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Nitrogen Cycle & Photosynthesis


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Laura Spaman

Chemistry

Lesson would involve teaching how chemical reactions occur in nature, conservation of mass/matter, examples would include the nitrogen cycle, carbon cycle, water cycle, etc.

Model exemplifies a simple version of the nitrogen cycle.

The Nitrogen Cycle:

Concepts/reactions covered →

1. $N_2 \rightarrow NH_4^+$ (by bacteria type 1)
2. $NO_3^- \rightarrow NH_3$ (by bacteria type 2) $\rightarrow NH_4^+$ (by bacteria type 1)
3. $NO_3^- \rightarrow \rightarrow \rightarrow N_2$ (by bacteria type 2)

NYS Standards covered:

Chemistry

S1.1 Elaborate on basic scientific and personal explanations of natural phenomena, and develop extended visual models and mathematical formulations to represent thinking.

- use theories and/or models to represent and explain observations
- use theories and/or principles to make predictions about natural phenomena
- develop models to explain observations

Key Idea 1:

Information technology is used to retrieve, process, and communicate information as a tool to enhance learning.

Examples include:

- use the Internet as a source to retrieve information for classroom use, e.g., Periodic Table, acid rain

3.4d Collision theory states that a reaction is most likely to occur if reactant particles collide with the proper energy and orientation.

The Living Environment

Lesson would involve simple diffusion explanations, cellular processes, photosynthesis and cellular respiration.

Model exemplifies diffusion of gases involved in photosynthesis and the photosynthetic process as a whole in a simplified sense.

Model would also be well suited for middle school classroom concepts when learning about cellular structure and photosynthesis processes.

Photosynthesis:

Concepts/reactions covered:

1. Photosynthesis = $\text{CO}_2 + \text{H}_2\text{O} \rightarrow$ glucose and O_2
2. Diffusion of gases is modeled by the random movement of CO_2 and O_2 in and out of the leaf through the designated pore areas.

NYS Standards covered:

The Living Environment

6.3c A stable ecosystem can be altered, either rapidly or slowly, through the activities of organisms (including humans), or through climatic changes or natural disasters. The altered ecosystem can usually recover through gradual changes back to a point of long term stability.

7.1a The Earth has finite resources; increasing human consumption of resources places stress on the natural processes that renew some resources and deplete those resources that cannot be renewed.

Paige Whitney

Earth Science

Goal:

- ✓ To illustrate the molecular interactions in the nitrogen cycle and photosynthesis
- ✓ Help students understand the molecular interactions of processes that are understood in a general sense.

Procedure:

- ✓ Define nitrogen, explain how it is used, briefly explain photosynthesis
- ✓ Nitrogen cycle Agentsheets model, reiterate the cycle, explain generally the reactions that occur, explain how the soil and air relate in cycle
- ✓ Show the relationship with the number of molecules/compounds; explain what each compound is used for.
- ✓ Photosynthesis Agentsheets model, as model is running, explain components, explain chlorophyll, sunlight, carbon dioxide, oxygen etc.
- ✓ Show the relationship with the number of molecules/compounds; explain what each compound is used for.

Standards Covered:

STANDARD 1

Analysis, Inquiry, and Design

MATHEMATICAL ANALYSIS:

Key Idea 1:

Abstraction and symbolic representation are used to communicate mathematically.

Key Idea 3:

Critical thinking skills are used in the solution of mathematical problems.

STANDARD 6

Interconnectedness: Common Themes

MODELS:

Key Idea 2:

Models are simplified representations of objects, structures, or systems used in analysis, explanation, interpretation, or design.

PATTERNS OF CHANGE:

Key Idea 5:

Identifying patterns of change is necessary for making predictions about future behavior and conditions.

STANDARD 7

Interdisciplinary Problem Solving

CONNECTIONS:

Key Idea 1:

The knowledge and skills of mathematics, science, and technology are used together to make informed decisions and solve problems, especially those relating to issues of science/technology/society, consumer decision making, design, and inquiry into phenomena.