

# Earthquakes Answer Sheet

## LEVEL 1

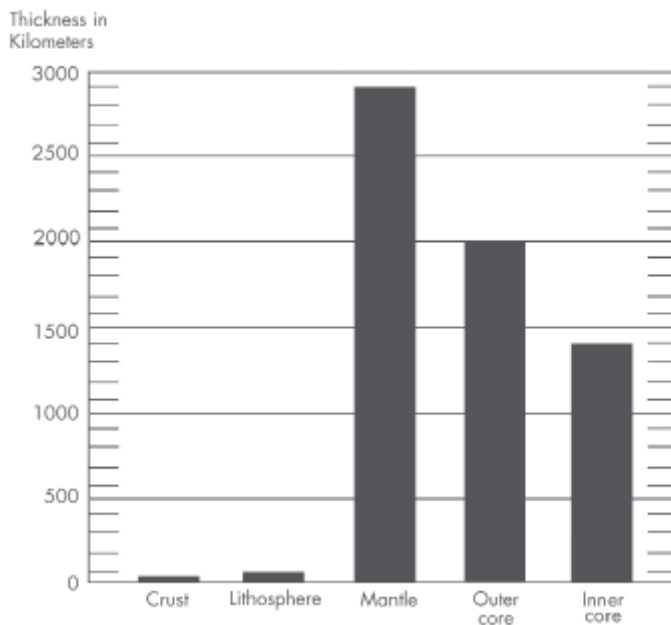
Answers to *Earth Changes*: 4 (mountains); 1 (flat ground); 3 (big hills); 2 (little hills).

### Answers to *Is It Tsunami Safety?*

1. **Safe.** If you live in an area where tsunamis are possible, an earthquake longer than 20 seconds could trigger a locally generated tsunami. This type of tsunami could arrive minutes after a strong earthquake has been felt and you must evacuate for high ground immediately after you have Dropped, Covered and Held On during the earthquake.
2. **Safe.** The first indication of an approaching tsunami could be water suddenly receding from the shore. You must go to high ground—at least 100 feet (30 meters) above sea level—immediately.
3. **Safe.** The first indication of an approaching tsunami could be an unusual rise in the water along the shore. You must head inland and up to high ground immediately.
4. **Safe.** Stay at your safe evacuation spot until you hear the All-Clear Signal. Tsunamis are a series of waves that could last over a period of several hours—the first wave is not usually the largest.
5. **Unsafe.** If the water recedes unexpectedly, a tsunami that has been generated by a distant source could be following immediately. The coming wave is incorporating, or swallowing, the receding water.
6. **Unsafe.** Tsunamis move quickly. You may have as little as 15 minutes to reach your place of safety. Often, there are so many cars trying to cross bridges that it's imperative to be able to evacuate on foot to a location about 100 feet above sea level within 15 minutes.

## LEVEL 2

### Answers to *Graphing the Depth*



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1. Mantle
2. Crust
3. 6,440 kilometers (4,002 miles)

## Answers to *Chocolate Crust*

### *Experiment 1*

The denser bar (continental crust) rises above the lighter bar (oceanic crust); or conversely, the lighter bar (oceanic crust) plunges below the denser bar (continental crust). This illustrates what the plates do—the denser continental plate rises above the lighter oceanic plate when they push against each other.

### *Experiment 2*

The two dense bars (continental crusts) will fold or push upward. That is, the ends will push into each other and up. The same thing happens when two continental plates press into each other. Folded mountains, such as the Rockies, Appalachians, Himalayas and Andes, are the result of two continental plates pushing into each other.

### *Experiment 3*

The two less-dense bars will fold or push upward. The results on the ocean floor are folded mountains rising up above the earth's crust. The mountains of the ocean's depths are formed in this manner.

## Answers to *Making Waves*

### *Ocean Wave Simulation*

What do you observe about the changing size of waves?

The wave grows larger as it flows from one end of the bottle to the other.

### *Wave Formation*

What happens as the waves spread from the point where the pebble is dropped? Why?

As the waves flow away from the pebble [the epicenter of the disturbance], they decrease in height and the ripples [troughs] are spaced further apart. As the energy spreads over a larger area and a longer time, it dissipates.

Are the ripples smaller or larger on the side where you struck the bucket? Why?

Once again, the waves decrease as they move away from the initial cause of the disturbance in the water and the energy dissipates.

**Challenge:** In an actual pool, the waves increase in size as they approach the shore because the energy is confined to a smaller (shallower) area.

### *The Seiche*

When the student walks, waves begin to slosh back and forth in the pan. The waves continue even when the student stops and stands still. The waves go to every side of the pan, and it is impossible to control or stop them. The energy first generated by the initial movement continues as the waves hit the sides of the pan and push back and forth.

**Challenge:** A seiche is not a tsunami. It is similar because it is generated by a localized disturbance, but different because it occurs in an enclosed water area—pools, lakes or ponds—rather than moving across the open ocean.

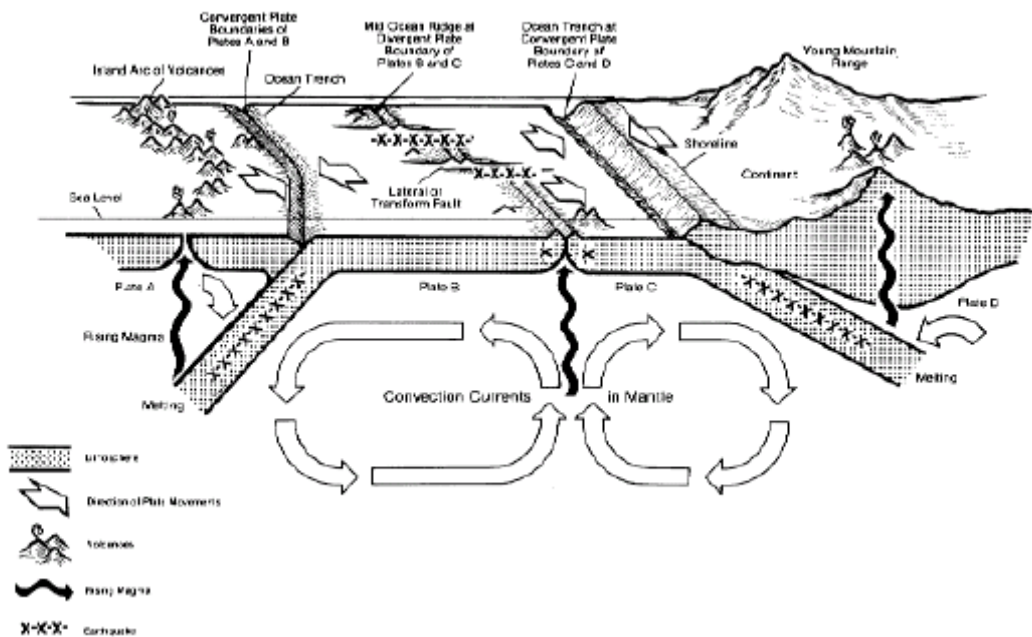
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## LEVEL 3

### Answers to *Earth as an Egg*

- What parts of the earth's structure are represented by the shell, the white, and the yolk?  
The shell represents the lithosphere, or the crust and uppermost mantle—earth's plates. The white represents all the remaining mantle, and the yolk represents the core of the earth.
- What about the egg's membrane?  
The membrane corresponds to the asthenosphere, the partially molten part of the mantle that becomes pliable or "plastic," stretching, folding, compressing and flowing. Earth's plates float on the denser asthenosphere.
- Do the plates slide smoothly when pushed alongside each other? If not, where do they catch?  
The plates, represented by pieces of shell, will slide smoothly on the liquid dropped on the membrane of the egg, which represents the asthenosphere. If moving laterally, they will catch when they slide against a rough spot. With continued pressure along the rough surface, the edges will eventually crumble and the plates will lurch until they can slide smoothly or are caught by another rough edge.
- What happens if you push two plates together—head-to-head?  
Given enough pressure, one plate may dive under the other, so that one pushes up and the other down, or they will break against each other.

### Answers to *Reading Earth's Features*



1. Island Arc of Volcanoes
2. Convergent Plate Boundary of Plates A and B
3. Ocean Trench

4. Mid-Ocean Ridge at Divergent Plate Boundary of Plates B and C
5. Ocean Trench at Convergent Plate Boundary of Plates C and D
6. Young Mountain Range
7. Lateral or Transform Fault