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 15 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: Final Review

Key Concepts:

Ecosystems (Week 10) consist of all of the biotic and abiotic factors in an area. Within an ecosystem, there is a **flow of energy** from the sun, to the heat that is eventually lost to the environment. Throughout this process, detailed below, energy is conserved. Similarly, the chemical elements that enter and leave an ecosystem are conserved according to the law of conservation of mass.

Ecological Succession (Week 11): a sequence of changes in community composition following a disturbance. Succession can be PRIMARY or SECONDARY.

Circulatory Systems (Week 7): 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.

Osmoregulation (Week 8) is achieved by actively pumping solute in and out of cells to move water passively. There are two ways to maintain water balance: **Osmoconformance** and **Osmoregulation.**

Animals face different challenges related to osmolarity and therefore regulate differently:

Marine animals' main issue is water loss due to higher solute concentration in their environment, so they excrete **urine with a high concentration of salt** and very little water. **Land Animals** face the same issue, instead worrying dehydration. They **convert NH3 to urea** prior to excretion as a way to conserve water. **Freshwater Animals** face the opposite problem. Due to the higher concentration of salts in their bodies, as compared to their outside environments, they are worried about water gain. Thus, they take in salt through their gills and **excrete large amounts of very dilute urine**.

THE MAIN PURPOSE OF EXCRETION IS TO ELIMINATE NITROGEN WASTE

The form of nitrogen waste excreted will always match its function!!

Nephrons are the functional unit of the Kidney

Bodies of water and mountain ranges can affect regional climate conditions (Week 11).

Ocean currents heat or cool overlying air masses that pass across land. The high specific heat of water helps moderate the climate. Similarly, **mountains** can influence the air flow over land. Warm air goes up the mountain, cools and rains. The **leeward side** doesn't get much moisture, so a desert is made on the other side of the mountain.

Survivorship Curves (Week 6): describe the death patterns in types of communities.

- **Type 1-** low death rates at the beginning and middle, then steep at the end ex. humans
- **Type 2-** constant death rate over the lifespan
- **Type 3-** high death rate in young, but flattens out for those who survive

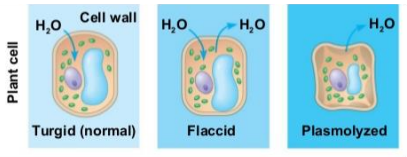
Population sizes can also be "selected" in different ways. Those that undergo **density dependent selection**, or selection for traits that maximize reproductive success in crowded environments are **R-selected Populations**. Those that undergo **density independent selection are K-selected Populations.**

Remember, there is always a tradeoff between reproduction and survival. There is competition. Among individuals in the population and the resources available that limit that population.

Vascular Plant Structure (Week 7):

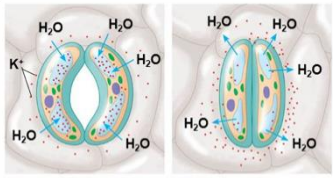
Xylem (water and mineral) and **Phloem** (sugar and solute) are the types of vascular tissue that conduct water throughout vascular plants

Turgor Pressure: the amount of force pushing out on the cell wall from water in the cell



- **Turgid:** high tonicity due to water gain with high turgor pressure
- **Flaccid:** tonicity when the cell loses water and has low turgor pressure
- **Plasmolysis:** when the cell membrane separates from the cell wall
- **Stomata:** pores on leaves that regulate water transpiration and gas exchange
- **Guard Cell:** cells which regulate the opening of stomata

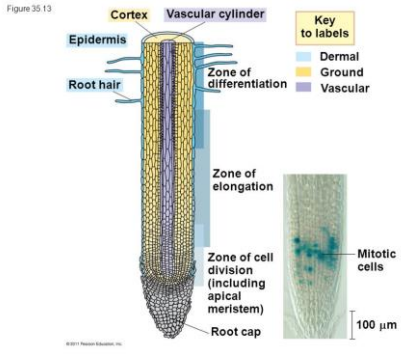
When guard cells are **flaccid**, the stomata close. When guard cells are **turgid**, the stomata open. Guard cells pump K^+ ions *out* to close stomata and pump K^+ *in*to open stomata.



(b) Role of potassium ions (K^+) in stomatal opening and closing

Apical Meristem: primary growth occurs in the roots and shoots.

- **Zone of cell division:** houses stem cells which constantly divide **Zone of elongation:** is where the actual lengthening happens
- **Zone of differentiation:** cells *differentiate* into the 3 tissue types (**ground**, **dermal**, **vascular**).
- **Shoot apical meristem**- where most primary shoot growth occurs



Apical Dominance: when an **axillary bud** is inhibited the nearer it is to an apical meristem; prevents the formation of lateral branches

Vascular Tissue: xylem and phloem

Dermal Tissue: tissues which protect the plant from external environment and prevent desiccation

Epidermis (non-woody plants) a single layer of tissue that provides a boundary with the environment

Ground Tissue: tissue *not* categorized as dermal or vascular; may be internal to the vasculature (**pith**) or external to the vasculature (**cortex**).

Cuticle: a thin, waxy layer over which covers the upper epidermis of leaves

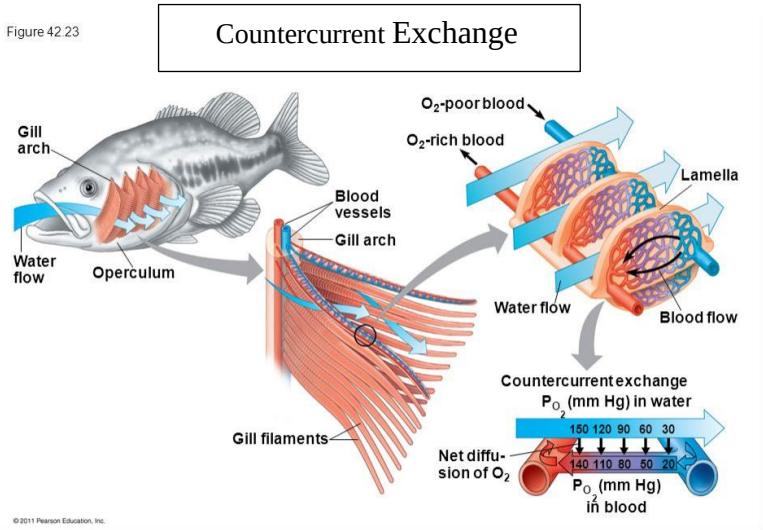
Periderm (woody plants)**:** tissues that replace the epidermis in woody plants

Animal Form and Function (Week 5): In order of increasing complexity, they are **cells, tissues, organs, organ systems and bodies.** By increasing complexity, organisms are able to maximize their **Surface Area to Volume** ratios. This is important because it enables organisms to exchange nutrients, water and other materials with their environment.

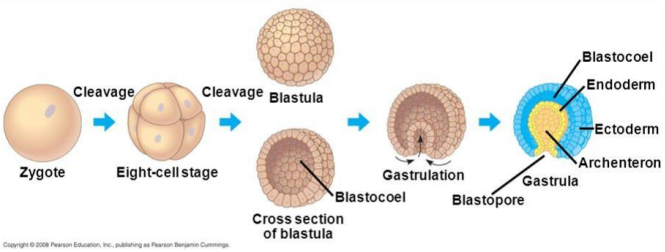
Exotherm: organism which gains their heat from external sources

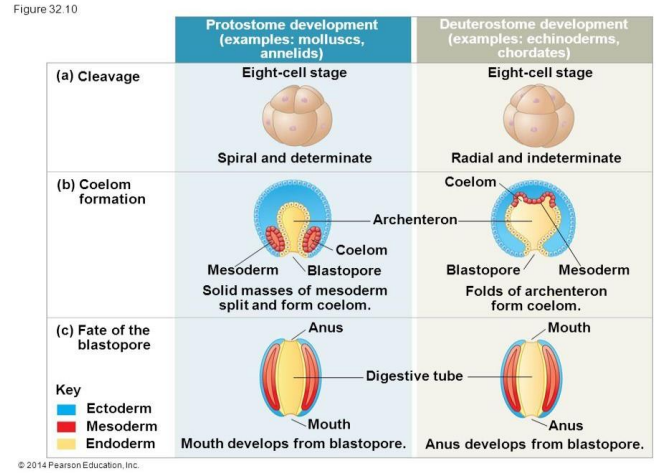
Endotherm: organism which is warmed by heat generated through metabolism

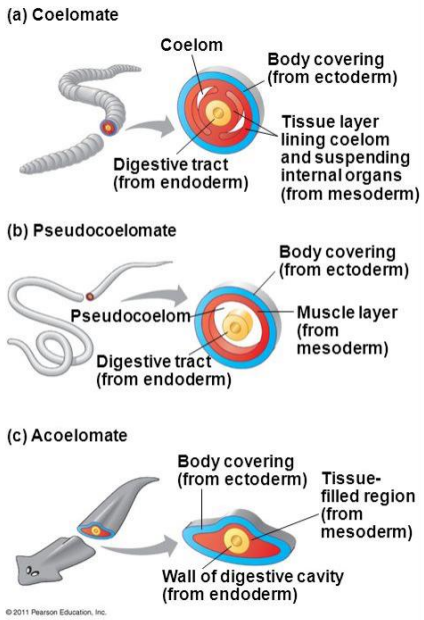
All endotherms are homeothermic, but some exotherms can be as well, depending on their external environments.



Animal Diversity (Week 6): Animals are multicellular, heterotrophic eukaryotes with tissues that develop from **embryonic layers**. The stages of **embryonic development** are shared among all animals and proceeds through many cleavages, or successions of mitotic cell division without cell growth, meaning that cells divide into two cells over and over.







PLEASE KNOW THE ABOVE FIGURES

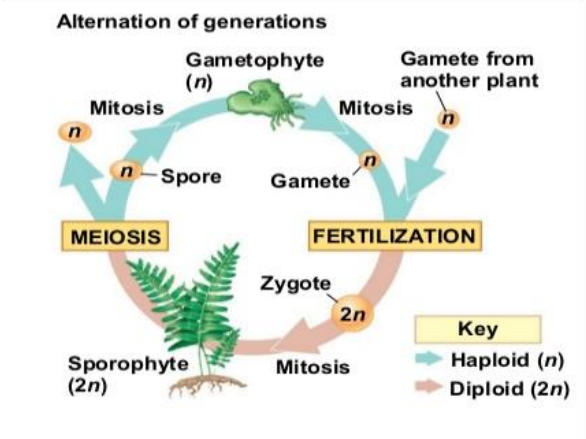
Origin of Species (Week 9): According to the **Biological Species Concept**, members of a **Species** can interbreed and form viable, fertile offspring. When species become **Reproductively Isolated** and can no longer interbreed, **Speciation**, or two new species arising from one, can occur. Reproductive Isolation can be either Prezygotic, or before the creation of a zygote, or Postzygotic, after the creation of a zygote.

Prezygotic Isolating Mechanisms include: Behavioral Isolation, Mechanical Isolation, Habitat Isolation, Temporal Isolation, and Genetic Isolation

Postzygotic Isolating Mechanisms include: Hybrid breakdown, Reduced hybrid fertility, and Reduced hybrid viability

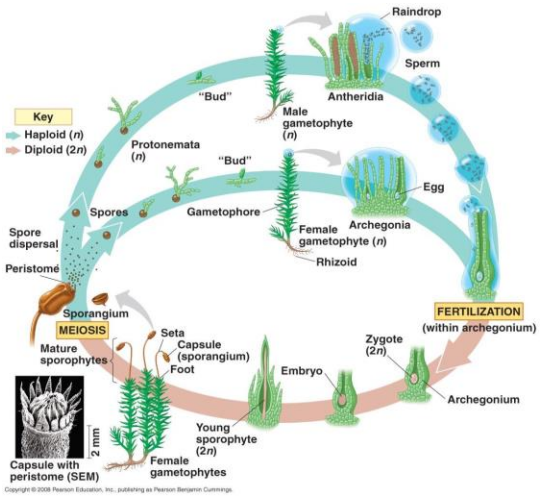
•**Allopatric Speciation** occurs when members of a population are kept **APART** by a geographic barrier; **Sympatric Speciation** occurs when the members of a population are not geographically isolated and are in the **SAME** area

Plant Life Cycles (Week 7): Please be familiar with, and able to draw these figures.



Seedless Vascular Life Cycle

Moss Life Cycle



Seed Plants (Week 11): 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*

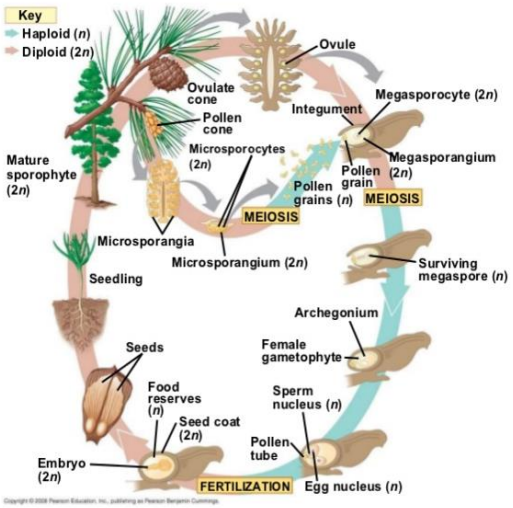
Gymnosperm: naked seed of **conifers**. The mature **sporophyte** (2n), bear pollen cones (♂) and ovulate cones (♀), where **gametophytes**(n) are formed. Check out this video to learn more about gymnosperm life cycles: https://www.youtube.com/watch?v=2gWEgrMwMe0

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).

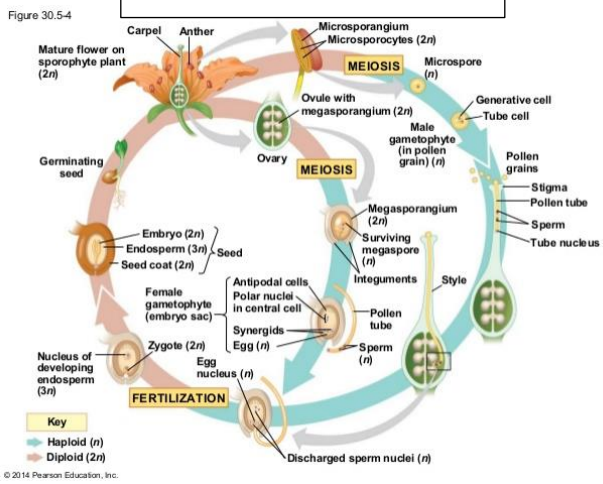
Double Fertilization: the two sperm nuclei fertilize the egg and polar nuclei of the female gametophyte

Cotyledon: one or two embryonic seed leaves

Gymnosperm Life Cycle



Angiosperm Life Cycle



Heterosporous spore production
(all seed plants)

Megasporangium on megasporophyll → Megaspore → Female gametophyte → Eggs

Microsporangium on microsporophyll → Microspore → Male gametophyte → Sperm

Evolution (Week 15): Evolution describes **Descent with Modification**, or the change in a species over time.

While changes can occur in individual organisms, *only populations can evolve*.

Evolution occurs through the action of **Natural Selection** in which individual organisms which are more suited to their environments are more likely to survive long enough to reproduce than other individuals of the same species who are less suited to the same environment. Over time, these individuals who survive to reproduce shape the characteristics of the population. Evolution is a **very slow process** but can produce **large changes** in a population **over time**.

For natural selection to occur:

- members of the same population must **vary in their inherited traits**
- individuals with favorable inherited traits must have a **higher probability of survival and reproduction**, therefore producing more offspring than other individuals
- the species must **produce more offspring than the environment can support**, meaning many "less fit" offspring die before reproducing.

Outcome of Natural Selection: Traits which are reproductively favorable accumulate in a population

Hardy Weinberg Equilibrium- assesses whether evolution is occurring in a population.

- **For a population to be in Hardy Weinberg Equilibrium there must be**:
  1. No mutations
  2. No natural selection
  3. Random mating
  4. No gene flow between populations
  5. A large population size.
- If these criteria are met, the population is **Not evolving,** and the following equation can be used: p+q=1

Neurons (Week 4): A potential is a charge difference caused by the unequal distribution of ions on either side of a membrane. **Membrane potential** is the charge difference across a membrane. In a cell at **resting potential**, the membrane potential is around **-70mV** and is maintained by the **sodium potassium pump** which actively pumps **2Na+ out of the cell and 3K+ into the cell** using ATP. **Equilibrium potential** is the magnitude of membrane potential when an ion reaches equilibrium.

ACTION POTENTIAL FAST FACTS:

- All action potentials for a neuron have the same magnitude
- Action potentials can only move in one direction due to the refractory period
- Action Potentials are all or nothing: either they occur or do not occur

Links to Conceptual Videos:

Male Reproductive Anatomy: https://www.youtube.com/watch?v=RhBS9ANCVL8
Female Reproductive Anatomy: https://www.youtube.com/watch?v=LPvqphgIYXE
Spermatogenesis and Oogenesis:https://www.youtube.com/watch?v=vonVty4kTuc
Cardiac Cycle: https://www.youtube.com/watch?v=7XaftdE_h60
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
Competitive Exclusion: https://www.youtube.com/watch?v=Ddq5tXVZ2HA
Major Aquatic Biomes: https://www.youtube.com/watch?v=4fMemcd-VXw
Terrestrial Biomes: https://www.youtube.com/watch?v=4kQSXIWsUtg
Bulk transport, (7:08): https://www.youtube.com/watch?v=bsY8j8f54I0
Vascular Plants: https://www.youtube.com/watch?v=h9oDTMXM7M8
Geologic Record: https://www.youtube.com/watch?v=rWp5ZpJAIAE
Alternation of Generations: https://www.youtube.com/watch?v=iRKu2MN4T04
Life Cycle of a Moss: https://youtu.be/o1z0Vfo62Lg

Life Cycle of a Fern and the differences between the **Moss Life Cycle**, check out this video: https://youtu.be/Fhk-Y0duNj
Monocots vs Eudicots or more about **double fertilization**: https://www.youtube.com/watch?v=xe99TGccbxo; (**double fertilization {**4:38-6:38})
https://www.youtube.com/watch?v=HLYPm2idSTE
Seed Germination: https://www.youtube.com/watch?v=_be5P30G36U&pbjreload=101
Fruit Structure and function: https://www.youtube.com/watch?v=nax2mH1bFa4
Basics of sustainability: https://www.youtube.com/watch?v=_5r4loXPyx8
Plant Hormones: https://www.youtube.com/watch?v=HdwIcIkSoBY
Nitrogen Cycle: https://youtu.be/UrP1E-yM7Cs
Protist Characteristics, check out this video: https://youtu.be/kQdRVq0b9Bk
Natural Selection: https://www.youtube.com/watch?v=0SCjhI86grU

Study Tips:

*** Review the main concepts in each chapter, and be especially familiar with the main ones that your professor has stressed***

That's all folks. Thank you for a great semester.

Good luck on finals!