **motile gametes**
- and must have **water** to reproduce.
- During part of their life cycle, they produce sperm that must swim
- through water to reach the egg.
- They must live in places where there is rainfall or dew for at least part of the year.

Bryophytes have **no… …true roots, stems and leaves.**

They have **Rhizoids**. Rhizoids are **root-like structures** that **anchor** the plant to the ground.

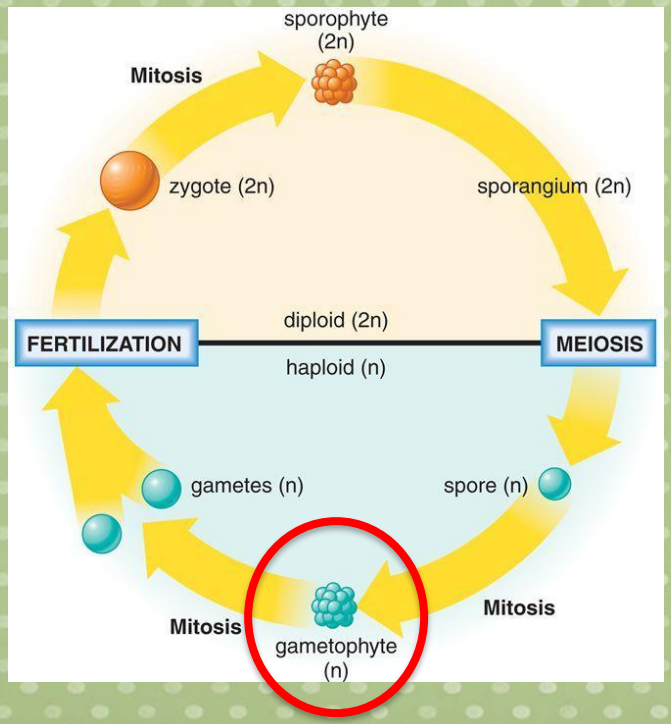
Rhizoids are capable of: **absorbing water and minerals from the soil.**

- **Water** moves from **cell to cell by osmosis**, through the **rhizoids,** and into the rest of the plant.
- This limits the **growth** of the plant.

Bryophytes are **small** and **grow close to the ground** because they have no way to transport water **large distances**.

Bryophytes show Alternation of Generations

In bryophytes, the **GAMETOPHYTE** (haploid) is the **dominant**, **recognizable** stage of the life cycle and is the stage that carries out most of the plant's **photosynthesis**.



As members of the plant kingdom, they do possess **chlorophyll** and carry out **photosynthesis**.

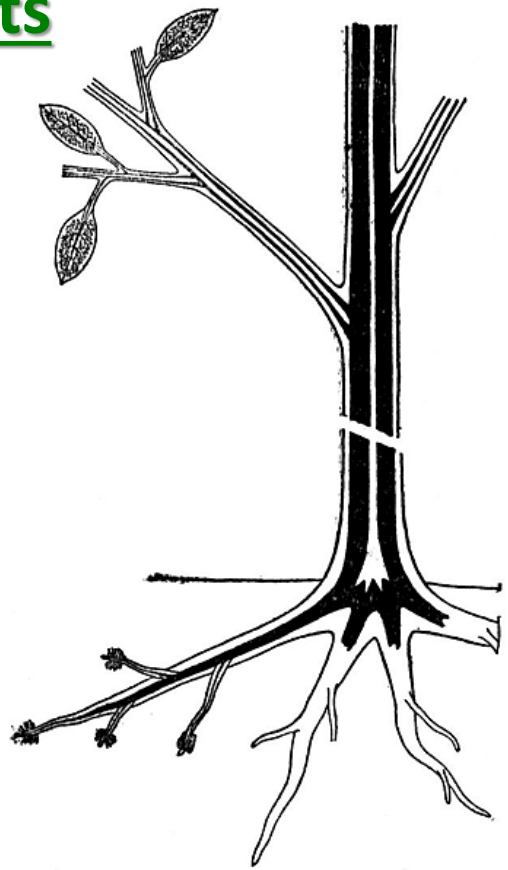
The Vascular Plants (Tracheophytes)

Transport system called Vascular Tissue.

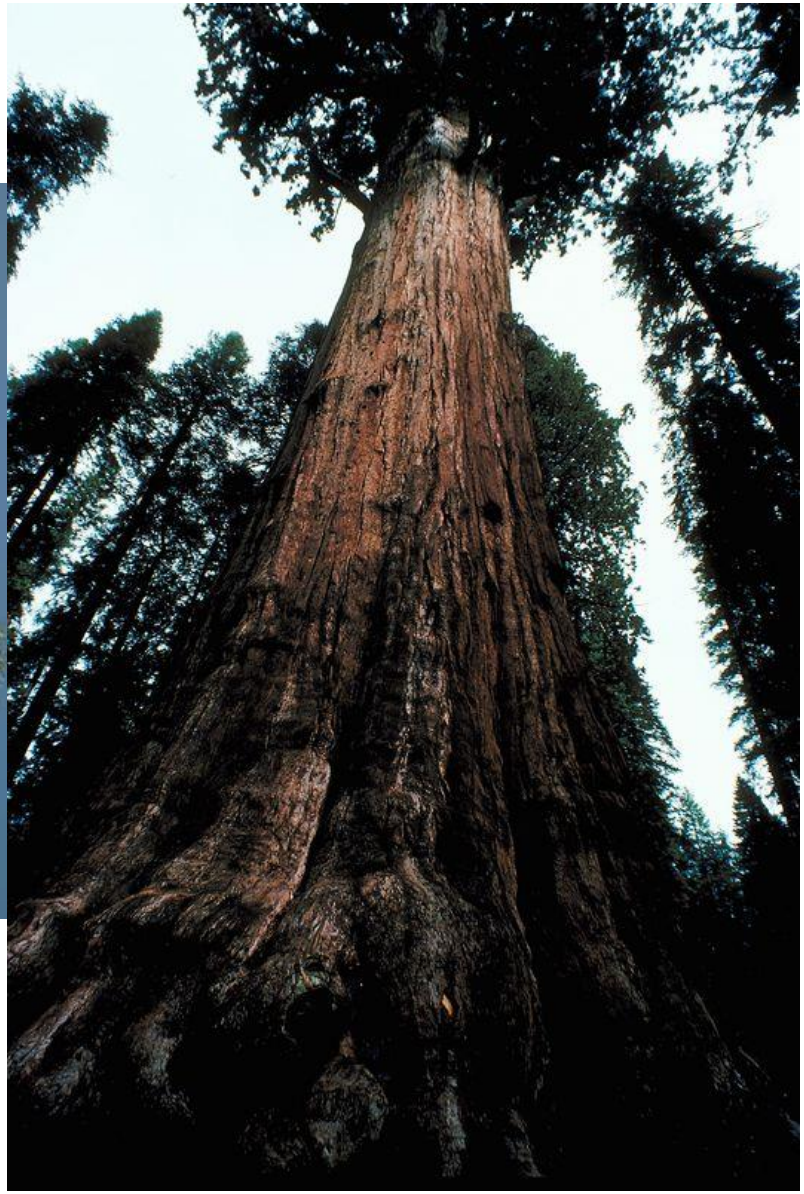
Vascular Tissue is specialized to conduct **Water and Nutrients** throughout the plant.

The two types of vascular tissue are:

XYLEM AND PHLOEM.



VASCULAR TISSUE enables plants to grow upward, away from the surface of the ground.



FERNS are SEEDLESS Vascular (Tracheophytes) plants

1. Ferns have true roots, stems and leaves.
2. The **SPOROPHYTE** (diploid) generation is dominant.
3. Ferns have vascular tissue (xylem and phloem).

4. Like the nonvascular plants, they have **motile, swimming sperm.**

Water must be present for the **fertilization of the Egg.**

The Seed Plants

SEEDED Vascular Plants (Tracheophytes):
Plants with the ability to form seeds.

The **Seed Plants** have:

1. **Flowers** or **Cones**
2. The transfer of sperm by **Pollination.**
3. The protection of embryos within **Seeds.**

REPRODUCTION FREE FROM WATER : HUGE ADVANTAGE!!

Like the bryophytes and ferns, all seed plants show Alternation of Generations, alternating between the gametophyte and sporophyte stages.

Unlike the bryophytes and ferns, the seed plants do NOT require water for the fertilization of the gametes.

This allows the seed plants to occupy many more types of habitats than the bryophytes and the ferns.

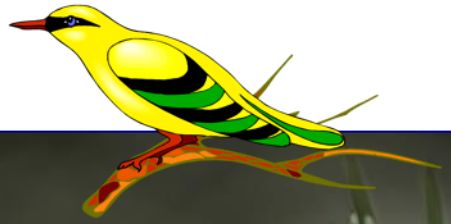
In the seed plants, the SPOROPHYTE (diploid) generation is the dominant, recognizable stage of the life cycle and is the stage that carries out most of the plant's photosynthesis.

CONES AND FLOWERS

- Cones and Flowers are SPOROPHYTE structures.
- The gametophytes grow and mature within these sporophyte structures.

The **Seed Plants** are divided into 2 groups:

← Angiosperms



Gymnosperms →

Cones are the seed bearing structures of…

… **GYMNOSPERMS**

The **Gametophyte** generations of seed plants live **INSIDE Cones** and **Flowers.**

Flowers are the seed bearing structures of the ANGIOSPERMS.

Pollen

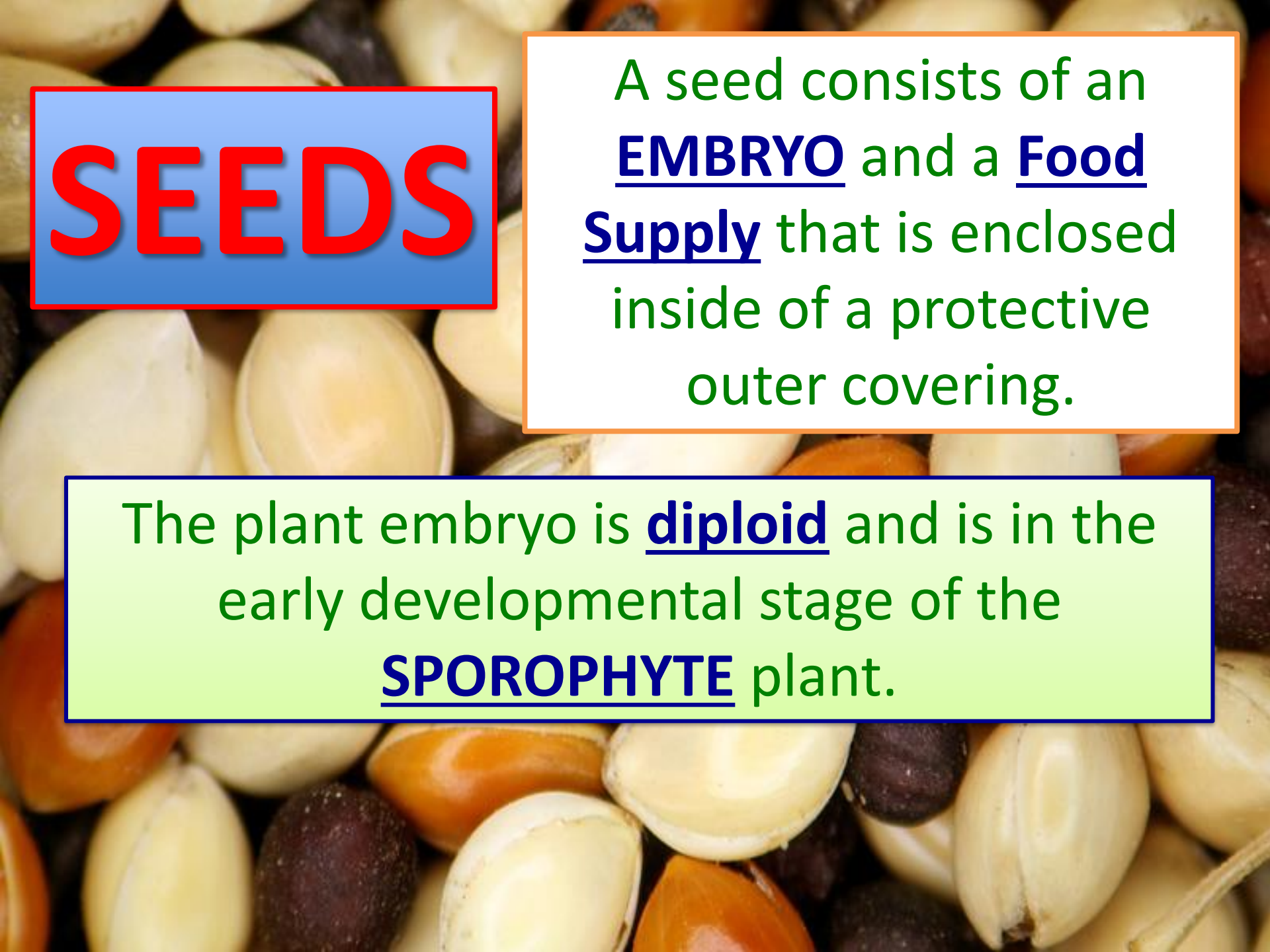
MALE GAMETOPHYTE

POLLEN GRAIN

Pollen grains contain **Sperm** cells.

Rather than the sperm swimming through water, the pollen (sperm) is carried to the female gametophyte by: wind, insects, or small animals.

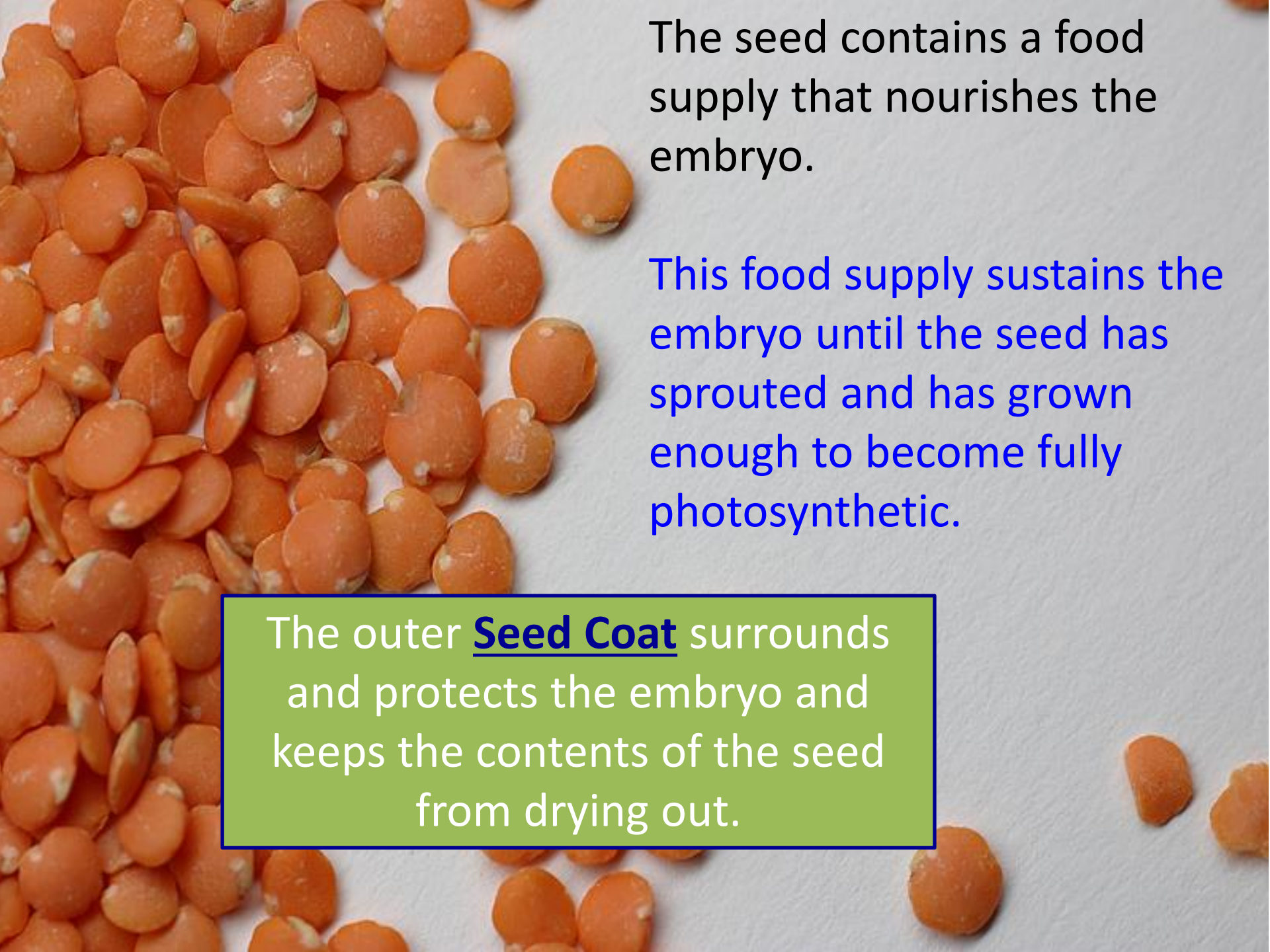
POLLINATION is the transfer of pollen from the male reproductive structures to the female reproductive structures.



SEEDS

A seed consists of an **EMBRYO** and a **Food Supply** that is enclosed inside of a protective outer covering.

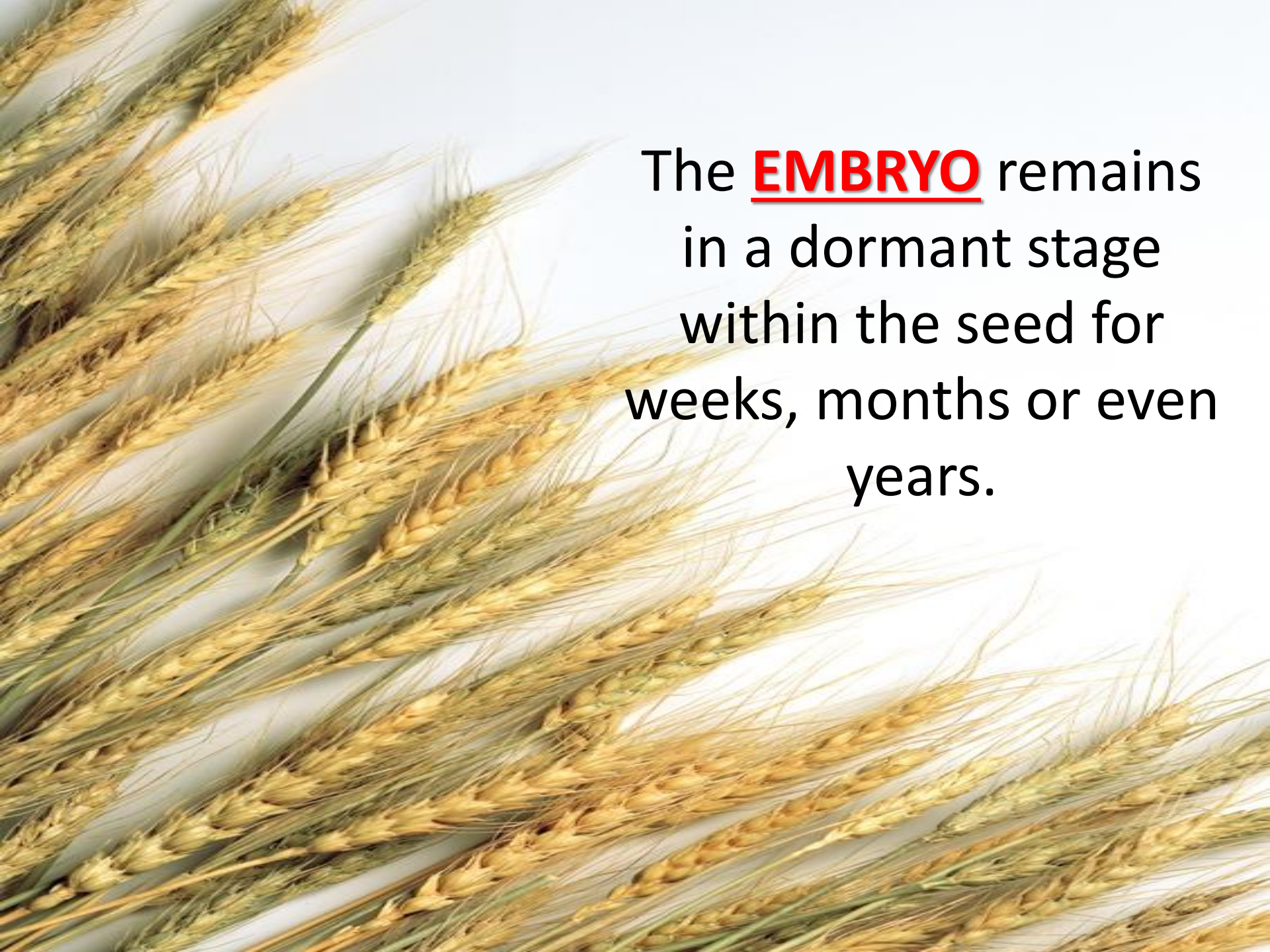
The plant embryo is **diploid** and is in the early developmental stage of the **SPOROPHYTE** plant.



The seed contains a food supply that nourishes the embryo.

This food supply sustains the embryo until the seed has sprouted and has grown enough to become fully photosynthetic.

The outer **Seed Coat** surrounds and protects the embryo and keeps the contents of the seed from drying out.


The EMBRYO remains in a dormant stage within the seed for weeks, months or even years.

The seed can survive long periods of bitter cold, extreme heat or drought. When growing conditions become favorable, the seed germinates and begins to grow.

GYMNOSPERMS

Bear their seeds directly on the surfaces of **CONES**.

Include the: CONIFERS such as pines and spruces.

The term "**Gymnosperm**" means "**Naked Seed**".

The **Cone** is the seed bearing structure and all seeds are exposed.

The Gymnosperms

Cycads

Ginkgoes

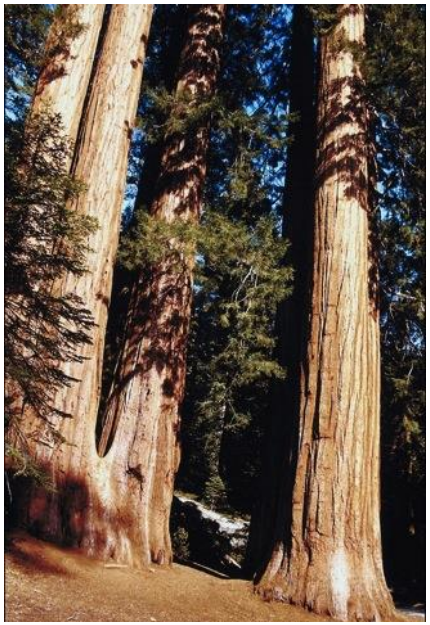
Pine

Spruce

Cypress

Fir

Cedar



Redwood

ANGIOSPERMS

- Also called FLOWERING plants.
- Bear their seeds within a layer of tissue that protects the seed.
- Angiosperms include grasses, flowering trees, and shrubs.

ANGIOSPERMS: The Flowering Plants

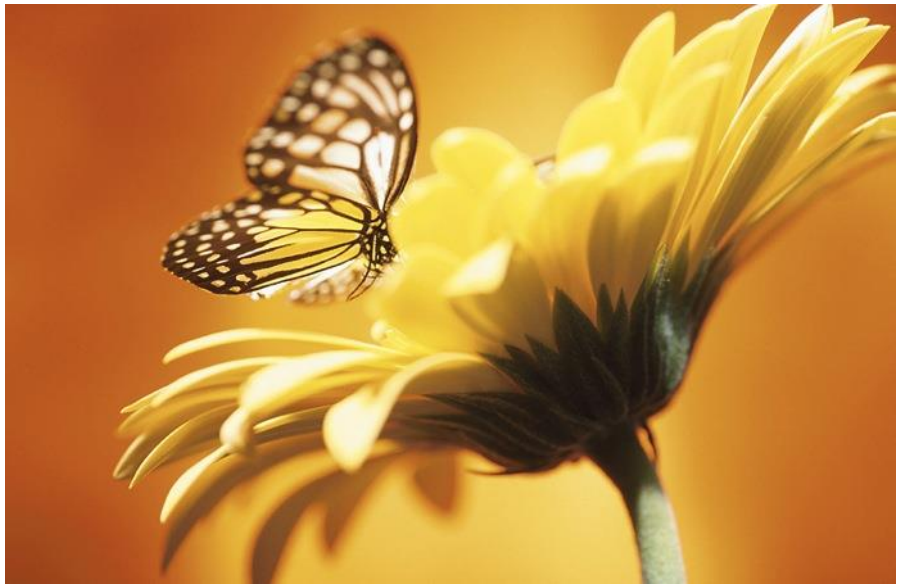
According to evolutionists, Angiosperms appeared in the fossil record “only” 135 million years ago, making them the most “recent” of all plants.

Flowering plants are thought to be the dominating form of plant life on Earth.

They have a method of reproduction and development that involves **FLOWERS AND FRUITS**.

Flowers and Fruits

Unique to the angiosperms is the development of the FLOWER as the reproductive structure.

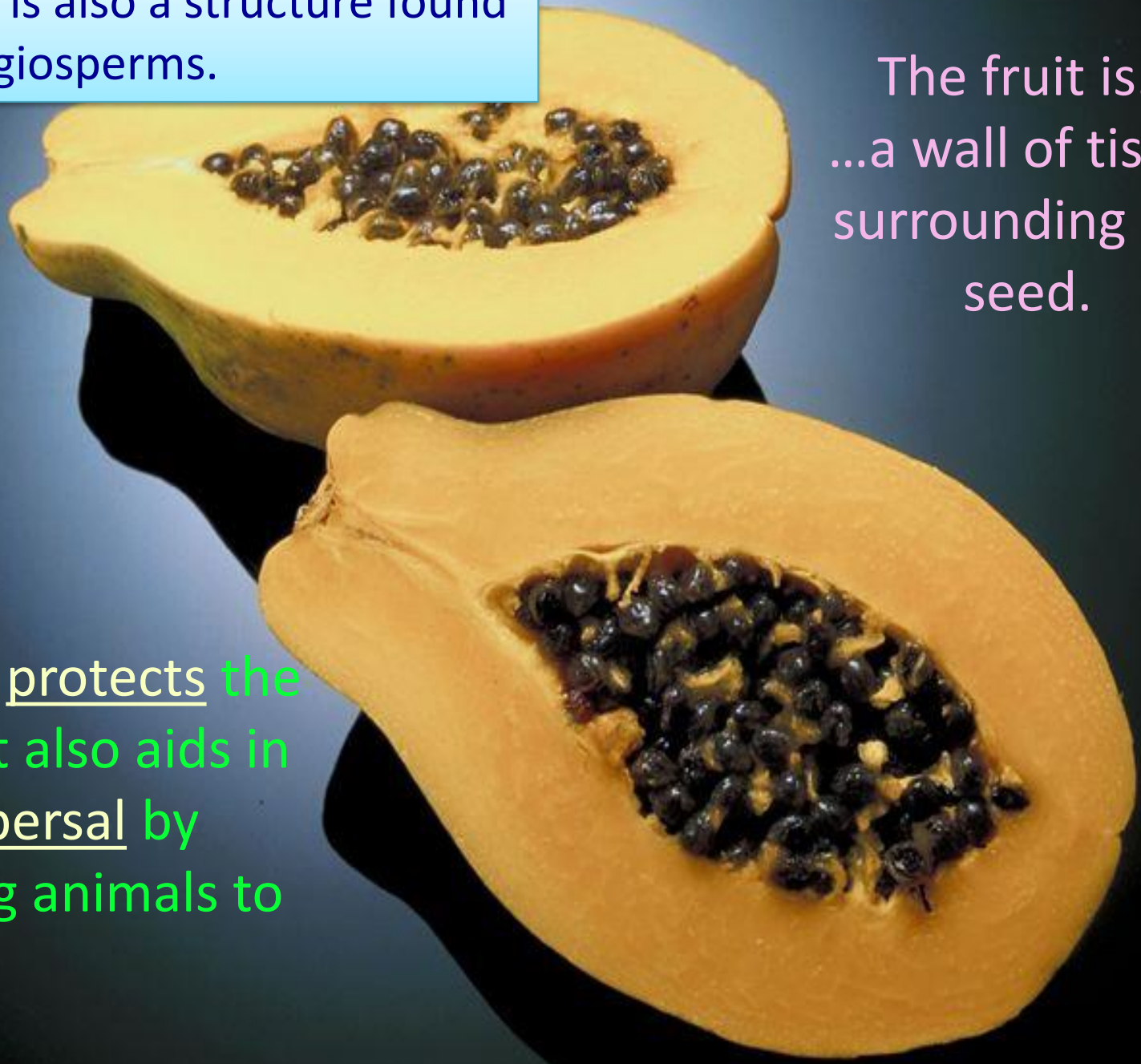


Flowers are an advantage to plants because they attract insects and other small animals to the flower.

These insects and animals then transport **pollen** from one flower to another.

This means of **pollination** is much more efficient than the wind pollination of most gymnosperms.

The **FRUIT** is also a structure found only in Angiosperms.



The fruit is…
…a wall of tissue surrounding the seed.

The fruit protects the seed, but also aids in seed dispersal by attracting animals to the fruit.

Angiosperm Diversity

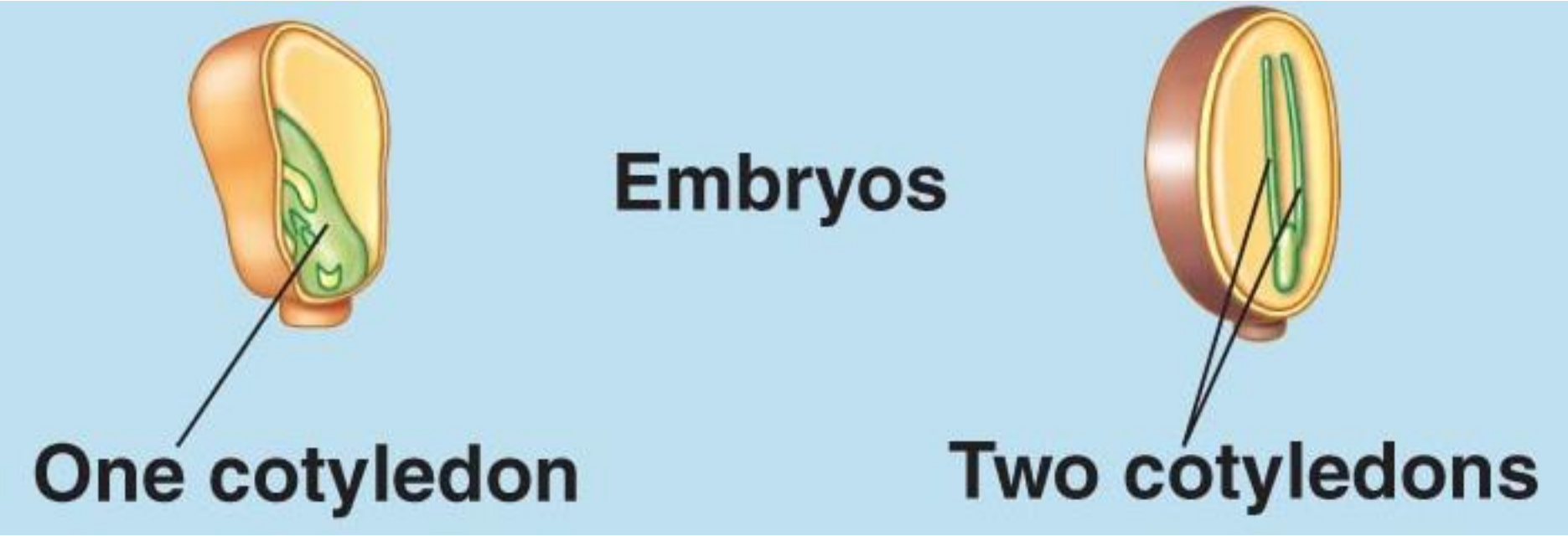
The phylum containing the **Angiosperms** is divided into two classes:

MONOCOTS

DICOTS

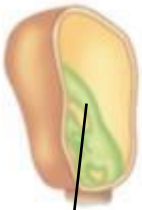
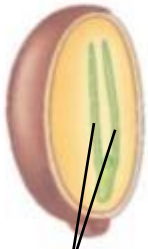
The **Monocots** and **Dicots** are named for the number of **COTYLEDONS** their seeds contain.

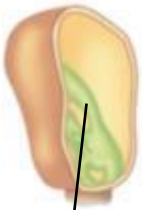
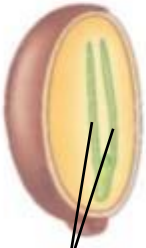
Monocots have **one** cotyledon and dicots have **two** cotyledons.

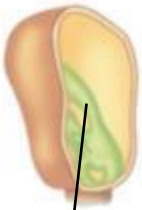
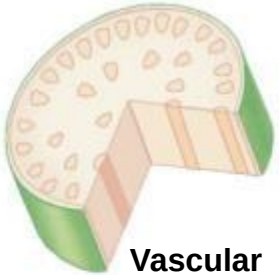
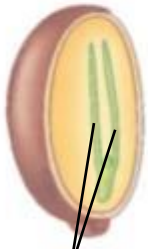
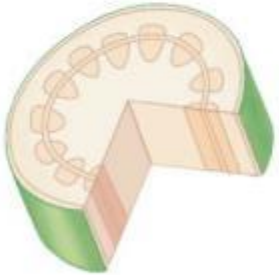


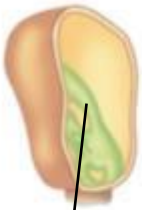
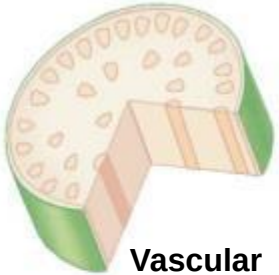
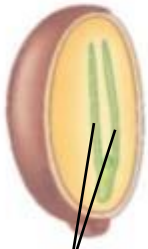
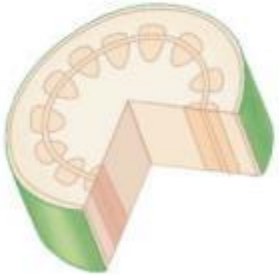
A COTYLEDON is….

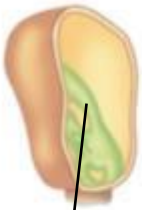
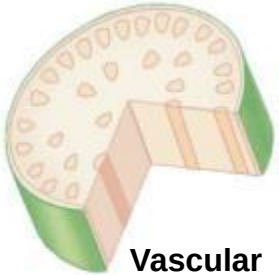
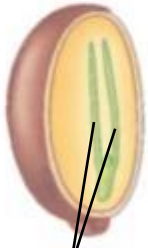
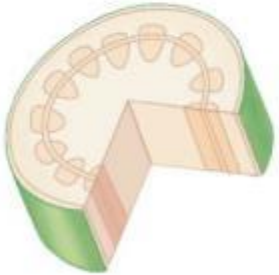
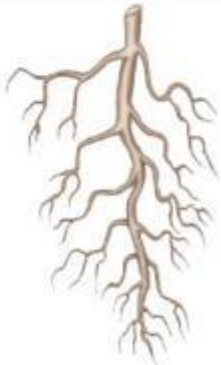
….the first leaf or the first pair of leaves produced by the embryo of a seed plant.

Seed leaves	
MONOCOTS	 One cotyledon
EUDICOTS	 Two cotyledons

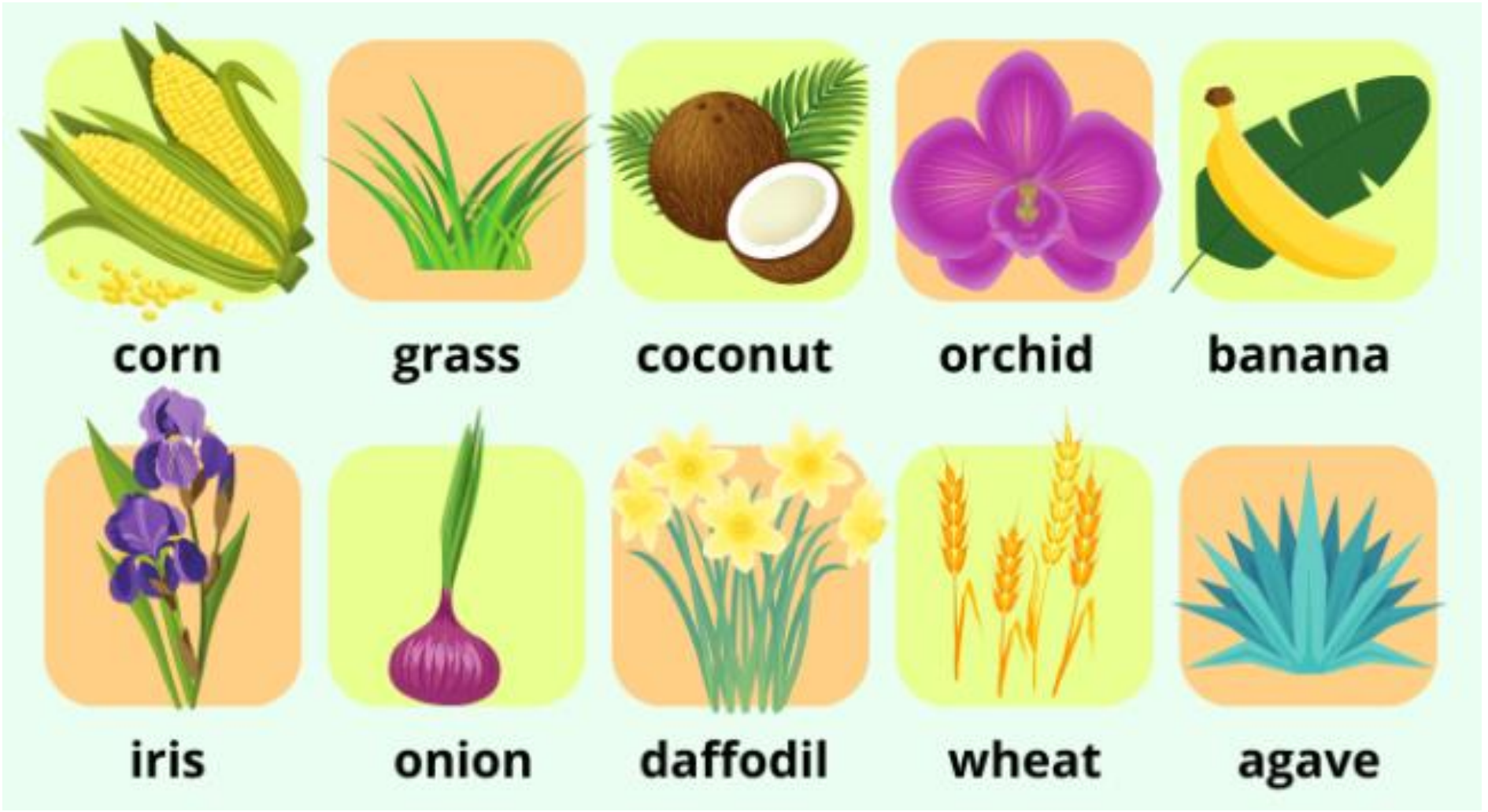
	Seed leaves	Leaf veins
MONOCOTS	 One cotyledon	 Veins usually parallel
EUDICOTS	 Two cotyledons	 Veins usually branched

	Seed leaves	Leaf veins	Stems
MONOCOTS	 One cotyledon	 Veins usually parallel	 Vascular bundles scattered in complex arrangement
EUDICOTS	 Two cotyledons	 Veins usually branched	 Vascular bundles arranged in ring

	Seed leaves	Leaf veins	Stems	Flowers
MONOCOTS	 One cotyledon	 Veins usually parallel	 Vascular bundles scattered in complex arrangement	 Floral parts usually in multiples of three
EUDICOTS	 Two cotyledons	 Veins usually branched	 Vascular bundles arranged in ring	 Floral parts usually in multiples of four or five

	Seed leaves	Leaf veins	Stems	Flowers	Roots
MONOCOTS	 One cotyledon	 Veins usually parallel	 Vascular bundles scattered in complex arrangement	 Floral parts usually in multiples of three	 Fibrous root system
EUDICOTS	 Two cotyledons	 Veins usually branched	 Vascular bundles arranged in ring	 Floral parts usually in multiples of four or five	 Taproot usually present

Monocots


corn
grass
coconut
orchid
banana
iris
onion
daffodil
wheat
agave

Dicots

Most deciduous trees are dicots.

TRY IT

Kingdom Plantae Graphic Organizer

	The Kingdom Plantae				
Characteristic	Liverworts	Mosses	Ferns	Gymnosperms	Angiosperms
Vascular tissue present?					
True roots, stems, leaves?					
Dominant Generation?					
Water required for fertilization?					
Seeds?					
Flowers?					
Motile or nonmotile gametes?					
Flowers or cones?					

TRY IT

Kingdom Plantae Graphic Organizer

	The Kingdom Plantae				
Characteristic	Liverworts	Mosses	Ferns	Gymnosperms	Angiosperms
Vascular tissue present?	No	No	Yes	Yes	Yes
True roots, stems, leaves?	No	No	Yes	Yes	Yes
Dominant Generation?	Gametophyte	Gametophyte	Sporophyte	Sporophyte	Sporophyte
Water required for fertilization?	Yes	Yes	Yes	No	No
Seeds?	No	No	No	Yes	Yes
Flowers?	No	No	No	No	Yes
Motile or nonmotile gametes?	Motile	Motile	Motile	Nonmotile	Nonmotile
Flowers or cones?	No	No	No	Cones	Flowers

Basic Plant Tissue Types

Each plant organ (roots, stems, leaves) contain all three types.

Tissue	Components	Function
Dermal	Epidermis	• Protective outer covering • Prevent loss of water
Ground	**Lies between dermal and vascular tissues** **Parenchyma** **Collenchyma** **Sclerenchyma**	• **Bulk of plant body** • **Metabolism (Photosynthesis, Cell Respiration, etc.)** • **Storage of Sugars** • **Physical Support**
Vascular	**Xylem** **Phloem**	• **Transport water and nutrients** • **Supports the plant body**

Plant Organs have 3 Tissue Types

Dermal tissue-

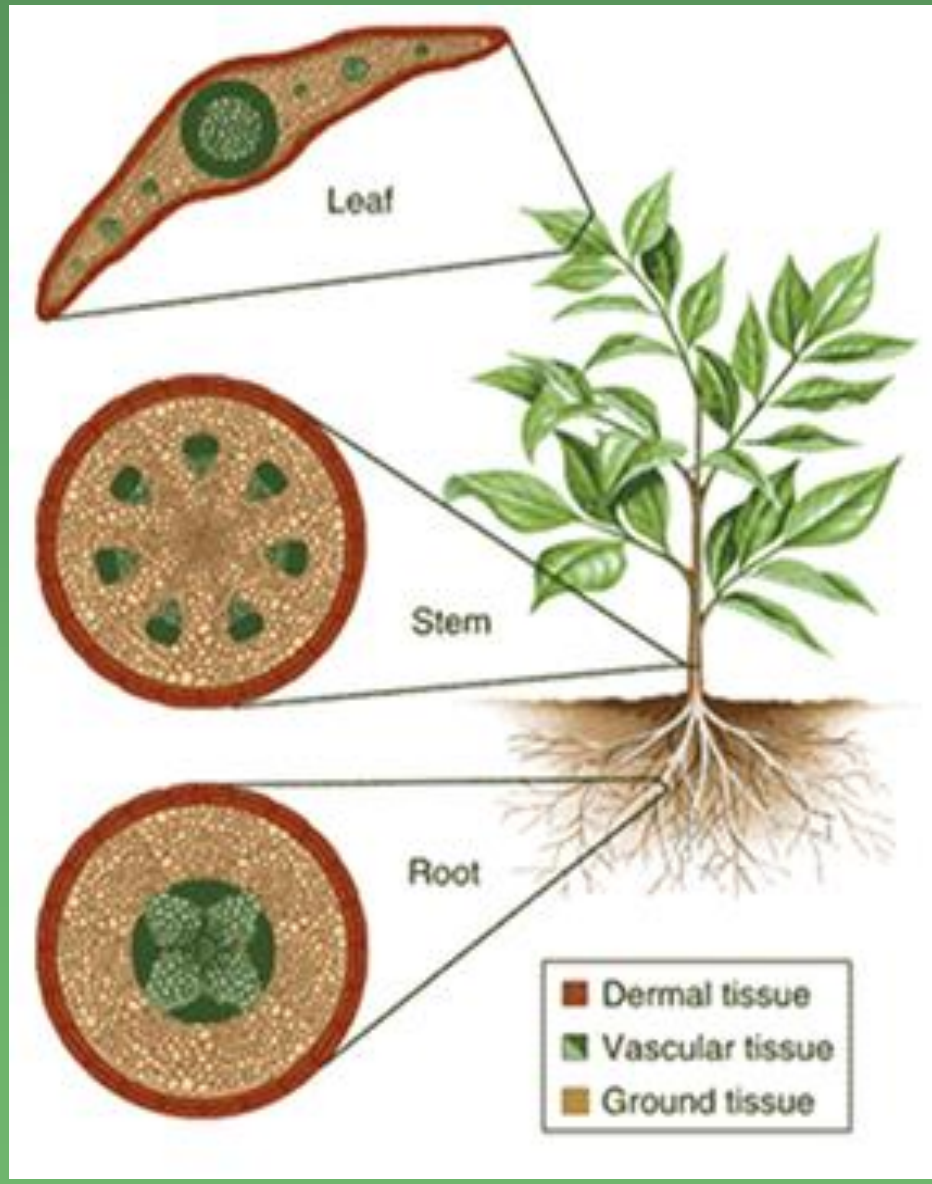
- often called the epidermis
- a single layer of cells that forms a protective "skin"
- secretes a waxy cuticle to prevent water loss

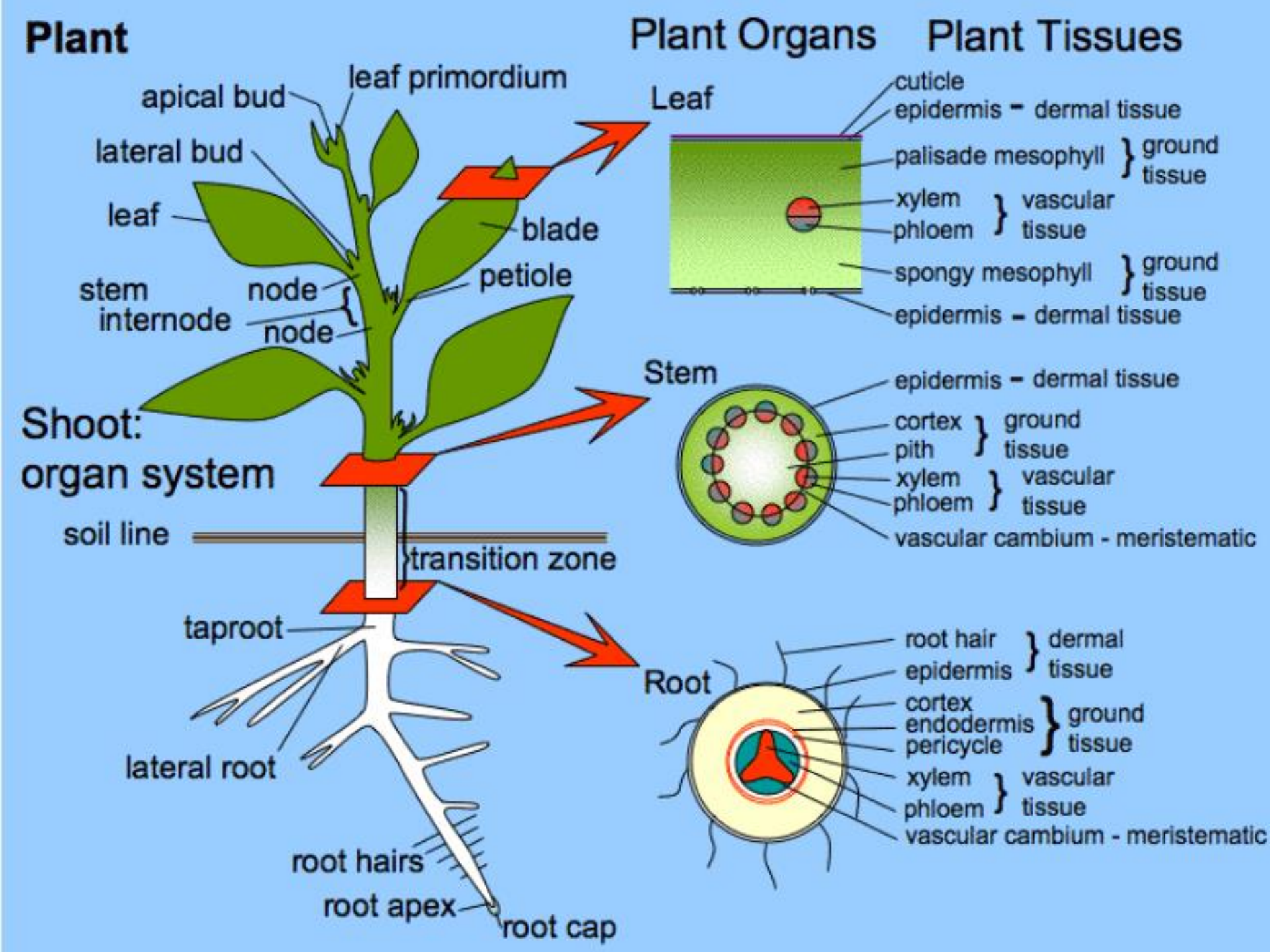
Vascular tissue-

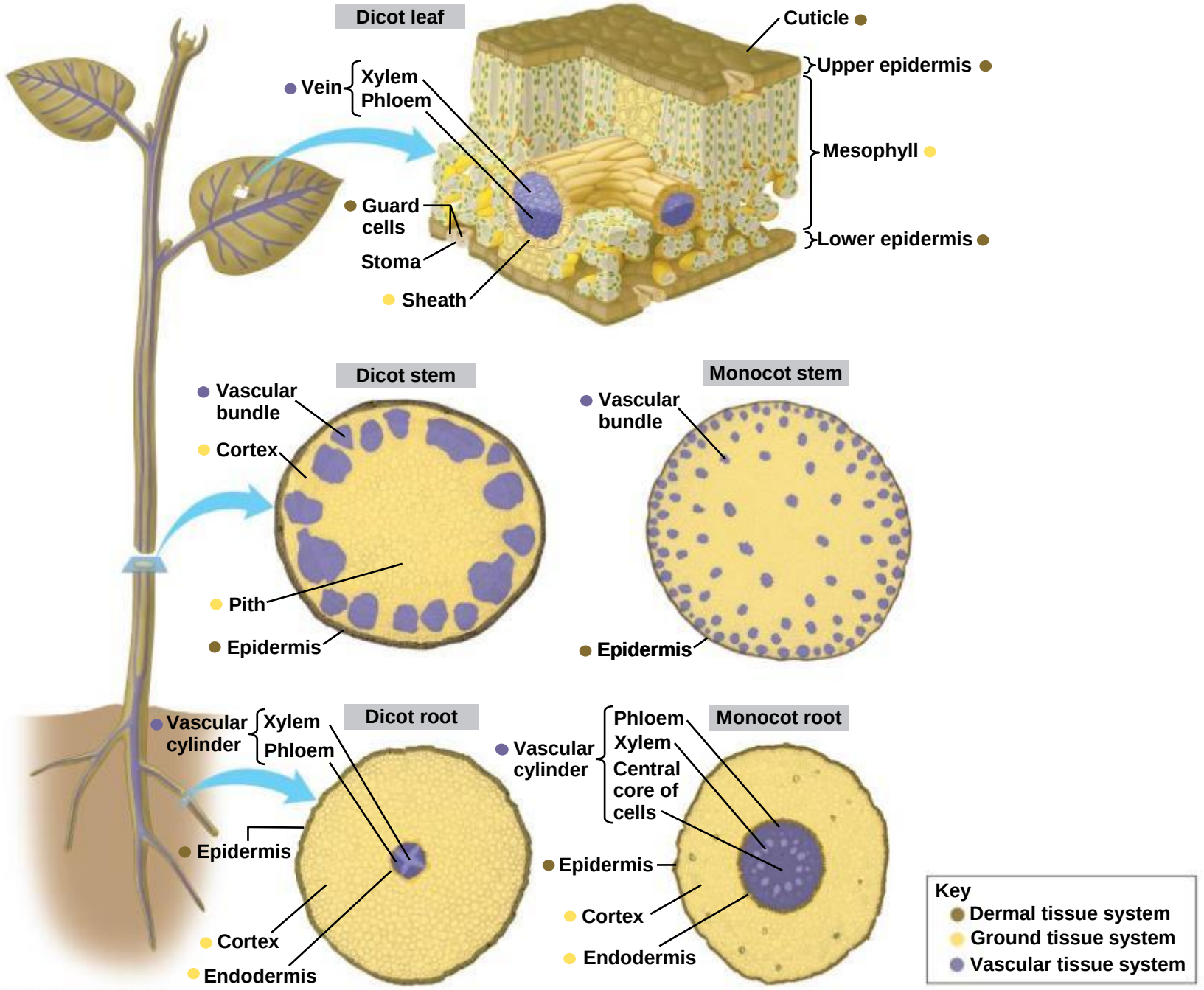
- transports water, minerals and sugars between roots and shoots
- arranged in strands called vascular bundles
- made up of xylem and phloem

Ground tissue-

- fills the space between the epidermis and vascular bundles that supports the plant
- the location of metabolic processes such as photosynthesis
- provides support and storage for the plant



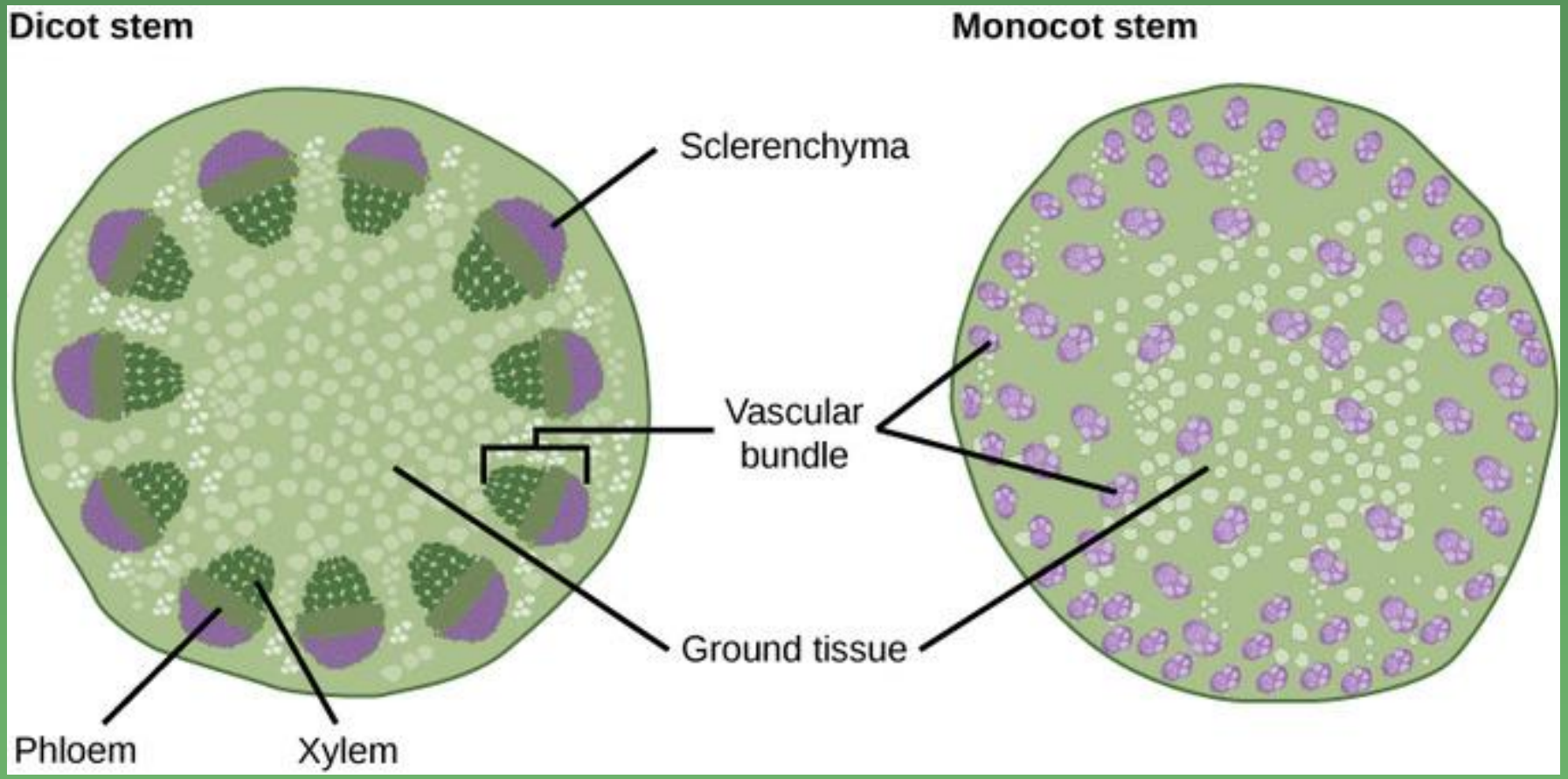

Plant
Plant Organs
Plant Tissues
apical bud
leaf primordium
lateral bud
leaf
blade
petiole
stem
node
internode
node
Shoot:
organ system
soil line
transition zone
taproot
lateral root
root hairs
root apex
root cap
Leaf
cuticle
epidermis – dermal tissue
palisade mesophyll
ground tissue
xylem
phloem
vascular tissue
spongy mesophyll
ground tissue
epidermis – dermal tissue
Stem
epidermis – dermal tissue
cortex
pith
ground tissue
xylem
phloem
vascular tissue
vascular cambium - meristematic
Root
root hair
epidermis
dermal tissue
cortex
endodermis
pericycle
ground tissue
xylem
phloem
vascular tissue
vascular cambium - meristematic


Dicot leaf
Cuticle
Upper epidermis
Vein
Xylem
Phloem
Mesophyll
Guard cells
Lower epidermis
Stoma
Sheath
Dicot stem
Vascular bundle
Cortex
Pith
Epidermis
Monocot stem
Vascular bundle
Epidermis
Vascular cylinder
Xylem
Phloem
Dicot root
Epidermis
Cortex
Endodermis
Phloem
Xylem
Vascular cylinder
Central core of cells
Monocot root
Epidermis
Cortex
Endodermis
Key
Dermal tissue system
Ground tissue system
Vascular tissue system

Vascular Tissue is made up of:

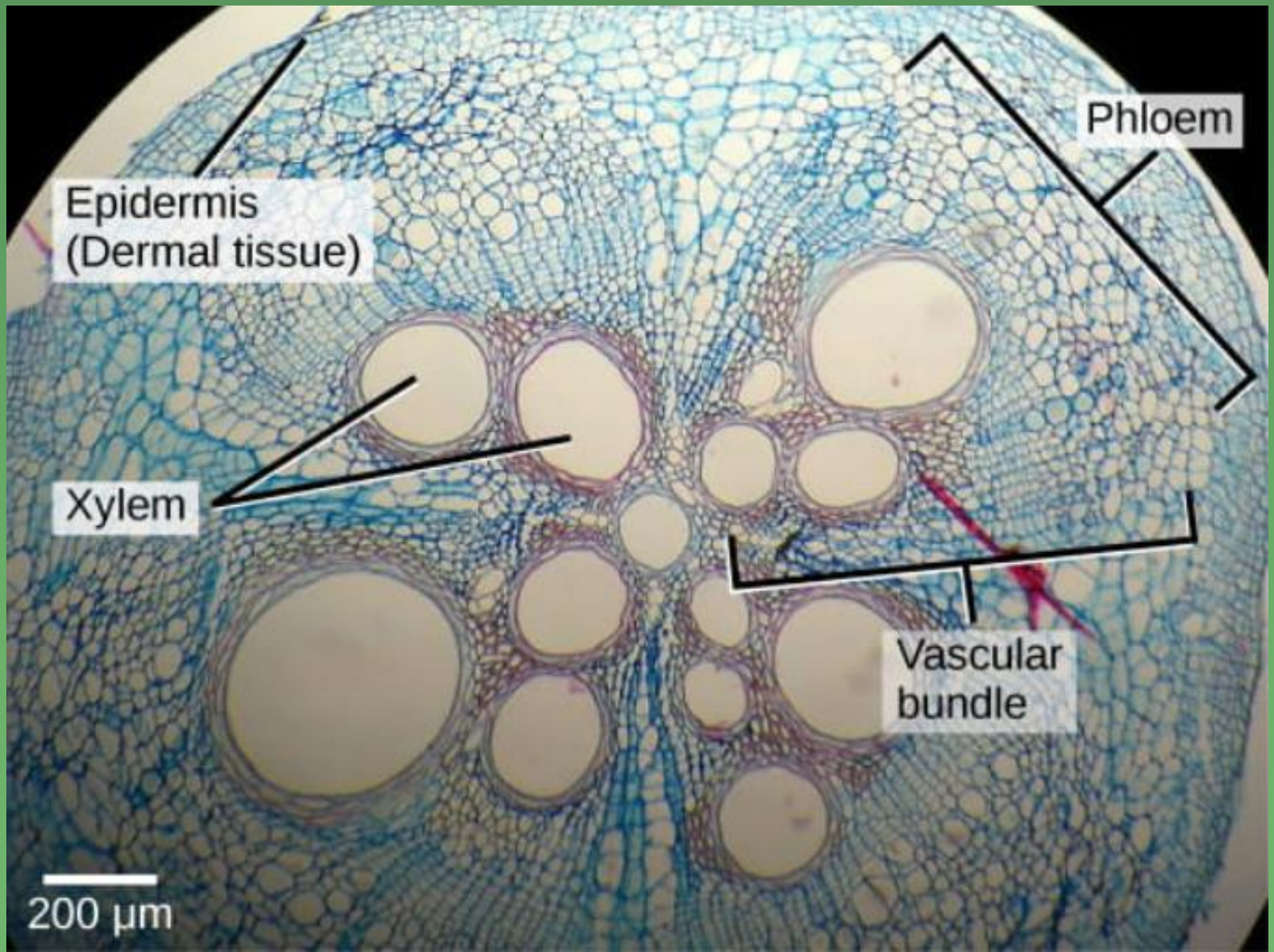
- Xylem:
  - Carries Water and Minerals from the roots to the rest of the plant.
  - Composed of Dead Cells (Cell Walls remain).
  - Cell Walls are lignified, which provide support for the plant (helps it grow tall).
  - In Trees it is the Wood.
- Phloem:
  - Carries the food made in the leaves during photosynthesis, to other plant structures.
  - Living Tissue, but arranged in tubes.

Vascular Tissue



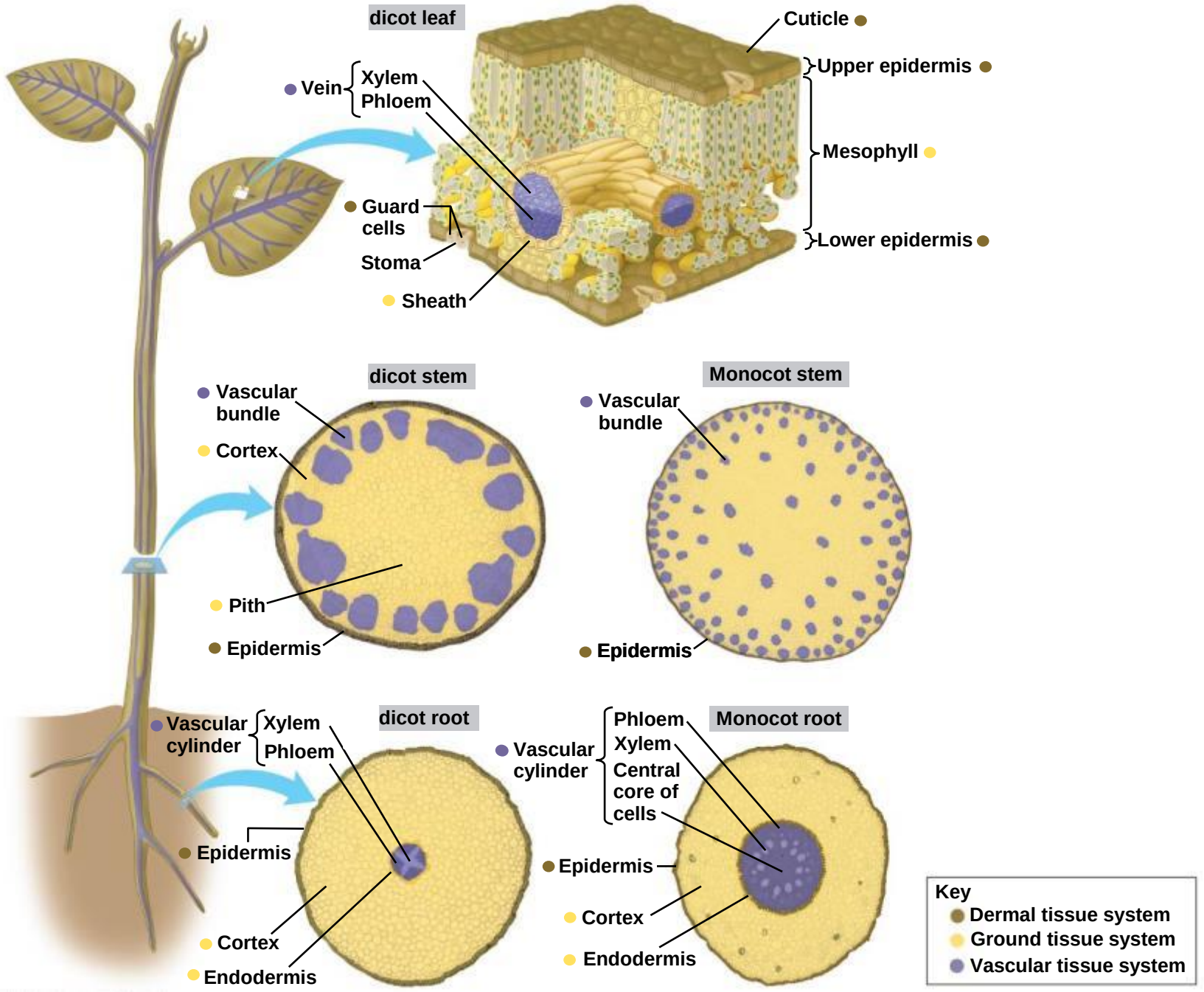
Xylem and Phloem form a **continuous network** from the tip of the roots, through the stem, all the way to the leaves, and vice versa.

Vascular Tissue



Ground Tissue

- Lies between dermal and vascular tissue.
- Divided into: Pith and Cortex.
- Leaf Ground Tissue is called Mesophyll.
- Includes **PARENCHYMA** (photosynthesis in the leaves, and storage in the roots).
- **COLLENCHYMA** (shoot support in areas of active growth).
- **SCHLERENCHYMA** (shoot support in areas where growth has ceased).


dicot leaf
Cuticle
Upper epidermis
Vein
Xylem
Phloem
Mesophyll
Guard cells
Lower epidermis
Stoma
Sheath
dicot stem
Monocot stem
Vascular bundle
Cortex
Vascular bundle
Pith
Epidermis
Epidermis
dicot root
Monocot root
Vascular cylinder
Xylem
Phloem
Phloem
Xylem
Vascular cylinder
Central core of cells
Epidermis
Epidermis
Cortex
Cortex
Endodermis
Endodermis
Key
Dermal tissue system
Ground tissue system
Vascular tissue system

Plant Growth

- Most plants have **indeterminate growth**, continuing to grow throughout a plant's life.
- Plants are categorized based on the length of their life cycle:
  - **Annuals** complete their life cycle in one year.
  - **Biennials** complete their life cycle in two years.
  - **Perennials** live for many years.

Plant Growth

Biennial

Annual

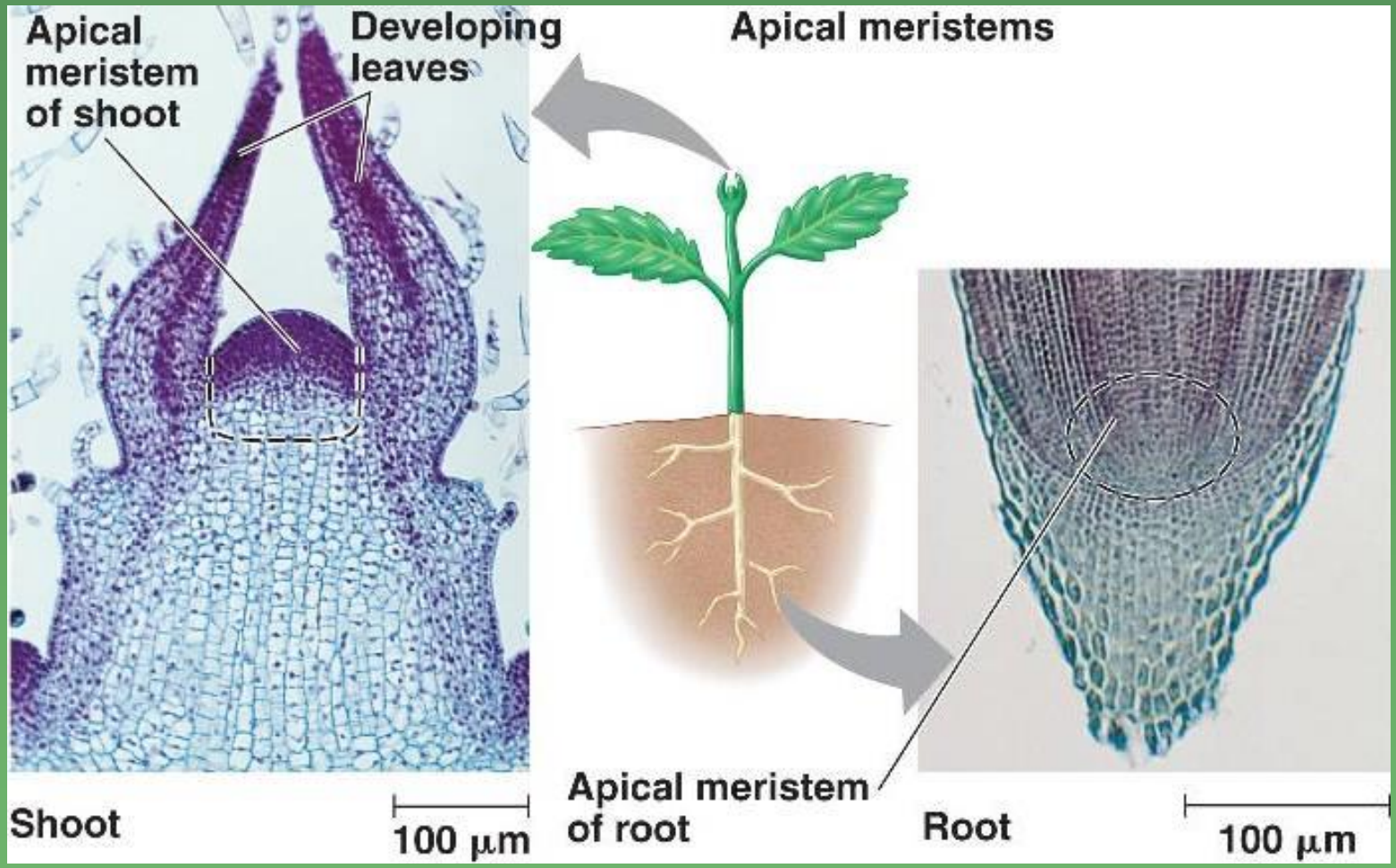
Perennial

Plant Growth

Occurs in specialized tissues called **Meristems**, consisting of undifferentiated cells that divide when conditions permit.

- **Apical Meristems** are found at the tips of roots and in the buds of shoots.
- **Primary Growth**
  - occurs at apical meristems.
  - allows roots to push downward through the soil.
  - allows shoots to grow upward, increasing exposure to light and CO_2.

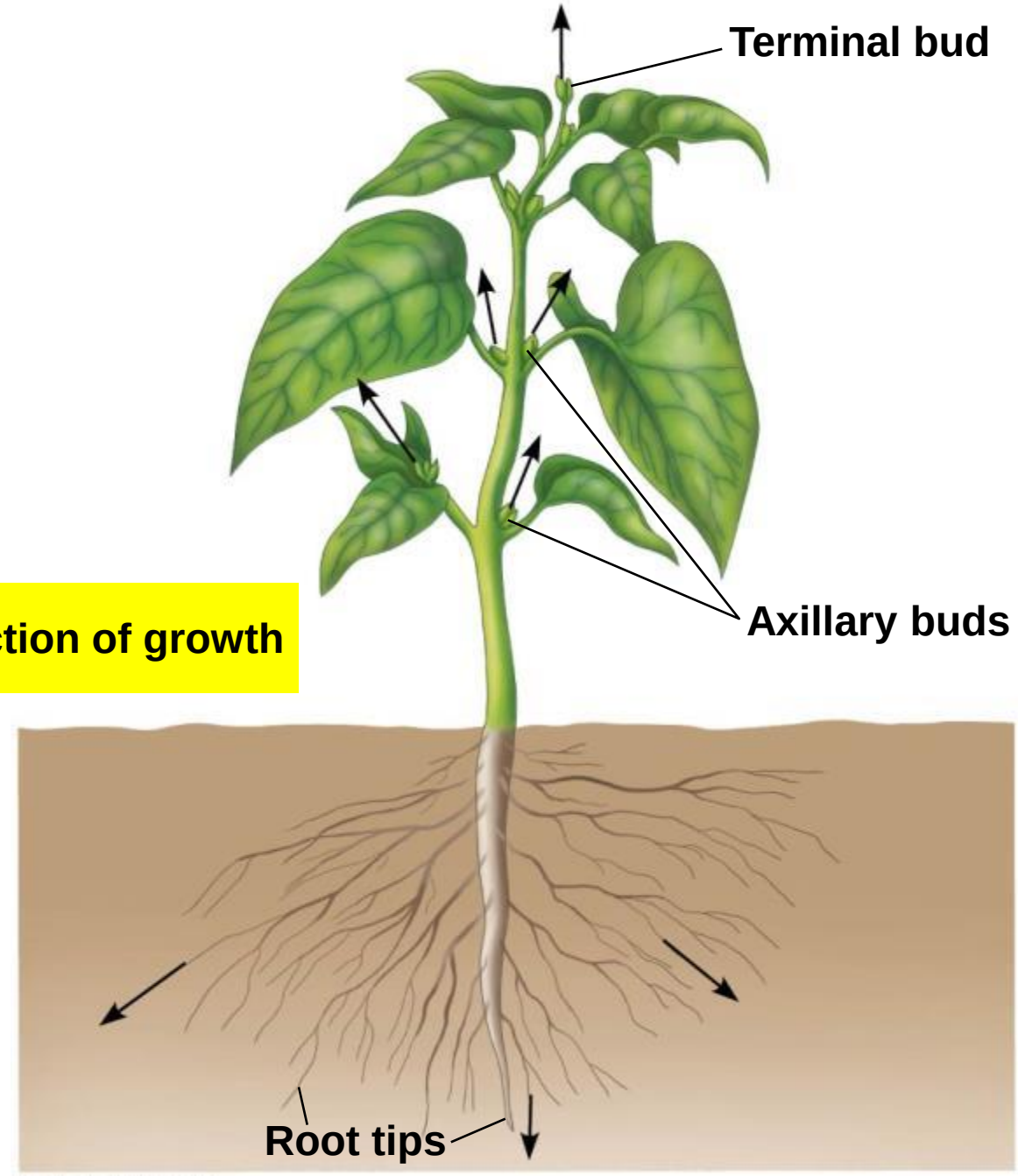
Meristems: Growth Tissue



STEM Apical Meristem

ROOT Apical Meristem

Arrows → direction of growth



Classifying Organism Using a Dichotomous Key

How to use a Dichotomous Key:

1. Read the first pair of statements. Decide which statement (1a or 1b) applies to the organism you are trying to identify.
2. Follow the direction at the end of the statement.
3. Continue reading the paired statements and following the directions until you determine the identity of the organism.

Classifying Organism Using a Dichotomous Key

1a. The leaf is a compound leaf; it is divided into leaflets ..... Go to step 2
1b. The leaf is a simple leaf; it is not divided into leaflets ..... Go to step 4

2a. Leaflets are palmate; they are attached at one central point ..... Buckeye
2b. Leaflets are pinnate; they are attached at several points ..... Go to step 3

3a. Leaflets taper to pointed tips ..... Pecan
3b. Leaflets are oval with rounded tips ..... Locust

4a. Veins branch from one central point ..... Go to step 5
4b. Veins branch from a main vein in the middle of the leaf ..... Go to step 6

5a. The leaf is heart shaped..... Redbud
5b. The leaf is star shaped ..... Sweet gum

6a. The leaf has a jagged edge ..... Birch
6b. The leaf has a smooth edge ..... Magnolia

Classifying Organisms Using a Dichotomous Key

Here are the leaves from seven trees.
Use the dichotomous key to classify each leaf.

1

Magnolia

2

Buckeye

3

Redbud

4

Pecan

5

Birch

6

Locust

7

Sweet Gum

Classifying Organisms Using a Dichotomous Key

Here are the leaves from seven trees.
Use the dichotomous key to classify each leaf.

1

Magnolia

2

Buckeye

3

Redbud

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Classifying Organism Using a Dichotomous Key

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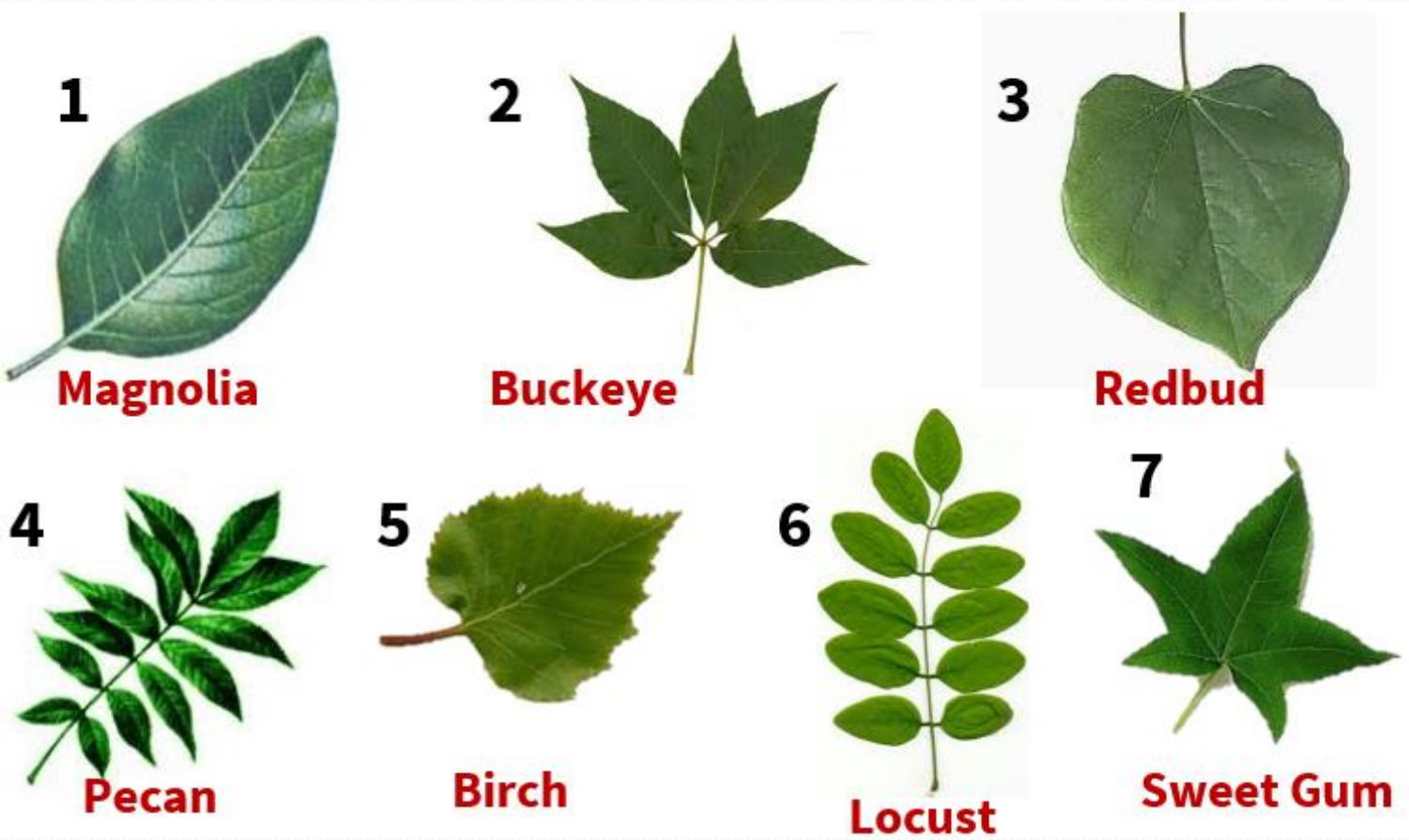

Classifying Organism Using a Dichotomous Key

1a. The leaf is a **compound** leaf; it is divided into leaflets …….. Go to step 2

Pecan

Buckeye

Locust

1b. The leaf is a **simple** leaf; it is not divided into leaflets …….. Go to step 4

Magnolia

Birch

Redbud

Sweet Gum

Classifying Organism Using a Dichotomous Key

1a. The leaf is a **COMPOUND** leaf; it is divided into leaflets ..... Go to step 2

2a. Leaflets are **palmate**; they are **attached at one central point** ..... **Buckeye**
2b. Leaflets are pinnate; they are **attached at several points** ..... Go to step 3

Buckeye **1a 2a**

Pecan

Locust

Classifying Organism Using a Dichotomous Key

2b. Leaflets are **pinnate**; they are attached at several points ..... Go to step 3

3a. Leaflets taper to **pointed tips** ..... **Pecan**
3b. Leaflets are oval with **rounded tips** ..... **Locust**

Pecan 1a 2b 3a

Locust 1a 2b 3b

Classifying Organism Using a Dichotomous Key

1b. The leaf is a **SIMPLE** leaf; it is not divided into leaflets ..... Go to step 4

4a. **Veins** branch from one central point ..... Go to step 5
4b. Veins branch from a main vein in the middle of the leaf ..... Go to step 6

Magnolia

Birch

Redbud

Sweet Gum

Classifying Organism Using a Dichotomous Key

1b. The leaf is a **simple** leaf; it is not divided into leaflets ..... Go to step 4

4a. **Veins** branch from one central point ..... Go to step 5

5a. The leaf is **heart shaped**..... **Redbud**
5b. The leaf is **star shaped** ..... **Sweet gum**

Redbud **1b 4a 5a**

Sweet Gum
1b 4a 5b

Classifying Organism Using a Dichotomous Key

1b. The leaf is a **simple** leaf; it is not divided into leaflets ..... Go to step 4

4b. Veins branch from a **main vein** in the middle of the leaf ..... Go to step 6

6a. The leaf has a **jagged edge** ..... **Birch**
6b. The leaf has a **smooth edge** ..... **Magnolia**

Birch **1b 4b 6a**

Magnolia **1b 4b 6b**