Name _____ Class _____ Date _____

How Does the Intensity of an Earthquake Change With Distance?

When an earthquake occurs, waves of energy spread outward in all directions from the point where the earthquake originated. As the waves pass through rock material, they cause the rock to shake or vibrate. The closer a person is to the point of origin, which is called the focus, the more noticeable the shaking becomes. At the location on the Earth's surface, directly above the earthquake's focus, great damage and terrible destruction sometimes take place. This location is called the epicenter. Farther away, less damage occurs.

Earth scientists have developed "scales of intensity" that describe the kinds of experiences that people share during an earthquake, depending on their distance from the earthquake's focus. One example of such a scale of intensity is shown below. Notice that this scale, called the Rossi-Forel Scale of Earthquake Intensity, ranges from I to X. Earthquake intensities of I are the least noticeable while those labeled X are the most intense.

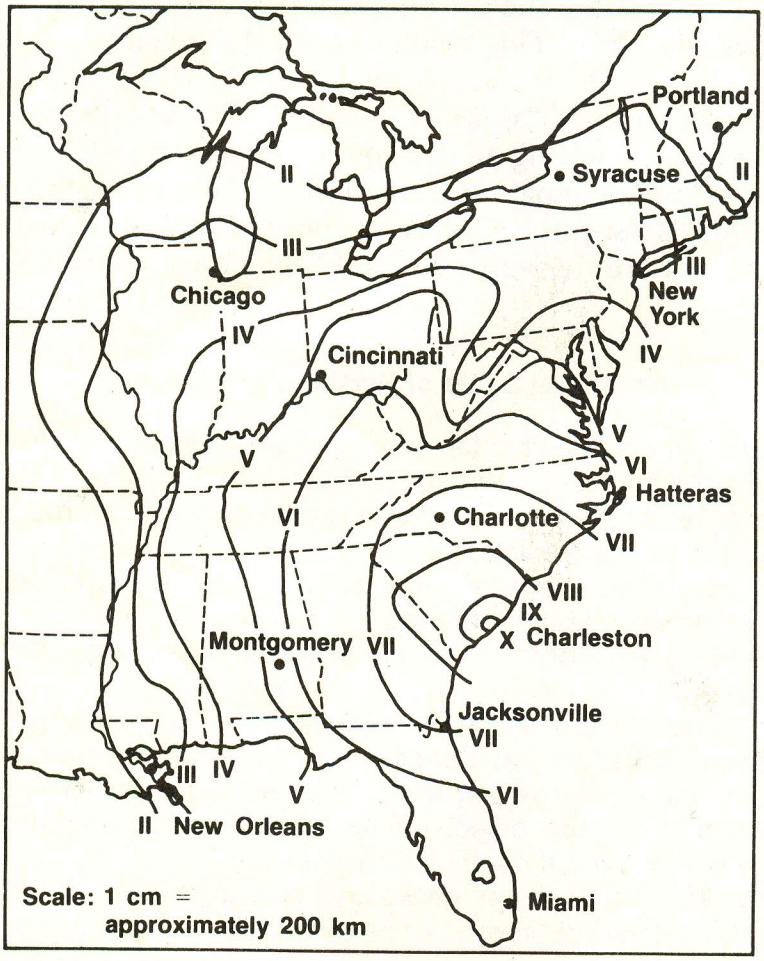
Rossi-Forel Scale of Earthquake Intensity

I. Recorded by instruments; felt only by experienced observers at rest.
II. Felt by small number of persons at rest.
III. Felt by several persons at rest; strong enough for the duration or direction to be appreciable.
IV. Felt by several persons in motion; disturbance of movable objects, door, windows; creaking of floors.
V. Felt generally by everyone; disturbance of furniture and beds; ringing of some bells.
VI. General awakening of those asleep; general ringing of bells; oscillation of chandeliers; stopping of clocks; visible disturbance of trees and shrubs; some startled persons leave their dwellings.
VII. Overthrow of movable objects, fall of plaster, ringing of church bells, general panic, without damage to buildings.
VIII. Fall of chimneys, cracks in the walls of buildings.
IX. Partial or total destruction of some buildings.
X. Great disaster, ruins, disturbance of strata, fissures in the Earth's crust, rock-falls from mountains.

A description of one intensity level from this scale states that an earthquake of intensity IV would be "felt by several persons in motion . . . while movable objects such as doors and windows would be disturbed. Floors of houses would creak." At a different intensity level, people located in an intensity zone of IX would experience partial or total destruction of some of their buildings. Truly a frightening experience!

How would a severe earthquake affect people over a large region? On August 31, 1886, a devastating earthquake struck Charleston, South Carolina. The map illustrates the range of intensity of that earthquake as it was felt throughout the eastern part of the United States.

Observe the map carefully. Compare it to the Rossi-Forel scale of earthquake intensity. Answer the following questions that are based on both the map and the scale of earthquake intensity. Before you answer the questions, though, let's look at two examples that will help you to proceed. Charlotte, North Carolina, is a city about 300 km from Charleston and is inside the number VII earthquake intensity line. Therefore, people living in Charlotte at the time of the earthquake would probably have seen plaster fall, heard church bells ringing, and have experienced general panic. However, most people living in the city of New Orleans, because they were located inside the number II earthquake intensity line, and nearly 1000 km away, probably would not even have felt the Charleston earthquake.



1. Name a city shown on the map in which the earthquake of August 31, 1886, was detected mainly by instruments, rather than people. _____

2. Name two cities that suffered damage similar to Charleston but less severe.

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3. What indication of the August 31, 1886, earthquake might a person have experienced in Chicago?_____

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How would their experiences have compared to those of people living in New York City?_____

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4. Would people who were located 1000 km from Charleston generally have been awakened from their sleep as a result of the earthquake? Explain.

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5. Describe the effect that the earthquake of August 31, 1886, had upon the city of Charleston, South Carolina._____

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6. What general relationship seems to exist between earthquake intensity and distance from the earthquake center?_____

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7. On the map on page 44, shade in the complete region where an earthquake would be felt by everyone, but where there would be no visible disturbance of trees and shrubs.

Name at least two cities located in this zone._____

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