WAUCONDA SCHOOL DISTRICT 118
UNIT PLANNING ORGANIZER

Subject: Biology Storylining

Grade Level or Course: 11th Grade

Unit: Unit 2 (Homeostasis)

Pacing: 6-7 Weeks

STAGE 1 – DESIRED RESULTS

Essential Questions/Target Objectives:

- How are organisms interdependent within their environment?
- How have humans impacted ecosystems and its communities?
- How does homeostasis maintain balance in ecosystems?
- How does homeostasis maintain balance in organisms?
- How does homeostasis maintain balance in cells?

Big Ideas/Major Concepts:

- Food chains and food webs
- Energy flow in ecosystems
- Keystone species
- Ecosystem homeostasis
- Abiotic v. biotic limiting factors
- Carrying capacity of populations
- Allelic and phenotypic frequencies in populations
- Natural selection and selective pressures
- Genetic Drift
- Sea urchin structure and physiology
- Ocean acidification
- Carbon and nitrogen cycles
- Mammalian dive response (feedback mechanisms)
- Human impact on ecosystems
- Transport of molecules during digestion and respiration
- Photosynthesis
- Cellular respiration

NGSS Performance Standards:

- LS1-2: Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
- LS1-3: Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
- LS1-5: Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.

- LS 1-6: 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.
- LS 1-7: Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.
- LS2-1: Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.
- LS 2-2: Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.
- LS 2-3: Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.
- LS 2-4: Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.
- LS 2-5: Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.
- LS2-6: Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.
- LS2-7: Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.
- LS 4-3: Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait.
- LS 4-4: Construct an explanation based on evidence for how natural selection leads to adaptation of populations.
- LS4-5: Evaluate the evidence supporting claims that changes in the environmental conditions may result in (1) increases in the numbers of individuals in some species, (2) the emergence of new species over time, and (3) the extinction of other species.
- LS4-6: Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.

NGSS - Science and Engineering Practices:

- SEP 1: Asking and defining problems
- SEP 2: Developing and using models
- SEP 4: Analyzing and interpreting data
- SEP 5: Using mathematics and computational thinking
- SEP 6: Constructing explanations and designing solutions
- SEP 7: Engaging in argument from evidence
- SEP 8: Obtaining, evaluating, and communicating information

NGSS - Disciplinary Core Ideas:

- LS1.A: Structure and Function
- LS1.C: Organization for Matter and Energy Flow in Organisms
- LS2.A: Interdependent Relationships in Ecosystems
- LS2.B: Cycles of Matter and Energy Transfer in Ecosystems

- LS2.C: Ecosystem Dynamics, Functioning, and Resilience
- LS4.B: Natural Selection
- LS4.C: Adaptation
- LS4.D: Biodiversity and Humans
- ETS1.B: Developing Possible Solutions

NGSS - Cross-Cutting Concepts:

- Cause and Effect
- Patterns
- Stability and Change
- Scale, Proportion, and Quantity
- Energy and Matter
- Structure and Function
- Systems and System Models

STAGE 2 – EVIDENCE

Concepts (Big Ideas and Themes)	**Performance Tasks (What students will be able to do)**	**21st Century Skills - Science and Engineering Practices**
● Food chains and food webs ● Energy flow in ecosystems ● Keystone species ● Ecosystem homeostasis ● Abiotic v. biotic limiting factors ● Carrying capacity of populations ● Allelic and phenotypic frequencies in populations ● Natural selection and selective pressures ● Genetic Drift ● Sea urchin structure and physiology ● Ocean acidification ● Carbon and nitrogen cycles ● Mammalian dive response (feedback mechanisms)	● LS1-2: Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. ● LS1-3: Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. ● LS1-5: Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy. ● LS 1-6: Construct and revise an explanation based on	● SEP 1: Asking and defining problems ● SEP 2: Developing and using models ● SEP 4: Analyzing and interpreting data ● SEP 5: Using mathematics and computational thinking ● SEP 6: Constructing explanations and designing solutions ● SEP 7: Engaging in argument from evidence ● SEP 8: Obtaining, evaluating, and communicating information

• Human impact on ecosystems • Transport of molecules during digestion and respiration • Photosynthesis • Cellular respiration	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. • LS 1-7: Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy. • LS2-1: Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales. • LS 2-2: Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales. • LS 2-3: Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions. • LS 2-4: Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem. • LS 2-5: Develop a model to illustrate the role of photosynthesis and cellular	

	respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere. ● LS2-6: Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem. ● LS2-7: Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity. ● LS 4-3: Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait. ● LS 4-4: Construct an explanation based on evidence for how natural selection leads to adaptation of populations. ● LS4-5: Evaluate the evidence supporting claims that changes in the environmental conditions may result in (1) increases in the numbers of individuals in some species, (2) the emergence of new species over time, and (3) the extinction of other species. ● LS4-6: Create or revise a simulation to test a solution to mitigate adverse impacts	

	of human activity on biodiversity.	

Common Summative Assessments:

- **Homeostasis Day 1 Assessment**
- **Homeostasis Day 2 Assessment**

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Common Formative Assessments:

- **Pacific Northwest Food Chains Activity**
- **Building Keystone Models Activity**
- **Abiotic Factors Activity**
- **Carrying Capacity Data Sets and Analysis Activity**
- **Urchin Hunting and Natural Selection Lab**
- **Virtual Urchin Part 1-3 Activity**
- **Sea Urchin Dissection Lab**
- **Testing Sea Water for CO_2 and pH Lab**
- **Ocean Acidification and Egg Lab**
- **Human Impacts on the Ecosystem Activity with CER**
- **Sea Urchin Close Read Activity**
- **Carbon and Nitrogen Cycle Close Read Activity**
- **Mammalian Dive Response Lab**
- **Transport Modeling Activities - Digestion and Respiration**
- **Energy Game**

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Modified Summative Assessments:

- **Differentiated and Spanish versions available for summative assessments**

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Modified Formative Assessments:

- **Differentiated and Spanish versions available for all labs and activities**

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STAGE 3 – LEARNING PLAN (INSTRUCTIONAL PLANNING)

Suggested Resources/Materials/Informational Texts

Suggested Research-based Effective Instructional Strategies

Academic Vocabulary/ Word Wall	Enrichment/Extensions/ Modifications	Interdisciplinary Connection

Essential Vocabulary:		