

Biol 103

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Biol 103

- Attendance is expected.
- Small bonus points will be given randomly in class.
 - Bonus points, because they are an attendance incentive, cannot be made up for any reason.
- The lecture of the day will be posted on my website that morning.

Exams & grading

- Grades will be based on three exams and your lab points.
 - Missing three labs, or failing the lab section results in you failing the entire course.
- Test Format
 - Multiple Choice
 - True/False
 - Matching (w/ Diagrams)
 - Fill-in-the-blank / Short Answer
- Grades will be on a straight scale
 - No pluses or minuses.
 - 90% or higher = A, 80% - 89% = B, etc.

Biol103 contains a lot of material

- You will be covering material that includes
 - Plant physiology
 - Animal physiology
 - ❖ Invertebrates
 - ❖ Vertebrates
 - Animal behavior
- If your studying habits are 100% memorization
 - *You will not do well.*
 - Take advantage of all study materials given to you. I will put up useful materials on my website.

Biol103 contains a lot of material

- Know your learning style if you don't already
 - Link to where you can assess your learning study is on my website
 - This will help you learn how to study more effectively for your learning style.
 - Study well, not hard!

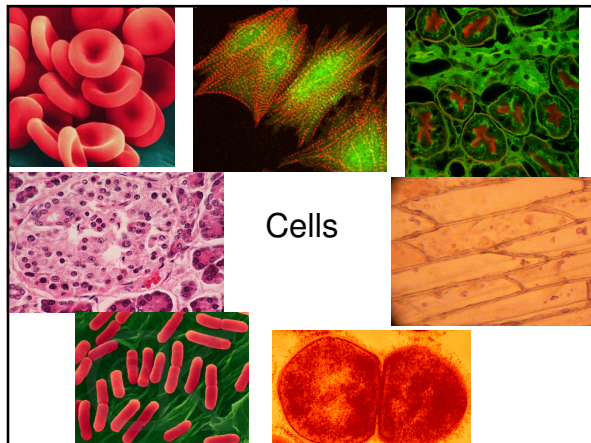
So to pass Biol103

- You should attend as many lectures as possible.
- Participate in the in-class activities.
- Read the book.
- Do well in the laboratory section

Remember, failure in lab results in failure for the entire course!

Any questions?

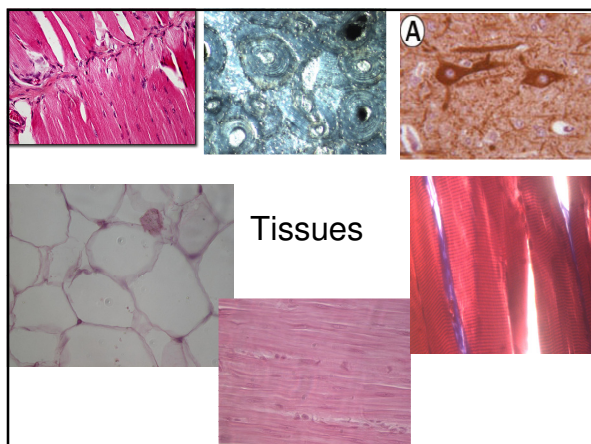
Chapter 1



Cell

- Cell
 - Smallest living unit
- Types of cells vary widely among organisms.
 - Prokaryotes & protists
 - Bacteria, paramecium
 - Eukaryotic
 - Animals, plants, fungi

The diagram shows a prokaryotic cell (top) with labels: Capsule, Ribosomes, DNA, Cytoplasm, Plasma membrane, Cell wall, and Flagellum. Below it is a eukaryotic cell with labels: Rough endoplasmic reticulum, Ribosome, Nucleus, Nuclear pores, Nuclear envelope, Golgi apparatus, Centriole, Lysosome, Smooth endoplasmic reticulum, Mitochondrion, Cytoplasm, and Cell membrane.



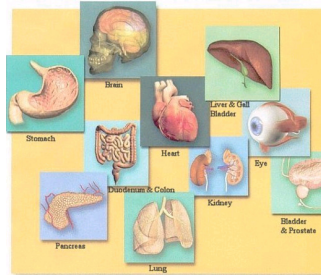
Tissues

- Tissues are groups of similar cells with a similar function

The diagram shows a human arm with callouts to different tissues: Epithelial tissue (lines surfaces in the body), Muscle tissue (made up of fibers that contract), Nervous tissue (consists of cells with projections that transmit electrical signals), Protein fibers (Soft extracellular matrix), Cells, Connective tissues (Loose connective tissue acts as padding under skin and elsewhere. Bone and cartilage are connective tissues made up of cells in a hard or stiff extracellular matrix.), and Blood (Blood is a connective tissue made up of cells in a liquid matrix).

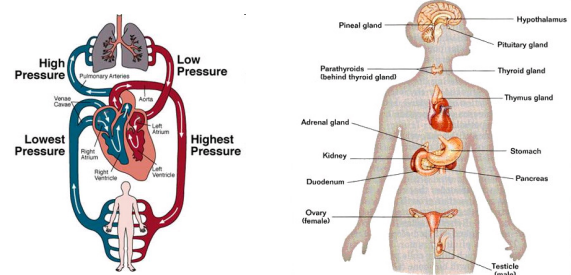
Organs

- Organ: A structure usually composed of several tissue types that form a functional unit.



Organ system

- Two or more organs working together in the execution of a specific body function.



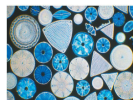
Unicellular vs multicellular

Bacteria Archaea

Prokaryotes
(no nucleus)



Eukarya (Eukaryotes = nucleus)



1) Protista



2) Fungi



3) Plantae



4) Animalia

How life is connected to each other

Evolutionary view of diversity

- Mutations create trait variations
 - Red hair vs black hair.
- Evolution
 - Change in gene frequencies over time
 - Changes due to adaptive fitness of one trait over another.
 - ❖ Natural selection



Evolution: the unifying theory of biology

- Definition of evolution: Change in gene frequencies in a population over time.
 - Example 1: Antibiotic resistance in *Staphylococcus aureus*. From 1943 – present, *S. aureus* went from highly sensitive to penicillin to highly resistant to most antibiotics.
 - Example 2: American Amish population have seen increase in several genetic conditions in their 300 year history.

Evolutionary view

- Mutations create trait variations in populations
 - Example: Red hair vs black hair.
 - The ultimate source of genetic variation.
- Variations are passed down to future generations
 - Usually due to adaptive fitness of one trait over another.
 - ❖ Black rabbits more easily seen in the snowy north results in genes coding for black pigments being less frequent over the generations.
- Natural selection
 - The process when environmental differences results in changes of the gene frequencies in a population of organisms.

Evolutionary view of diversity

- Natural selection
 - When changes in the environment changes the gene frequencies of population of organisms.



Eat me!



Try and find me!
I dare you.

Man also drives evolution

- Artificial selection is the selection of a genetic trait over others by human breeders, not nature.



Artificial selection

- Sometimes artificial selection goes wrong...
 - Just like natural selection can go wrong!



Valuable silver fox coloring,
but skittish and aggressive



Tame silver fox, but spotted.
Not valuable for furs.

Selection for friendly behavior also selected genes that code for spotted coats!

Selection and evolution

- Evolution: Change in gene frequencies over time.
- Molecular view: accumulation of mutations change organisms to the point where they diverge.
 - Closely related species: Few differences between their genomes.
 - Distantly related species: Many differences between their genomes.

Molecular data indicates surprising relationships



Molecular data indicates surprising relationships



Termites, long believed to be a separate insect order, are now considered highly specialized wood roaches.

Characteristics of life

Characteristics of living things

- DNA
- Energy
- Energy and Life's organization
- Life's responsiveness to change

DNA

- All living organisms use DNA in some capacity.
 - "semi-living" organisms, like viruses, use DNA or RNA to reproduce.
- DNA is used by most organisms to produce amino acids.
 - Enzymes
 - Muscles
 - Collagen/keratin



Genetic code

- All living organisms use the same genetic code
 - The nucleotides A, C, G, T

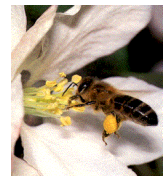


Golden rice (left) has had beta-carotene precursors transferred from daffodils.



Alba had a jellyfish gene for fluorescence incorporated in her genome.

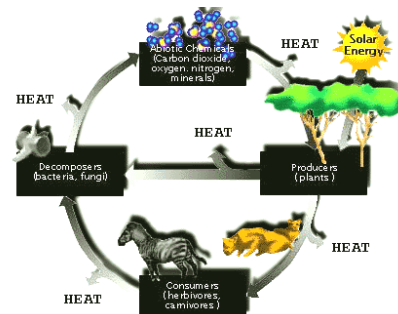
Energy utilization



Energy

- Maintaining life requires energy
 - Even in death, energy is required to decompose.
- Metabolism
 - The process of how cells acquire and uses energy
- Living things often acquire energy through eating other organisms.
 - Plants, however, can produce their own food with sunlight.

Energy flow in life



Response to environment



Responding to change

- All things respond to the environment
 - But only living things can make responses to change by using receptors.
- Receptors detect stimuli in environment.
 - Living things respond to the stimuli to create changes to bring the body back homeostasis.
- Homeostasis: the normal operating condition of an organism.

Receptors

- Types of receptors:
 - Mechanical receptors sense physical pain
 - Biochemical receptors sense changes in blood chemistry
 - ❖ Example/ rising/lowering blood sugar levels
 - Thermoreceptors sense hot and cold
 - Photoreceptors respond to light