Earthquake Energy Released Item Set
Constructed Response Anchor Papers

6 Using the information provided, describe the sequence of destabilizing effects caused by an undersea earthquake that produces resulting changes to Earth's crust. Include data to support your reasoning.

Type your answer in the space provided.

Score Level 0 Anchor Paper

the earth is made up of a lot of things

This response demonstrates that the student has no understanding of the question. The student response is too vague for credit.

Score Level 0 Anchor Paper

teh scientists observe earthquakes from seismograph stsations located around the world

This response demonstrates that the student has no understanding of the question. The statement is factual but does not address the question. The response is irrelevant to the question.

Score Level 0 Anchor Paper

Earthquakes changes results to the earths crust because when the earth shakes the crust gets together and breaks the bond causing things to shake.

This response demonstrates that the student has no understanding of the question. The response vaguely discusses earthquakes and shaking but it is unclear if the shaking is the cause or the effect. The student response is too vague to earn credit.

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Score Level 1 Anchor Paper

The undersea earthquake can change Earth's crust by affecting the zone of erosion and the zone of deposition.

This response demonstrates a minimal understanding and constructs a minimal explanation of the question. The explanation is minimally based on disciplinary core ideas when it describes undersea earthquakes affecting zones of erosion and deposition but does not tell how. The student demonstrates no integration of the science and engineering practices by not use any data in the response. The response reflects no synthesis of complex ideas or crosscutting concepts.

Score Level 1 Anchor Paper

When a underwater sea earthquake occurs Tsunami waves form off coast. when they form they take alot of water with them and they are so big and powerful that It destroys whatever It hits and when It hits a coast line the shape of the land changes because It Is so distructive. Also erosion zones form on the sea floor to change the shape of the earths crust because of how powerful the waves are.

This response demonstrates a minimal understanding and constructs a minimal explanation of the question. The explanation minimally uses disciplinary core ideas to describe the formation of a tsunami and its destructive power. There is a misinterpretation of erosion occurring on the sea floor rather than coastal areas. The student demonstrates a little integration of the science and engineering practices by using minimal data from the stimulus to support their answer. The response reflects no synthesis of crosscutting concepts.

Score Level 1 Anchor Paper

Waves that are created by earthquakes on the ocean floor travel through the ocean floor crust and the ocean water, as well. These waves cause a tsunami. Undersea earthquakes are what causes tsunamis, and the deeper they are in the ocean, and the faster the earthquake waves are moving, the higher the waves, the faster the waves will reach the shore, and the more damage it will cause to the Earth's crust and the main land.

This response demonstrates a minimal understanding and constructs a minimal explanation of the question. The explanation minimally uses disciplinary core ideas to describe the formation of a tsunamis and its damaging effects but does not detail the coastal effects. There are misconceptions related to a relationship between the speed of the waves and the height of the waves. The student demonstrates a little integration of the science and engineering practices

by using minimal data from the stimulus to support their answer. The response reflects a little synthesis of the crosscutting concept of stability and change by identifying some factors that would impact the amount of change in the Earth's crust.

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Score Level 2 Anchor Paper

Undersea earthquake waves travel through the ocean floor and water creating a tsunami that can travel for thousands of kilometers and gets larger as it comes ashore. The waves travel slower through the water than through solid crust. When the tsunami hits land it causes a zone of erosion where it takes away some of the sand/land there. It also causes a zone of deposition where it deposits that sand/land from the erosion zone. This erosion and deposition zones are direct changes In Earth's crust from the tsunami.

This response demonstrates that the student has a complete understanding and constructs a complete explanation of the question. The explanation uses disciplinary core ideas to accurately describe a sequence of destabilizing effects which also reflect the synthesis of complex ideas and the crosscutting concepts. The student demonstrates a complete integration of the science and engineering practices by including data from multiple places in the stimulus to support their reasoning. The student's statement about a wave's speed through water and solid crust is a concise use of data. The response demonstrates an understanding of all three dimensions.

Score Level 2 Anchor Paper

An earthquake starts of as a release of tension and stress along the Earth's tectonic plates, causing the land to shift. In an undersea earthquake, this sudden shift occurs along the crust of the ocean floor. P waves travel through both the crust and the Ocean, creating ripples in the water. Because P waves travel at only 1,500 m/s through water (as opposed to faster speeds of 8/500 m/s through hard rock), the ripples start off small but grow increasingly taller as they near the shoreline. When the waves reach the shore, the water level is much higher than sea level because of the momentum of the water. When they break, erosion and disposition of the Earth's crust happens as a result of their strength. The Coastline Diagram In the article "Effects on Ocean and Land," shows how shoreline materials are deposited further inland from the coast as a result of a tsunami, resulting in changes to the Earth's crust.

This response demonstrates that the student has a complete understanding and constructs a complete explanation of the question. The explanation uses disciplinary core ideas to accurately describe a sequence of destabilizing effects which also reflect the synthesis of complex ideas and the crosscutting concepts. The student demonstrates a complete integration of the science and engineering practices by including specific data from the various locations in the stimulus to support their reasoning. The response demonstrates an understanding of all three dimensions.

Earthquake Energy Released Item Set
Constructed Response Anchor Papers

Score Level 2 Anchor Paper

The series of unfortunate events leading up to a change In the Earth's crust begins with the undersea earthquake. Potential elastic energy, stored in plates deep below the Earth's surface, is released suddenly, causing violent seismic waves to propogate outwards. These cause the water to resonate as well, although the velocity of said waves may be upwards of 8 times slower. As the waves travel towards land, the waves at sea get higher and higher as the surface water level effectively "approaches" the land level below sea. At shore, this effect hits a peak, causing a massive wave to slide to land at tremendous speeds. With luck, the people have evacuated as the S and P waves forshadow this catastrophe. The violent tide of water will pick up sand from the beach, which is a very loose landscape, and deposit it elsewhere, further up shore where the kinetic energy of the water is not enough to push the sand higher. If enough sand is eroded away, the shoreline may potentially move Inland as the old water level is restored after the tsunami, but the landscape remains eroded to the point where the land is below sea level. This then causes the landscape to remain permanently marred by the tsunami/ a change in the Earth's crust.

This response demonstrates that the student has a complete understanding and constructs a complete explanation of the question. The explanation uses disciplinary core ideas to accurately describe a sequence of destabilizing effects which also reflect the synthesis of complex ideas and the crosscutting concepts. The student demonstrates a complete integration of the science and engineering practices by including unique and accurate interpretations of the data from the stimulus to support their reasoning. The student's understanding of the disciplinary core ideas, their interpretation of data, and their ability to synthesize complex ideas with the crosscutting concepts demonstrate an understanding of all three dimensions.