

Possible Answers to the Reflection Sections

Note to Educator: The purpose of the Reflection Section Questions is to encourage students to think critically about what they have read. The following “answers” are only suggestions to assist you in using these questions in the classroom.

Are You Red-dy to Change? Learning What Affects Leaf Color Change

Introduction

What was the research question the scientists wanted to answer? *Are the air temperature, the length of daylight, or the chemicals in the leaves more likely to result in leaf color change in sugar maples?*

Do you think it is important for people to know when fall leaf color will be at its most colorful? Why or why not? *This is an individual question and must be answered individually. Students should support their answers with logical explanations.*

Method

Why do you think the scientists decided to collect leaf samples from June to October instead of from October to June? *Deciduous trees drop their leaves in the fall and winter. If they collected leaves from October to June, they would only be able to collect leaves in October and November.*

Why is it important for the scientists to take a number of leaves from several trees and not just one or two? *Scientists need to collect leaves from more than one or two trees so that they get a good sample of leaves from the trees. If they only collected leaves from one or two trees, there might be something different about those two trees than all the other trees. This would throw off their results.*

Findings

This study was done in South Burlington, Vermont. Do you think late October would be the best time to view yellow leaves in Georgia? Why or why not? *This is an individual question and must be answered individually. Students should support their answers with logical support.*

Discussion

Understanding when fall leaf color is at its peak is good for a lot of people. What is one of the benefits for store owners? *One of the benefits for store owners is to plan supply orders or they also use it to schedule enough employees for the times when many tourists are visiting.*

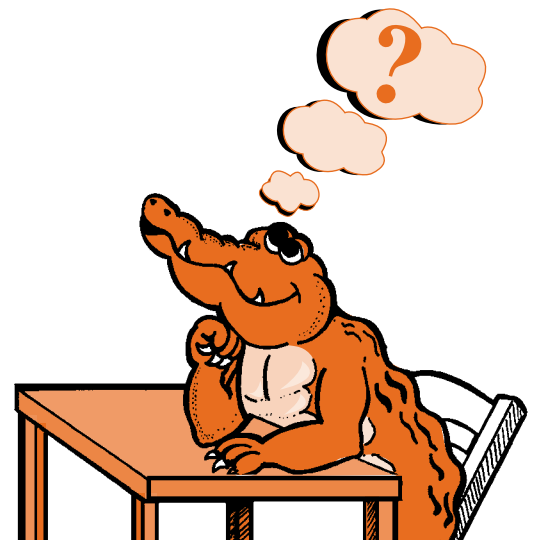
Give another example of something in nature that attracts tourists to an area. If possible, think of an example from an area close to where you live. *This is an individual question and must be answered individually. Students should support their answers with logical support. Some examples are beaches in the summer and snow for skiing in the winter.*

No Littering o-Zone: How Rising Ozone Levels Affect Tree Growth

Introduction

In your own words and in the form of a question, state what the scientists wanted to learn. *How do rising ozone levels affect tree growth? Here tree growth is determined by how many leaves were produced and the amount of nutrients in the leaves.*

Think about trees growing inside a building and trees growing outside. Name three things that make observing trees outside more natural than observing them inside. *This is an individual question and must be answered individually. Students should support their answers with logical support. Examples of some answers are the sun is outside, there is rain and other changing weather conditions, and insects and animals use the trees as habitats.*



Method

When people rake leaves in the fall, they take nutrients away that could one day become a part of the soil. What do people do to their lawns to make up for this?

They add fertilizer to their lawns.

Why do you think the scientists measured the chemical content of leaf litter from trees that were not sprayed with higher levels of ozone? *The scientists measured the chemical content of leaf litter from trees that were not sprayed with higher levels of ozone so that they could estimate how ozone was affecting the forest by comparing the measurements between the two sets of trees.*

Do you think scientists must have patience to do some of their experiments? What evidence of this can you find in the section above. Yes, scientists must be patient. *There is evidence of this because they have to collect leaves from June through October and then come up with their results. Also scientists had to wait six years for their results.*

Findings

Based on the findings, do you think that higher levels of ozone would be good for trees and other plants growing in the forest? Why or why not? *Higher levels of ozone are not good for trees and other growing plants because there are lower levels of leaf litter, carbon, and nitrogen which are all important for tree and plant growth.*

If less leaf litter is produced, would growing plants be helped or hurt? Explain your answer. *Less leaf litter hurts growing plants because there are fewer leaves for photosynthesis: and each leaf has fewer nutrients, which also lowers photosynthesis, and finally fewer nutrients are returned to soil as leaf litter falls to the ground.*

Discussion

Based on the findings and discussion in this study, do you think humans should try to reduce the amount of ozone being produced? Why or why not? *Humans should try to reduce the amount of ozone produced every year so that trees and plants will have better growing conditions.*

What is the answer to the scientists' question? Reread the end of the "Introduction" if you have forgotten the scientists' question. *The scientists wanted to know how rising levels of ozone will affect how trees grow. They discovered fewer leaves will grow on trees, and that the levels of carbon and nitrogen in the leaves will be lower.*

Out of the Penalty Box: Protecting the Environment Through Policies

Introduction

Environmental policies either use penalties or rewards to achieve their objectives. Think of two policies that you must follow at home or school, one based on penalties and the other based on rewards. Think about whether you would follow the policy without the penalty or the reward. Is one type of policy more effective than the other or are they equally effective? Why or why not? You must think beyond whether you like the policy. *This is an individual question and must be individually answered. Students should be able to back up their thinking with logic and sound reasons.*

What are the questions the scientists wanted to answer in this study? *The first question is: What are the characteristics of the policies that have been used to manage urban growth and protect urban space? The second question is: Which of these types of policies has been most effective?*

Method

Name at least two of the criteria used by the scientists to select which environmental policies to study. *1) Policies made by local, State, or Federal governments, 2) Policies made after 1980, or 3) Policies made in the United States.*

Think about the last time you chose to buy something. This could be a piece of clothing, a CD, or any other item. Name two criteria that you used when you decided which item to buy. *This is a personal question, but the student should offer valid criteria. For a CD, for example, criteria might include that the music be hip hop, and that it not cost over \$14.*

Examine figure 4. The third category is land that is or was purchased by a government and managed for the public good. Name one area in your community that would fit into that category. *This is an individual question, but students should think about their school grounds, public parks and recreation areas, local forests, or other public lands.*

Findings

Look at the list of four reasons a policy was more effective. Which of the four applies most to the policies that you must follow at home? *Someone keeping a close check on whether the policy is being followed.*

In most communities, people can be fined if they throw litter on the ground. Into which row and column in figure 4 would you place this policy? Why would you place it there? *Control and punishment and protecting open space. Because a fine is a penalty and litter on the ground could hurt the quality of open space.*

Discussion

Think about the conclusions of the scientists, outlined in the “Discussion” section, above. Based on these conclusions, what is one important aspect of implementing a successful policy? *Communication among everyone involved. Citizens should be involved.*

Do you think it is important to manage urban growth and protect open space? Why or why not? *This question is individual and must be answered by each student. The student should be able to back up their answer with reason and logic.*

Snowed In? A Closer Look at Soil Activity in the Wintertime

Introduction

What question did the scientists want to answer? *The scientists wanted to know what happens to the activity of microbes if the freezing and thawing cycle happens in the natural environment instead of a laboratory setting.*

If soil that never froze before began to freeze during the winter, do you think soil activity would be affected? If so, how do you think soil activity might be affected? *Students must answer this individually. However, logic would suggest that soil activity would slow down or stop if the ground freezes.*

Method

Do you think that wintertime soil activity in the northeastern United States is similar to wintertime soil activity in Canada? Why or why not? *Students should answer this using logic, and they should back up their answers with reason. Logic suggests that wintertime soil activity in the northeastern United States would be similar to wintertime soil activity in Canada.*

Do you think the scientists should have read about research done on wintertime soil activity near the equator? Why or why not? *Students should be aware that the equatorial zone is warm year-around, and that research done there would not help them understand what happens in cold*

climates during the winter. If this is not clear to some of the students, you can use Figure 9 to contrast the climatic zones of the equator and the northeastern United States.

Findings

Does the human body produce heat as a result of activity? How do you know? *Yes. This is evident from perspiration. When a person becomes active, they get hotter.*

Restate in your own words what the scientists discovered. *The scientists found no evidence of greater microbe activity when the study was completed in a natural environment. This finding was different from what they found in a laboratory setting. In the laboratory setting, the scientists found that soil microbe activity increased.*

Why do you think the scientists had two different findings depending on whether it was a laboratory setting or a natural setting? *This is an individual question. Students should discuss this as a group and make a list of possible differences between the two settings and discuss which setting may be better for this study.*

Discussion

If you were the scientist, how would you explore whether higher average temperatures affect soil activity over the entire winter? *If one assumes that snow will fall and thaw many times over the winter if the average temperature is higher than normal, one way to explore this question would be to remove snow repeatedly from an area during the entire winter. When snow falls, it could be removed by shoveling it or heating it with a tool like a hair dryer. Then the soil activity could be measured over the course of the whole winter.*

Why do you think scientists first tested soil microbe activity in a laboratory setting? *This is an individual question. Students might want to consider the time of year, the availability of resources, the availability of money to complete the study, etc.*