Biology 1306/1406 – Modern Concepts in Bioscience II

Hello and welcome to the weekly resources for BIO-1306/1406 - Biology 2

This week is Week 7 of class, and typically in this week of the semester, your professors are covering the topics below. If you do not see the topics your particular section of class is learning this week, please take a look at other weekly resources listed on our website for additional topics throughout the semester.

We also invite you **to look at the group tutoring chart on our website to see if this course has a group tutoring session offered this semester.**

If you have any questions about these study guides, group tutoring sessions, private 30 minute tutoring appointments, the Baylor Tutoring YouTube channel, or any tutoring services we offer, please visit our website www.baylor.edu/tutoring or call our drop in center during open business hours (M-Th 9am8pm on class days at 254-710-4135).

Keywords: Seed Plants, Plant Life cycles, How Plants Colonized Land, Animal Nutrition, Heart, Circulatory and Gas Exchange

Topic of the Week:

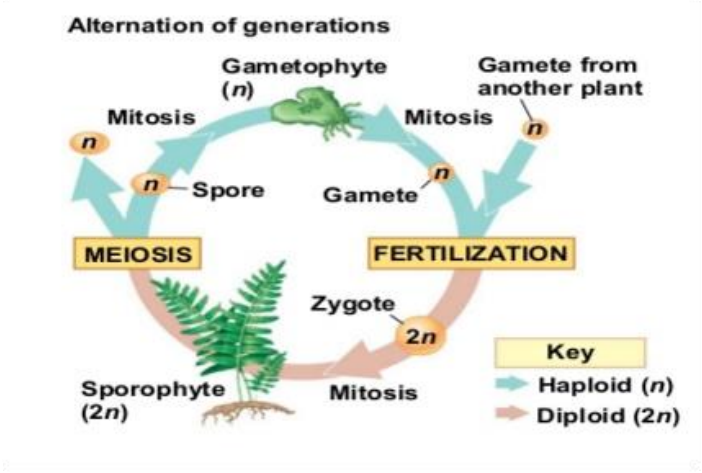
This week in Biology 1306, we will be covering how plants colonized land, evolution of seed plants, animal nutrition and Circulatory and Gas Exchange
Campbell Chapters 29, 30, 41, and 42.

Plant Diversity I: How Plants Colonized Land – Campbell Ch. 29

There is a significant amount of evidence indicating that **plants descended from Charophytes** (green algae). This evidence includes: 1) Rings of proteins that synthesize the cellulose microfibrils of the cell wall; 2) Structure of **flagellated sperm**; 3) Formation of a **phragmoplast**- structure of microtubules that forms between the 2 splitting daughter nuclei in cell division

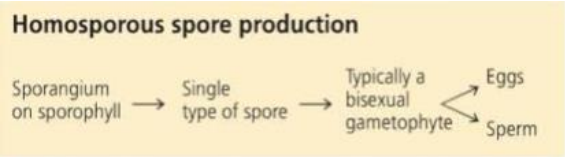
Traits that are **specific to Plants**:

1. **Alternation of Generations**
   Check out this video:
   https://www.youtube.com/watch?v=iRKu2MN4T04
2. **Multicellular, dependent embryos**
3. **Walled spores produced in sporangia**
4. **Multicellular gametangia**
   Gametangia- gametes within multicellular organs
   Archegonia- female gametangia; releases a single egg that is kept in the bulbous part of the organ
   Antheridia- male gametangia; produces sperm and releases them into the environment
5. **Apical meristems (described in chapter 30)**



Lycophytes (Phylum Lycophyta)- require a host to grow (**epiphyte**); sporophytes can have upright stems with many small leaves or can have ground-hugging stems; contains **Club Mosses, Spikemosses, and Quillworts**

Monilophytes (Phylum Monilophyta)- megaphyll leaves and branching roots; contains Ferns, Horsetails and Whisk Ferns

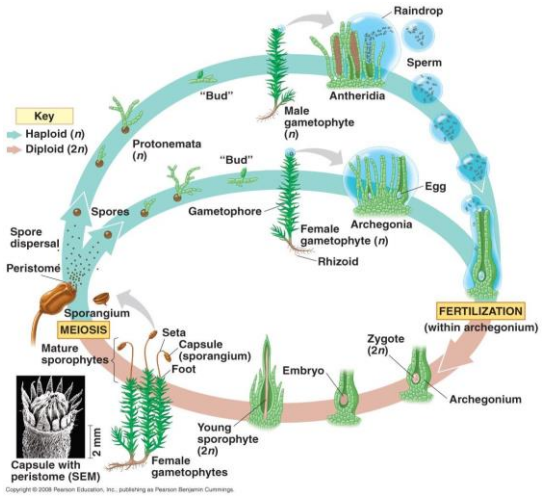


Vascular and Non-vascular Plant Life Cycles

Vascular Plants: Lycophytes and Monilophytes

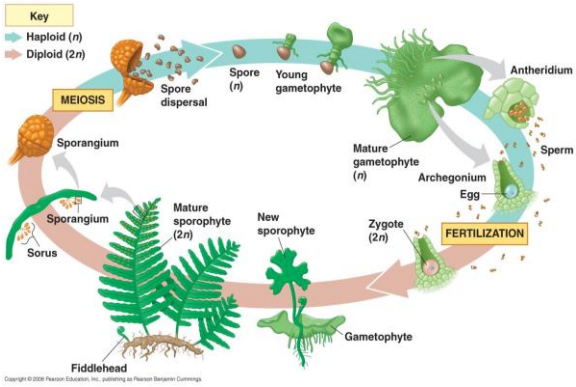
Non-Vascular Plants (Bryophytes): Liverworts, Mosses, Hornworts

Non-Vascular (MOSS) Plant Life Cycle: **haploid (n) gametophytes** are the **dominant stage** of the life cycle



Protonema- small filaments with a large surface area to increase water and nutrient absorption; protonema produces buds which go on to produce the antheridia (male structure)
Gametophore- gamete producing structure
Gametophyte anchored by **rhizoid** (similar to roots except they are not composed of tissues and do not play a primary role in water and nutrient absorption)
For fertilization to occur, moisture/a film of water is required
Sporophyte- consists of a **foot, a seta, and a sporangium**
Peristome- teeth-like structures open and close to allow for intermittent dispersal of the spores
For a further explanation of the Life Cycle of a Moss, check out this video: https://youtu.be/o1z0Vfo62Lg

Seedless Vascular Plant Life Cycle:



Xylem- brings up the water and minerals with tracheids
Tracheids- lignified vascular tubes that carry water and minerals from the roots into the leaves
Phloem- stacked cells (tube) that distribute sugars, amino acids
Roots- absorb water and nutrients and anchor the plant in the soil
Leaves- primary photosynthetic organ
Lycophytes have **microphylls** (small, spine shaped leaves)
All other vascular plants have **megaphylls** (larger and highly branched leaves)
Sporophylls- leaves with sporangia
For a further explanation of the Life Cycle of a Fern and the differences between the Moss Life Cycle, check out this video: https://youtu.be/Fhk-Y0duNjg

Plant Diversity II: Evolution of Seed Plants – Campbell Ch. 30

Seed Plants: larger, more complex plants displaying sporophyte dominant cycles and using
Sporophyte: the **diploid** (2n) stage of the seed plant's life cycle which is enlarged and is the 'structure' we associate with a plant
Gametophyte: the **haploid** (n) stage of the seed plant's life. The male gametophyte is the sperm-containing *pollen grain* and the female is the egg-containing *archegonia*/*ovules*
Seed: a plant embryo and its food supply stored within a
Heterospory: describes the fact that seed plants produce multiple types of gametes**

Heterosporous spore production
(all seed plants)

Megasporangium on megasporophyll	→	Megaspore	→	Female gametophyte → Eggs
Microsporangium on microsporophyll	→	Microspore	→	Male gametophyte → Sperm

Important Characteristics of Seed Plant Evolution:

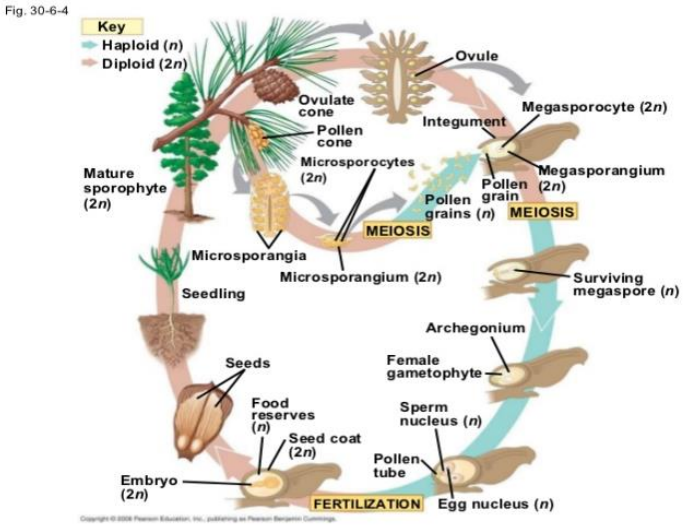
Evolution of seed plants is a result of the development of protective seeds and the continuing decrease in the size of gametophytes. The reduced **gametophyte** is better protected from the environment (ex. UV radiation) due to the larger **sporophyte**. This **prevents *dehydration* and potential UV damage** of the gametic genome. Seeds allow plant embryos to be **dormant**, meaning they only grow when the conditions are correct to foster development. This and other structural features allow for the *transport* of seeds to better growing environments.

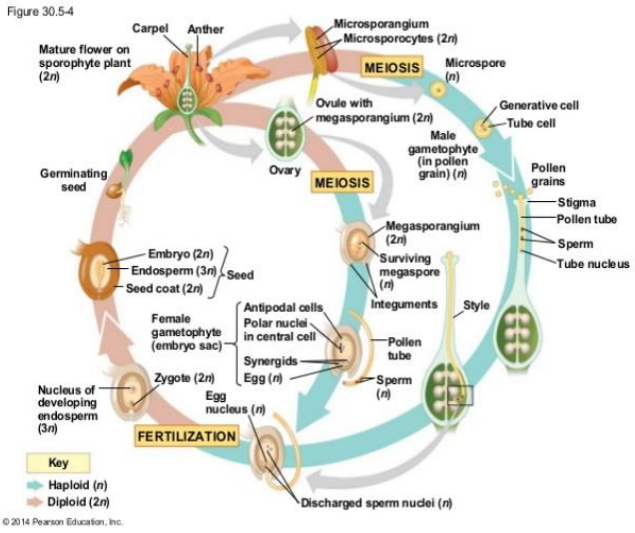
Gymnosperm: naked seed of **conifers**. The mature **sporophyte** (2n), bear pollen cones (♂) and ovulate cones (♀), where **gametophytes**(n) are formed. Check out this video to learn more about gymnosperm life cycles: https://www.youtube.com/watch?v=2gWEgrMwMe0

Angiosperms: flowering plants, which utilize male and female components of the sporophyte (**stamen** and **carpels**, respectively) to form the male and female gametophytes. A pollen grain (2 components: the **tube cell** (n) and the **generative cell** (n)) from an anther may be transferred to a stigma. The tube cell forms a tube down the style to an ovule while the generative cell divides *mitotically* to form 2 sperm nuclei. At the female gametophyte, one sperm nucleus will fertilize the egg, and the *discharged* nucleus will fertilize the **polar nuclei** to form the **endosperm** (3n).
Double Fertilization: the two sperm nuclei fertilize the egg and polar nuclei of the female gametophyte
Cotyledon: one or two embryonic seed leaves
For **Monocots** vs. **Eudicots** or more about **double fertilization**, please check out these videos:
https://www.youtube.com/watch?v=xe99TGccbxo; (**double fertilization {**4:38-6:38})
https://www.youtube.com/watch?v=HLYPm2idSTE

Gymnosperm Life Cycle

Angiosperm Life Cycle





Animal Nutrition – Campbell Chapter 41

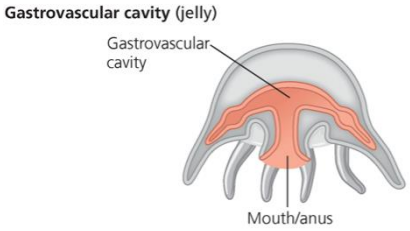
This chapter is unique to only a few BIO 1306 sections, but important to understand. To begin, Animals gain their nutrients from what they eat. As such, they are characterized as **heterotrophs.** For animals, their diet must provide all of the chemical energy, organic building blocks and nutrients that are essential for life.

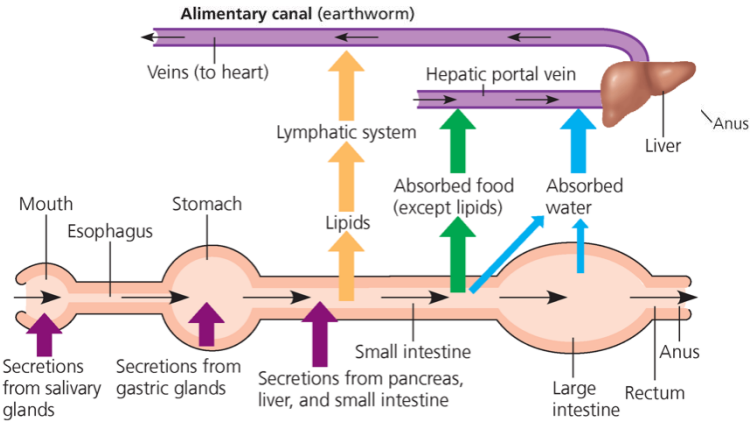
Essential nutrients must be "provided" in their final forms. This means that animals cannot synthesize these nutrients on their own and must get them from external sources. These include some amino acids, vitamins, minerals and fatty acids. If the intake of these nutrients is inadequate, **malnutrition** can result.

Animals can obtain food in different ways including **bulk feeding, filter feeding, substrate feeding and fluid feeding.** No matter how animals obtain their food, they will break it down similarly. One concept that is important to all animals that are digesting food is **compartmentalization.** Inside of the digestive system of animals, food is being broken down in different ways:

Intracellular Digestion involves food being brought into a cell by phagocytosis, an infolding of the cell membrane to create a membrane-sealed "bubble" around the food so that it can be brought to lysosomes where the food is broken down.

Extracellular Digestion is a little bit different. Extracellular digestion is much more common than intracellular digestion and involves enzymatic hydrolysis in some sort of **gastrovascular cavity** or **alimentary canal.**





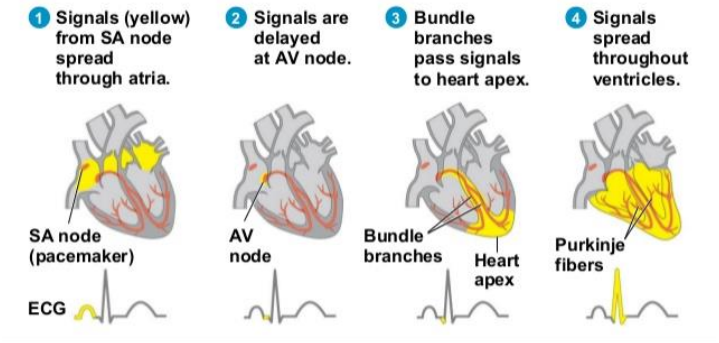
In **mammals**, we see many organs which are specialized for specific stages of food processing. The Campbell Textbook gives a good summary of these stages which I have summarized below:

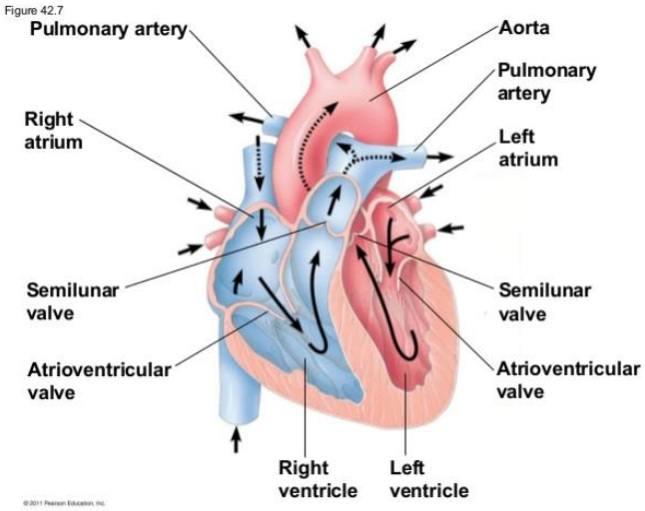
1. Food enters the digestive "system" through the **mouth**, and we see secretions from **salivary glands** that begin to break down aspects of the food.
2. Food then travels into the **Esophagus.**
3. From the Esophagus, food travels into the **Stomach** where secretions from **gastric glands** continue to break down the food.
4. From the stomach, the food travels to the **Small Intestine** and is met with secretions from the **pancreas and liver**. From here, lipids will travel to the **lymphatic system**, and all other substances which have been absorbed travel to the **hepatic portal vein**. This vein takes these substances to the **Liver** and then back to the **Heart**.
5. From the small intestine, unabsorbed food enters the **Large Intestine**. Here, water is absorbed into the blood and travels to the hepatic portal vein and back to the heart.
6. All other non-absorbed food travels from the large intestine into the **Rectum**.
7. In the rectum, no food is absorbed, and we see the contents of the rectum excreted from the body through the **Anus**.

Circulatory and Gas Exchange: Campbell Chapter 42

Every cell in an organism must be able to exchange gases with the environment. For this to be possible, organisms must either have a **simple body plan** which places many or all of the cells in direct contact with the environment or must have a **circulatory system** which moves fluid between each cell's surrounding tissues.

Check out this video to learn more about the Cardiac Cycle: https://www.youtube.com/watch?v=7XaftdE_h60





Structure of Blood Vessels:

Endothelium- minimizes resistance to fluid flow

Capillaries- smallest vessels, thin walls for diffusion; low pressure to allow for gas exchange

Made of only endothelium and basal lamina, **no smooth muscle**

- Arteries feeding into capillaries are like a hose connected to a sprinkler system: There is very high velocity and pressure in the hose, but lowered pressure in the capillaries as blood is sent into many different vessels
- **Pre-capillary sphincters** regulate blood flow into capillaries

Arteries- thick, strong and elastic; high blood pressure to pump blood throughout the body; made of endothelium, smooth muscle, and connective tissue

Veins- thinner walls and lower pressure than arteries, uses valves to ensure unidirectional flow; made of endothelium, thin smooth muscle and connective tissue

It is impossible to cover everything in chapter 42 given the length of this resource, but here are links to videos that explain concepts I did not cover above:

Clot Formation: https://www.youtube.com/watch?v=RQpBj8ebbNY
Positive and Negative Feedback: https://www.youtube.com/watch?v=Iz0Q9nTZCw4
Countercurrent Exchange (shown in fish): https://www.youtube.com/watch?v=cVFqME-NW9s
Amphibian Breathing: https://www.youtube.com/watch?v=uYoElFVvL5U
Bird Breathing: https://www.youtube.com/watch?v=yDvWlDmCKcU
Transportation of CO2: https://www.youtube.com/watch?v=BShB8_1oCGk

CHECK YOUR LEARNING

1. What is the difference between a sporophyte and a gametophyte?
2. What is Alternation of Generations?
3. What kind of plants have double fertilization?

THINGS YOU MAY STRUGGLE WITH

1. Vocabulary! These chapters are all about memorization. Make sure that you can differentiate between the similar concepts presented by your professor.
2. The Plant Life Cycles. Grab a white board and draw out the processes. If you are struggling with any of the concepts on particular, check out the Baylor Tutoring Center YouTube page under the biology 2 folder!

Study Tips:

*** Review all vocabulary in each chapter and make sure you understand what the terms mean***

That's all folks.

If you have any questions, feel free to reach out to the tutoring center or use the link at the top of the resource to make an appointment.

Answers:

1.Sporophytes are diploid and divide meiotically to produce spores. Gametophytes are haploid and divide mitotically to produce gametes.

2.Alternation of Generations is when an organism alternates between a haploid life cycle and a diploid life cycle.

3.Angiosperms!