2022 MCAS Sample Student Work and Scoring Guide

Grade 5 Science and Technology/Engineering
Question 13: Constructed-Response

Reporting Category: Earth and Space Science
Practice Category: Evidence, Reasoning, and Modeling
Standard: 5.ESS.2.1 - Use a model to describe the cycling of water through a watershed through evaporation, precipitation, absorption, surface runoff, and condensation.
Item Description: Analyze climate data to compare the amount of water that becomes groundwater during different seasons and explain how two design solutions affect the amount of groundwater in an area.

View item in MCAS Digital Item Library

Scoring Guide

Select a score point in the table below to view the sample student response.

Score*	Description
3A	The response demonstrates a thorough understanding of the cycling of water through a watershed through evaporation, precipitation, absorption, surface runoff, and condensation. The response correctly identifies the season when the least amount of water becomes groundwater, clearly explains why this season has the least amount of groundwater, and includes data from the table to support the answer. The response also clearly describes how design solutions 1 and 2 will affect the amount of groundwater near the sports field and clearly explains the reasoning.
3B	
2	The response demonstrates a partial understanding of the cycling of water through a watershed through evaporation, precipitation, absorption, surface runoff, and condensation.
1	The response demonstrates a minimal understanding of the cycling of water through a watershed through evaporation, precipitation, absorption, surface runoff, and condensation.
0	The response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.

*Letters are used to distinguish between sample student responses that earned the same score (e.g., 3A and 3B).

Score Point 3A

At a school, a sports field became flooded following a large rainstorm. Students were unable to play on the field for several days while the water slowly absorbed into the ground. To better predict when a rainstorm might flood the field, a group of students gathered the seasonal climate data shown in the table.

Seasonal Climate Data

	Winter	Spring	Summer	Fall
Average Precipitation (in.)	10.6	11.3	9.8	10.4
Average Low Temperature (°F)	22.7	38.7	61.7	45.3
Average High Temperature (°F)	38.3	56.7	80.0	63.0
Average Wind Speed (mi. per hr)	17.3	12.7	7.3	10.0

This question has three parts.

The amount of groundwater in the area near the sports field changes throughout the year.

Part A

Identify the season when the **least** amount of water becomes groundwater in the area near the sports field. Explain why, in this season, the least amount of water becomes groundwater. Include data from the climate data table to support your answer.

I think the season with the least amount of water that becomes groundwater is summer. On the chart it says that the Average precipitation is 9.8 in. and the average low temperature is 61.7*F and the average high temperature is 80.0*F. So the precipitation is low and the weather is really hot. If the weather is really hot then instead of the water become ground water it would probably evaporate in the air, and since the precipitation is low then there isn't lots of water to become ground water.

Part B

Describe how design solution 1 will affect the amount of groundwater in the area near the sports field (increase, decrease, or stay the same) compared to the design of the existing field. Explain your reasoning.

I think that the groundwater in the area would decrease. in the current field there aren't any drains so all the water goes into the ground. The design solution 1 has raised surfaces and drains that eventually help the water get to a nearby stream. In doing so they are decreasing the amount of ground water in the area.

Part C

Describe how design solution 2 will affect the amount of groundwater in the area near the sports field (increase, decrease, or stay the same) compared to design solution 1. Explain your reasoning.

I think that the groundwater would increase around the area. On the current field all the water is going directly down, causing it to flood. Design solution 2 shows the surface as rounded, which then allows it to slide off, going into the rain gardens, where the water is then absorbed. There isn't a type of drainage to it and to absorb the water completely takes some time, and the using the water takes even more time, therefore increasing the amount of groundwater in the area.

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Score Point 3B

At a school, a sports field became flooded following a large rainstorm. Students were unable to play on the field for several days while the water slowly absorbed into the ground. To better predict when a rainstorm might flood the field, a group of students gathered the seasonal climate data shown in the table.

Seasonal Climate Data

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This question has three parts.

The amount of groundwater in the area near the sports field changes throughout the year.

Part A

Identify the season when the **least** amount of water becomes groundwater in the area near the sports field. Explain why, in this season, the least amount of water becomes groundwater. Include data from the climate data table to support your answer.

The season when the least amount of water becomes groundwater is Winter. The season when the least amount of water becomes groundwater is Winter because almost all of the precipitation that falls freezes before it can soak into the ground. According to the chart, the average high temperature is 38.3 degrees, which is still pretty cold. The average low temperature is 22.7 degrees, which is below freezing. That means that most, if not all, of the precipitation freezes before it turns to groundwater.

Part B

Describe how design solution 1 will affect the amount of groundwater in the area near the sports field (increase, decrease, or stay the same) compared to the design of the existing field. Explain your reasoning.

Solution 1 will affect the amount of groundwater in the area near the sports field by decreasing it. Solution 1 will decrease the amount of groundwater in the area near the sports field because it will be raised and will have a rounded surface, allowing water to become runoff and flow down the side. At the bottom, there are drains on each side to catch all of the water. The current field is just a flat surface, leaving the water to go nowhere but to sink into it. That is why solution 1 will decrease the amount of groundwater near the sports field.

Part C

Describe how design solution 2 will affect the amount of groundwater in the area near the sports field (increase, decrease, or stay the same) compared to design solution 1. Explain your reasoning.

Solution 2 will affect the amount of groundwater in the area near the sports field by having it increase compared to solution 1. Solution 2 will have the amount of groundwater in the area near the sports field increase compared to solution 1 because they both have rounded surfaces, and so the water will runoff of them, but in solution 2, there is no place for it to go other than into the plants. But, if there was a big rain, then the plants might of had too much water and will not let any more water in, which means that the water will soak into the ground, increasing the amount of groundwater in the area around the sports field. Solution 1, however, will take all of that water away to a nearby stream. That is why solution 2 will increase the amount of groundwater in the area around the sports field compared to solution 1.

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Score Point 2

At a school, a sports field became flooded following a large rainstorm. Students were unable to play on the field for several days while the water slowly absorbed into the ground. To better predict when a rainstorm might flood the field, a group of students gathered the seasonal climate data shown in the table.

Seasonal Climate Data

	Winter	Spring	Summer	Fall
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This question has three parts.

The amount of groundwater in the area near the sports field changes throughout the year.

Part A

Identify the season when the **least** amount of water becomes groundwater in the area near the sports field. Explain why, in this season, the least amount of water becomes groundwater. Include data from the climate data table to support your answer.

Summer is going to be the least amount of groundwater because the lowest and highest temperture are 61.7 and 80.0 F which means more water would evaporate then become groundwater.

Part B

Describe how design solution 1 will affect the amount of groundwater in the area near the sports field (increase, decrease, or stay the same) compared to the design of the existing field. Explain your reasoning.

the design of solution 1 will decrease groundwater by allowing the rain to fall in the drain decreasing the amount of water in the feild while carrying the rainwater to a nearby stream.

Part C

Describe how design solution 2 will affect the amount of groundwater in the area near the sports field (increase, decrease, or stay the same) compared to design solution 1. Explain your reasoning.

The design of solution 2 will decrease less water because when water is flowing into the plants the plants can only hold a limit amount of water.

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Score Point 1

At a school, a sports field became flooded following a large rainstorm. Students were unable to play on the field for several days while the water slowly absorbed into the ground. To better predict when a rainstorm might flood the field, a group of students gathered the seasonal climate data shown in the table.

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This question has three parts.

The amount of groundwater in the area near the sports field changes throughout the year.

Part A

Identify the season when the **least** amount of water becomes groundwater in the area near the sports field. Explain why, in this season, the least amount of water becomes groundwater. Include data from the climate data table to support your answer.

Summer.
In the table, it shows that Summer has the least amount of precipitation in inches.

Part B

Describe how design solution 1 will affect the amount of groundwater in the area near the sports field (increase, decrease, or stay the same) compared to the design of the existing field. Explain your reasoning.

It will increase.

Part C

Describe how design solution 2 will affect the amount of groundwater in the area near the sports field (increase, decrease, or stay the same) compared to design solution 1. Explain your reasoning.

It will decrease.

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Score Point 0

At a school, a sports field became flooded following a large rainstorm. Students were unable to play on the field for several days while the water slowly absorbed into the ground. To better predict when a rainstorm might flood the field, a group of students gathered the seasonal climate data shown in the table.

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This question has three parts.

The amount of groundwater in the area near the sports field changes throughout the year.

Part A

Identify the season when the **least** amount of water becomes groundwater in the area near the sports field. Explain why, in this season, the least amount of water becomes groundwater. Include data from the climate data table to support your answer.

the least amount of water becoming ground water is in spring when its low degree weather.

Part B

Describe how design solution 1 will affect the amount of groundwater in the area near the sports field (increase, decrease, or stay the same) compared to the design of the existing field. Explain your reasoning.

it wilk affect the amount of ground water because the grass will get the water all over it not the dirt.

Part C

Describe how design solution 2 will affect the amount of groundwater in the area near the sports field (increase, decrease, or stay the same) compared to design solution 1. Explain your reasoning.

it would decrease because there will be less water because of the grass and the football field.

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