

Earthquake Research

Created by Bonnie Streeter -GHS

Introduction: You will have two days in the Writing Center to research the answers to the following questions. For each answer, provide as much evidence as possible when applicable. For students who do not finish in class, the web sites may be accessed on my staff web page.

World Information:

What do the following abbreviations stand for? Write *simple* but complete definitions of only a few words.

<http://www.seis.utah.edu/qfacts/glossary.shtml>

- ML (Magnitude, local)
(Magnitude, body wave)
 - Intensity (earthquake)
 - Ms (Magnitude, surface wave)
 - M (Magnitude, moment)
 - Mb
 - Isoseismal

- The next site shows world earthquake locations and the following site shows plate boundaries- to make comparisons easier for you. View the world map showing the major plates and their boundaries.

Zoom-out if necessary to view more of the world.

<http://earthquake.usgs.gov/earthquakes/map/>

Clicking on the option icon to the upper right will allow you to select layers.

Select **Terrain** and **Plate Boundaries** from the map layers on the bottom-right.

a. Where, on plates, do most Earthquakes occur worldwide?

- Select 1 day, magnitude 2.5+ Worldwide. The setting may be adjusted by clicking on the **tool icon**. Click the tool icon again to return to the map.

a. What do you notice about the number of earthquakes worldwide? (numbers/locations)

Go back to the tool icon and select **1 day all magnitudes** worldwide then **30 days all magnitudes 2.5+....**

Explore the size vs number of earthquakes worldwide. Click the option icon again to return to the map.

b. What do you observe about the number of earthquakes worldwide now?

- For the next questions select **7 Days, Magnitude 4.5+** Worldwide. Click on the site name to observe the quake's map location. It will appear as a blue dot. Notice the name and location of the quake appears below the listing. Scroll down when necessary.

Find the **most recent quake** from the list provided on the left side of the page. If most recent is selected to the right, the most recent will be on top.

a. Where and when was the most recent earthquake?

b. What was its depth?

c. What was its Magnitude?

5. Select the **date of the most recent** earthquake with a **magnitude 5.0 or greater**. (Same list as questions 2, 3, and 4).
Select **30 days magnitude 4.5+ rather than 7 days**. If some of the **icons are not present** for your quake, **find one that has them**. (not all will show a green pager) Name the quake change for that question.

a. What is the location, magnitude and date of the earthquake you have chosen?

b. What is the meaning of the dot color on the map?

Click on the name of the earthquake you selected in the lower left.

Observe the tectonic summary text and map details presented in the map to the lower right. The map may be enlarged by clicking on it.

c. What kind of plate boundaries are shown? (hypothesize if a key is not provided)

d. What range of magnitudes are shown on the map? What ranges of depth are shown on the map?

(if a historic seismicity map is not provided go back to the first map and observe quakes in the area. Look to the right for depth in km and the left for Magnitude)

e. Have any aftershocks been felt with this or previous earthquakes in the area? Explain. (check map in area, if needed)

Click on the **green pager** icon if it is present, look for one on another quake if it is not. Observe the map and enclosed lines within the map, scroll down if needed.

f. What does MMI stand for?

g. What amount of shaking did the residents feel?

h. What are the estimated fatalities and structural damages for this earthquake based upon the population numbers and building construction?

i. Are there any secondary effects for this earthquake? Name/explain.

j. Were there tsunami warnings? For what cities. (If many, name 2-3)

Click on the **DYFI icon** then on the **Intensity vs Distance** icon at the top.

k. Summarize the Intensity vs Distance map information.

United States Information

http://earthquake.usgs.gov/earthquakes/states/top_states_maps.php

6. Compare the **Eastern U.S. with the Western U.S.** Use a "T" chart.

a. Which is most active? Provide evidence.

b. Where is the activity centered for each region?

7. **a. What are the 3 most earthquake-active of our 50 states? Guess first. Write them down once you check.**
Check yourself with this link: http://earthquake.usgs.gov/regional/states/top_states.php

<http://earthquake.usgs.gov/regional/states/>

8. Alaska and Montana
a. Compare and contrast quakes in Montana with those in Alaska with a “T” Chart and at least 3 variables.

9. Scroll through the list to find the U.S. earthquake with the highest magnitude.

http://earthquake.usgs.gov/regional/states/10_largest_us.php

Click on the **largest quake** and collect the following data: **a. Location**

b. Magnitude

c. Date and time

10. Locate the **Isoseismic map** which provides intensity. To save time, read a-e below before continuing.

http://earthquake.usgs.gov/regional/states/events/1964_03_28_iso.php

a. What is the Mercalli intensity pattern shown?

b. Provide a reason for the pattern of Mercalli intensity (destruction).

c. What was the damage in Nome?

(The site provided below tells damage represented by the Roman Numerals)

http://www.dnr.mo.gov/geology/geosrv/geores/richt_mercali_relation.htm

d. What is the maximum intensity for this quake? The site takes you to a glossary if you need it.

<http://www.seis.utah.edu/qfacts/glossary.shtml>

e. Use the site in 10-c, above, to tell what damage occurred at the maximum intensity you listed above.

11. **What is and what are some examples of Induced Seismicity?**

http://earthquake.usgs.gov/earthquakes/eventpage/usc000tca7#general_summary

12. **Make an observation from the next site listing the largest earthquakes by state.**

http://earthquake.usgs.gov/earthquakes/states/state_largest.php

13. **Which state has the awful claim of having an earthquake that caused the most deaths? List the causes and Sites of death if it is different from the quake.**

http://earthquake.usgs.gov/earthquakes/states/us_deaths.php

14. **Make an observation from the next site listing significant historic quakes by state.**

<http://earthquake.usgs.gov/earthquakes/states/historical.php>

Montana Information

15. **What is the Intermountain Seismic Belt?**

<http://mbmgquake.mtech.edu/montanaseismicity.html>

16. **a. What portion of Montana receives the largest number of earthquakes?**

<http://earthquake.usgs.gov/regional/states/montana/seismicity.php>, <http://dphhs.mt.gov/publichealth/PHEP/YourPreparedness/BeInformed/Earthquake>

b. What is the depth of most of these earthquakes?

17. **What physical location(s) in Montana have had the largest number of earthquakes?**

18. **What have been the two largest historical quakes to occur in Montana?** Give the following for each:

http://earthquake.usgs.gov/regional/states/historical_state.php#montana

You may get more information by clicking on the earthquake name. Prepare a “T” Chart.

a. Site names

b. Magnitude

c. Intensity

d. Date, time, month day

e. Were there after-shocks? Explain.

19. Look for information about quakes in the Flathead. (skim for the **7th** and **14th** paragraphs)

<http://earthquake.usgs.gov/regional/states/montana/history.php>

a. When did the largest magnitude earthquake occur at Flathead Lake?

b. What magnitude and intensity was it?

To answer the following questions, you may need to refer back to the Modified Mercalli Scale.

http://www.dnr.mo.gov/geology/geosrv/geores/richt_mercali_relation.htm

20. For the largest quake in Montana, click on the Isoseismal map.

http://earthquake.usgs.gov/regional/states/events/1959_08_18.php

a. Could we have felt the effects of this quake in Kalispell?

b. Explain what was experienced in Kalispell from this quake.

21. For the most recent quake in Montana

<http://earthquaketrack.com/r/western-montana/recent>

<http://earthquaketrack.com/r/eastern-montana/recent>

a. When did the most recent Earthquake occur in Montana?

b. Where was it?

c. What was its magnitude and depth? **Seismic Hazards.**

22. Use your knowledge of plate tectonics to observe which color represents the greatest danger of earthquake damage in the United States.

http://web.ics.purdue.edu/~braile/edumod/eqhazard/eqhazard2_files/image003.gif

a. Give a reason for at least two regions having this color. List the region and the reason.

<http://earthquake.usgs.gov/earthquakes/states/montana/hazards.php>

b. What region in Montana have very low seismic dangers?

c. What two regions have the highest dangers?