Science Excerpt, Prompt, and Scoring Guide

Prompt

A farmer purchased 30 acres of farmland. The farmer calculated that the average topsoil thickness on the farmland is about 20 centimeters.

The farmer wants to maintain the thickness of the soil on this farmland by reducing erosion. The farmer plans to test the effectiveness of two different farming methods for reducing soil erosion.

Method 1: *No-till (planting crops without plowing the soil)*

Method 2: Winter cover crop (growing plants during the winter that are plowed into the soil in spring)

The farmer hypothesizes that using either method will reduce erosion compared to using traditional farming methods (plowing and no cover crop).

Design a controlled experiment that the farmer can use to test this hypothesis. Include descriptions of data collection and how the farmer will determine whether his hypothesis is correct.

Type your response in the box. This task may require approximately 10 minutes to complete.

Scoring Guide

3-Point Response
Response contains

- A well-formulated, complete controlled experimental design
- A well-formulated data collection method
- A well-formulated, complete explanation of the criteria for evaluating the hypothesis

2-Point Response
Response contains

- A logical controlled experimental design
- A logical data collection method
- A logical explanation of the criteria for evaluating the hypothesis

1-Point Response
Response contains

- A minimal experimental design
- A minimal or poorly formulated data collection method
- A minimal or poorly formulated explanation of the criteria for evaluating the hypothesis

0-Point Response
Response includes

- An illogical or no experimental design
- An illogical or no data collection method
- An illogical or no explanation of the criteria for evaluating the hypothesis

Sample Anchor Papers for Science Short Answer

Sample Paper 1

The farmer would have to set up 3 experiments. The first would be a years worth of tratitional farming methods (plowing and no cover crop) on a 5 x 5 acres of land. He would have to measure the top soil in every month throughout the year and record it in a data table. For the second experiment the farmer would have to farm a plot of land 5 x 5 acres of land with winter cover crop and measure the soil every month and record it in a lab table. At the end of the year the farmer would have to compare the 2 mehos against the traditional methid and determine if he is correct.

Sample Paper 2

The farmer could separate the land into two sections (15 acres each), and use mone method on each section over a two season period. Over the two season period he would record how much soil was left after using each method, comparing the results to each other and the traditional farming method.

Sample Paper 3

To test his hypothesis the farmer should divide his land into three equal parts one for the first method, one for the second method and one for the controle group. In the first part he divided he should test method one and keep a record of the process and the results. In the second part he divided he should test the second method and keep a record of the process and the results. In the third p5rt that he divided he should have the controle group where he would use the traditional method keep a record of tre process and the results, then compare the records he has collected identify the different results, make an annalasys and decide which method is the best way to prevent soil erosion.

Annotations

Annotation for Sample Paper 1: Score Point 3

The response earns all three points because it includes a complete description of the experiment and includes the controlled variable, "The farmer would have to set up 3 experiments. The first would be a years worth of tratitional farming methods (plowing and no cover crop) on a 5 x 5 acres of land." The response also dexcribes data collection methods for the control group and experimental group by stating that the farmer "...He would have to meaure the top soil every month for a year and record it in a data table." Finally, the response provides an explanation of how the farmer will determine if his hypothesis is correct, "At the end of the year the farmer would have to compare the 2 methos against the traditional methid and determine if he is correct."

Annotation for Sample Paper 2: Score Point 2

The response includes a logical description of the experiment, "The farmer could separate the land into two sections (15 acres each) and use one method on each section..." While the response does not include the controlled variable in this initial description of the experiment, in the last sentence of the response the writer states, "comparing the results to each other and the traditional method." This statement demonstrates that the writer understands the connection and importance of having the controlled variable as part of the experiment and data collection methods. The response also describes a logical data collection method by stating, "over the two season period he would record how much soil was left after using each method..." However, this response only provides an implied, logical explanation of the criteria for evaluating if the hypothesis is correct by stating, "comparing the results to each other and the traditional method." While it is clear that the response is attempting to connect the results of the experiement with an evaluation of the hypothesis, this is not a complete statement.

Annotation for Sample Paper 3: Score Point 1

The response includes a description of the experiment, "the farmer should divide his land into three equal parts one for the first method, one for the second method and one for the controle group..." The response also describes a poorly formulated data collection method by stating, "In the first part he divided he should test method one and keep a record of the process and the results. In the second part he divided he should test the second method and keep a record of the process and the results. In the third p5rt that he divided he should have th controle group where he would use the traditional method keep a record of tre process and the results..." While the response is describing the collection of data in all three sections of land, the phrase "keep a record of tre process and the results" is NOT a clear statement describing what data will be collected. The response also describes a minimal explanation of the criteria for evaluating the hypothesis by stating "then compare the records he has collected identify the different results, make an annalasys and decide which method...".