Name: _____

Date: _____ Period: _____

Earthquakes

Earth Science

Packet: Locating Epicenters

CLASS NOTES

- The first _____ was invented in 132 AD by the Chinese astronomer and mathematician Chang Heng
    - It could register an earthquake and determine direction the earthquake came from

- Mercalli Scale - _____

    _____

    - Higher values of intensities are _____ to the epicenter and lower values of intensity are _____ away

Intensity	Type of Damage
I	Instrumental
II	Feeble
III	Slight
IV	
V	Rather Strong
VI	
VII	Very Strong
VIII	
IX	Ruinous
X	Disastrous
XI	Very Disastrous
XII	

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- Richter Scale - _____

  _____

  - Magnitude - _____

    _____

  - The Richter Scale's magnitude is determined from the following measurement:
    - Seismogram's _____ of waves
    - Distances from other _____
    - _____

- Modern seismographs are used to accurately determine the location of an epicenter
- To find the epicenter location you need to triangulate a position using _____ different seismograph stations

- Steps to Locate an Epicenter:
  1. Find the arrival time difference between the _____ and _____
  2. Use scrap paper to mark the _____ on the "Earthquake P-Wave and S-Wave Travel Time" chart
  3. Slide the scrap paper [with the time difference marks] until it fits _____ between the S and P lines
  4. Look straight down for the "Epicenter Distance"
  5. Using a safety compass, draw a _____ from the seismograph station for the determine "Epicenter Distance"
  6. Repeat steps 1-5 for the two additional _____ to find the _____ point for the _____ circles
  7. Mark it with an "X"

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PART I QUESTIONS: MULTIPLE CHOICE

1. Earthquakes generate compressional waves [P-waves] and shear waves [S-waves]. Compared to the speed of shear waves in a given earth material, the speed of compressional waves is
    a. always faster
    b. always slower
    c. always the same
    d. sometimes faster and sometimes slower

2. The time that an earthquake occurs can be inferred by knowing the
    a. distances between seismograph stations
    b. epicenter distance and arrival time of the P-waves
    c. travel time of the S-waves
    d. arrival time of P-waves

3. If the epicenter of an earthquake is located near Massena, New York, where would the greatest difference in arrival times of the P- and S-waves for this earthquake occur?
    a. Utica, New York
    b. Binghamton, New York
    c. Plattsburgh, New York
    d. Albany, New York

4. An earthquake occurred at 5:00:00 a.m. According to the Earth Science Reference Tables, at what time would the P-wave reach a seismic station 3,000 kilometers from the epicenter?
    a. 5:04:30 a.m.
    b. 5:05:40 a.m.
    c. 5:01:40 a.m.
    d. 5:10:15 a.m.

5. Which statement best characterizes the arrival times of the seismic waves at station?
    a. The P-wave and S-wave arrived at the same time.
    b. The S-wave arrived first.
    c. Only the S-wave arrived.
    d. The P-wave arrived first.

6. The first *P*-wave of an earthquake travels 5600 kilometers from the epicenter and arrives at a seismic station at 10:05 a.m. At what time did this earthquake occur?
    a. 9:49 a.m.
    b. 9:56 a.m.
    c. 10:02 a.m.
    d. 10:14 a.m.

7. If a seismic station is 3200 km from an earthquake epicenter, what is the time needed for an *S*-wave to travel from the epicenter to the seismic station?
    a. 4 min 40 sec
    b. 6 min 0 sec
    c. 10 min 40 sec
    d. 11 min 10 sec

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Questions 8 through 12 refer to the following:

An earthquake originated in New York State. The P-wave travel time for this earthquake was recorded in the data table below for four widely separated seismic stations, A, B, C, and D.

Seismic Station	P-wave Travel Time
A	8 min 20 sec
B	0 min 31 sec
C	12 min 18 sec
D	3 min 20 sec

8. If the first P-wave arrived at station A at 10:22:30, what was the origin time for the earthquake?
    a. 02 hrs: 02 min: 30 sec
    b. 10 hrs: 30 min: 50 sec
    c. 10 hrs: 14 min: 10 sec
    d. 10 hrs: 22 min: 30 sec

9. If it takes 50 seconds for the P-wave to arrive at Buffalo, about how long would it take for the S-wave from this same earthquake to arrive at Buffalo?
    a. 0 min: 50 sec
    b. 6 min: 40 sec
    c. 4 min: 00 sec
    d. 1 min: 40 sec

10. What is the approximate distance between the earthquake's epicenter and station A?
    a. 7,500 km
    b. 1,130 km
    c. 5,100 km
    d. 2,400 km

11. Which seismic station is farthest away from the epicenter?
    a. A
    b. B
    c. C
    d. D

12. Which seismic station could be located in New York State?
    a. A
    b. B
    c. C
    d. D