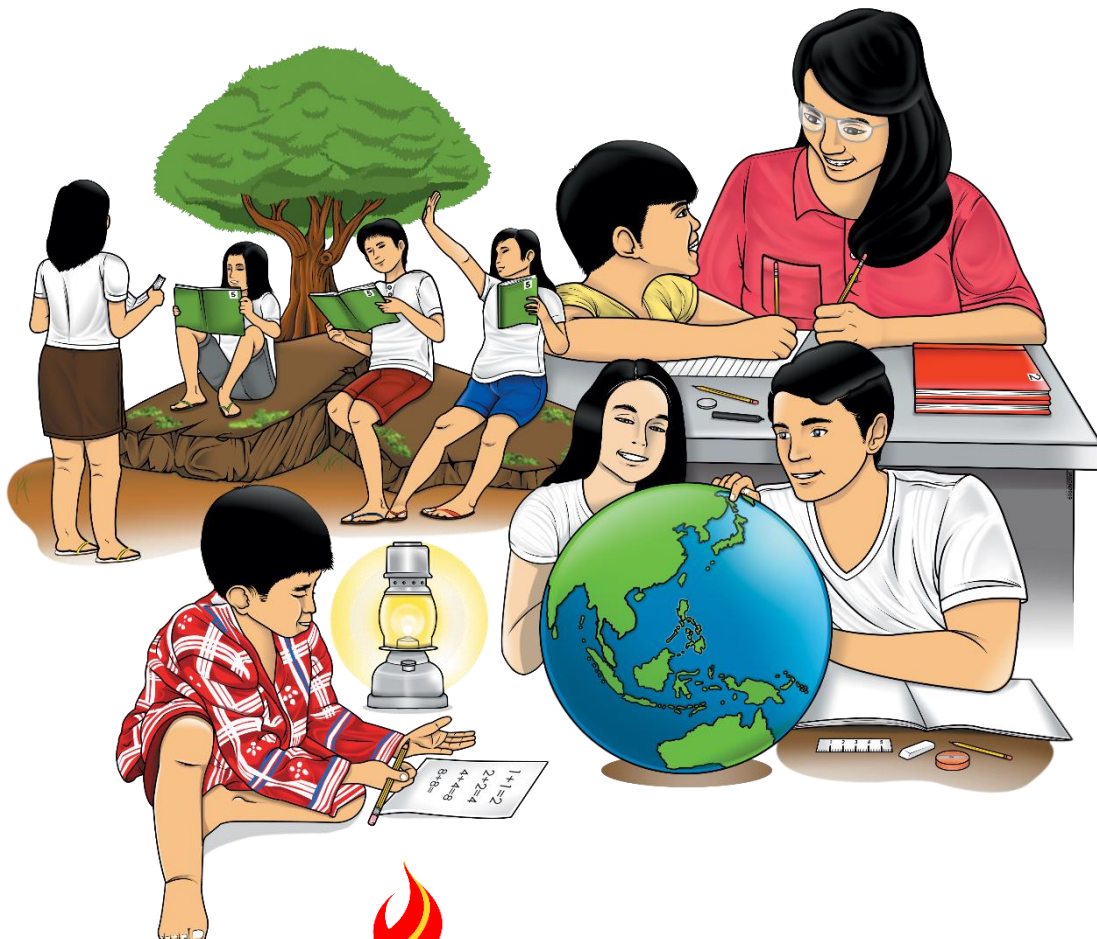


Disaster Readiness and Risk Reduction

Quarter 1 – Module 12: Natural Signs of Impending Tsunami



**Disaster Readiness and Risk Reduction
Alternative Delivery Mode
Quarter 1 – Module 12: Natural Signs of Impending Tsunami
First Edition, 2021**

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**Disaster Readiness and
Risk Reduction**
Quarter 1 – Module 12:
**Natural Signs of
Impending Tsunami**

Introductory Message

This Self-Learning Module (SLM) is prepared so that you, our dear learners, can continue your studies and learn while at home. Activities, questions, directions, exercises, and discussions are carefully stated for you to understand each lesson.

Each SLM is composed of different parts. Each part shall guide you step-by-step as you discover and understand the lesson prepared for you.

Pre-tests are provided to measure your prior knowledge on lessons in each SLM. This will tell you if you need to proceed on completing this module or if you need to ask your facilitator or your teacher's assistance for better understanding of the lesson. At the end of each module, you need to answer the post-test to self-check your learning. Answer keys are provided for each activity and test. We trust that you will be honest in using these.

In addition to the material in the main text, Notes to the Teacher are also provided to our facilitators and parents for strategies and reminders on how they can best help you on your home-based learning.

Please use this module with care. Do not put unnecessary marks on any part of this SLM. Use a separate sheet of paper in answering the exercises and tests. And read the instructions carefully before performing each task.

If you have any questions in using this SLM or any difficulty in answering the tasks in this module, do not hesitate to consult your teacher or facilitator.

Thank you.



What I Need to Know

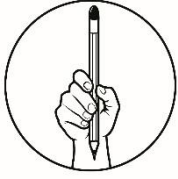
This module was designed and written with you in mind. It is here to help you master the Natural Signs of Impending Tsunami. The scope of this module permits it to be used in many different learning situations. The language used recognizes the diverse vocabulary level of students. The lessons are arranged to follow the standard sequence of the course. But the order in which you read them can be changed to correspond with the textbook you are now using.

This module focuses on:

- Recognizing the natural signs of impending tsunamis.
DRR11/12-If-g-18

After going through this module, you are expected to:

1. Identify the natural signs of impending tsunami;
2. Appreciate the topic by locating places for possible evacuation during tsunamis; and
3. Create guidelines or warning signs to be aware and prepared for possible tsunami.



What I Know

PRE-TEST

Read carefully the following questions. Choose the letter of the correct answer.

1. Which of the following should be done if you experience any sign of a tsunami?
 - A. Go immediately to higher ground.
 - B. Wait for an official evacuation order from the authorities.
 - C. Go down to the beach to view the retreating ocean exposing the seafloor.
 - D. Stay where you are and wait until you see a huge wave before running.
2. Which of the following should be done if a tsunami warning has been issued while you are in school?
 - A. Stay and observe what will happen next.
 - B. Run immediately out of school and go to higher ground.
 - C. Stay out of danger by doing the Duck, Cover, and Hold.
 - D. Follow the advice of teachers and other school personnel before making any move.
3. Which of the following should be done if you experience any sign of tsunami while you are out to sea?
 - A. Immediately take the ship back and fasten securely it on the harbors.
 - B. Stay out of danger by doing the Duck, Cover, and Hold.
 - C. Return to the port immediately when a tsunami warning has been issued for the area.
 - D. Contact the harbor authority to verify that conditions are safe for navigation and berthing.
4. Which of the following can cause a tsunami?
 - A. Landslide
 - B. Underwater earthquake
 - C. Volcanic eruption
 - D. All of the above
5. Which of the following is a common indicator of an impending tsunami?
 - A. The sky suddenly clears.
 - B. Winds suddenly change direction.
 - C. Seawater suddenly retreats from the shore.
 - D. All of the above.
6. Which of the following statements about tsunamis is CORRECT?
 - A. Tsunamis are perceptible in open ocean.
 - B. Tsunamis consist of just a huge single wave.
 - C. Tsunami waves can be very long and be as far as one hour apart.
 - D. Tsunamis generated in local locations will generally give people enough time to move to higher ground.

7. Which of the following correctly describes the sound of a tsunami?
 - A. cracking ice
 - B. exploding firecrackers
 - C. passing freight train
 - D. deafening sound of silence

8. Which of the following is not a natural sign of an impending tsunami?
 - A. a felt earthquake
 - B. drawback of ocean
 - C. a loud rumbling sound
 - D. surge of cold winds

9. Which of the following should be done if retreating ocean water is observed?
 - A. Go immediately to higher ground.
 - B. Stay calm and keep on swimming.
 - C. Check the ocean floor and the exposed reefs.
 - D. Watch the waves for a sudden change in level.

10. Which of the following should be done if you are staying near the coastal areas in an event of a tsunami warning?
 - A. Wait for an official evacuation order from the authorities.
 - B. Wait until you observe a drawback or feel an earthquake.
 - C. Do not panic and stay at home or small buildings located in low lying coastal areas.
 - D. Stay in upper floors of high, multi-story, reinforced concrete hotels for they can provide a safe place to find refuge.

11. Which of the following should not be done if a tsunami warning has been issued while you are at home?
 - A. Follow the orders of the local authorities.
 - B. Make sure your entire family is aware of the issue.
 - C. Wait for evacuation orders by the authority especially if you live near the coast.
 - D. Move in an orderly, calm and safe manner to the evacuation site or to any safe place outside your evacuation zone.

12. Which of the following should be done after a felt earthquake while you are at the beach?
 - A. Immediately go to higher ground.
 - B. Protect yourself by doing the Drop, Cover, and Hold.
 - C. Always look behind to see if a tsunami is behind you.
 - D. Stay calm and wait for the roaring sound before evacuating.

13. Which of the following should not be done in preparation of a tsunami?
 - A. Go to higher ground and away from the shore immediately.
 - B. Make a copy of the contact numbers of emergency hotlines.
 - C. Prepare things to include in your emergency or survival kit.
 - D. Practice with all your family members the evacuation routes and sites in case an evacuation is issued.

14. Which of the following should not be done if you are in harbor during a tsunami?
- A. Leave your boat in the pier.
 - B. Wait for the official orders of the harbor authority.
 - C. You may move your vessel to deep water if there is enough time.
 - D. Physically move to higher ground especially in the event of a locally generated tsunami.
15. Which of the following statements is incorrect?
- A. You may only have a few minutes to move to higher ground if a local tsunami is generated.
 - B. Earthquakes can cause rapid changes in water level and unpredictable dangerous currents in harbors and ports.
 - C. Tsunamis generated in distant locations will generally give people enough time to move to higher ground.
 - D. A tsunami from a local earthquake could strike some areas before a tsunami warning could be announced.

Lesson

1

Natural Signs Impending Tsunami

Perhaps you have already witnessed the worst water nightmares anyone could imagine from different movies. In 2004, around 170,000 lives were lost in Indonesia due to the effects of a tsunami occurring in Indian Ocean. Most of the victims were tourists and residents in the nearby shore. Yet if you go to the beach on a regular hot summer day, people seem to be unmindful of the possible dangers waves might bring them.

In this part of the module, you will learn about natural signs of impending tsunami and what you should do in the event of a tsunami warning.



What's In

Earthquakes are dangerous natural events because of the different hazards they may bring. These hazards may inflict devastating effects to people, physical structures and to the environment.

Activity 1 “Earthquake-related hazards”

Recall the different earthquake-related hazards and answer the questions below.

What are the different related hazards brought by an earthquake? What are their effects? Differentiate one from the others.



What's New

Have you ever experienced an earthquake? Oftentimes, people experience it while on the ground, maybe inside a building, and rarely while near to a body of water. What do you think will happen if you were to experience an earthquake nearby an ocean?

Activity 2 “Aftermath”

Analyze the picture below. Evaluate what you think had happened or what do you think is happening in the picture? Describe the condition of the buildings and infrastructures. Write your answers in a paragraph form in 5 sentences only.



Source: *What Are the Natural Warning Signs for a Tsunami?* American Geosciences Institute, June 15, 2020, retrieved <https://www.americangeosciences.org/critical-issues/faq/what-are-natural-warning-signs-tsunami>

5	3	1
Responses are excellent. Spelling is correct and rules of grammar and punctuation are followed.	Responses are adequate. Spelling is correct and rules of grammar and punctuation are followed with minor errors.	Responses are inadequate. Contains a lot of grammatical, punctuation, and spelling errors.



What Is It

What are the natural signs of an impending tsunami?

Although earthquakes are yet to be predicted, tsunamis may give off several natural signs when they are about to come. One can anticipate the following signs below:

1. **Feel an earthquake.** Severe ground shaking from local earthquakes may cause tsunamis. However, an earthquake may not be felt if the event is far away.
2. **See ocean water disappear from beach, bay, river.** Water may recede from the coast, exposing the ocean floor, reefs and fish before returning as a fast-moving wall of water (tsunami). This is called “drawback.” Drawback can exceed hundreds of meters exposing normally submerged areas.
3. **Hear an unusual roaring sound.** Abnormal ocean activity, a wall of water, and an approaching tsunami can create a loud “roaring” sound similar to that of a train or jet aircraft.

If you experience any of these signs, do not wait for official evacuation orders. Immediately leave low-lying coastal areas and move to higher ground.

What should you do when a tsunami threatens?

1. Preparations before a tsunami:

- a. If you live near or visit a coastal area, learn about the risk of a tsunami. Some at-risk communities have maps with evacuation zones and routes.
- b. Learn the signs of an impending tsunami.
- c. Know and practice community evacuation plans and map out your routes from coming from your house, work, and other areas.
- d. Create a family emergency plan with all your family members.

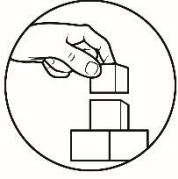
2. During the event of a tsunami:

- a. Protect yourself first from an earthquake if you are in a tsunami area. Do the Duck, Cover, and Hold. Tsunamis generated in distant locations will generally give people enough time to move to higher ground. For locally-generated tsunamis, where you might feel the ground shake, you may only have a few minutes to move to higher ground.
- b. If there is a warning, either from the officials or a natural sign, move immediately to a safe place as high and as far from the inland as possible.
- c. If you are outside the tsunami hazard zone and a warning has been issued, stay where you are unless officials tell you otherwise.
- d. If you are in **school** and a tsunami warning has been issued, follow the advice of teachers and other school personnel.
- e. If you are at **home** and hear there is a tsunami warning, you should make sure your entire family is aware of the warning. Move in an orderly, calm and safe manner to the evacuation site or to any safe place outside your evacuation zone. Always follow the evacuation instructions of local emergency and law enforcement authorities.
- f. High, multi-story, reinforced concrete hotels are located in many low-lying coastal areas. The upper floors of these hotels can provide a safe place to find refuge should there be a tsunami warning and you cannot move quickly inland to higher ground. On the other hand, homes and small buildings located in low lying coastal areas are not designed to withstand tsunami impacts. Do not stay in these structures should there be a tsunami warning.
- g. Offshore reefs and shallow areas may help break the force of tsunami waves, but large and dangerous waves can still be threat to coastal residents in these areas. Stay away from all low-lying coastal areas when there is a tsunami warning.
- h. If you are in a **boat at sea or in a harbor**, and a tsunami warning has been issued for your area, do not return to port. Tsunamis are imperceptible and can cause rapid changes in water level and unpredictable dangerous currents in harbors and ports.

Most large harbors and ports are under the control of a harbor authority and/or a vessel traffic system. Keep in contact with the authorities should a forced movement of vessels be directed. On the other hand, smaller ports may not be under the control of a harbor authority. In this case, be sure you have enough time to move your vessel safely to deep water.

Small boat owners may find it safest to leave their boat at the pier and physically move to higher ground, particularly in the event of a locally-generated tsunami. Severe weather conditions (rough seas outside of the harbor) could present a greater hazard to small boats, so physically moving yourself to higher ground may be the only option.

- i. Contact the harbor authority before returning to port to verify that conditions in the harbor are safe for navigation and berthing.



What's More

Activity 3: Look Out for the Warnings!

Read the following passages carefully. Analyze and determine the recognized sign of an impending tsunami in each passage.

Passage 1

An earthquake usually shakes the coasts that its tsunami will strike soonest and hardest. The shaking provides a natural warning to go to high ground or inland, or to seek refuge in high buildings or trees.

At Simeulue, it has become almost a routine to run to the hills whenever a strong earthquake is felt. The islanders especially take this precaution at night, when they cannot easily confirm a *smong* - occurrence of giant waves after a major earthquake, by watching from high ground for its next sign, recession of the sea. At Simeulue, a strong earthquake is sufficient reason to expect a tsunami. By contrast in mainland Aceh, few heeded the giant 2004 earthquake as a tsunami warning. The shaking could not have gone unnoticed, for it damaged buildings, knocked people off their feet, and was said to have lasted ten minutes.

When it was over, many people went outdoors, fearing further damage from aftershocks. Some gathered at buildings that had collapsed. Others just carried on with what they had been doing. A few even followed a receding river 2 km to the sea. Meanwhile, the tsunami was approaching. It followed the earthquake by 15-20 minutes on mainland Acehese coasts and by 45-50 minutes in Lampulo, 1.5 km seaward from the scene at right. Some Indonesian earthquakes, however, scarcely shake the nearby coasts their tsunamis will soon strike. Such gentle earthquakes sent deadly tsunamis to southern Java in 1994 and 2006. The 1994 tsunami took 238 lives in the east, the 2006 tsunami about twice that number in the west. They had the stealth of a tsunami in 1896 that killed 22,000 people in Japan, that country's greatest tsunami disaster (Yulianto et al, 2010).

Passage 2

A felt earthquake usually surpasses all other natural warnings of an impending tsunami in speed and reliability. However, if the shaking is weak, as it was on the south coast of Java in 2006, later cues to evacuate may come into play. The most common of these is a wave trough that may precede the first wave crest. The trough causes the sea to go out, and it may also cause river mouths to drain. Those in Banda Aceh who saw the water went out included Katiman, who lost a leg and his wife to the tsunami. He and coworkers headed down Krueng Cut soon after the earthquake threw them to the ground at a sawmill 2 km from the sea. They followed the river to its mouth near Alue Naga beach.

Along the way, they saw fish stranded, first on the exposed bed of the river and later at the beach, where a tsunami crest would catch them. Many people in Padang knew to expect initial withdrawal of the sea in the event of a tsunami from the strong earthquake of September 30, 2009 (facing page). Some of these people flocked to the beach, unsure whether to evacuate in response to the earthquake alone. This response used up much of the time they would have needed to flee a tsunami had one been generated. It also jammed up evacuation routes (Yulianto et al, 2010).

Passage 3

Incoming waves announced themselves by booming like cannons during the 2004 tsunami in Aceh and during the 2006 tsunami at Pangandaran. In Aceh, those who heard such sounds include Harianto, Mochtar, Sharla Emilda Binti Muhammad, and Emirza. Sharla, onshore along west coast in Alue Ambang, thought she was hearing artillery fire from a conflict that had been going on for 28 years, since her childhood. Emirza, in his boat off Ulee Lheue, may have observed a real source of these loud, resonant sounds. From the crest of a wave Emirza glimpsed the exposed floor of the sea. The sound of an explosion filled his ears as the water collapsed. A loud noise noticed at Pangandaran had a somewhat different cause. There, several people reported hearing the sound of an explosion when a tsunami wave ran into limestone cliffs (Yulianto et al, 2010).

Activity 4: “Tsunami VS Tidal Wave”

Read the following statements. Write TSUNAMI if the statement is true. Otherwise, write TIDAL WAVE.

1. I should go to the shore to watch a tsunami.
2. All undersea earthquakes cause tsunamis.
3. If I felt a strong earthquake while near the coast, I should wait to hear the rumbling sound before moving to high ground.
4. If a small tsunami is coming, I should get out of the water and wait until I hear it is safe to return.
5. If a big tsunami is coming, I should move as far inland as I can or to higher ground.
6. If I am swimming when a small tsunami comes, I could get dragged out to sea by the strong rips and currents.
7. A tsunami is most often caused by undersea earthquakes.

Activity 5: Look Out!

Make a poster or a slogan that gives warning to people about an approaching tsunami. Use long bond paper for your slogan or poster. Refer to the rubric attached.

5	4	3	2	1
Substantial, specific, illustrative, and creative content demonstrating strong development of ideas	Sufficiently developed content with adequate creativity and explanation of ideas	Limited content with less creativity and inadequate explanation	Minimal content and minimal creativity	Irrelevant content and no creativity

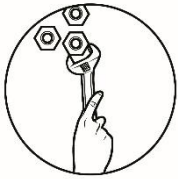


What I Have Learned

Activity 6

Fill in the blanks with the correct answer.

A (1) _____ is a massive sea wave caused by (2) _____, (3) _____, (4) _____, and (5) _____. Natural warning signs are often monitored and observed to prevent this sea wave. One of the signs is a felt shaking of the ground. If you are in a tsunami-prone area while the ground is shaking, protect yourself first by doing the (6) _____. Immediately go to (7) _____ when the shaking stops. Another sign is (8) _____ which is the receding of the water exposing the normally submerged areas. If this is observed, immediately run away from the shore. And the last sign to look for is hearing an unusual (9) _____ similar to that of a train or jet aircraft. Do not wait for an (10) _____ if one of the natural signs of an impending tsunami is observed.



What I Can Do

Activity 7 “Captain, Oh Captain!”

In times of disasters and calamities, the local government unit plays an important role in keeping and maintaining the community safe. Effective emergency action can avoid the escalation of an event.

Read the following statements below and answer the following questions.

You are the barangay captain in your place near coastal area. The news mentioned your barangay as one of the tsunami prone areas in the country. As a barangay captain, what guidelines or warning signs will you suggest for your constituents to be aware and prepared for possible tsunami?

Also, how can you help the people in your barangay in the preparation in time of a tsunami? What are the ways of promoting the preparation for such phenomena? How will you attract other captains of nearby barangays to do the same as what you will be doing in your place in the preparation of an impending tsunami?

<u>Criteria</u>	<u>5 (Outstanding)</u>	<u>3 (Satisfactory)</u>	<u>1 (Needs Improvement)</u>
<u>Content</u>	<ul style="list-style-type: none"> - Content is comprehensive and accurate. - Major points are stated clearly. - Responses are excellent. - Content is clear. 	<ul style="list-style-type: none"> - Content is accurate. - Major points are stated. - Responses are adequate. - Content is clear. 	<ul style="list-style-type: none"> - Content is not comprehensive and accurate. - Major points are addressed. - Responses are inadequate.
<u>Organization and Structure</u>	<ul style="list-style-type: none"> - Structure of the paper is clear and easy to follow. - Transitions are logical and maintain the flow of thought throughout the paper. 	<ul style="list-style-type: none"> - Structure is mostly clear and easy to follow. - Transitions are present. 	<ul style="list-style-type: none"> - Structure of the paper is not easy to follow. - Transitions need improvement.
<u>Grammar, Punctuation, and Spelling</u>	<ul style="list-style-type: none"> - Rules of grammar, usage, and punctuation are followed. - Spelling is correct. 	<ul style="list-style-type: none"> - Rules of grammar, usage, and punctuation are followed with minor errors. - Spelling is correct. 	<ul style="list-style-type: none"> - Paper contains a lot of grammatical, punctuation, and spelling errors.



Assessment

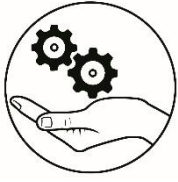
POST TEST

Choose the letter of the best answer.

1. Which of the following should be done if a tsunami warning has been issued while you are in school?
 - A. Stay and observe what will happen next.
 - B. Run immediately out of school and go to higher ground.
 - C. Stay out of danger by doing the Duck, Cover, and Hold.
 - D. Follow the advice of teachers and other school personnel before making any move.
2. Which of the following is a common indicator of an impending tsunami?
 - A. The sky suddenly clears.
 - B. Winds suddenly change direction.
 - C. Seawater suddenly retreats from the shore.
 - D. All of the above
3. Which of the following is not a natural sign of an impending tsunami?
 - A. a felt earthquake
 - B. drawback of ocean
 - C. a loud rumbling sound
 - D. surge of cold winds
4. Which of the following should be done if you experience any sign of a tsunami?
 - A. Go immediately to higher ground.
 - B. Wait for an official evacuation order from the authorities.
 - C. Go down to the beach to view the retreating ocean exposing the seafloor.
 - D. Stay where you are and wait until you see a huge wave before running.
5. Which of the following should not be done if a tsunami warning has been issued while you are at home?
 - A. Follow the orders of the local authorities.
 - B. Make sure your entire family is aware of the issue.
 - C. Wait for evacuation orders by the authority especially if you live near the coast.
 - D. Move in an orderly, calm and safe manner to the evacuation site or to any safe place outside your evacuation zone.

6. Which of the following statements is incorrect?
- A. Earthquakes can cause rapid changes in water level and unpredictable dangerous currents in harbors and ports.
 - B. Tsunamis generated in distant locations will generally give people enough time to move to higher ground.
 - C. A tsunami from a local earthquake could strike some areas before a tsunami warning could be announced.
 - D. You may only have a few minutes to move to higher ground if a local tsunami is generated.
7. Which of the following should be done if you experience any sign of tsunami while you are out to sea?
- A. Stay out of danger by doing the Duck, Cover, and Hold.
 - B. Immediately take the ship back and fasten securely it on the harbors.
 - C. Contact the harbor authority to verify conditions are safe for navigation and berthing.
 - D. Return to the port immediately when a tsunami warning has been issued for the area.
8. Which of the following should not be done in preparation of a tsunami?
- A. Go to higher ground and away from the shore immediately.
 - B. Make a copy of the contact numbers of emergency hotlines.
 - C. Prepare things to include in your emergency or survival kit.
 - D. Practice with all your family members the evacuation routes and sites in case an evacuation is issued.
9. Which of the following can cause a tsunami?
- A. landslide
 - B. underwater earthquake
 - C. volcanic eruption
 - D. all of the above
10. Which of the following should be done after a felt earthquake while you are at the beach?
- A. Immediately go to higher ground.
 - B. Protect yourself by doing the Drop, Cover, and Hold.
 - C. Stay calm and wait for the roaring sound before evacuating.
 - D. Always look behind to see if a tsunami is behind you.
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- A. Wait for an official evacuation order from the authorities.
 - B. Wait until you observe a drawback or feel an earthquake.
 - C. Do not panic and stay at home or small buildings located in low lying coastal areas.
 - D. Stay in upper floors of high, multi-story, reinforced concrete hotels for they can provide a safe place to find refuge.
15. Which of the following should not be done if you are in harbor during a tsunami?
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 - D. Physically move to higher ground especially in the event of a locally generated tsunami.



Additional Activity

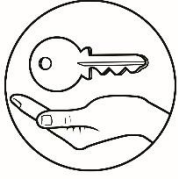
Activity 8

Do the following.

1. In a long bond paper, create an evacuation plan for your household in preparation for a tsunami warning. Make use of arrows, different colors of ink and standard symbols for clearer representation.

5	4	3	2	1
90-100% completeness of content demonstrating illustrative and strong development of ideas	80-89% completeness of content with adequate explanation of ideas	70-79% completeness of content with inadequate explanation of ideas	60-69% completeness of content with minimal explanation of ideas	59% and below completeness and irrelevant explanation of content

2. Why do you think it is important to be prepared in times of natural calamities?
3. List ten (10) things that you think are needed in preparation for a tsunami.
(*hint: things to include in an emergency kit or survival kit*)



Answer Key

POST-TEST

1. D
2. C
3. D
4. A
5. C
6. A
7. C
8. A
9. D
10. A
11. C
12. C
13. A
14. D
15. B

ACTIVITY 6

1. tsunami
- 2 - 5. Possible answers in no particular order: earthquakes, underwater landslides, volcanic eruptions, or asteroids
6. Duck, Cover, and Hold
7. Higher ground
8. Drawback
9. Rumbling sound
10. Official warning

ACTIVITY 4

1. TIDAL WAVE
2. TIDAL WAVE
3. TIDAL WAVE
4. TSUNAMI
5. TSUNAMI
6. TSUNAMI
7. TSUNAMI

ACTIVITY 3

Passage 1 : felt earthquake

Passage 2 : drawback or receding of ocean water

Passage 3 : loud rumbling sound like an explosion or freight train

ACTIVITY 1

1. Ground shaking
2. Ground rupture
3. Landslide
4. Tsunami
5. Liquefaction
6. Ground subsidence

PRE-TEST

1. B
2. D
3. D
4. D
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