

GRADE 10	TERM 2	SOCIAL SCIENCES (GEOGRAPHY) GEOMORPHOLOGY UNIT 4: EARTHQUAKES - MEMO
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LEARNING OUTCOMES:

- How and where earthquakes occur
- The relationship between earthquakes and tectonic forces
- Measuring and predicting earthquakes
- How earthquakes and tsunamis affect people and settlements
- Strategies to reduce the impact of earthquakes

DEFINITIONS

Provide concise definitions for each of the terms below:

Earthquake	<i>A sudden violent shaking of the ground, typically causing great destruction as a result of movements within the Earth's crust or volcanic action.</i>
Tsunami	<i>A long, high sea wave caused by an earthquake or other disturbance.</i>
Seismic Waves	<i>An elastic wave in the Earth produced by an earthquake.</i>
Focus	<i>The location where the earthquake begins, this is below the Earth's surface.</i>
Epicentre	<i>The point of the earthquake on the Earth's surface, located directly above the focus of the earthquake.</i>
Seismograph	<i>An instrument that measures and records details of earthquakes, such as force and duration.</i>
Richter Scale	<i>A numerical scale for expressing the magnitude of an earthquake on the basis of seismograph oscillations. The more destructive earthquakes typically have magnitudes between about 5.5 and 8.9; it is a logarithmic scale and a difference of one represents an approximate thirtyfold difference in magnitude.</i>

HAZARDS AND HUMAN RESPONSE

Complete the table below:

	Less Economically Developed Countries (LEDCs)	More Economically Developed Countries (MEDCs)
<i>Early Warning Systems</i>	<i>Very few warnings available.</i>	<i>Sirens and alarms are used. Weather reports allow citizens to take the necessary precautions.</i>
<i>Kind of Settlement</i>	<i>Rural settlements are worst affected. Urban settlements are also affected, but not as badly as they have better infrastructure.</i>	<i>More urban settlements than rural settlements. Rural settlements are worse affected but still not as badly as LEDC's.</i>
<i>Disaster Management</i>	<i>Very few management plans in place and very few evacuation measures. Relies heavily on aid from foreign countries to help them recover.</i>	<i>Lots of management plans and evacuation measures in place. Country has funding available for emergencies.</i>

ACTIVITY 5: CASE STUDY OF AN EARTHQUAKE

Today in Earthquake History: Japan, March 11, 2011

At least 15,550 people killed, 5,344 missing, 5,314 injured, 130,927 displaced and at least 332,395 buildings, 2,126 roads, 56 bridges and 26 railways destroyed or damaged by the earthquake and tsunami along the entire east coast of Honshu from Chiba to Aomori.

The majority of casualties and damage occurred in Iwate, Miyagi and Fukushima from a Pacific-wide tsunami with a maximum run-up height of 37.88 m at Miyako. The total economic loss in Japan was estimated at 309 billion US dollars. Electricity, gas and

water supplies, telecommunications and railway service disrupted and several reactors severely damaged at a nuclear power plant near Okuma. Several fires occurred in Chiba and Miyagi. At least 1,800 houses destroyed when a dam failed in Fukushima. Maximum acceleration of 2.93 g recorded at Tsukidate. Landslides occurred in Miyagi.

The tsunami destroyed or severely damaged many coastal towns in the Kuji-Minamisanriku-Nami area.

(reference: <http://earthquake.usgs.gov/learn/today/>; Accessed: 15 March 2015)

1. What is a tsunami?
A Tsunami is a long and very high wave caused by an earthquake.
2. What was the estimated total economic loss for Japan?
309 billion dollars
3. List the PRIMARY consequences of the earthquake.
 - ***People killed, missing and displaced.***
 - ***Buildings collapsed.***
 - ***Transport routes are ruined.***
4. Explain three possible secondary consequences of the earthquake and tsunami.
 - ***Electricity, gas and water supplies interrupted.***
 - ***Telecommunications and railway services disrupted.***
 - ***Fires occurred.***
 - ***Flooding from damaged dams***
 - ***Landslides.***
5. Suggest FOUR methods that can be implemented to make an area more prepared for future earthquakes.
 - ***Better education around earthquakes and safety procedures.***
 - ***Have earthquake health and safety people in place in businesses and schools.***
 - ***Better housing structures.***
 - ***Have evacuation routes in place.***
 - ***Make sure people have emergency supplies.***

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6. Explain how an earthquake occurs and WHY a tsunami could result from one that occurs in the ocean. ***Earthquakes are usually caused when rock underground suddenly breaks along a fault. This sudden release of energy causes the seismic waves that make the ground shake. When two blocks of rock or two plates are rubbing against each other, they stick a little. They don't just slide smoothly; the rocks catch on each other. The rocks are still pushing against each other, but not moving. After a while, the rocks break because of all the pressure that's built up. When the rocks break, the earthquake occurs. During the earthquake and afterward, the plates or blocks of rock start moving, and they continue to move until they get stuck again. The spot underground where the rock breaks is called the focus of the earthquake. The place right above the focus (on top of the ground) is called the epicentre of the earthquake.***

By far, the most destructive tsunamis are generated from large, shallow earthquakes with an epicentre or fault line near or on the ocean floor. These usually occur in regions of the Earth characterized by tectonic subduction along tectonic plate boundaries. The high seismicity of such regions is caused by the collision of tectonic plates. When these plates move past each other, they cause large earthquakes, which tilt, offset, or displace large areas of the ocean floor from a few kilometres to as much as a 1,000 km or more. The sudden vertical displacements over such large areas, disturb the ocean's surface, displace water, and generate destructive tsunami waves. The waves can travel great distances from the source region, spreading destruction along their path.