

**LCM Formal Loop Lesson Plan:
Nitrogen Cycle**

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Grade Level: High School (Grades 9/10)

Standards:

Science: A9,A14, A15, B1,B2

Math: B6,D1,D2,E3

Cultural: E2

Science Concept:

All organisms need nitrogen to build proteins, which are used to build new cells. Plants that do not have nitrogen-fixing bacteria in their roots must get nitrogen from the soil, or die.

Activity (2-3-days)	Process Skills	Vocabulary
<p>Gear up: Life depends upon the sun for its energy. The concepts of photosynthesis and cellular respiration will be discussed. Why are they important? How do plants convert the sun’s energy into sugar molecules? $6\text{CO}_2 + 6\text{H}_2\text{O} + \text{solar energy} \Rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$ $\text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 \Rightarrow 6\text{CO}_2 + 6\text{H}_2\text{O} + \text{energy}$</p>	<p>classifying</p>	<p>Photosynthesis Cellular respiration</p> <p>Producer Consumer Food chain Tropical level Energy pyramid Ecosystem</p> <p>Carbon Carbon cycle</p>

Activity	Process Skills	Materials
<p>Experiment: Using Ward's N_P_K Soil test kit, students will test for all three factors using a heaping teaspoon of soil added to the provided container. The tube is shaken and the soil is allowed to settle to the bottom. Filter paper is used to filter out the sediment and create a clear liquid to be used to test for Nitrogen, Potassium, and phosphorus levels. Students transfer some of the liquid to a separate container provided in the kit. They add one tablet and wait five minutes for the color to develop. They then will compare the pink color that developed to the Nitrogen Color Chart provided.</p>	<p>Hypothesizing Investigating Experimenting Reading instructions</p>	<p>Test kit: N_P_K Soil test kit. Tundra soil</p>
<p>Interpret: Students will interpret their findings and state whether or not the soil is indeed deficient in nitrogen. Students will record their findings in their science journals.</p> <p>Did the findings prove that the tundra soil is indeed nitrogen deficient?</p> <p>How could we apply this knowledge and conduct further experiments?</p>	<p>Interpreting data Inferring Communicating Generalizing</p>	
<p>Apply/Assess: Students should be able to accurately report the results of their experiment and write a conclusion to their hypothesis. Students will write a brief report using the Scientific Method, giving a brief background, the hypothesis, explain the experiment, and conclusion.</p>	<p>Predicting Generalizing</p>	
<p>Extensions: With this new data, students should be able to create a new experiment. Students can grow both radishes and peas using tundra soil in two pots, one pot unfertilized, the other fertilized.</p>	<p>Predicting Generalizing Experimenting Hypothesizing</p>	

Nitrogen Cycle – Grading Rubric

Background

Score	Criteria
1	No understanding of the previous experiment conducted.
2	Some understanding of previous experiment. Sketchy account of purpose of lab.
3	Clear understanding of previous experiment. Well written account of purpose of lab.
Comments:	

Hypothesis

Score	Criteria
1	Hypothesis or questions stated but confusing and not clear
2	Hypothesis or questions stated with less confusion
3	Hypothesis or questions well written or well stated
Comments:	

Procedure

Score	Criteria
1	Steps written, but considerable confusion of meaning
2	Well-written steps, but have grammatical or careless mistakes
4	Well-written steps, high degree of accuracy
Comments:	

Interpretation and Conclusion

Score	Criteria
1	Some evidence that test was performed, no indication for further experimentation
2	Test performed and interpretation is correct, but only sketchy indication of any thought for further experimentation
3	Interpretation is correct and well thought-out explanation for further experimentation
Comments:	