

Unit 1: Structure and Function

Content Area: **Science**
Course(s): **Biology/Lab Honors**
Time Period: **1st Marking Period**
Length: **10 Weeks**
Status: **Published**

Unit Overview

Cells are the basic units of life. Cell parts carry out functions necessary for the survival of the cell/organism. Cells must maintain homeostasis.

Transfer

Students will be able to independently use their learning to...

- Predict the response of a cell to changes in its environment.
- Identify the proper amino acid sequence when given a DNA nucleotide sequence.

Meaning

Understandings

Students will understand that...

- Biological molecules are made of repeating subunits.
- Living things are made of cells.
- DNA determines the structure of a protein.
- Cell transport of materials is dependent on the structure and function of the cell membrane.

Essential Questions

Students will keep considering...

- How do the structures of organisms enable life's functions?
- How does DNA determine the functioning of a cell and organisms?

Application of Knowledge and Skill

Students will know...

Students will know...

- Living things are made of one or more cells.
- Multicellular organisms are made up of cells, tissues, organs, and organ systems.
- Cell structures are responsible for carrying out specific functions for the organism.
- Living things must maintain homeostasis.
- DNA is made up of a particular sequence of subunits which are used to make a certain proteins.

Students will be skilled at...

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- Describing how a living thing is organized.
- Modeling the structure of nucleic acids and proteins.
- Predicting the cell's response to different types of environment.

Academic Vocabulary

Cell

Unicellular

Multicellular

Prokaryote

Eukaryote

Organelle

Cell membrane

Cell wall

Nucleus

Cytoplasm/Cytosol

Ribosomes

Mitochondria

Chloroplasts

Golgi apparatus

Endoplasmic reticulum

Deoxyribonucleic Acid

Ribonucleic Acid

Nucleic Acid

Nucleotides

Proteins

Amino Acids

Peptide bond

Replication

Transcription

Translation

Purine

Pyrimidine

Double helix

Complementary base pairs

Replication fork

Helicase

DNA polymerase

RNA polymerase

Adenine

Guanine

Thymine

Cytosine

Uracil

Promoter

Terminal signal

Dipeptide

Polypeptide

Lipids

Tissues

Organs

Organ system

Homeostasis

Passive transport

Diffusion

Concentration gradient

Equilibrium

Osmosis

Hypotonic solution

Cytolysis

Turgor pressure

Hypertonic solution

Plasmolysis

Isotonic solution

Contractile vacuole

Facilitated diffusion

Carrier proteins

Ion channels

Active transport

Cell membrane pumps

Sodium-potassium pump

Endocytosis

Pinocytosis

Phagocytosis

Exocytosis

carbohydrate

monosaccharide

disaccharide

glucose

isomers

polysaccharide

Learning Goal 1

Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.

Proficiency Scale

- Develop and use a model to illustrate the hierarchical organization of interacting systems that provide

specific functions within multicellular organisms.

SCI.HS-LS1-2

Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.

Target 1

SWBAT:

- Identify characteristics of living things.
- Define cell and describe the types of cells.
- Restate the Cell Theory.
- Compare and contrast the essential components of prokaryotic versus eukaryotic cells.
- Prove an organism is alive based on the characteristics of living things.
- Determine the type of cell based on its structures.

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- -Prove an organism is alive based on the characteristics of living things.
- -Restate the Cell Theory.

Target 2

SWBAT:

- Differentiate between unicellular and multicellular organisms.
- Describe the structure and function of relevant organelles.
- Illustrate the hierarchical organization of interacting systems.
- Hypothesize why animal cells lack certain structures in plant cells.
- Relate the structures/functions of cells to the complexity of an organism.

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Further Inquiry

Salt crystals grow and are highly organized. Why aren't they considered to be alive?

Learning Goal 2

Construct and revise an explanation based on evidence for how carbon, hydrogen and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.

Proficiency Scale

- Construct and revise an explanation based on evidence for how carbon, hydrogen and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.

SCI.HS-LS1-6

Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.

Target 1

-Identify the atoms in carbohydrates and other large carbon-based molecules.

-Show the relationship between carbon-based molecules.

-Relate the structure of the four organic macromolecules to its functions in the cell.

-Differentiate between ionic and covalent bonds.

-Investigate the properties of water molecules as it relates to organisms.

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- -Identify the atoms in carbohydrates and other large carbon-based molecules.
- -Investigate the properties of water molecules as it relates to organisms.
- -Relate the structure of the four organic macromolecules to its functions in the cell.
- -Show the relationship between carbon-based molecules.

Further Inquiry

Many birds store significant amounts of energy to power flight during winter migration. Explain what type of

organic molecule might be best suited for energy storage.

Learning Goal 3

Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.

Proficiency Scale

- Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.

SCI.HS-LS1-3

Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.

Target 1

SWBAT:

- Define homeostasis and describe the permeability of the cell membrane.
- Define passive transport and describe its types.
- Predict the flow of water when cells are in different environments.
- Construct models that explain the movement of molecules across membranes with membrane structure and function.
- Prove the advantages of large surface area versus disadvantages of large volume for a cell.
- Relate homeostasis and the permeability of the cell membrane within living systems.

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- -Relate homeostasis and the permeability of the cell membrane within living systems.

Target 2

SWBAT:

- Define active transport and describe its types.
 - Describe how active transport allows living things to function properly.
 - Provide examples and explain how organisms use feedback systems to maintain their internal environments.
 - Investigate the changes that occur within the human body to maintain homeostasis through positive and negative feedback systems.
 - Provide examples of active transport in the human body.
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 - -Describe how active transport allows living things to function properly.
 - -Investigate the changes that occur within the human body to maintain homeostasis through positive and negative feedback systems.
 - -Provide examples and explain how organisms use feedback systems to maintain their internal environments.
 - -Relate homeostasis and the permeability of the cell membrane within living systems.

Further Inquiry

Dietary iodine is needed for the body to make thyroid hormones. How would lack of dietary iodine affect the negative feedback of the thyroid hormones?

Learning Goal 4

Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential function of life through systems of specialized cells.

[Proficiency Scale](#)

SCI.HS-LS1-1

Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.

Target 1

SWBAT:

- Explain the connection between the sequence and the subcomponents of a biomolecule and its properties.

- Describe the structure and function of the DNA molecule and the importance of replication to organisms.
- Determine the complementary strand of DNA when given a DNA sequence.
- Connect the role of enzymes to reduce the error rate during DNA replication.
- Identify possible complications that may arise from errors during DNA replication.

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- -Describe the structure and function of the DNA molecule and the importance of replication to organisms.
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- -Explain the connection between the sequence and the subcomponents of a biomolecule and its properties.
- -Identify possible complications that may arise from errors during DNA replication.

Target 2

SWBAT:

- Describe the structure and functions of each type of RNA molecule and the importance of transcription.
- Determine the complementary strand of RNA when given a DNA sequence.
- Identify possible complications that may arise from errors during transcription.

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- -Determine the complementary strand of RNA when given a DNA sequence.
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Target 3

SWBAT:

- Identify the importance of ribosomes in the process of translation.
- Create representations that explain how genetic information flows from a sequence of nucleotides in a gene to a sequence of amino acids in a protein.
- Determine the sequence of amino acids when given a DNA sequence.
- Apply the concept of a single nucleotide mutation to list all codons that could be changed into a stop codon.
- Identify possible complications that may arise from errors during translation.

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- -Identify possible complications that may arise from errors during translation.
- -Identify the importance of ribosomes in the process of translation.

Further Inquiry

A plant's DNA has nucleotides that are 20% thymine. What percentage of guanine would be present?

Formative Assessment and Performance Opportunities

- Science notebook
- Homework assignments
- Classwork assignments
- Lab activities/explorations
- Quizzes, Tests, Projects
- Formal Lab Report
- Unit Test Open-ended Response

Summative Assessment

Common unit assessment aligned to the NJSLs and differentiated for varied learners. Common Assessment is administered through LinkIt

Accommodations/Modifications

- 504 accommodations
- IEP modifications
- Science notebook entries

-Videos, models, posters

Ex:

- 3D plant and animal cell models
- Lab demonstration of cellular transport
- Demonstrate protein synthesis through physical modeling and or visual representation

Unit Resources

-Holt Modern Biology, 2009

-Supplemental textbook materials

-Online resources

-Laptops

-Student Response Systems

-Lab materials

-POGIL:Activities for HS Biology

21st Century Life and Careers

CRP.K-12.CRP1.1

Career-ready individuals understand the obligations and responsibilities of being a member of a community, and they demonstrate this understanding every day through their interactions with others. They are conscientious of the impacts of their decisions on others and the environment around them. They think about the near-term and long-term consequences of their actions and seek to act in ways that contribute to the betterment of their teams, families, community and workplace. They are reliable and consistent in going beyond the minimum expectation and in participating in activities that serve the greater good.

CRP.K-12.CRP2.1

Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real-world applications, and they make correct insights about when it is appropriate to apply the use of an academic skill in a workplace situation.

CRP.K-12.CRP4.1

Career-ready individuals communicate thoughts, ideas, and action plans with clarity, whether using written, verbal, and/or visual methods. They communicate in the workplace with clarity and purpose to make maximum use of their own and others' time. They are excellent writers; they master conventions, word choice, and organization, and use

effective tone and presentation skills to articulate ideas. They are skilled at interacting with others; they are active listeners and speak clearly and with purpose. Career-ready individuals think about the audience for their communication and prepare accordingly to ensure the desired outcome.

CRP.K-12.CRP5.1

Career-ready individuals understand the interrelated nature of their actions and regularly make decisions that positively impact and/or mitigate negative impact on other people, organization, and the environment. They are aware of and utilize new technologies, understandings, procedures, materials, and regulations affecting the nature of their work as it relates to the impact on the social condition, the environment and the profitability of the organization.

CRP.K-12.CRP6.1

Career-ready individuals regularly think of ideas that solve problems in new and different ways, and they contribute those ideas in a useful and productive manner to improve their organization. They can consider unconventional ideas and suggestions as solutions to issues, tasks or problems, and they discern which ideas and suggestions will add greatest value. They seek new methods, practices, and ideas from a variety of sources and seek to apply those ideas to their own workplace. They take action on their ideas and understand how to bring innovation to an organization.

CRP.K-12.CRP7.1

Career-ready individuals are discerning in accepting and using new information to make decisions, change practices or inform strategies. They use reliable research process to search for new information. They evaluate the validity of sources when considering the use and adoption of external information or practices in their workplace situation.

CRP.K-12.CRP8.1

Career-ready individuals readily recognize problems in the workplace, understand the nature of the problem, and devise effective plans to solve the problem. They are aware of problems when they occur and take action quickly to address the problem; they thoughtfully investigate the root cause of the problem prior to introducing solutions. They carefully consider the options to solve the problem. Once a solution is agreed upon, they follow through to ensure the problem is solved, whether through their own actions or the actions of others.

CRP.K-12.CRP9.1

Career-ready individuals consistently act in ways that align personal and community-held ideals and principles while employing strategies to positively influence others in the workplace. They have a clear understanding of integrity and act on this understanding in every decision. They use a variety of means to positively impact the directions and actions of a team or organization, and they apply insights into human behavior to change others' action, attitudes and/or beliefs. They recognize the near-term and long-term effects that management's actions and attitudes can have on productivity, morals and organizational culture.

CRP.K-12.CRP12.1

Career-ready individuals positively contribute to every team, whether formal or informal. They apply an awareness of cultural difference to avoid barriers to productive and positive interaction. They find ways to increase the engagement and contribution of all team members. They plan and facilitate effective team meetings.