



# Biology 11 Notes



## Self-Guided Notes : “Complex” Invertebrates : Chapter 27, 28, 29 (Miller & Levine)

### 27-1 Mollusks

#### I. What is a Mollusk?

- A. Phylum Mollusca, Origin: from Latin; \_\_\_\_\_ = \_\_\_\_\_
- B. Contains animals that \_\_\_\_\_ and \_\_\_\_\_ very differently from each other.
- C. Mollusks (def'n):

#### II. Form and Function in Mollusks

- A. Body plans have 4 basic parts:
  - 1. \_\_\_\_\_
  - 2. \_\_\_\_\_
  - 3. \_\_\_\_\_
  - 4. \_\_\_\_\_
- B. Foot
  - 1. Usually contains the \_\_\_\_\_ and other structures associated with \_\_\_\_\_.
  - 2. Many different shapes:
    - a. \_\_\_\_\_
    - b. \_\_\_\_\_
    - c. \_\_\_\_\_
- C. Mantle: (Definition)
- D. Visceral Mass contains \_\_\_\_\_
- E. Radula:
  - 1. Is a \_\_\_\_\_-shaped structure used in feeding.
  - 2. A layer of \_\_\_\_\_ skin that carries hundreds of tiny \_\_\_\_\_.
  - 3. Acts like \_\_\_\_\_ to scrape/tear off food from surfaces.
- F. Carnivores have a radula or sharp \_\_\_\_\_; some produce \_\_\_\_\_ to subdue prey.
- G. Filter feeders use \_\_\_\_\_ to sift food from water. \_\_\_\_\_ and \_\_\_\_\_ on gills trap plankton and move it to \_\_\_\_\_.
- H. Respiration
  - 1. Aquatic species: use \_\_\_\_\_ inside the mantle.
  - 2. Land species: \_\_\_\_\_ is lined with \_\_\_\_\_ vessels, folded and kept moist so \_\_\_\_\_ can enter cells.
- I. Transport
  - 1. Slow moving species: \_\_\_\_\_ circulatory system.
    - a) The \_\_\_\_\_ is pumped by a simple \_\_\_\_\_
    - b) Blood works its way through body tissues in open spaces called \_\_\_\_\_.
    - c) These \_\_\_\_\_ into vessels that pass first through the \_\_\_\_\_, where oxygen and carbon dioxide are exchanged, and then back to the heart.
  - 2. Fast moving species: \_\_\_\_\_ system (more \_\_\_\_\_).

J. Excretion

1. Undigested food leaves through the \_\_\_\_\_ as \_\_\_\_\_.
2. Ammonia is removed from the body \_\_\_\_\_ by tube-shaped organs called \_\_\_\_\_.

K. Response

1. \_\_\_\_\_ nervous systems.
  - a) In mollusks that live inactive lives ie. \_\_\_\_\_
    - i) several small \_\_\_\_\_ near the mouth
    - ii) a few \_\_\_\_\_ cords
    - iii) simple sense organs such as a \_\_\_\_\_ and \_\_\_\_\_ receptors, statocysts and ocelli
2. \_\_\_\_\_ nervous systems.
  - a) In active and intelligent predators ie. \_\_\_\_\_
    - i) well-developed \_\_\_\_\_ = \_\_\_\_\_ & intelligence.
    - ii) complex sense organs ie. Image forming \_\_\_\_\_

L. Reproduction

1. Most commonly: \_\_\_\_\_ sexes and \_\_\_\_\_ fertilization; eggs and sperm are released into the \_\_\_\_\_ water and find each other by chance. A free-swimming \_\_\_\_\_ (called a trochophore) develops from the resulting fertilized eggs.
2. \_\_\_\_\_ mollusks: separate sexes and \_\_\_\_\_ fertilization.
3. Many snails: hermaphrodites / \_\_\_\_\_

**III. Snails, Slugs, and Their Relatives**

- A. Class \_\_\_\_\_; Origin of name:
- B. All move by means of a broad, muscular \_\_\_\_\_ located on the \_\_\_\_\_ (stomach) side.
- C. Have a \_\_\_\_\_ - \_\_\_\_\_ shell that protects their soft bodies.

**IV. Two-Shelled Mollusks**

- A. Class \_\_\_\_\_; Origin of name: bi = two; valve = shell.
- B. Have \_\_\_\_\_ shells that are hinged together at the back and held together by one or two powerful \_\_\_\_\_.
- C. Examples of bivalves:

**V. Tentacled Mollusks**

- A. Class \_\_\_\_\_; Origin of name: cephalo = head; pod = foot.
- B. Examples of cephalopods:
- C. Size:
- D. Most cephalopods have small \_\_\_\_\_ shells or \_\_\_\_\_ shells.
- E. Defense and Predation:
  1. Move rapidly by using a form of \_\_\_\_\_ propulsion forcing \_\_\_\_\_ out of the mantle cavity through the tubelike siphon.

2. Release large amounts of dark-colored, foul-tasting \_\_\_\_\_ when they are frightened.
3. Can change \_\_\_\_\_ to blend into their \_\_\_\_\_.

## VI. How Mollusks Fit into the World

- A. Many ecological roles:
  1. \_\_\_\_\_ivores
  2. \_\_\_\_\_ivores
  3. Scavengers: eat \_\_\_\_\_ (clean up dead material)
- B. Food source for \_\_\_\_\_ and other animals.
- C. 3 examples of mollusks and how they are detrimental:
  1. Damage \_\_\_\_\_ and \_\_\_\_\_.
  2. Shipworms: destroy wooden \_\_\_\_\_ and \_\_\_\_\_.
  3. \_\_\_\_\_ and \_\_\_\_\_ can concentrate toxins from the water (ie. \_\_\_\_\_ tide) into their body tissues. This can harm or kill individuals who consume them.

<b>29-1 Echinoderms</b>
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### I. Echinoderms

A. Origin of the Phylum name Echinodermata

1. echino = \_\_\_\_\_ dermis = \_\_\_\_\_

### II. What is a Echinoderm?

A. Characteristics of Phylum Echinodermata

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.

B. Water vascular system

1. Description: internal network of fluid-filled \_\_\_\_\_ connected to external appendages called \_\_\_\_\_.
2. Water vascular system is involved in 5 essential life functions:
  - a.
  - b.
  - c.
  - d.
  - e.

C. What do Echinoderms have in common with vertebrates?

1.

2.

### III. Form and Function in Echinoderms

A. Body Plan:

1. No \_\_\_\_\_ nor a \_\_\_\_\_  
end and no \_\_\_\_\_

2. But, most are \_\_\_\_\_ sided

a. Mouth is located on \_\_\_\_\_ surface, opposite side is called the \_\_\_\_\_  
surface

B. All echinoderms have a water \_\_\_\_\_ system

1. Opens to outside through a  
\_\_\_\_\_

2. In starfish:

a. Madreporite connects to a tube  
called the \_\_\_\_\_

b. From the ring canal, 5 \_\_\_\_\_  
extend into each arm

c. Attached to each radial canal are hundreds of movable \_\_\_\_\_

3. System operates like a series of living \_\_\_\_\_ pumps

a. When water is pushed into a tube  
foot, the tube foot \_\_\_\_\_

b. When water is pulled out, the cup  
on the end of the tube foot \_\_\_\_\_,  
creating a partial \_\_\_\_\_ that holds  
on

c. Alone, a tube foot cannot \_\_\_\_\_ much, but hundreds acting  
\_\_\_\_\_ create enormous \_\_\_\_\_

D. Feeding

1. Describe how starfish feed (in detail)?

E. Respiration

1. Most species use tissue of \_\_\_\_\_ tube feet.

2. Others (e.g. starfish) have small  
outgrowths called \_\_\_\_\_

- F. Internal transport
- Nutrient distribution done by \_\_\_\_\_ glands and fluid in \_\_\_\_\_
- G. Excretion
- Solid wastes released through \_\_\_\_\_
  - Ammonia excreted by \_\_\_\_\_ & \_\_\_\_\_
- H. Response
- Most echinoderms have a \_\_\_\_\_ ring that surrounds the mouth and \_\_\_\_\_ nerves that connect the ring with the body sections
  - Scattered \_\_\_\_\_ cells detect food
  - Starfish have clusters of \_\_\_\_\_-sensitive cells called \_\_\_\_\_ at arm tips
  - \_\_\_\_\_ tell if organism is \_\_\_\_\_ up
- I. Movement
- Echinoderms use \_\_\_\_\_ feet and thin layers of \_\_\_\_\_ fibers attached to the plates of the \_\_\_\_\_ to move
- J. Reproduction
- Most echinoderms are \_\_\_\_\_ or \_\_\_\_\_
  - Egg and sperm are released in the \_\_\_\_\_ when other eggs and sperms are detected so fertilization occurs in \_\_\_\_\_ water.
  - Larvae swims in the \_\_\_\_\_ community until they mature and \_\_\_\_\_ into adults at the bottom of the ocean.

#### IV. The Echinoderm Classes

- A. Echinoderms are NOT found:
- \_\_\_\_\_
  - \_\_\_\_\_
- B. Starfish
- Also known as:
  - Physical Description:
- D. Sea Urchins and Sand Dollars
- Physical description:
    - Sand dollars are \_\_\_\_\_-shaped; Sea urchins are \_\_\_\_\_-shaped
- E. Sea Cucumbers
- Physical description:

#### V. How Echinoderms Fit into the World

- A. Ecological roles:
- Starfish are important \_\_\_\_\_ that control \_\_\_\_\_ of other animals
  - Sea urchins control \_\_\_\_\_, but can “overeat” and destroy habitats
- B. Use by humans:
- As food:

2. As sources of chemicals used as potential drugs against \_\_\_\_\_ and \_\_\_\_\_
3. Sea urchins used to study embryological development because:

## 28-1 Introduction to Arthropods

### I. Form and Function in Arthropods

- A. All arthropods have 3 key features:
1. \_\_\_\_\_
  2. \_\_\_\_\_
  3. \_\_\_\_\_
- B. Many arthropods have 3 additional features:
1. \_\_\_\_\_
  2. \_\_\_\_\_
  3. \_\_\_\_\_
- C. Arthropod body plan
1. Exoskeleton: (definition)
    - a. Function:
      - i. \_\_\_\_\_
      - ii. \_\_\_\_\_
      - iii. \_\_\_\_\_
    - b. Disadvantages: \_\_\_\_\_
- D. Feeding
1. List and give an example of an organism employing each type of feeding method
    - a. \_\_\_\_\_
    - b. \_\_\_\_\_
    - c. \_\_\_\_\_
    - d. \_\_\_\_\_
    - e. \_\_\_\_\_
- E. Respiration
1. 3 basic types of respiratory structures
    - a. \_\_\_\_\_
    - b. \_\_\_\_\_
    - c. \_\_\_\_\_
- F. Internal Transport
1. Have a well-developed \_\_\_\_\_ pumping blood through an \_\_\_\_\_ system.
  2. Blood moves out of \_\_\_\_\_ moves through spaces called \_\_\_\_\_.
- G. Excretion
1. Solid waste: \_\_\_\_\_
  2. Metabolic waste eliminated by:
    - a. \_\_\_\_\_
    - b. \_\_\_\_\_
    - c. \_\_\_\_\_
- H. Response
1. Nervous system composed of:
    - a. \_\_\_\_\_
    - b. \_\_\_\_\_

2. Have sense organs such as:
  - a.
  - b.
  - c.
  - d.
  - e.
  - f.
3. Defense against predators (be descriptive):
  - a.
  - b.
  - c.
  - d.

I. Reproduction

1. Fertilization is \_\_\_\_\_.
2. Males transfer \_\_\_\_\_ directly or drop a \_\_\_\_\_ of sperm that is picked up by the \_\_\_\_\_.

**III. Growth and Development in Arthropods**

A. What is the problem with exoskeletons?

B. Describe the steps that occur during molting (5 steps).

C. What is the difference between complete metamorphosis and incomplete metamorphosis?



## 28-2 Spiders and Their Relatives

### I. Spiders and Their Relatives

- A. Subphylum Chelicerata has 3 main characteristics
- 1.
  - 2.
  - 3.

### III. Arachnids

- A. Characteristics:
- 1.
  - 2.

- B. Some examples of Arachnids:

- 1.
- 2.
- 3.

- C. Spiders

1. Diet:

- a. Describe how a spider eats (3 steps).

2. Silk: (definition)

- a. Why do arachnids build silk structures?

## 28-3 Crustaceans

### I. Crustaceans

- A. Characteristics:

- 1.
- 2.
- 3.

- B. Examples of Crustaceans:

1. \_\_\_\_\_(terrestrial)
2. \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, etc (aquatic)

- C. The 3 body parts are called:

- 1.
- 2.
- 3.

- D. Cephalothorax: (definition)

- E. First two pair of appendages are: \_\_\_\_\_

- F. Third pair of appendage are \_\_\_\_\_ called \_\_\_\_\_ for: \_\_\_\_\_

- G. The appendages on the thorax and abdomen can be for:
- 1.
  - 2.
  - 3.

<b>28-4 Insects and Their Relatives</b>
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**I. Insects and Their Relatives**

- A. Characteristics:
- 1.
  - 2.
- B. Habitat:

**II. Centipedes and Millipedes**

- A. Centipedes
1. Description:
  2. Lifestyle:
- B. Millipedes
1. Description:
  2. Lifestyle:

**III. Insects**

- A. Characteristics:
- 1.
- B. Feeding
1. Why are the mouthparts so different in different insects?
  2. \_\_\_\_\_ contains specialized enzymes:
    - a.
    - b.
    - c.
- C. Movement
- 1.
  - 2.
- D. Insect societies
1. Society: (definition)
  2. Within societies, there is division of \_\_\_\_\_.

3. The 3 basic castes and their main function(s) are:
  - a.
  - b.
  - c.

E. Insect communication

1. Use:
  - a.
  - b.
  - c.
2. Functions of communication are:
  - a.
  - b.
3. Pheromone: (definition)

<b>28-5 How Arthropods Fit into the World</b>
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**I. How Arthropods Fit into the World**

- A. Ecological role:
  - 1.
  2. \_\_\_\_\_plants
- B. Contributions to human life:
  - 1.
  2. \_\_\_\_\_and \_\_\_\_\_ research
- C. List 3 things that arthropods damage
  - 1.
  - 2.
  - 3.

## Self-Guided Notes : “Simple” Plants : Chapter 20 & 21 (Miller & Levine)

### 20-1 Characteristics of Algae

#### I. Introduction

- A. Description:
1. Are \_\_\_\_\_ organisms
  2. Live in fresh water (e.g. \_\_\_\_\_) and \_\_\_\_\_
- B. Must live in or near a:
1. Reason:
  2. Water they live in:
    - a. provides: \_\_\_\_\_ and \_\_\_\_\_ carries away \_\_\_\_\_
- C. Types of algae
1. Most are: \_\_\_\_\_; Giant kelp can grow to \_\_\_\_\_ long
  2. Unicellular are \_\_\_\_\_, and can also classified as \_\_\_\_\_
- D. Algae structures
1. Cells have \_\_\_\_\_
  2. Never have specialized \_\_\_\_\_, \_\_\_\_\_, or \_\_\_\_\_ like land plants do

#### II. Adaptations of Algae to Life Under Water

- A. How they differ from land plants:

<b>Because they:</b>	<b>Means that Algae:</b>
Don't need protection from drying out	Are thin ( only _____ thick!)
Exchange materials directly with surrounding water	Have no _____ tissues.
Are supported by water	Don't need stems to keep from _____
Reproduce in water	Make gametes that _____

#### II. Chlorophyll and Accessory Pigments

- A. Challenges of underwater life:
1. Water \_\_\_\_\_ much of the \_\_\_\_\_ of sunlight
  2. Algae groups have evolved \_\_\_\_\_ that absorb different \_\_\_\_\_ of light
  3. Some also evolved other \_\_\_\_\_ compounds called \_\_\_\_\_
    - a. They can live in deeper water
    - b. Different \_\_\_\_\_ wavelengths give algae a wide range of \_\_\_\_\_

## 20-2 Groups of Algae

### I. Chlorophyta – The Green Algae

A. Habitat:

1. Found mostly on moist \_\_\_\_\_ and in \_\_\_\_\_ water

B. Examples:

Cell arrangement:	Name:	Sketch:
Single-celled		
	Volvox	
Filamentous (threadlike)		
	Ulva “sea lettuce”	

### II. Phaeophyta – The Brown Algae

A. Habitat:

1. Marine: especially cool, shallow waters in \_\_\_\_\_ or \_\_\_\_\_ oceans

B. Most “sea weeds” are: \_\_\_\_\_

1. Giant kelp
2. Fucus (common name: \_\_\_\_\_):
  - a. make a labeled sketch:
  - b. give function of:
    - i) holdfast:
    - ii) bladders:

### III. Rhodophyta – The Red Algae

A. Habitat:

1. Marine: from arctic to \_\_\_\_\_, from surface to \_\_\_\_\_ deep due to \_\_\_\_\_

B. Examples:

1. Porphyra (dried, it’s called \_\_\_\_\_ and used to make \_\_\_\_\_)

## 20-4 Where Algae Fit into the World

A. Ecological role:

1. In food chains: called the “\_\_\_\_\_”
2. Habitat for others: e.g. the \_\_\_\_\_ of North American coasts
3. Oxygen providers:
  - a. Life could not have \_\_\_\_\_ without the O<sub>2</sub> they release in \_\_\_\_\_
  - b. Algae do \_\_\_\_\_ of all photosynthesis on Earth

B. Uses by humans

1. Sources of \_\_\_\_\_ used in:
  - a. Drugs
  - b. Food additives
  - c. Industrial products
  - d. \_\_\_\_\_ used to make plates for microbiology

**21-1 Plants Invade the Land**

**I. Demands of Life on Land**

The demands:	What land plants must do:
Provide cells with a constant _____	a. find water b. _____ to all cells c. Protect against _____ by evaporation
Expose food-making parts to _____	need _____ to hold up & _____ leaves
Different tasks performed in distant plant parts: a. _____ take up water & nutrients b. _____ make food	Need a transport system: a. water/nutrients _____ b. sugars made by _____ downward
For reproduction, gametes must find each other	Need a mechanism to deliver sperm that DOESN'T involve having them _____

**21-2 The Mosses, Liverworts, and Hornworts**

**I. Introduction**

- A. Need \_\_\_\_\_ for reproduction to occur
- B. Thrive only in wet areas: \_\_\_\_\_
- C. All less than a few \_\_\_\_\_ tall
- D. Mosses:
  1. Each plant has:
    - a. A thin, upright \_\_\_\_\_ like a stem with tiny \_\_\_\_\_ called the Gametophyte
    - b. From base of the shoot grow \_\_\_\_\_ that anchor the plant
    - c. Shoots may be topped with a brown flag-like structure called a \_\_\_\_\_
  3. Copy and label the diagram in 21-5:

## II. Physical Characteristics of Bryophytes

- A. Water Conduction
1. Lack tubes
  2. Water passes between cells by \_\_\_\_\_ and \_\_\_\_\_
  3. These methods work: \_\_\_\_\_ only; can't grow \_\_\_\_\_
  4. Lack a protective surface covering to prevent evaporation
  5. "Leaves" only \_\_\_\_\_ thick; dry out \_\_\_\_\_
  6. Lack true roots: \_\_\_\_\_ anchor, but don't \_\_\_\_\_ and \_\_\_\_\_ water & minerals
- B. Reproduction
1. Sperm must \_\_\_\_\_ to the egg, using \_\_\_\_\_ to propel themselves
  2. Moss environment must be wet for: \_\_\_\_\_

## III. Alternation of Generations in Mosses

- A. Life Cycle Stages:
1. At the tips of the gametophyte:
    - a. \_\_\_\_\_: makes sperm
    - b. \_\_\_\_\_: makes eggs
  2. Fertilization
    - a. Sperm swims to \_\_\_\_\_
    - b. Plants must be covered with \_\_\_\_\_ or \_\_\_\_\_
    - c. Gamete fusion produces a \_\_\_\_\_ (diploid, or "2n")
  3. Growth
    - a. Zygote grows into \_\_\_\_\_
    - b. Its \_\_\_\_\_ are supplied by female gametophyte
    - c. Sporophytes cannot live \_\_\_\_\_
    - d. \_\_\_\_\_ at end of stalk makes haploid (1n) \_\_\_\_\_ by \_\_\_\_\_
  4. Spore Release
    - a. When \_\_\_\_\_, capsule opens, shakes out spores
    - b. Spores \_\_\_\_\_ off by \_\_\_\_\_ and \_\_\_\_\_
  5. Growth of 1n Generation
    - a. Spores that land in moist places germinate into a \_\_\_\_\_
    - b. Protonema = mass of \_\_\_\_\_  
(look like algae!)
    - c. This grows \_\_\_\_\_ into soil and \_\_\_\_\_ into the air that develop into moss \_\_\_\_\_
    - d. The cycle begins again!
- B. Summary:
1. Gametophyte (1n or haploid) is the \_\_\_\_\_, obvious stage
  2. Fertilization requires \_\_\_\_\_
  3. Sporophyte is dependent upon \_\_\_\_\_

## 21-3 The Ferns and the First Vascular Plants

### I. Introduction to Tracheophyta

- A. "True" Land Plants because they:
- Vascular tissues: two types:
    - \_\_\_\_\_ : moves water from roots to rest of plant
    - Phloem:
  - \_\_\_\_\_ cells in xylem have thick, strong walls that help plants \_\_\_\_\_
  - True roots have transport tissue in a central \_\_\_\_\_
  - True leaves have:
    - veins (def'n):
    - cuticle (def'n):

### II. Club Mosses and Horsetails

- The only living descendants of \_\_\_\_\_
- Some grew up to \_\_\_\_\_ tall!
- Some fossilized into \_\_\_\_\_
- Sketch a horsetail: Label its stem and leaves:

### III. Physical Characteristics of Ferns

- A. Organs:
- Have true \_\_\_\_\_
  - True roots
  - Underground stems called \_\_\_\_\_
  - Large leaves called \_\_\_\_\_
- B. Size & Habitat
- Up to \_\_\_\_\_ tall in North America; in tropical forests can be the size of \_\_\_\_\_
  - Found in \_\_\_\_\_, or \_\_\_\_\_ places (e.g. rainforests of \_\_\_\_\_)

### IV. Alternation of Generations in Ferns

- A. Life Cycle Stages:
- Spore Production/Release:
    - Adult sporophytes produce haploid \_\_\_\_\_ on \_\_\_\_\_ of fronds
    - Formed in tiny containers called \_\_\_\_\_
    - Sporangia cluster together in groups called \_\_\_\_\_



- d. When \_\_\_\_\_, spores released; carried by \_\_\_\_\_, \_\_\_\_\_
2. Growth
    - a. Spores develop into \_\_\_\_\_ (1n) \_\_\_\_\_
    - b. Grow into small, heart-shaped \_\_\_\_\_
    - c. \_\_\_\_\_ and \_\_\_\_\_ develop on underside of prothallium
  3. Fertilization
    - a. Antheridia release \_\_\_\_\_
    - b. Sperm must swim through \_\_\_\_\_ to an \_\_\_\_\_
    - c. Each archegonium contains one \_\_\_\_\_
    - d. Fusion of gametes produces a \_\_\_\_\_ (2n) \_\_\_\_\_
  4. Growth
    - a. New sporophyte puts out \_\_\_\_\_, \_\_\_\_\_
    - b. Gametophyte \_\_\_\_\_
- B. Summary:
1. Dominant, obvious stage is the \_\_\_\_\_
  2. Sporophyte is a \_\_\_\_\_ with true \_\_\_\_\_
  3. Gametophyte can only grow in \_\_\_\_\_
  4. Sex still requires \_\_\_\_\_

## 21-4 Where Mosses and Ferns Fit into the World

### I. Mosses: Ecological Role

- A. Common in \_\_\_\_\_

### II. Mosses: Uses by Humans

- A. Gardening
1. Used as plants
  2. Peat moss added to soil to \_\_\_\_\_
- B. Burning sphagnum
1. Flavours \_\_\_\_\_
  2. Peat is used as \_\_\_\_\_

### III. Ferns: Ecological Role

- A. Common in the shadows of \_\_\_\_\_, because they:  
\_\_\_\_\_

### IV. Ferns: Uses by Humans

- A. Gardening
1. Used as plants
- B. Food
1. Some species eaten when young; fronds called \_\_\_\_\_

## Self-Guided Notes : “Complex” Plants : Chapter 22, 23, 25 (Miller & Levine)

### 22-1 Seed Plants

Benefits to plants of living on land are:

- 1.
- 2.

Problems encountered by life on land are:

- 1.
- 2.
- 3.
- 4.

#### **I. Seed plants – designed for life on land**

Seed plants exhibit numerous \_\_\_\_\_ that allow them to survive the difficulties of life on \_\_\_\_\_. They evolved a variety of new adaptations that enabled them to live where \_\_\_\_\_ could not.

#### **II. Roots, Stems, Leaves**

A. The three main organs in a plant are \_\_\_\_\_  
\_\_\_\_\_perform three jobs:

- 1.
- 2.
- 3.

B. \_\_\_\_\_ hold a plants \_\_\_\_\_up to the sun.

C. \_\_\_\_\_are vital to the process of \_\_\_\_\_.

#### **III. Vascular Tissue**

Tall plants face a challenge, \_\_\_\_\_must be lifted from \_\_\_\_\_ to \_\_\_\_\_ and \_\_\_\_\_produced in \_\_\_\_\_must be sent to the \_\_\_\_\_.

A. \_\_\_\_\_is responsible for carrying \_\_\_\_\_and \_\_\_\_\_up. They have thick \_\_\_\_\_ so also provide \_\_\_\_\_ to the woody parts.

B. \_\_\_\_\_carries the products of \_\_\_\_\_from one part of the plant to another.

#### **IV. Reproduction Free From Water**

The seed plants you see around you are members of the \_\_\_\_\_generation.

A. \_\_\_\_\_and \_\_\_\_\_are the reproductive structures where the \_\_\_\_\_generation of the seed plant develops.

B. Male gametophytes are called \_\_\_\_\_. Pollen grains are carried to the female gametophyte so no \_\_\_\_\_is required.

C. \_\_\_\_\_protect the zygotes of seed plants. They are surrounded by a \_\_\_\_\_ so can wait until \_\_\_\_\_are right.

## 23-5 Leaves

The leaves of green plants are the world's oldest \_\_\_\_\_. Leaves are also the world's most important \_\_\_\_\_.

### I. Leaf Structure

- A. Leaves consist of two parts: \_\_\_\_\_ and \_\_\_\_\_.
- B. Blades are adapted to the specific \_\_\_\_\_ in which they live. Adaptations range from \_\_\_\_\_ to \_\_\_\_\_.  
Leaves contain specialized tissues such as:
  - 1.
  - 2.
  - 3.

### II. Epidermis: Controlling Water Loss

- A. Epidermal cells are \_\_\_\_\_ and do not contain \_\_\_\_\_. Together with the \_\_\_\_\_, this layer protects delicate leaf tissues by slowing down the loss of \_\_\_\_\_ through \_\_\_\_\_.
- B. BUT, plants still need to "breathe" just as we do. They need to:
  - 1.
  - 2.
- C. Leaves must stay *moist* to carry out these gas exchanges. Seed plants solve this problem by balancing their need for \_\_\_\_\_ with \_\_\_\_\_. They use small openings called \_\_\_\_\_. \_\_\_\_\_ are generally located on \_\_\_\_\_.
- D. The specialized cells on either side of a stoma are called \_\_\_\_\_. When water pressure is high, the cells \_\_\_\_\_. When water pressure is low, \_\_\_\_\_.
- E. Each type of plant has guard cells that balance \_\_\_\_\_ against \_\_\_\_\_.

### III. Vascular tissues: The Veins of a leaf

- A. Vascular tissue in leaves is directly connected to the vascular tissues of stems. In monocot leaves, \_\_\_\_\_. In dicot leaves, \_\_\_\_\_.

### IV. Mesophyll Tissue: The food factory of the leaf

- A. Most leaf tissue is called \_\_\_\_\_. This is separated into two layers:
  - 1.
  - 2.
- B. The surfaces of the mesophyll layer are kept \_\_\_\_\_ so that gases can \_\_\_\_\_ the cells easily. A substantial amount of water is still lost to the outside through \_\_\_\_\_.

## 25-1 Cones & Flowers as Reproductive Organs

### I. Introduction

- A. Sexual Reproductive Organs
  - 1. Gymnosperms have \_\_\_\_\_
  - 2. Angiosperms have \_\_\_\_\_
- B. Review: Plant Life Cycles
  - 1. Two generations
    - a) diploid (2n) \_\_\_\_\_
    - b) haploid (1n) \_\_\_\_\_ which produces \_\_\_\_\_ and \_\_\_\_\_ gametes
  - 2. Fusion of gametes forms a \_\_\_\_\_ that grows into the next generation, the \_\_\_\_\_
- C. Sizes in Seed Plants
  - 1. Dominant generation (the one that is \_\_\_\_\_ & \_\_\_\_\_) = \_\_\_\_\_  
Gametophyte is \_\_\_\_\_ in the cones/flowers
- D. Advantages of Cones/Flowers
  - 1. Enable \_\_\_\_\_ plants to reproduce without standing \_\_\_\_\_
  - 2. An adaptation that helps them survive: \_\_\_\_\_

## 22-2 Evolution of Seed Plants

### I. Gymnosperms

\_\_\_\_\_ means naked, \_\_\_\_\_ means seed.

There are three classes of gymnosperms:

- 1.
- 2.
- 3.

Reproductive structures are called \_\_\_\_\_. Male cones produce male gametophytes called \_\_\_\_\_. Female cones produce female gametophytes called \_\_\_\_\_.

- A. \_\_\_\_\_ are palmlike plants. They only grow in \_\_\_\_\_ and \_\_\_\_\_ places.
- B. \_\_\_\_\_ are represented by one species, *Ginkgo biloba*. It is a living \_\_\_\_\_.

### II. Conifers

Are the most \_\_\_\_\_ gymnosperms today.

- A. The leaves are called \_\_\_\_\_. Conifers appear to be “\_\_\_\_\_” because older needles drop off but are gradually replaced.
- B. Male cones, or \_\_\_\_\_, and female cones, or \_\_\_\_\_, contain the very small gametophytes.  
In the \_\_\_\_\_, pollen cones release millions of dustlike pollen grains to be carried by the \_\_\_\_\_. These land on seed cones and \_\_\_\_\_ them. The zygotes grow into seeds on the \_\_\_\_\_ of the seed cones.

## from ..... 25-1 Cones & Flowers as Reproductive Organs

### II. Life Cycle of Gymnosperms

- A. Pine Tree Example
  - 1. Tree grew from a zygote contained in a \_\_\_\_\_
  - 2. It is the \_\_\_\_\_ (2n) \_\_\_\_\_ generation

3. Sapling matures, makes two types of cones:
  - a) Male: contain \_\_\_\_\_ -sporangia that produce \_\_\_\_\_ (male gametophyte)
  - b) Female: contain \_\_\_\_\_ -sporangia that produce \_\_\_\_\_ (female gametophyte)

B. Process

1. Pollen grains (from \_\_\_\_\_ ) carried by \_\_\_\_\_
2. Female cones make a \_\_\_\_\_ that traps \_\_\_\_\_
3. Grain splits open, grows a \_\_\_\_\_ which contains \_\_\_\_\_
4. Pollen tube grows into the \_\_\_\_\_, located in \_\_\_\_\_
5. Sperm \_\_\_\_\_ of the tube and fertilize \_\_\_\_\_ in the ovule
6. Zygote grows into an \_\_\_\_\_
7. Embryo is encased in a package; now called a *seed* \_\_\_\_\_
  - a) seed = \_\_\_\_\_ plant + \_\_\_\_\_ for growth

**from..... 22-2 Evolution of Seed Plants**

**III. Angiosperms**

A. These are \_\_\_\_\_. They reproduce sexually through their \_\_\_\_\_ in a process called \_\_\_\_\_. Angiosperm seeds are contained within a \_\_\_\_\_ that develops into a \_\_\_\_\_.

B. Angiosperms are the most widespread of all land plants. They range from \_\_\_\_\_ to \_\_\_\_\_. Some even live \_\_\_\_\_.

C. There are two main subclasses:

Subclasses		
Number of cotyledons (seed leaves)	One.	
Leaves		Veins are branching.
		Parts in fours or fives or multiples.
Xylem/Phloem	Scattered throughout.	
Stems	Stems do not thicken from year to year.	
Examples		

**III. Structure of a Flower**

- A. Typical Flower
  - 1. produces both \_\_\_\_\_
- B. Other 'strategies':
  - 1. specialized male and female flowers on \_\_\_\_\_ plant (e.g. corn)
  - 2. male and female flowers on separate \_\_\_\_\_ (e.g. willow)
- C. Flower Parts
  - 1. Are specialized \_\_\_\_\_
  - 2. Arranged in \_\_\_\_\_
  - 3. Four kinds:

Name:	Location:	Description:	Function:	Group Name:
Sepals				
Petals				
Stamens				
Carpels		Ovary:  Style:  Stigma:		

**IV. Pollination**

- A. Definition:
- B. Two types:
  - 1. Self-pollination:
  - 2. Cross pollination:
- C. Most plants \_\_\_\_\_ -pollinate, which increases \_\_\_\_\_ in their offspring

**V. Fertilization**

- A. Process
  - 1. Pollen grain lands on \_\_\_\_\_ of same species
  - 2. \_\_\_\_\_ grows down the style, following a \_\_\_\_\_
  - 3. Tube reaches \_\_\_\_\_ and enters the \_\_\_\_\_
  - 4. Inside pollen tube are two \_\_\_\_\_ (Note: no tails needed; don't need propel them)
    - a) one sperm fuses with \_\_\_\_\_ to form the \_\_\_\_\_
    - b) \_\_\_\_\_ fuses with spare female nuclei to form \_\_\_\_\_ (3N)
  - 5. Endosperm = \_\_\_\_\_ for baby plant
- B. Ecological Importance
  - 1. Endosperm is rich in \_\_\_\_\_

2. Examples: grass endosperm: \_\_\_\_\_
- C. After fertilization
1. Outer parts of ovule toughen into \_\_\_\_\_
  2. Ovary wall \_\_\_\_\_, merges with other parts to become \_\_\_\_\_
  3. Plants may use bright \_\_\_\_\_ and \_\_\_\_\_ tastes to make fruit attractive to \_\_\_\_\_

## VI. Formation of Seeds

- A. The evolution of seeds was: a major factor in the success of angiosperms on land
- B. Seeds assist embryos by providing:
- 1.
  - 2.
- C. Structure
1. Cotyledon= \_\_\_\_\_; they contain \_\_\_\_\_ that is used when seed germinates
    - a) \_\_\_\_\_ (e.g. corn) have \_\_\_\_\_
    - b) \_\_\_\_\_ (e.g. beans) have \_\_\_\_\_
  2. Seed coats: Function: to protect seed from
    - a) \_\_\_\_\_ (e.g. dryness, salt water)
    - b) \_\_\_\_\_, \_\_\_\_\_
- D. When animals eat seeds:
1. They \_\_\_\_\_ after their trip through the \_\_\_\_\_ tract
  2. Animal waste acts as \_\_\_\_\_
  3. Usually deposited \_\_\_\_\_ from where fruit was eaten
  4. Reduces \_\_\_\_\_ between adult (\_\_\_\_\_) and offspring (\_\_\_\_\_)

## 25-2 Seed Development

### I. Germination

- A. Process:
1. Water absorption causes \_\_\_\_\_ & \_\_\_\_\_ to swell
  2. \_\_\_\_\_ cracks open
  3. Radicle emerges; grows into \_\_\_\_\_
  4. Growing \_\_\_\_\_ pushes up through soil

### II. Seed Dormancy

- A. Definition:
- B. Purposes:
1. A long time required for dispersal
    - a) e.g. \_\_\_\_\_
  2. To wait until \_\_\_\_\_ conditions will support \_\_\_\_\_
    - b) e.g. plants from temperate regions; \_\_\_\_\_ in winter, \_\_\_\_\_ in spring
- C. Triggers that end it:
- 1.
  - 2.

## 22-3 Coevolution of Flowering Plants and Animals

Coevolution:

The first flowering plants evolved at about the same time as the \_\_\_\_\_, shortly \_\_\_\_\_ and a while \_\_\_\_\_.

Evolution of angiosperms with modern insects, birds and mammals is very important.

### I. Flower Pollination

A. Wind:

B. Birds, insects, mammals:

1. Plants provide food in the form of \_\_\_\_\_.
2. Animals provide direct \_\_\_\_\_ between male and female \_\_\_\_\_.

	Pollinator	Flower
Attractants for Pollinators	Bee	
	Moth	
	Fly	
	Bird	

### II. Seed Dispersal

The process of:

There are 2 reasons for dispersal:

- 1.
- 2.

Dispersal Method	Description
Wind	Blown to different places.
Pressure	
Barbed or hooked fruits	
Tasty Fruit	