Chapter 10
Plant
Study Sheet

I. Chapter 10: Introduction to Plants

A. Section 1: **The Plant Kingdom**

1. **Autotrophs** - produce their own food, all are **Eukaryotes**
2. Photosynthesis converts carbon dioxide and water in the presence of chlorophyll and sun light into sugar and oxygen.
3. $6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$
4. Plant cells have **cell wall** made from **cellulose**, **large vacuole**, **Chloroplasts** w/ stacks of **Grana** which contain **Chlorophyll**
5. Living on Land
    a. For plants to survive they must:
        i. Be able to **obtain water** and other materials from the environment
            - **Rhizoids** – nonvascular plants
            - **Roots** – vascular plants
        ii. **Reduce water loss** thru transpiration
            - Cuticle, stomata, leaf modifications
        iii. **Transport** materials throughout plant
            - Vascular tissue: phloem, cambium and xylem
            - Simple diffusion
        iv. **Support** their bodies
            - Stems and vascular tissue
        v. **Reproduce** successfully
            - Complex life cycles w/ **sporophyte** and **gametophyte** stages

B. Section 2: **Photosynthesis and Light**

1. Light striking the green leaves of a plant absorb the visible spectrum and reflects back (doesn't use) the green part of the spectrum
2. Photosynthesis absorbs and then stores the energy of the sun (light) by converting **ADP into ATP** and **NADP into NADPH**
3. Photosynthesis converts **carbon dioxide** and **water** in the presence of chlorophyll and sun light into **sugar** and **oxygen**.
4. **$6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$**

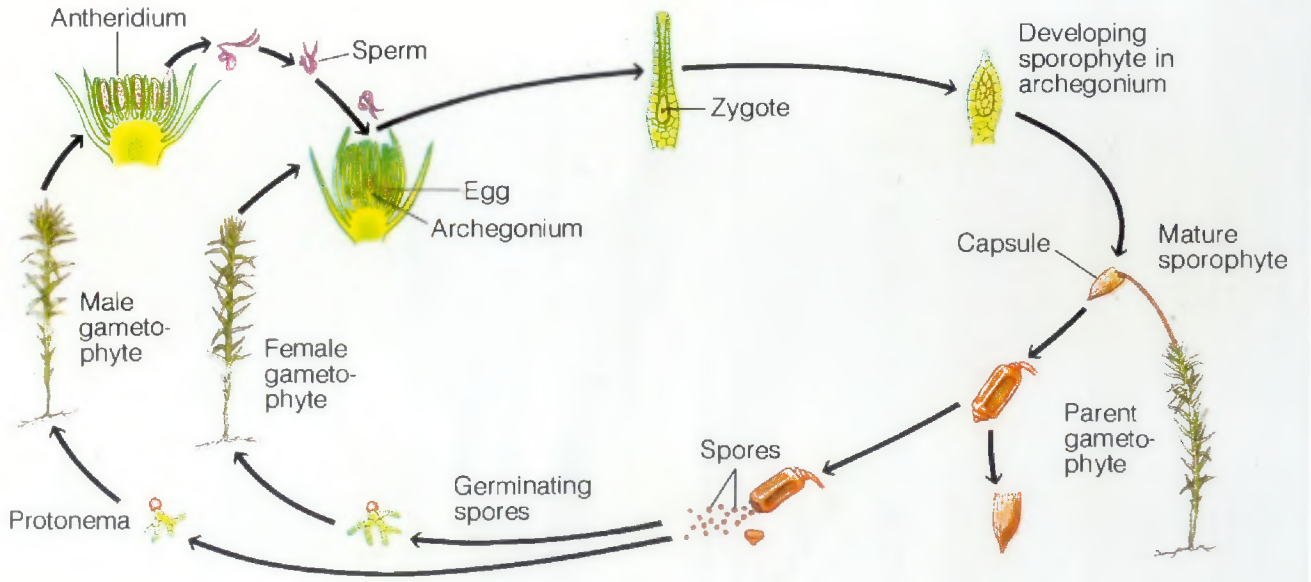
C. Section 3: **Bryophytes: Mosses, Liverworts and Hornworts:**

1. Nonvascular plants
2. Small, low growing plants that lack vascular tissue
3. Difficult to transport plant materials throughout the plant
4. Difficult to support plant – only the rigid cell walls
5. Reproduce w/ spores

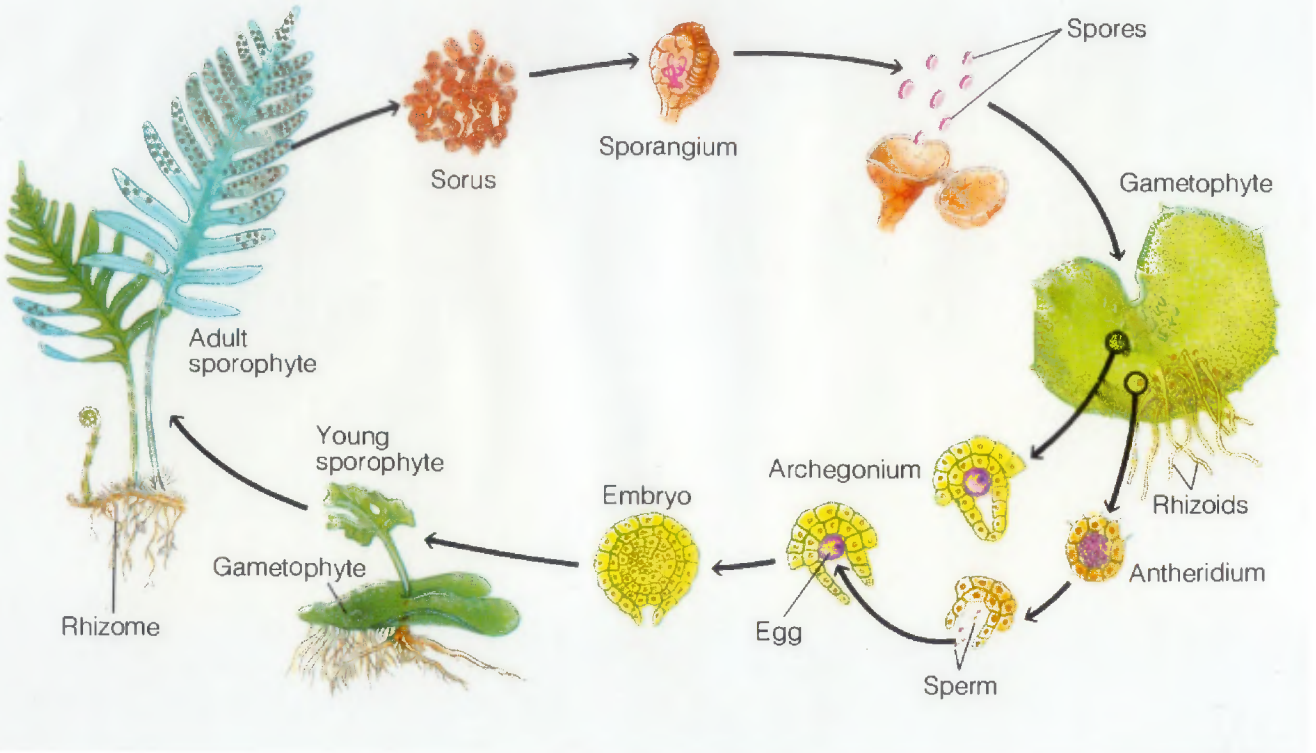
D. Section 4: **Tracheophytes: Ferns and other land plants**

1. Ferns have a vascular system
2. Use spores to reproduce – do not produce seeds
3. Stems are usually horizontal and fronds sprout above the surface
4. Spores produced on tips of the frond leaflets

23. The Life Cycle of a Moss



24. The Life Cycle of a Fern



LIFE SCIENCE CHAPTER 10

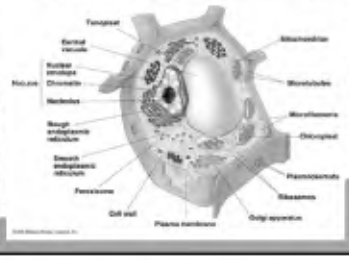
INTRO TO PLANTS

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.
- $6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$







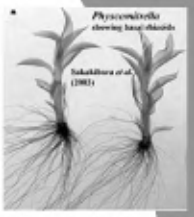

Living on Land ...what is required?

- 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!!

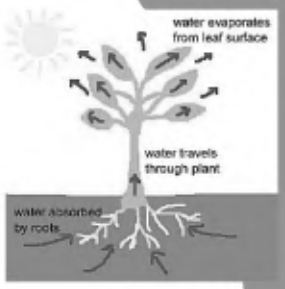
Be able to **obtain water**

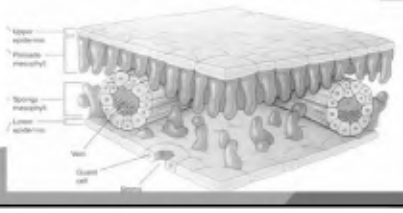
- Aquatic plants are surrounded by water, but to live on land they must be able to pickup water from the environment
- Bryophytes use rhizoids & Tracheophytes use true roots



Retain Water

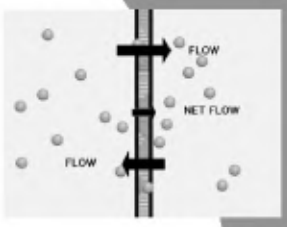
- Plants lose water by a process called transpiration
  - Water taken into the plant by the roots is pumped throughout the plant and escapes through leaf stomata.
- Waxy leaf covering – cuticle
- Stomata – protected by Guard Cells that open & close preventing water loss during dry times
- Desert plants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

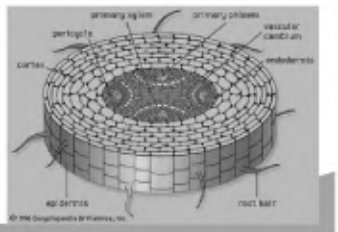


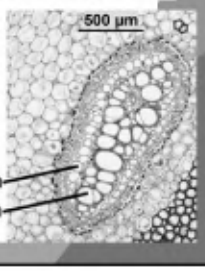


Transport materials

- 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

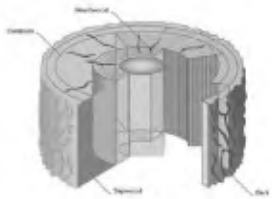






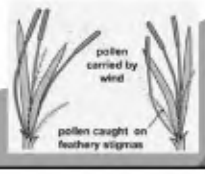
Support their bodies

- 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



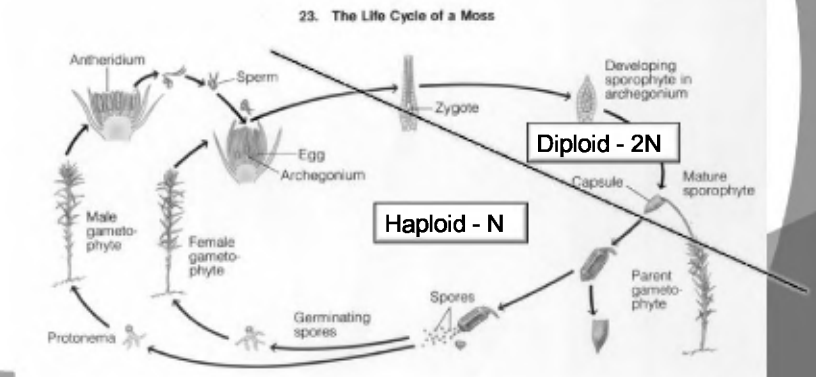
Reproduce successfully

- 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.



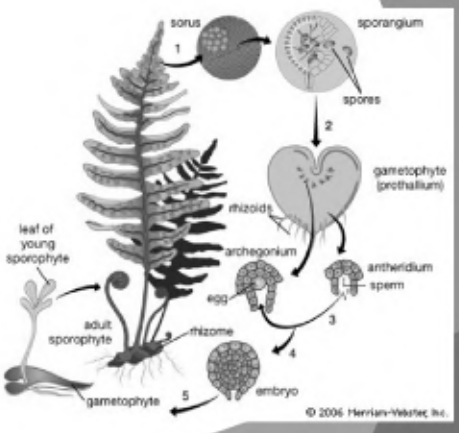
Alternation of generations

- 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.

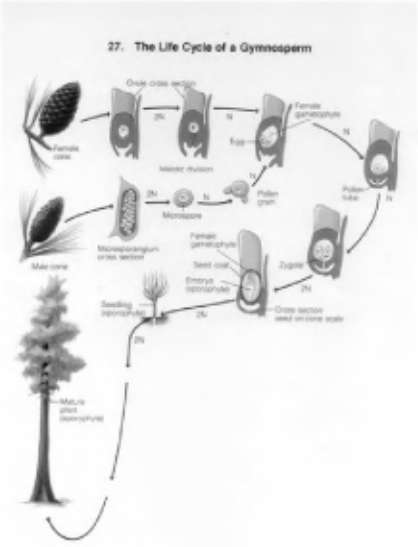


Alternation of Generations

- 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 is the gametophyte stage.
  - Gametophyte produces both sperm & egg. When fertilization occurs, the new sporophyte grows off of the gametophyte
  - As the sporophyte grows it over powers the tiny gametophyte stage



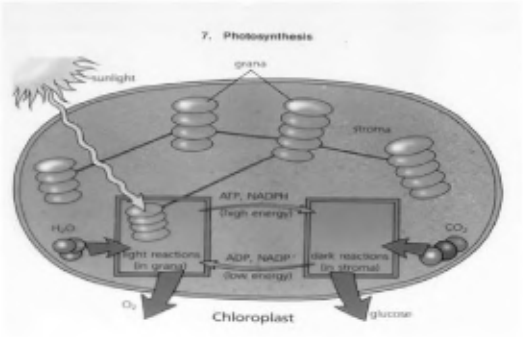
Alternation of generations



- 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)**
- **$6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$**



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

Photosynthesis: overall reaction

- $6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$

Reactants: carbon dioxide & water

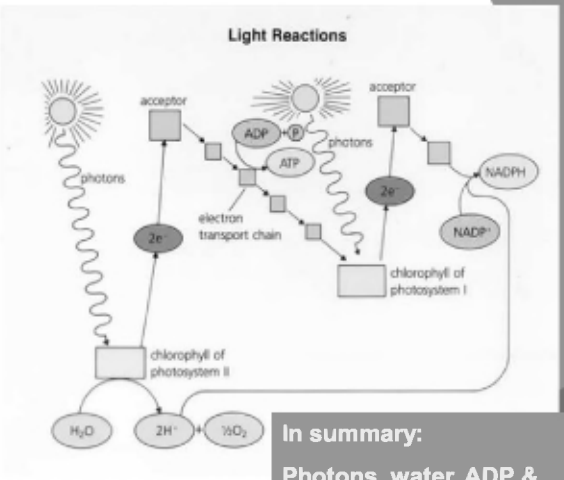
In the presence of sunlight & chlorophyll

Yield

Products: Glucose and oxygen

Light Reaction – Takes place in the Grana

- Requires sunlight
- Photons from sun & water, H_20, from the plant come into the grana.
- Chlorophyll kicks off an electron from the splitting of H_2O into hydrogen & Oxygen.
- ADP (low energy) is converted into ATP (high energy)
- $NADP^+$ (low energy) is converted into NADPH (high energy)



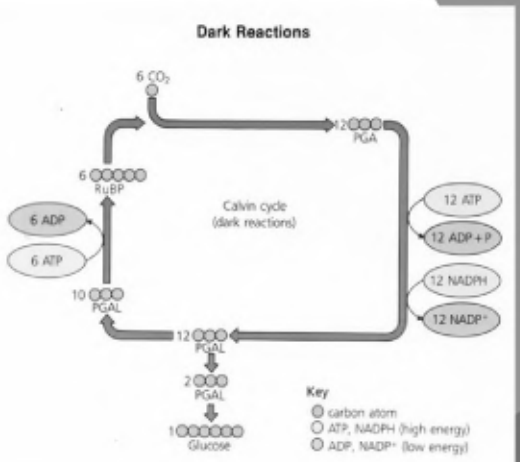
In summary:

Photons, water, ADP & $NADP^+$ in…

Oxygen, ATP & NADPH out

Dark Reaction – Takes place in the Stroma

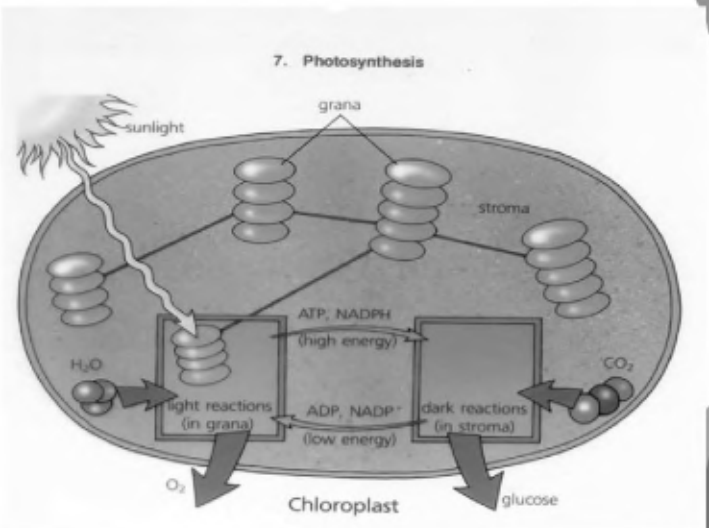
- Takes place day or night, no sun required
- ATP (high energy) & NADPH (high energy) along with carbon dioxide in the stroma.
- Goes through the Calvin Cycle and converts them into glucose.
- ADP (low energy) & $NADP^+$ (low energy)
- ATP & NADPH are short term high energy molecules
- ADP & NADP+ are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



In summary: Carbon dioxide, ATP & NADPH in…

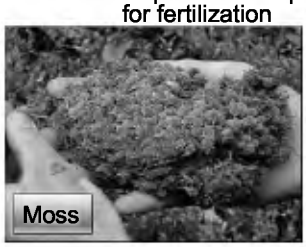
Glucose, ADP & $NADP^+$ out

Photosynthesis - Summary



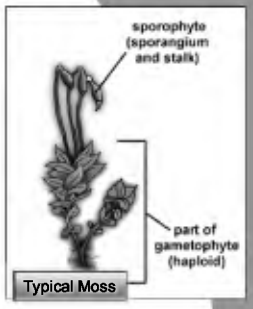
Bryophytes

- **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_2O to transfer sperm to eggs for fertilization



Bryophyte Structure

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

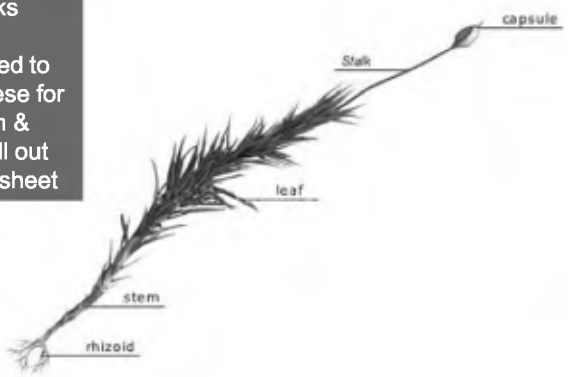


Types of Mosses…
(Hehe)

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

Try and identify the blanks

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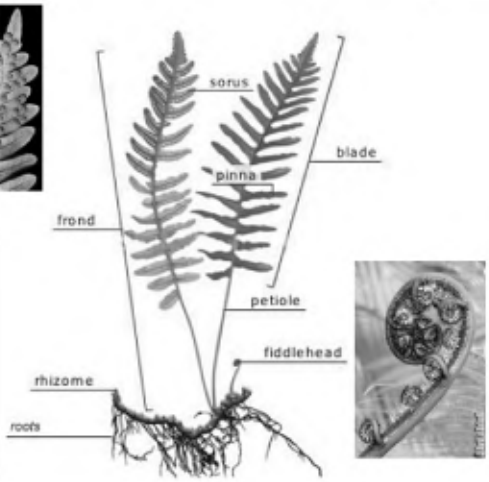
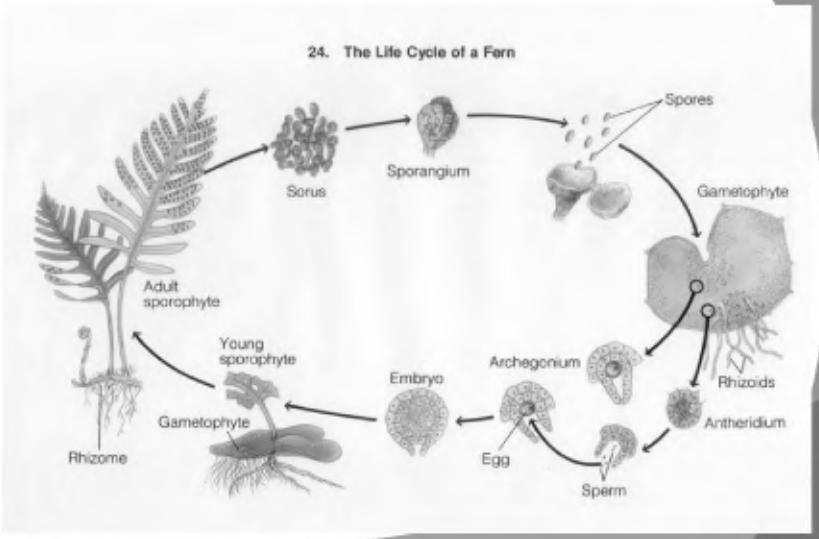


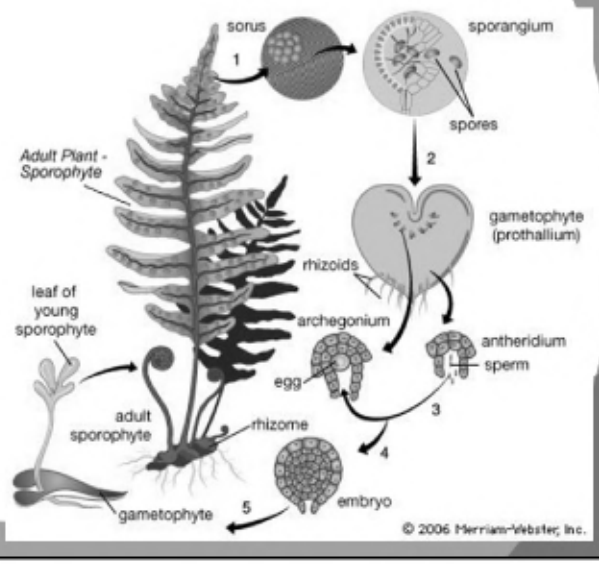
Life Cycle of the Ferns



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