Seismic Waves and Plotting Earthquakes

Geology/Earth Science Mr. Traeger

Name: _____ Period: ____ Date: _____

Purpose

The purpose of this activity is to become familiar with the different kinds of earthquake waves. Knowledge of these waves will be used to locate and measure earthquakes.

Materials

▪ Slinky® or Spring	▪ Drafting compass	▪ Ruler
▪ Seismic Sleuths Packet	▪ Stopwatch	▪ Meter Stick
▪	▪	▪

Part 1: Seismic Body Waves

Slinkies® are very good for demonstrating earthquake waves. Watch the demonstration of seismic body waves using Slinkies®. Answer the questions that follow.

1. Describe and draw the motion that you saw when we simulated a P wave. Geology: Calculate the speed of the P wave in your Slinky® using the meter stick, stopwatch, and a well-know formula.

2. Describe and draw the motion that you saw when we simulated an S wave. Geology: Calculate the speed of the S wave in your Slinky® using the meter stick, stopwatch, and a well-know formula.

3. Why are the waves that we simulated called ***Body*** Waves?

4. Which wave, P or S, travels the fastest in the real world?

5. How can you use the difference in P and S wave speeds to calculate the distance to an earthquake epicenter from a seismograph station?

6. Geology: Compare the speeds that you calculated for P and S waves using Slinkies® to the speed of the waves generated by an earthquake. Do these speeds match up? Why or why not?

Part 2: Seismic Surface Waves

Watch the demonstration of seismic surface waves using Slinkies®. Answer the questions that follow

1. Describe and draw the motion that you saw when we simulated a Love Wave.

2. Describe and draw the motion that you saw when we simulated a Rayleigh Wave.

3. After watching these demonstrations, which type of wave is more damaging to structures on the surface? Surface waves or Body waves? Why do you think this is?

Part 3: Analyzing Seismograms to Calculate Distance, Magnitude, and Epicenter

1. Explain how a seismograph machine works. Drawing a picture is very helpful.

2. Using Part I in your Seismic Sleuths packet, analyze the seismogram for each city. Fill in the following chart. Use the formula (T_S ï T_P) X 8 or the chart on the back of the packet to find the distance to the earthquake.

Seismograph Location	**Largest Wave Amplitude in mm**	**Difference in S and P Wave Travel Times (T_S – T_P) in seconds**	**Distance to Earthquake in km**	**Magnitude of Earthquake**
Salt Lake City, UT				
Pinyon Flats, CA				
Tucson, AZ				
Pasadena, CA				
Yuma, AZ				
			Final Magnitude (average of 5)	

3. Using Part II in your Seismic Sleuths packet, analyze the seismogram for each station. Fill in the following chart. Use the formula (T_S ï T_P) X 8 or the chart on the back of the packet to find the distance to the earthquake.

Seismograph Station Identifier	**Difference in S and P Wave Travel Times (T_S – T_P) in seconds**	**Distance to Earthquake in km**
TRYN		
TKL		
FGTN		
BBG		
BHT		

4. Refer to the Map of Station Locations. Using the distance to the earthquake that you calculated in #3, plot circles of the appropriate radius around each station. Use a drafting compass for this. Use the scale bar at the top of the map to measure the appropriate radius for your circle!

5. What is the name of the place where all of your circles intersect?

6. What is the minimum amount of circles needed to find the location of an earthquake?

7. What happens to the difference between S and P Wave Travel Times the farther you go away from an earthquake?

8. What does a bigger *amplitude* on a seismogram reading mean?