2024 MCAS Sample Student Work and Scoring Guide

High School Introductory Physics Question 20: Constructed-Response

Reporting Category: Waves **Practice Category:** None

Standard: <u>HS.PHY.4.1</u> - Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling within various media. Recognize that electromagnetic waves can travel through empty space (without a medium) as compared to mechanical waves that require a medium.

Item Description: Identify sound waves as a type of mechanical wave, describe how one type of electromagnetic wave can be used, explain why electromagnetic waves must be used in space, and describe a difference between mechanical and electromagnetic waves.

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 |
|-----------|--|
| <u>4A</u> | The response demonstrates a thorough understanding of mechanical and electromagnetic waves. The response correctly identifies the mechanical wave used for communication. The response correctly identifies and clearly describes one electromagnetic wave used for communication. The response correctly identifies that electromagnetic waves should be used to send a signal from Earth to Mars and clearly explains the answer. The response also clearly describes one difference between mechanical and electromagnetic waves. |
| <u>4B</u> | |
| <u>3</u> | The response demonstrates a general understanding of mechanical and electromagnetic waves. |
| <u>2</u> | The response demonstrates a limited understanding of mechanical and electromagnetic waves. |
| <u>1</u> | The response demonstrates a minimal understanding of mechanical and electromagnetic waves. |
| <u>0</u> | 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., 4A and 4B).

Score Point 4A

This question has four parts.

Mechanical and electromagnetic waves are used in different forms of communication.

Part A

Identify the mechanical wave commonly used for communication between people near each other.



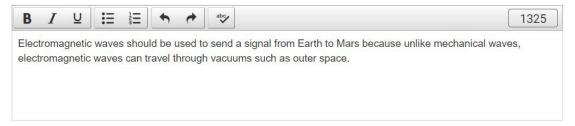
Part B

Identify one electromagnetic wave used for communication on Earth and describe how it is used.



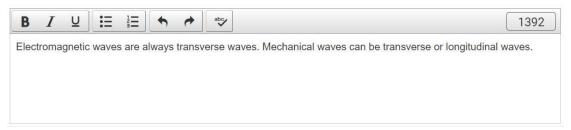
Part C

Identify which type of wave, mechanical or electromagnetic, should be used to send a signal from Earth to a rover on the surface of Mars. Explain your answer.



Part D

Describe one difference between mechanical and electromagnetic waves **not** identified in your explanation for Part C.



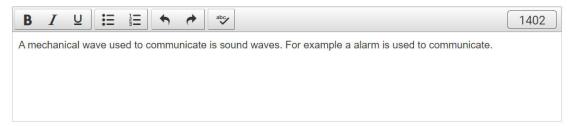
Score Point 4B

This question has four parts.

Mechanical and electromagnetic waves are used in different forms of communication.

Part A

Identify the mechanical wave commonly used for communication between people near each other.



Part B

Identify one electromagnetic wave used for communication on Earth and describe how it is used.



Part C

Identify which type of wave, mechanical or electromagnetic, should be used to send a signal from Earth to a rover on the surface of Mars. Explain your answer.



Part D

Describe one difference between mechanical and electromagnetic waves **not** identified in your explanation for Part C.



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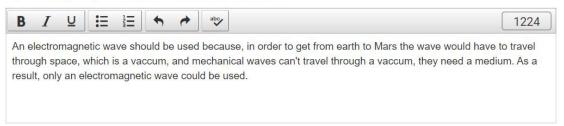
Part B

Identify one electromagnetic wave used for communication on Earth and describe how it is used.



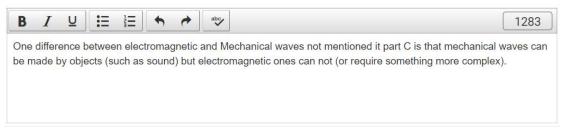
Part C

Identify which type of wave, mechanical or electromagnetic, should be used to send a signal from Earth to a rover on the surface of Mars. Explain your answer.



Part D

Describe one difference between mechanical and electromagnetic waves **not** identified in your explanation for Part C.



This question has four parts.

Mechanical and electromagnetic waves are used in different forms of communication.

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Part B

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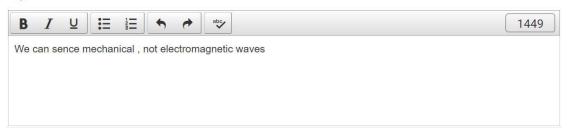
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This question has four parts.

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Part A

Identify the mechanical wave commonly used for communication between people near each other.



Part B

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Part C

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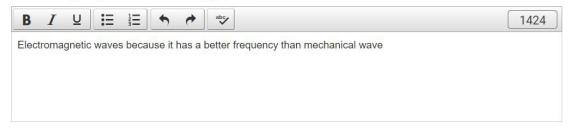
Part B

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Part C

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Part D

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