

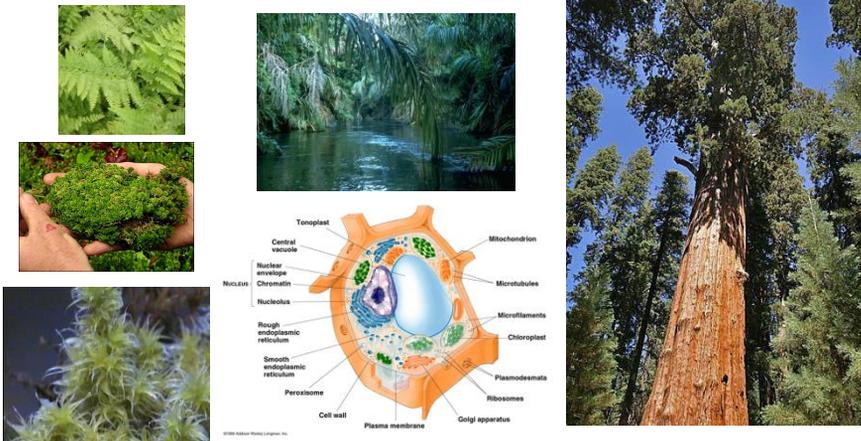
# Life Science

## Chapter 10

# INTRO TO PLANTS

## What is a Plant?

- They are autotrophic multicellular eukaryotes
- Their cells possess a cell wall made of cellulose, have no centrioles, contain a “gigundo” water vacuole & chloroplasts.
- $6\text{CO}_2 + 6\text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$



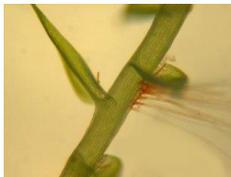
## Living on Land ...what is required?

- Be able to **obtain water** and other materials from the environment
- **Retain water** - Reduce water loss thru transpiration
- **Transport** materials throughout plant
- **Support** their bodies
- **Reproduce** successfully

Ding-a-ling!!

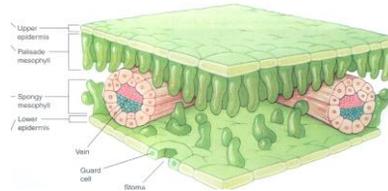
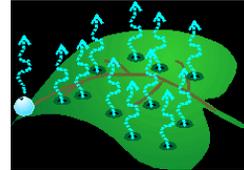
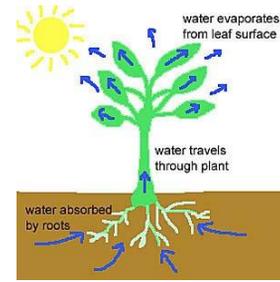
### e able to **obtain water**

- Aquatic plants are surrounded by water, but to live on land they must be able to pick up water from the environment
- Bryophytes use **rhizoids** & Tracheophytes use true **roots**



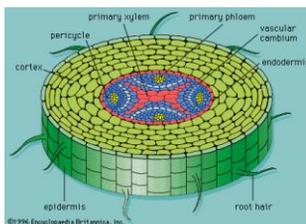
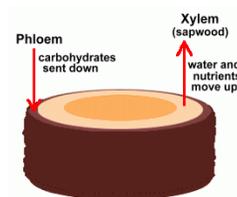
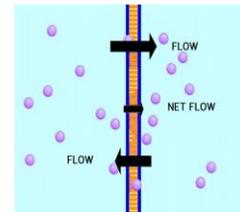
## Retain Water

- Plants lose water by a process called **transpiration**
  - Water taken into the plant by the roots is pumped throughout the plant and escapes through leaf stomata.
- Waxy leaf covering – cuticle
- Stomata – protected by Guard Cells that open & close preventing water loss during dry times
- Desert plants w/ needles or leathery leaves

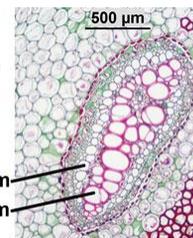


## ransport materials

- Bryophytes transport materials by diffusion / osmosis
  - Diffusion:** Moving material from high [ ] to low [ ] .
  - Osmosis:** Moving water from high [ ] to low [ ] thru semi permeable membrane
- Tracheophytes transport w/ vascular tissue
  - Phloem:** transports **food** from leaves **down** to the roots
  - Cambium:** produces new phloem & xylem cells
  - Xylem:** moves **water** & minerals from roots **up** to the leaves

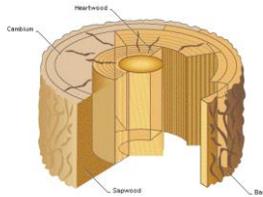


### Fern vascular bundle



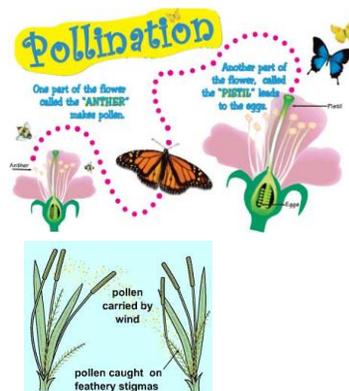
# Support their bodies

- Algae & water plants are supported by the water they live in and require little structural support
- Life on land requires the plant to be able to support itself and rise above the other competing organisms
  - Vascular tissue supports in Tracheophytes allowing them to grow over 300 feet tall
  - Bryophytes w/out vascular tissue and usually cannot grow more than a few inches tall



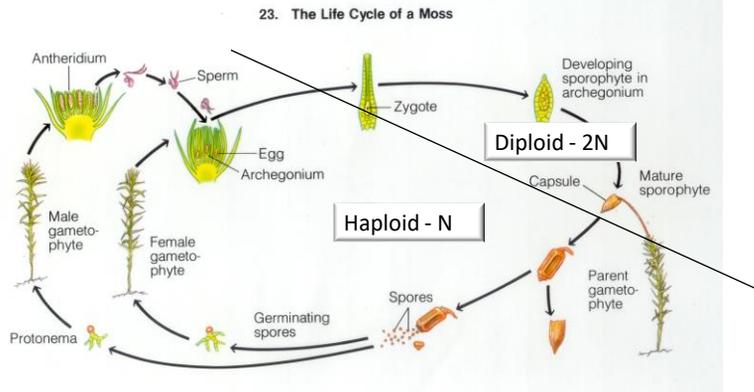
# Reproduce successfully

- For fertilization to occur male & female gametes must come together
  - Aquatic plants use the water itself to transport sperm, eggs, spores
  - Terrestrial plants needed to develop a new way to get the gametes together
    - Pollination by wind, insects, etc. etc.



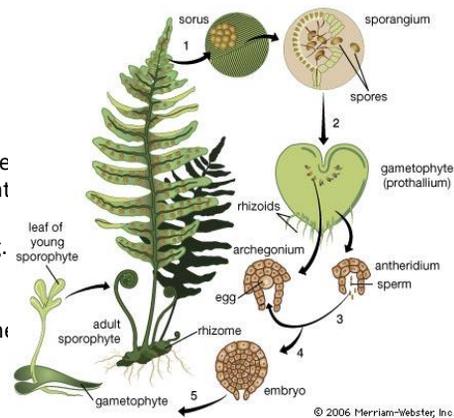
## Alternation of generations

- Life cycle of a plant has a haploid stage and a diploid stage
  - Haploid** stage is called the **gametophyte** generation
  - Diploid** is the **sporophyte** generation
- In most Bryophytes (mosses, hornworts & liverworts)
  - the main plant is in the **gametophyte** stage. Male gametophytes produce sperm from the **antheridium**, the female gametophyte produce eggs in the **archegonium**.
  - When fertilization takes place, the new **sporophyte** stage grows out the top of the archegonium, produces a capsule that makes hundreds of spores to be released.

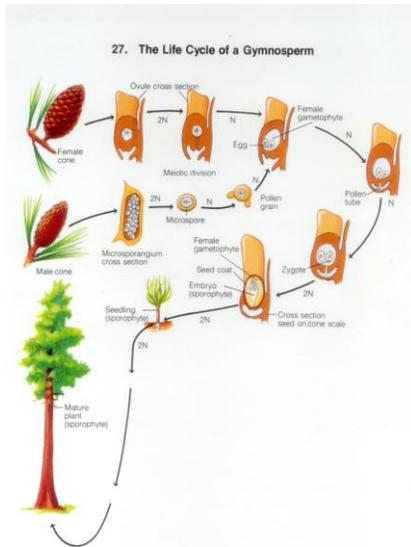


## Alternation of Generations

- Life cycle of a plant has a haploid stage and a diploid stage
  - Haploid** stage is called the **gametophyte** generation
  - Diploid** is the **sporophyte** generation
- In Primitive Tracheophytes (Ferns):
  - the familiar large frond plant is the sporophyte (spore producing). These spores grow into tiny inconspicuous mat-like plants which are the gametophyte stage.
  - Gametophyte produces both sperm & egg. When fertilization occurs, the new sporophyte grows off of the gametophyte.
  - As the sporophyte grows it overpowers the tiny gametophyte stage.



## Alternation of generations

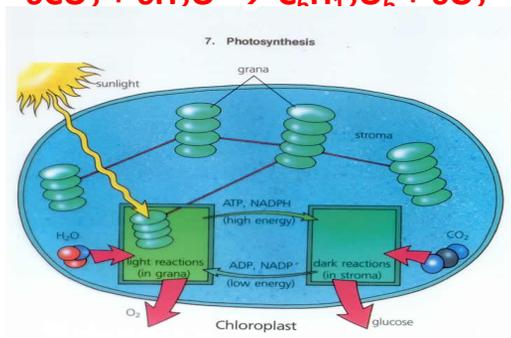


In advanced Tracheophytes

- (Gymnosperms & Angiosperms) the main plant 99% of its life cycle is in the diploid (2N) sporophyte generation.
- The haploid (N) gametophyte is only present inside the seed itself.

## Photosynthesis:

- **Converts sunlight energy into food for the plant.**
- **Takes place in the chloroplast**
- **Has a light (grana) & dark reaction (stroma)**
- **$6\text{CO}_2 + 6\text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$**



Remember the chloroplast has two main parts:  
The grana are composed of stacks of thylakoids & the space between grana is the stroma



Photosynthesis: overall reaction



**Reactants:** carbon dioxide & water

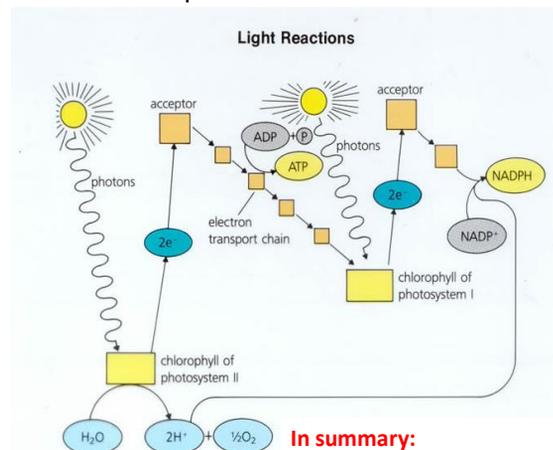
**In the presence of sunlight & chlorophyll**

**Yield**

**Products:** Glucose and oxygen

## Light Reaction — Takes place in the Grana

- Requires sunlight
- Photons from sun & water,  $\text{H}_2\text{O}$ , from the plant come into the grana.
- Chlorophyll kicks off an electron from the splitting of  $\text{H}_2\text{O}$  into hydrogen & Oxygen.
- ADP (low energy) is converted into ATP (high energy)
- $\text{NADP}^+$  (low energy) is converted into NADPH (high energy)



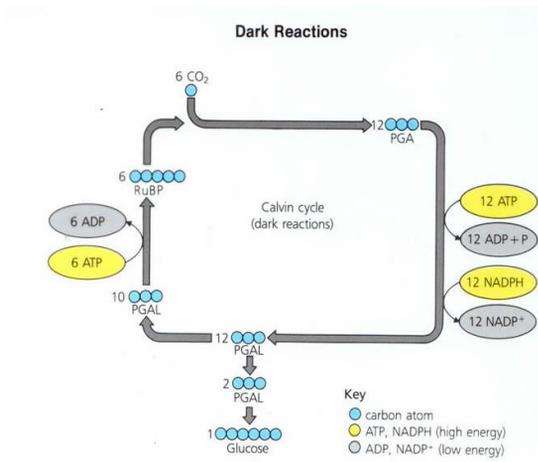
**In summary:**

**Photons, water, ADP &  $\text{NADP}^+$  in...**

**Oxygen, ATP & NADPH out**

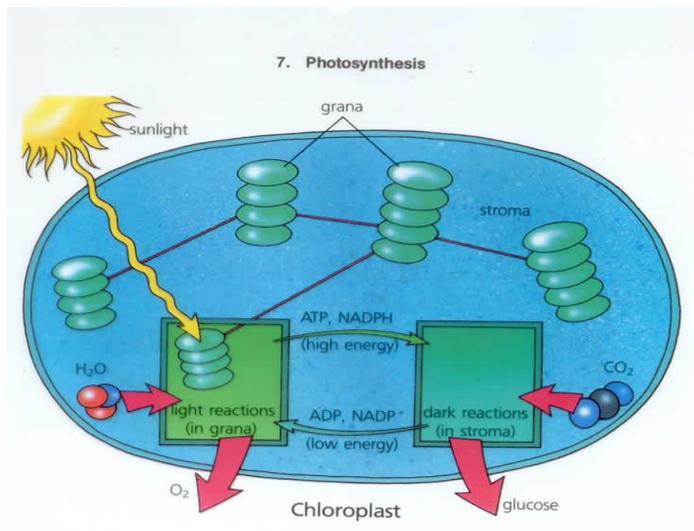
## Dark Reaction – Takes place in the Stroma

- Takes place day or night, no sun required
- ATP (high energy) & NADPH (high energy) along with carbon dioxide in the stroma.
- Goes through the Calvin Cycle and converts them into glucose.
- ADP (low energy) & NADP<sup>+</sup> (low energy)
- ATP & NADPH are short term high energy molecules
- ADP & NADP<sup>+</sup> are short term low energy molecules
- Glucose is a long term high energy molecule



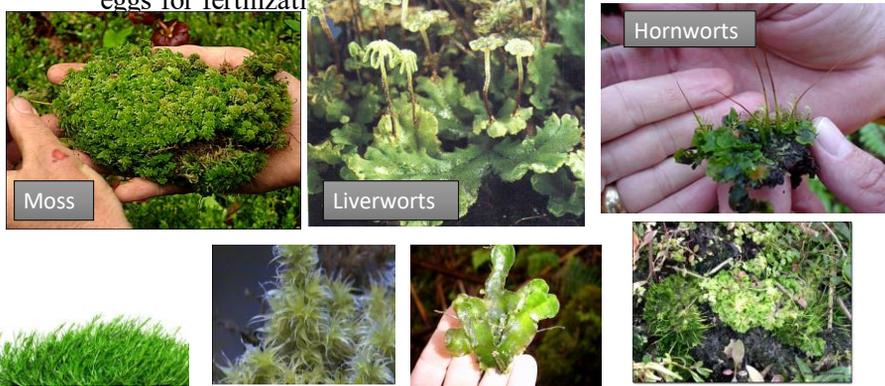
**In summary: Carbon dioxide, ATP & NADPH in...  
Glucose, ADP & NADP<sup>+</sup> out**

## Photosynthesis - Summary



# Bryophytes

- Mosses, Liverworts and Hornworts:
  - Require > moisture for life functions
  - Nonvascular plants – no true roots or leaves
  - Small, low growing plants that lack vascular tissue
  - Difficult to transport plant materials throughout the plant
  - Difficult to support plant – only the rigid cell walls
  - Reproduce w/ spores & require H<sub>2</sub>O to transfer sperm to eggs for fertilization

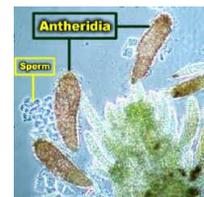


## Bryophyte Structure

- Moss structure
  - Sporophyte
  - Gametophyte
  - Seta (stalk)
  - Leaf
  - Capsule
  - Rhizoids
  - Antheridium
  - Archegonia
  - Spores



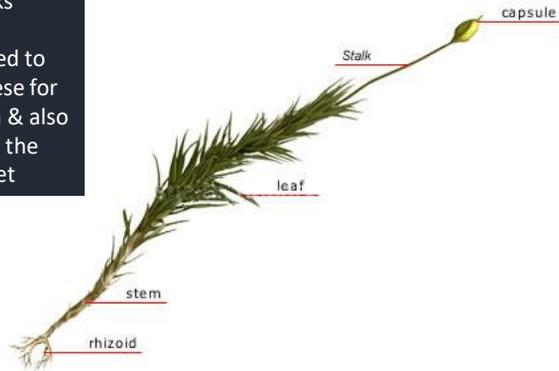
Types of Mosses...



## Typical Bryophyte Structure

Try and identify the blanks

you'll need to know these for the exam & also to fill out the worksheet



## Primitive Tracheophytes

- Ferns, Club "Mosses" & Horsetails
  - Ferns have a vascular system
  - Use spores to reproduce – do not produce seeds; need  $H_2O$  to transfer sperm to egg
  - Stems are usually horizontal and fronds sprout above the surface
  - Spores produced on tips of the frond leaflets



### Types of Primitive Tracheophytes...



## Typical Fern Structure

- We'll use a fern to demonstrate the structure of the primitive Tracheophytes

- Structures:

- Frond
- Blade
- Petiole
- Rhizome
- Roots
- Fiddlehead
- Pinna
- Sorus
- Sporangium
- Archegonium
- Antheridium
- Sporophyte
- Gametophyte

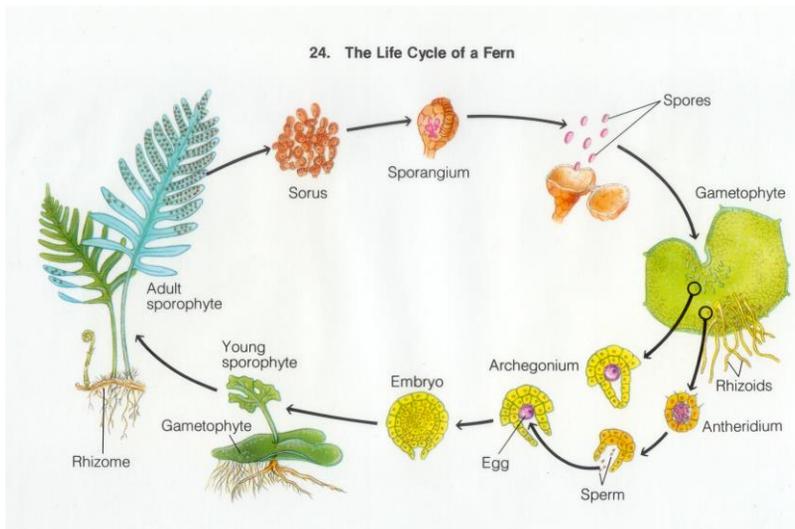


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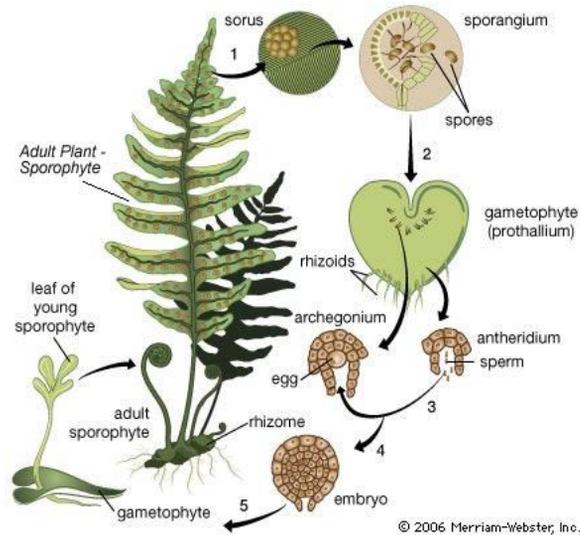
## Life Cycle of the Ferns



## Another diagram: Fern Life Cycle

Try and identify  
the letters A-J

you'll need to  
know these for  
the exam & also  
to fill out the  
worksheet



That's enough...  
Let's call it a night