Virtual Lab Activity – **Earthquake**

<http://www.glencoe.com/sites/common_assets/science/virtual_labs/ES09/ES09.html>

EARTHQUAKE

How do seismograph stations help determine an earthquake’s epicenter?

Earthquakes can be dramatic events. Although we can sometimes see and earthquakes effects, it actually occurs deep within Earth’s crust.

Forces inside Earth keep its crust in constant motion. When the crust moves, it puts stress on rocks. The rocks break when the force is too great. Earthquakes are the vibrations that a break produces.

Earthquakes produce seismic wave. Primary waves, or the first waves, move through Earth by making particles in rocks move back and forth in the direction the wave is moving. Secondary waves move through earth by making particles in rocks move at right angles to the direction of the wave.

Primary earthquake waves travel faster than secondary earthquake waves. Seismologists can use this difference in speed to determine the distance from a seismograph station to an earthquakes’ epicenter. Because primary waves are faster, they will arrive at a seismograph station before the secondary waves. The difference in arrival times of seismic waves increases with the distance between the epicenter and the seismograph station. Therefore seismologists can tell how far away a seismograph station is from an earthquake epicenter by measuring the difference in arrival times of the two seismic waves. The epicenter location can be found using three seismograph stations.

**Objective:** determine the epicenter of an earthquake, using seismograph readouts and a distance graph

**Procedures:**

1. Read the news flash. Click CLOSE to start the activity
2. Click a station letter on the U.S. map. Open the TABLE and record your selection in the appropriate row and column.
3. Read the Seismograph Readout for the station. Find the difference between the arrival times of the primary and secondary waves by subtracting P from S. Each tick on the Seismograph Readout represents 15 see the calculator is you need to.

*In order to find the difference in arrival times, you will need to subtract the primary wave arrival rime from the secondary wave arrival time…..REMEMBER to convert minutes to seconds if you need to….. (For example: if the primary wave arrived at 2:12 PM and thirty seconds, and the secondary wave arrived at 2:15 PM and fifteen seconds, you could re-write 2:15:15 as 2:14:75 and then subtract……….. 2:45:75 minus 2:12:30 = 2:45)*

*Open the Table and record your findings in the appropriate row and column.*

***NOTES:***

* *The time is always listed in Eastern Standard Time. (For example, 2:00:00 is two o’clock exactly)*
* *“P” stands for Primary Wave Arrival Time*
* *“S” stands for Secondary Wave Arrival Time*
* *The first major upswing or downswing is the beginning or arrival time of a primary wave.*

**Procedures continued……**

1. Click the DISTANCE GRAPH button. Each tick on the Y axis represents a 15 second increment. On the Y axis find the time difference you calculated and then find the corresponding X value. Round off the distance to the nearest 500m increment. Click CLOSE. Open the TABLE and record your findings in the appropriate row and column.
2. Click the pencil in the compass. Drag it to the notch that corresponds with your distance finding.
3. Click the DRAW CIRCLE button to place the circle around the station. (Some circles may not be completely visible because they are larger than the map.) Click ERASE Circle button if you want to erase the circle of the selected station.
4. Select another station. Repeat the above steps until you have at least three circles that all intersect.
5. Click CHECK.
6. If your circles are correct, the epicenter star will highlight. Click and drag the star to the epicenter – the intersection of the circles. RECORD your findings in your journal.
7. Click the RESET button to explore different stations and find another earthquakes epicenter.

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Virtual Lab Activity – **Earthquake**

RECORD UNTIL YOU HAVE THREE INTERSECTING CIRCLES …….. DO FOR TWO EARTHQUAKES

TABLE

 Station Letter Difference Arrival Times Distance from Epicenter

 (Minutes and Seconds) (km)

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Journal Questions……

1. Which state was the earthquakes epicenter located in? (Refer to a map of the United States if necessary)
2. Why does the time difference between the arrival of primary and secondary waves grow longer at seismograph stations that are farther away from the epicenter?
3. How can the epicenter of an earthquake be accurately located?