Subject: Living Environment Grade: 9 Unit #: 2 Title: Homeostasis

**UNIT OVERVIEW**

## STAGE ONE: Identify Desired Results

### Established Goals/ Standards

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| Key Idea 1 | Living things are both similar to and different from each other and from nonliving things. |
| Perf Ind 1.2 | Describe and explain the structures and functions of the human body at different organizational levels (e.g., systems, tissues, cells, organelles). |
| 1.2f | Cells have particular structures that perform specific jobs. These structures perform the actual work of the cell. Just as systems are coordinated and work together, cell parts must also be coordinated and work together. |
| 1.2g | Each cell is covered by a membrane that performs a number of important functions for the cell. These |

### Long-Term Transfer Goal

*At the end of this unit, students will use what they have learned to independently…*
research and assess health issues in order to come up with ideas to address those issues.

### Meaning

**Enduring Understandings**
*Students will understand that…*

- All organisms, organ systems, and cells are affected by interactions between their internal and external environments
- Organisms' internal systems maintain a dynamic balance called homeostasis
- Stressors may overwhelm the ability of organisms to maintain homeostasis
- Behaviors and physiological responses help maintain homeostasis

**Essential Questions**
*Students will consider such questions as…*
How do you stay healthy?

### Acquisition

*What knowledge will students learn as part of this unit?*

- *Internal conditions change in response to external conditions*
- *Compartmentalization and boundaries*
- *Cell membrane characteristics and selective permeability*
- *Diffusion, osmosis, and active transport*
- *Exchanging substances between internal and external environments*
- *Surface area—volume relationship and cell size*
- *Role of organ systems in regulation*
- *Circulatory system*
- *Urinary system*
- *Homeostatic responses*
- *Interaction of homeostatic systems*
- *Regulation in the human body*

*What skills will students learn as part of this unit?*

- *Supporting explanations with evidence and reasoning*
- *Modeling compartments and boundaries*
- *Controlled experiments*
- *Cost/benefit analysis*
- *Ethical analysis*

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| | | include: separation from its outside environment, controlling which molecules enter and leave the cell, and recognition of chemical signals. The processes of diffusion and active transport are important in the movement of materials in and out of cells. | *pH, buffering, and homeostasis*<br>● *Chemistry of acids and bases*<br>● *Positive feedback*<br>● *Negative feedback*<br>● *Gas exchange system*<br>● *Endocrine and nervous system integration*<br>● *Behavioral mechanisms that maintain homeostasis*<br>● *Disruption of homeostasis*<br>● *Vital signs*<br>● *Immune system*<br>● *Vaccines*<br>● *Regulatory mechanisms*<br>● *Mental health and homeostasis*<br>● *Behavioral effects on immune function*<br>● *Risk and behavior*<br>● *The dynamic nature of science* | |
| | 1.2h | Many organic and inorganic substances dissolved in cells allow necessary chemical reactions to take place in order to maintain life. Large organic food molecules such as proteins and starches must initially be broken down (digested to amino acids and simple sugars respectively), in order to enter cells. Once nutrients enter a cell, the cell will use them as building blocks in the synthesis of compounds necessary for life. | | |
| | 1.2i | Inside the cell a | | |

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| | | variety of specialized structures, formed from many different molecules, carry out the transport of materials (cytoplasm), extraction of energy from nutrients (mitochondria), protein building (ribosomes), waste disposal (cell membrane), storage (vacuole), and information storage (nucleus). | | |
| | 1.2e | The organs and systems of the body help to provide all the cells with their basic needs. The cells of the body are of different kinds and are grouped in ways that enhance how they function together. | | |
| | Perf Ind 1.3 | Explain how a one-celled organism is able to function despite lacking the levels of organization present in more complex organisms. | | |
| | 1.3a | The structures present in some single-celled organisms act | | |

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| | | in a manner similar to the tissues that systems found in multicellular organisms, thus enabling them to perform all of the life processes needed to maintain homeostasis. | | |
| | Key Idea 5 | Organisms maintain a dynamic equilibrium that sustains life. | | |
| | Perf Ind 5.2 | Explain disease as a failure of homeostasis | | |
| | 5.2a | Homeostasis in an organism is constantly threatened. Failure to respond effectively can result in disease or death. | | |
| | Perf Ind 5.3 | Relate processes at the system level to the cellular level in order to explain dynamic equilibrium in multicelled organisms. | | |
| | 5.3a | Dynamic equilibrium results from detection of and response to stimuli. Organisms detect and respond to change in a variety of ways | | |

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| | | both at the cellular level and at the organismal level. | | |
| | 5.3b | Feedback mechanisms have evolved that maintain homeostasis. Examples include the changes in heart rate or respiratory rate in response to increased activity in muscle cells, the maintenance of blood sugar levels by insulin from the pancreas, and the changes in openings in the leaves of plants by guard cells to regulate water loss and gas exchange. | | |
| | 2.1k | The many body cells in an individual can be very different from one another, even though they are all descended from a single cell and thus have essentially identical genetic instructions. This is because different parts of these instructions are used in different types of cells, and are influenced by the cell's environment and past history. | | |

<table>
<tr><th colspan="2">STAGE TWO: Determine Acceptable Evidence</th></tr>
<tr><td></td><td>Assessment Evidence</td></tr>
<tr><td rowspan="2">Criteria to assess understanding: (This is used to build the scoring tool.)<br>Concept: Health care proposal shows thorough understanding of how homeostasis in the human body may be disrupted by external and internal factors. Proposal shows clear understanding that humans are subject to many health risks that are frequently affected by their own behavior.<br><br>Explanation for proposal: Health care proposal uses 3 or more specific references to research data that explain why the proposed treatment program is needed.<br><br>Explanation for homeostasis: Health care proposal uses specific examples. It thoroughly explains which organs or regulatory systems will be most directly affected by the care provided by the treatment. Proposal uses specific examples and thorough explanations to describe the homeostatic disruption and the proposed treatment.</td><td>Performance Task focused on Transfer:<br><br>Health care grant proposal (p. 331): “entrepreneur to fund worthy health care programs”--choose one option and address:<ul><li>overview of program and whether there are other choices for participants</li><li>which organ or regulatory system is most involved and describe anatomy, physiology, and roles of immune system</li><li>nature of homeostatic disruption that your program will correct</li><li>how common the illness/injury is</li><li>how the population will be informed about the program</li><li>how behavior affects a person’s likelihood of experiencing the risks the proposal addresses</li><li>how controllable the risks are and how a person can change their behavior to minimize the risks</li><li>how your program will intervene to reduce the risk of the health condition</li><li>ethical dilemma that could be associated with proposal</li><li>use the 6 steps of ethical analysis (p. 330) to analyze the dilemma</li></ul></td></tr>
<tr><td>Other Assessment Evidence:<br><br>Ch. 4: “Can you stand the heat--again?” p. 245<ul><li>Review concept map and create a new one that reflects current understanding of homeostasis--list of key terms is provided<ul><li>Diffusion</li><li>Water</li><li>Gas exchange</li><li>Osmosis</li><li>Compartment</li><li>Concentration gradient</li><li>Waste removal</li><li>Cell membrane</li><li>Environment</li><li>Internal conditions</li><li>Homeostasis</li><li>Selectively permeable</li></ul></li><li>Read conclusion to dehydration scenario including info on diuretics and water lost from sweat</li><li>Copy in and annotate (“highlight comments”) data tables re. body mass and fluids before/during/after work in heat</li><li>Answer analysis questions:</li></ul></td></tr>
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| **Explanation for risk assessment:** Health care proposal uses research data to explain how common the illness or injury is that will benefit from its services. Proposal uses specific examples and thorough explanations for how the proposed treatment program will meet the peoples' needs. Description of the illness or injury to be treated uses research data and examples to explain the roles that behavior and choice play in a person's risk of being affected by this ailment.<br><br>**Explanation for ethical analysis**: Health care proposal uses research data to identify and explain an ethical dilemma that is associated with the proposed treatment. The writer states his or her own concerns regarding that dilemma. Proposal includes an ethical analysis using the 6 steps outlined in the essay Ethical Analysis. Writer explains his or her own decision as a result of that analysis.<br><br>**Presentation:** Answers are easy to read. | ○ what % of body mass did Josh lose in form of fluids?<br>○ how much fluid did Josh use from sweating vs. urinating?<br>○ in what ways was Josh's body attempting to maintain an internal balance in spite of his external environment?<br>○ imagine one of the cells that makes up Josh's tongue--draw sketches of before and after work; label key features of the cell; rewrite scenario from perspective of the cell<br>○ Use knowledge of homeostasis to write a brief explanation of why a plant in the hot sunlight might wilt--use list of terms<br>■ Osmosis<br>■ Balance<br>■ Compartment<br>■ Cell<br>■ Water<br>■ Permeability<br>■ Membrane<br><br>Ch. 5: "Homeostasis in your critter" p. 289<br>● Individually write 2 paragraphs that answer the following questions:<br>○ Summarize your understanding of homeostasis, including definition and examples<br>○ Explain why it is important for organisms to maintain homeostasis, including scenarios when homeostasis is disrupted<br>● Look at ch 3's work--description/sketch of critter--think about scenarios when its homeostasis would be challenged<br>● List at least 5 environmental stressors it might experience in its environment<br>● Respond to: "In what ways does your critter maintain its internal environment, considering the external stressors that it experiences?"--explain, illustrate, or demonstrate the following:<br>○ Changes in external temp<br>○ Water balance<br>○ 2 other stressors<br>○ How at least 2 key systems interact to adjust internal conditions<br>● Evaluate according to rubric |

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| Grammar and punctuation are used correctly, making it easy to understand what was meant. | |

| T, M, A<br>*(Code for Transfer, Meaning Making and Acquisition)* | **STAGE THREE: Plan Learning Experiences** | |
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| | Learning Events: | Evidence of learning:<br>*(formative assessment)* |