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 12 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).

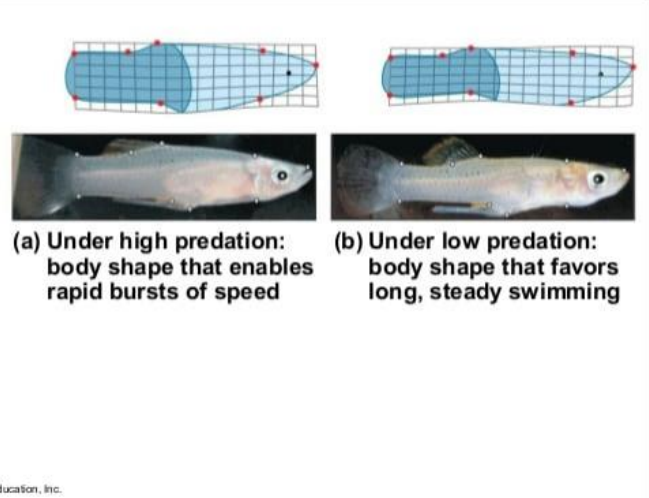
Keywords: Evolution, Natural Selection, Conservation Biology

Topic of the Week:

This week in Biology 1306, we will be covering Evolution.
Campbell Chapters 22, 23, 55, 56

Evolution - Campbell Chapters 22, 23

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

Now for some definitions:

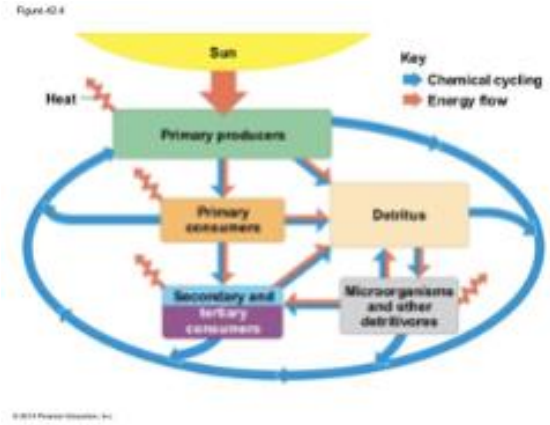
Homology- related species can have characteristics which function differently, but have an underlying similarity arising from a common ancestor ex. Human hand and bird wing **Convergent Evolution-** independent evolution of similar features in individuals who do not share a common ancestor. These features are **Analogous**, meaning they have the same function, and likely are in response to similar environments, but are unrelated.

Hardy Weinberg Equilibrium- assesses whether evolution is occurring in a population. •**For a population to be in Hardy Weinberg Equilibrium**, there must be no mutations, no natural selection, random mating, no gene flow, and a large population size. If these criteria are met, the population is **Not evolving,** and the following equation can be used:
•**p+q=1** where p is the frequency of the dominant allele and q, the recessive allele
•genotypic frequencies can be found using $p^2 + 2pq + q^2 = 1$; p^2 represents homozygous dominant individuals, 2pq represents heterozygous individuals, and q^2 represents homozygous recessive individuals

Genetic Drift: chance events which change allele frequencies unpredictably

Highlight 1: Ecosystems and Restoration Ecology – Campbell Chapter 55

Ecosystems 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. How much energy is available at each trophic level is determined by:



Net primary production: the energy accumulated in plant biomass

Production efficiency: the efficiency of turning chemical energy into biomass at each level of the food chain; how effectively energy level is maintained

Trophic Efficiency: the percentage of energy that is transferred from one trophic level to the next in a food chain; this is usually 10%

- For example, when a lion eats a gazelle, the lion is only going to get 10% of the energy held in the gazelle's organic matter

Finally, we will briefly touch on the concept of ecological succession:

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

Primary Succession: this occurs when no soil or any other substrate exists, and therefore it must be created. Examples are volcanic islands and moraines left by glaciers melting

Secondary Succession: this occurs when soil or any other substrate exists, but it cannot support life (no nutrients). Examples include agricultural fields that have been exploited and abandoned, and areas that have burned.

Highlight 2: Conservation Biology – Chapter 56

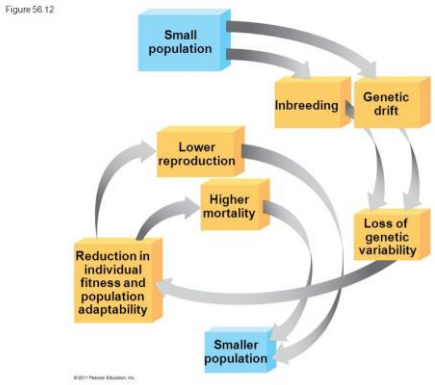
Conservation biology is the ecology, physiology, molecular biology, genetics and evolutionary biology that are used to conserve biodiversity on Earth.

Biodiversity can be considered at three main levels:

Genetic Diversity- enables a population to adapt to changes in the environment

Species Diversity- maintains the structure of food webs and communities

Ecosystem Diversity- allows for life; the presence of diversity among biotic and abiotic factors allows for the success of organisms by providing them with what they need



There are four major threats to Biodiversity: Habitat loss, introduced species, overharvesting and global change. When these act on **small populations,** the effects are even more significant and can lead to extinction. **Population conservation** efforts focus on **genetic diversity, population size, and critical habitat**, or a specific type of environment necessary for the conservation of an endangered or protected species.

Sustainability is defined as the avoidance of the depletion of natural resources in order to maintain an ecological balance. This is a particularly important concept as we face issues such as decreasing biodiversity.

This video does a great job in explaining the **basics of sustainability**:
https://www.youtube.com/watch?v=_5r4loXPyx8

CHECK YOUR LEARNING

1. T/F : Individuals evolve slowly over time.
2. Is genetic drift selective?
3. What does it mean for a population to be in Hardy Weinberg equilibrium?

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. Hardy Weinberg Equilibrium problems: Practice, practice, practice! Memorize the two equations and if needed, find practice problems online! With repetition, and understanding of the concepts, you'll become proficient in this type of problem!

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. F! Populations evolve, individuals do not.
2. Nope! Genetic drift is caused by chance events that do not select for traits. Each member of the population is equally likely to be affected!
3. The population is not evolving.