

MS-PS4-2 Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials. [Clarification statement: Emphasis is on both light and mechanical waves. Examples of models could include drawings, simulations, and written descriptions.] [*Assessment boundary: Assessment is limited to qualitative applications pertaining to light and mechanical waves.*]

Practice: Developing and Using Models

Crosscutting Concept: Structure and Function

TASK 1



Waterparks can make artificial waves. Sean is a surfer. He wants to be able to look at the artificial waves and decide whether or not they will be big enough to surf.

- A. Draw a model of a cross-section of a wave that explains how waves work and what Sean should measure to describe the waves.

TASK 2

Melissa tells her little brother that she has rice that can dance to music. Melissa takes an aluminum pie pan and places a shallow layer of rice in the pan. She holds the pan of rice over a speaker on the radio and turns the radio volume up. The rice begins to dance and her little brother is amazed! She shares this during science class the next day. Her teacher asks: "Melissa, can you draw a picture and explain using the concept of sound waves what really happened to make the rice dance"?

Write what Melissa should tell her teacher below.

Example response Melissa could say:

When you turned on the radio, you created vibrations from the music. The energy of the vibrations made the pie pan vibrate and the vibration made the rice move.

While we can't see the sound waves, we know that they are there because they travel and affect other objects. The vibrations make the particles of air around them vibrate. The vibrations bump against other particles and make them vibrate. These vibrations travel in all directions.

As sound waves travel, molecules are pressed together and spread apart. This is what creates a sound wave as they alternate with each other.

The louder the music, the more the rice will dance. Louder sounds are created by larger vibrations or a stronger movement of air molecules as the sound travels.

<http://wosu.org/blogs/education/wp-content/uploads/sound-and-vibration/Sound-and-Vibration-Assessment.pdf>

TASK 3

Fill in the blank:

Energy travels out in a wave in _____ directions.

Lower frequency waves are _____ apart.

Task 4

The waves in the pool have a crest height of about 1 foot. The diver does a cannonball dive off the side of the pool and sends waves 4 feet high. The waves that Bobby produced have a greater...

- A. amplitude.
- B. compression.
- C. frequency.
- D. wavelength.

Task 5

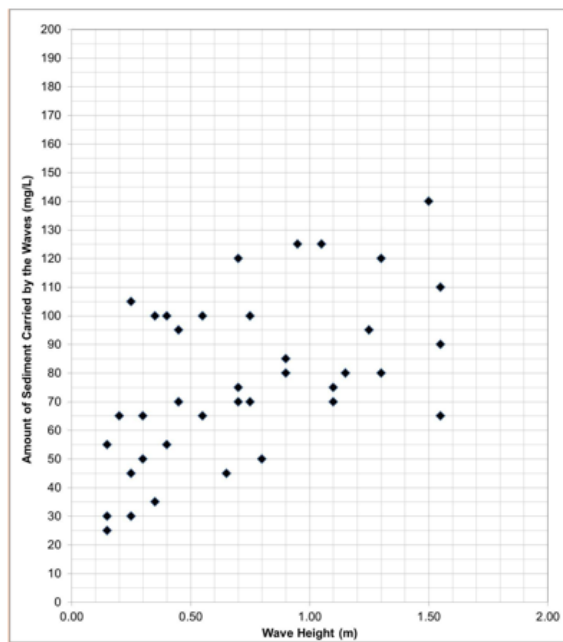
Ocean waves have enough energy to pick up and carry sand and other sediment. This wave action helps to move sand up and down the beach slope. It also moves sand along the length of the beach and out to sea. This shapes the beach over time. The most drastic changes to beaches happen when storms occur because higher energy waves carry more sediment than lower energy waves. During a big storm, a beach can experience a large amount of erosion.

In order to investigate how much sediment stormy ocean waters can carry away from beaches, scientists gathered data from ocean waters off the coast of the Shandong Peninsula in the Yellow Sea, China, during a storm in the spring of 2010.

A. The data from the scientists is represented in the graph below. Use this data to draw a model of the relationship between wave height and the amount of sediment the waves move.

B. Write an explanation of how waves move sediment.

Attachment 2. Sediment Load and Wave Height Scatter Plot for a Spring 2010 Storm Event Off of the Coast of Shandong Peninsula in the Yellow Sea, China



Task adapted from Achieve, the remainder of the task and supporting components available here: http://www.nextgenscience.org/sites/ngss/files/MS-PS-Ocean%20Waves_version2.docx