Station 1. Analyze the nature of the relationships between structures and functions in living cells.

a. Explain the role of cell organelles for both prokaryotic and eukaryotic cells, including the cell membrane, in maintaining homeostasis and cell reproduction.

Task:

Describe the structure and composition of the cell membrane. (make a sketch)

How does the cell membrane help maintain homeostasis?

What does the "Theory of Endosymbiosis" state?

List three differences between plant cells and animal cells.

What are the 3 part of the "cell theory?"
1._
2._
3._

What is Homeostasis? Give an example.

How does the contractile vacuole in some protists help maintain homeostasis?

How are prokaryotic cells different from eukaryotic cells?
Which have been around longer?

Station 2. Analyze the nature of the relationships between structures and functions in living cells.

b. Explain how enzymes function as catalysts.

Based on the graph to the right, what do enzymes do? Be specific

Make a sketch that explains what is meant by the sayings that "enzymes are specific" and fit like a "lock and key." Label your sketch with the following words: active site, substrate, enzyme, products

What will happen to the rate of reaction if you....
Heat up the enzyme?
Cool down the enzyme?
Change the pH?

If you add more enzymes (increases the concentration) to a solution of substrate, what will happen to the reaction rate?

What group of macromolecules do enzymes belong to?

Characteristics of Enzymes
1. They _______make processes happen that would not take place on their own. They just make the processes take place ________!
2. Enzymes are _____ permanently altered or ________ up in reactions.
3. The same enzyme works for the ________ and ________ directions of a reaction.
4. Each enzyme is highly ___________ about its substrate.

Word bank: reverse, selective, do not, forward, faster, not, used

Cells are constantly building up and breaking down molecules. Each step is helped along by ___________!!
Station 3. **Analyze the nature of the relationships between structures and functions in living cells.**

c. Identify the function of the four major macromolecules (i.e., carbohydrates, proteins, lipids, nucleic acids).
d. Explain the impact of water on life processes (i.e., osmosis, diffusion).

**Task:**

<table>
<thead>
<tr>
<th>What is Osmosis?</th>
</tr>
</thead>
</table>

Describe each type of solution and make a sketch of a cell placed in that type of solution. Use arrows to show water movement into or out of the cell.

<table>
<thead>
<tr>
<th>Hypotonic</th>
<th>Isotonic</th>
<th>Hypertonic</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Elements?</th>
<th>Major functions</th>
<th>Monomer</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbohydrates</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lipids</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proteins</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nucleic Acids</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

What are the cell walls of plants made of? What are the cell walls of fungi made of?

Station 4. **Analyze how biological traits are passed on to successive generations.**

a. Distinguish between DNA and RNA.
b. Explain the role of DNA in storing and transmitting cellular information.

**Task:**

<table>
<thead>
<tr>
<th>DNA</th>
<th>RNA</th>
</tr>
</thead>
<tbody>
<tr>
<td># of strands</td>
<td></td>
</tr>
<tr>
<td>Monomers</td>
<td></td>
</tr>
<tr>
<td>Major function</td>
<td></td>
</tr>
<tr>
<td>Involved in what processes?</td>
<td>4 Bases</td>
</tr>
<tr>
<td>Location in cell</td>
<td>Sugar</td>
</tr>
<tr>
<td>What it stands for</td>
<td></td>
</tr>
</tbody>
</table>

How many chromosomes do humans have in their somatic cells? Gametes? Define: Diploid: Haploid:

<table>
<thead>
<tr>
<th>Mitosis</th>
<th>Meiosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Types of cells made</td>
<td></td>
</tr>
<tr>
<td>Number of divisions</td>
<td></td>
</tr>
<tr>
<td>What happens to the # of chromosomes?</td>
<td></td>
</tr>
</tbody>
</table>

Sketch a cell for each phase of mitosis.

<table>
<thead>
<tr>
<th>Prophase</th>
<th>Metaphase</th>
<th>Anaphase</th>
<th>Telophase</th>
</tr>
</thead>
</table>

**Sketch a DNA molecule.** Label the three parts. Which part has the code for a protein?

What forms the backbone? What is the term used to describe its shape?

What are the 3 types of RNA?

Venn Diagram

Put the following in the venn diagram:
- Need energy
- High to low
- Low to high
- Does not need energy
- Molecules pass through cell membrane
- Facilitated diffusion

What is Osmosis?

Passive Transport

Active Transport

Hypotonic

Isotonic

Hypertonic
Station 5. Analyze how biological traits are passed on to successive generations.

b. Explain the role of DNA in storing and transmitting cellular information.

Briefly describe the steps of DNA replication.

Where are proteins made in the cell?

A section of a chromosome that codes for a protein is called a ____________.

What is the purpose/function of transcription and translation?

<table>
<thead>
<tr>
<th>Transcription</th>
<th>Translation</th>
</tr>
</thead>
<tbody>
<tr>
<td>What happens?</td>
<td></td>
</tr>
<tr>
<td>Where does it take place?</td>
<td></td>
</tr>
</tbody>
</table>

Transcribe and then translate the following DNA strand:

AGTAGCTAGCTTTTGCTAAUG

What are the 3 coding letters called in mRNA?

What are the 3 coding letters called in tRNA?

Station 6. Analyze how biological traits are passed on to successive generations.

c. Using Mendel’s laws, explain the role of meiosis in reproductive variability.

e. Compare the advantages of sexual reproduction and asexual reproduction in different situations.

The process of meiosis provides the opportunity for the shuffling of chromosomes. How is meiosis and sexual reproduction helpful for the survival of a species?

<table>
<thead>
<tr>
<th># of parents</th>
<th>Sexual reproduction</th>
<th>Asexual reproduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Genetics different or same?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Types</td>
<td>Bacteria &amp; Protista</td>
<td>Bacteria &amp; Fungi</td>
</tr>
<tr>
<td>Advantages</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disadvantages</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In rabbits, black fur (B) is dominant over brown fur (b). If one parent rabbit is heterozygous and the other parent rabbit is homozygous brown, what is the probability of producing an offspring with brown fur? (Use a Punnett square to determine your answer.)

What is the phenotypic ratio of the offspring?

What is the genotypic ratio of the offspring?

What are four sources of genetic variation in organisms?

 dystudy

Know these

Genetic terms:
- Allele
- Dihybrid
- Dominant
- Gene
- Genotype
- Heterozygous
- Homozygous
- Monohybrid
- Phenotype
- Recessive
- Trait

- Heterozygous: ______________________________
- Homozygous: ______________________________
Station 7. Analyze how biological traits are passed on to successive generations.
d. Describe the relationships between changes in DNA and potential appearance of new traits including
   - Alterations during replication: Insertions, Deletions, Substitutions
   - Mutagenic factors that can alter DNA:
     - High energy radiation (x-rays and ultraviolet) and Chemical
   f. Examine the use of DNA technology in forensics, medicine, and agriculture.

<table>
<thead>
<tr>
<th>Forensics</th>
<th>Medicine</th>
<th>Agriculture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Give examples of how DNA technology can be used in the following areas.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Explain the symptoms of each:

- Trisomy 21
- Hemophilia
- Sickle Cell Anemia
- Colorblindness

How can (do) mutations help populations survive and adapt (evolve)?

Station 8. Derive the relationship between single-celled and multi-celled organisms and the increasing complexity of systems.
a. Explain the cycling of energy through the processes of photosynthesis and respiration.

What is the equation for Photosynthesis?

What are the two steps in photosynthesis?

Which step could be called "Carbon Fixation"?

What types of organism can do photosynthesis? Give specific examples

What do we call them?

Where does photosynthesis take place in the cell?

What is the equation for cellular respiration?

Why do organisms do cellular respiration?

What types of organism perform cellular respiration?

Where do the 3 steps take place in eukaryotes? Be specific.

What is the difference between anaerobic and aerobic?

How are photosynthesis and cellular respiration related?

-What organelles makes ATP? __________ & __________

-What is stored in the bonds of glucose?

How do plants get CO₂ into their bodies?

H₂O?

What is stored in the bonds of glucose?

What types of organism can do photosynthesis? Give specific examples

What do we call them?

Where does photosynthesis take place in the cell?

These are the steps of __________

Glucose → Glycolysis → Pyruvic Acid → Krebs Cycle → Electron Transport Chain

+ 2 ATP

4 ATP

2 ATP

32 ATP

**Label the picture above: ATP, ADP**
Station 9. Derive the relationship between single-celled and multi-celled organisms and the increasing complexity of systems.

b. Compare how structures and function vary between the six kingdoms (archaeabacteria, eubacteria, protists, fungi, plants, and animals).

c. Examine the evolutionary basis of modern classification systems.

<table>
<thead>
<tr>
<th>Domain</th>
<th>Archaebacteria</th>
<th>Eubacteria</th>
<th>Protista</th>
<th>Fungi</th>
<th>Plant</th>
<th>Animals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prokaryotic or eukaryotic</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single or multicellular</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heterotrophic or Autotrophic</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cell wall??</td>
<td></td>
<td></td>
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</tbody>
</table>

Which kingdom is the most ancient?

What is the name of Linnaeus's naming system? Give a brief description of how it works.

Which of the following is written correctly?

- Quercus rubra
- Quercus Rubra
- quercus rubra
- Quercus R
- Rubr

Which one has organisms that are most closely related? ____________
Least? ______________

Station 10. Derive the relationship between single-celled and multi-celled organisms and the increasing complexity of systems.

d. Compare and contrast viruses with living organisms.

What is the basic structure of a virus? Make and label a sketch.

Why are viruses considered nonliving particles? Give four reasons.
1- 
2- 
3- 
4-

What type of genetic material does a virus have?

Explain how a virus replicates using the lytic cycle & the lysogenic cycle.

LYTIC CYCLE

LYSOGENIC CYCLE

Why is HIV called a retrovirus?

Why is it that scientist have been able to come up with vaccines for some DNA viruses, but have trouble when it comes to RNA viruses?
**Station 11.** Assess the dependence of all organisms on one another and the flow of energy and matter within their ecosystems.

a. Investigate the relationships among organisms, populations, communities, ecosystems, and biomes.

b. Explain the flow of matter and energy through ecosystems by
   - Arranging components of a food chain according to energy flow.
   - Comparing the quantity of energy in the steps of an energy pyramid.
   - Explaining the need for cycling of major nutrients (C, O, H, N, P).

c. Relate environmental conditions to successional changes in ecosystems.

d. Assess and explain human activities that influence and modify the environment such as global warming, population growth, pesticide use, and water and power consumption.

**Station 12.** Assess the dependence of all organisms on one another and the flow of energy and matter within their ecosystems.

c. Relate environmental conditions to successional changes in ecosystems.

d. Assess and explain human activities that influence and modify the environment such as global warming, population growth, pesticide use, and water and power consumption.
How can flowers be pollinated? Give three ways:

<table>
<thead>
<tr>
<th>Gravitropism</th>
<th>Phototropism</th>
<th>Thigmotropism</th>
</tr>
</thead>
<tbody>
<tr>
<td>What it causes plants to do</td>
<td>Why this is helpful</td>
<td>How it helps the plant</td>
</tr>
<tr>
<td>Close stomata during hot weather</td>
<td>Cacti have reduced the size of their leaves</td>
<td></td>
</tr>
<tr>
<td>Cuticle</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Station 13. Assess the dependence of all organisms on one another and the flow of energy and matter within their ecosystems.

e. Relate plant adaptations, including tropisms, to the ability to survive stressful environmental conditions.

What it causes plants to do

- Gravitropism: Plants grow toward gravity.
- Phototropism: Plants grow toward light.
- Thigmotropism: Plants grow in response to touch.

Why this is helpful

- Gravitropism: Helps plants orient themselves in the environment.
- Phototropism: Helps plants capture sunlight for photosynthesis.
- Thigmotropism: Helps plants grow around obstacles.

How it helps the plant

- Gravitropism: Helps plants grow downward to reach the soil.
- Phototropism: Helps plants grow upward to reach sunlight.
- Thigmotropism: Helps plants grow around barriers.

Station 14. Assess the dependence of all organisms on one another and the flow of energy and matter within their ecosystems.

f. Relate animal adaptations, including behaviors, to the ability to survive stressful environmental conditions.

<table>
<thead>
<tr>
<th>Behavior</th>
<th>What is it? Give an example.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Innate</td>
<td></td>
</tr>
<tr>
<td>Instincts</td>
<td></td>
</tr>
<tr>
<td>Territorial</td>
<td></td>
</tr>
<tr>
<td>Migration</td>
<td></td>
</tr>
<tr>
<td>Learned</td>
<td></td>
</tr>
<tr>
<td>Imprinting:</td>
<td></td>
</tr>
<tr>
<td>Habituation:</td>
<td></td>
</tr>
</tbody>
</table>

Animal Defenses

Give two examples of the following defenses:

Mechanical:
1-
2-

Chemical:
1-
2-
Station 15. Evaluate the role of natural selection in the development of the theory of evolution.
   a. Trace the history of the theory.
   b. Explain the history of life in terms of biodiversity, ancestry, and the rates of evolution.

What was Lamark's mechanism for evolution?

What was Darwin's mechanism for evolution?

List and describe 3 Mechanism of Speciation:

What is speciation?
1-_______________________________________________
2-_______________________________________________
3-_______________________________________________

What is natural selection?

What are the two rates of evolution? Explain each.
1. __________
2. __________

Explain each type of evolution. Give an example of each.

Sketch graphs to show 4 types of selection:

What was Lamark's mechanism for evolution?

What was Darwin's mechanism for evolution?

List and describe 5 pieces of evidence scientist's use for the theory of evolution:
1. Fossil Record
   a. radioisotope dating
   b. relative dating
2. DNA
3. Homologous structures
4. Embryology
5. Vestigial Organs

What is a fossil?

What is meant by an organism's "fitness?"

How can bacteria become resistant to an antibiotic?

Organisms with genes that allow them to survive get to __________ and pass on their "good" genes.

***Remember: Natural selection doesn't produce new genotypes and phenotypes, but it rather eliminates the less fit.