Senior High School

Department of Education
National Capital Region
SCHOOLS DIVISION OFFICE
MARIKINA CITY

Disaster Readiness and Risk Reduction

Module 12
Various Volcano- Related Hazards

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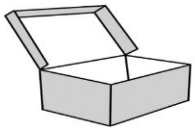


What I Need to Know

This module was designed and written with you in mind. It is here to help you understand the various-related volcano hazards. 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.

The module includes only one lesson which is the various- related volcano hazards

After going through this module, you are expected to explain various volcano-related hazards (DRR11/12-Ih-i-22).

Specifically, you should be able to

1. identify types of volcano-related hazards; and
2. describe each volcano related hazards.

What I Know

Choose the letter of the best answer. Write the chosen letter on a separate sheet of paper.

1. Which of the following volcano related hazards is described as volcanic materials directly ejected from the volcano's vent with force and trajectory?
   A. Ashfall
   B. Pyroclastic flow
   C. Volcanic glasses
   D. Ballistic projectile

2. Which of the following volcano related hazards is described as molten materials or molten volcanic rock flowing out of the erupting crater or fissure?
   A. Lahar
   B. Ash fall
   C. Lava flow
   D. Volcanic glasses

3. It is a volcano-related hazard described as a rapidly flowing thick mixture of volcanic sediments and water, usually triggered by intense rainfall during typhoons, monsoons, and thunderstorms.
    A. Lahar
    B. Ash fall
    C. Lava flow
    D. Volcanic glasses

4. Which of the following volcano related hazards is described as a turbulent mass of ejected fragmented volcanic materials (ash and rocks), mixed with hot gases that flow downslope at very high speeds (>60kph)?
    A. Ashfall
    B. Pyroclastic flow
    C. Volcanic glasses
    D. Ballistic projectile

5. Which of the following volcano related hazards is described as gases and aerosols released into the atmosphere Which include water vapor, hydrogen sulfide, sulfur dioxide, carbon monoxide, hydrogen chloride, and hydrogen fluoride?
    A. Ashfall
    B. Pyroclastic flow
    C. Volcanic glasses
    D. Ballistic projectile

6. Which of the following volcano related hazards is described as generated by sudden displacement of water?
    A. Tsunami
    B. Volcanic glasses
    C. Debris avalanche
    D. Ballistic projectile

7. Which of the following volcano related hazards is described as massive collapse of a volcano usually triggered by an earthquake or volcanic eruption?
    A. Tsunami
    B. Volcanic glasses
    C. Debris avalanche
    D. Ballistic projectile

8. Which of the following analogies about tephra is **INCORRECT**?
    A. Lapilli: 2-64 mm in diameter
    B. Ash: less than 2 mm in diameter
    C. Ash: greater than 64 mm in diameter
    D. Blocks: greater than 64 mm in diameter

9. Which of the following volcano related hazards is described as a mudflow of volcanic debris and water?
    A. Lahar
    B. Pyroclastic flow
    C. Volcanic glasses
    D. Ballistic projectile

10. Which of the following volcano related hazards is described as showers of airborne fine- to coarse-grained volcanic particles that fallout from the plumes of a volcanic eruption; ashfall distribution/ dispersal is dependent on prevailing wind direction?
    A. Tephra fall
    B. Pyroclastic flow
    C. Volcanic glasses
    D. Ballistic projectile

11. Which of the following statements describe volcanic gases?
    A. It can bury homes and agricultural areas under meters of hardened rock.
    B. High concentrations of CO_2 which is colorless and odorless can be lethal to people, animals, and vegetation.
    C. It endangers life and property by the force of impact of falling fragments, but this occurs only close to an eruption vent.
    D. Producing suspensions of fine-grained particles in air and water which clogs filters and vents of motors, human lungs, industrial machines, and nuclear power plants.

12. Which of the following statements best describes lava flow?
    A. It can bury homes and agricultural areas under meters of hardened rock.
    B. High concentrations of CO_2 which is colorless and odorless can be lethal to people, animals, and vegetation.
    C. It endangers life and property by the force of impact of falling fragments, but this occurs only close to an eruption vent.
    D. Producing suspensions of fine-grained particles in air and water which clogs filters and vents of motors, human lungs, industrial machines, and nuclear power plants.

13. Which of the following statements describe tephra fall?
    A. It can bury homes and agricultural areas under meters of hardened rock.
    B. High concentrations of CO_2 which is colorless and odorless can be lethal to people, animals, and vegetation.
    C. It endangers life and property by the force of impact of falling fragments, but this occurs only close to an eruption vent.
    D. Producing suspensions of fine-grained particles in air and water which clogs filters and vents of motors, human lungs, industrial machines, and nuclear power plants.

14. Which of the following statements describe ballistic projectile?
    A. It can bury homes and agricultural areas under meters of hardened rock.
    B. High concentrations of CO_2 which is colorless and odorless can be lethal to people, animals, and vegetation.
    C. It endangers life and property by the force of impact of falling fragments, but this occurs only close to an eruption vent.
    D. Producing suspensions of fine-grained particles in air and water which clogs filters and vents of motors, human lungs, industrial machines, and nuclear power plants.

15. Which of the following analogies is **INCORRECT**?
    A. Kanlaon eruption on1993: Ash fall only
    B. Taal eruption on 1754, 1911 and 1965: ash fall only
    C. Pinatubo eruption on 1991: pyroclastic flow, ash fall and lahar
    D. Mayon eruption on 1814, 1984, 1993, 2000-200, and 2014: ballistic projectile, ashfall, pyroclastic flow, lahars, lava flow

Lesson	Various- Related Volcano Hazards

Any kind of volcano can cause harmful events to any form of living things. Knowing the characteristics of volcanoes is very important in reducing he possible volcanic hazards, but it is important to remember that even if scientists have studied a volcano for many years, they do not necessarily know everything it is capable of. They have always had some elements of unpredictability.

What's In

In the previous module, you have learned about the interpretation of earthquake hazard map. You also learned that earthquake hazard map shows the possible physical and geographical effect of an earthquake within a particular area or region. It is also important for land use management, building codes formulation, and risk assessment.

Furthermore, earthquake hazard map can be created by the following:

1. Analyzing the geographical features and historical seismic record of a particular region.
2. Analyze geographical maps that contains information about the distribution of different rock units, soil compositions, and ground conditions.

What's New

Various volcano- related hazards

To understand more about this lesson, accomplish the activity below. Decode the following sets of symbols and briefly describe the meaning of the decoded words using dictionary or internet. Write the meaning of the word (s) on the space provided below. Use the ***Cryptogram*** below, to unlock sets of symbols into words. Decoded word (s) and the given meaning corresponds to two (2) points each.

Activity 1. Cryptogram

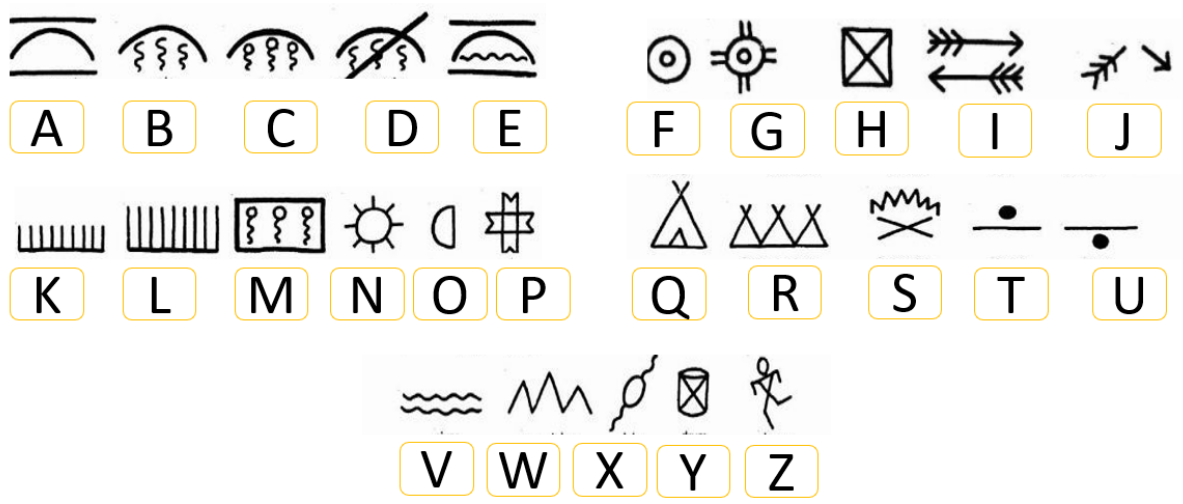
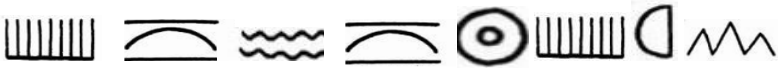


Photo Credit: https://s-media-cache-ak0.pinimg.com/736x/d7/2c/2b/d72c2ba1d1c3b9e0ac70ed35cf518cbe.jpg

1.  = _____

Description:_____

_____

2.  = _____

Descripiton:_____

_____

3.  = _____

Description:_____

_____

What Is It

Figure 1. Mt. Mayon Eruption
Source: *Topalidis, Tryfon. "Mayon 0052.jpg." 2009. Accessed August 15, 2020. https://commons.wikimedia.org/wiki/File:Mayon_0052.jpg.*

In your previous activity, some various related hazards were mentioned, and some other related hazards includes pyroclastic flow, ballistic projectile, and volcanic glasses. Now, let us impart more knowledge about the volcano- related hazards.

The information below came from Frontlearners.com site.

Volcano- related hazards are occurrences or events directly or indirectly caused by volcanic activities that are potentially dangerous to life and can create damage to property.

Volcano related hazards can be classified into two categories based on whether the event is directly or indirectly associated with volcanic activity. Primary volcanic hazards are a direct result of a volcanic eruption while secondary hazards are events that indirectly arise from volcanic activity.

PRIMARY VOLCANIC HAZARDS (DIRECT) includes the following:
LAVA FLOW: They are molten materials or molten volcanic rock flowing out of the erupting crater or fissure. It cascades down the slope and can bury, crush, cover, and burn anything in its path.

Figure 2. Lava Flow
Source: *Canli, Ekrem. "Kīlauea lava flow 2017(2).jpg." 2017. Accessed August 16, 2020. https://commons.wikimedia.org/wiki/File:K%C4%ABlauea_lava_flow_2017(2).jpg.*

PYROCLASTIC DENSITY CURRENT: Pyroclastic density currents are moving masses of mixed volcanic rock fragments and hot gasses. It is classified into the pyroclastic flow or pyroclastic surge depending on the concentration of volcanic fragments and gases**. Pyroclastic flow** has a high concentration of volcanic fragments and gases, move in contact with the ground confined to valleys while **pyroclastic surge** has a low concentration of volcanic fragments and gases, move above ground, expand over hill and valleys.

Figure 3. Pyroclastic flow
Source: *Newhall, C.G. "Pyroclastic flows at Mayon Volcano.png." 1984. Accessed August 16, 2020. https://commons.wikimedia.org/wiki/File:Pyroclastic_flows_at_Mayon_Volcano.png.*

TEPHRA FALLS: It is a shower of pyroclastic materials.
These are the particle size classification of Tephra Falls:
Ash=less than 2 mm in diameter
Lapilli= 2-64 mm in diameter
Blocks= greater than 64 mm in diameter

Figure 4. Tephra Falls

Source: *Arcullo, Janna. "TEPHRA FALLS & BALLISTIC PROJECTILES." 2018. Accessed August 16, 2020. https://prezi.com/p/-knkw3ljl2oi/tephra-falls-ballistic-projectiles/.*

VOLCANIC GAS

Gas components of volcanic rocks reacted with other elements in the environment which results to harmful chemicals.

Figure 5. Volcanic gas

Source: *Willink, Cai T. "Lava Lake Nyiragongo 2.jpg." 2011. Accessed August 16, 2020. https://commons.wikimedia.org/wiki/File:Lava_Lake_Nyiragongo_2.jpg.*

SECONDARY VOLCANIC HAZARDS (INDIRECT) include the following:

LAHAR: It is a mudflow of volcanic debris and water. The two (2) classifications are Primary (Hot Lahar) which is caused by pyroclastic materials reaching watersheds or eruption of the crater lake and Secondary (Cold Lahar)- which is caused by heavy rains.

Figure 6. Lahar

Source: *Newhall, Chris. "A lahar on the east side of Pinatubo volcano.jpg." 1991. Accessed August 16, 2020. https://commons.wikimedia.org/wiki/File:A_lahar_on_the_east_side_of_Pinatubo_volcano.jpg.*

DEBRIS AVALANCHES: It is an outward and downward movement of volcanic debris, soil, and rocks over a slope. It is also the result of the build-up of volcanic debris or from a volcanic earthquake that renders a land section too weak to support its weight.

Figure 7. Debris Avalanches

Source: *G310Luke. "Goodell Creek Debris Avalanche.jpg." 2008. Accessed August 16, 2020. https://commons.wikimedia.org/wiki/File:Goodell_Creek_Debris_Avalanche.jpg.*

TSUNAMI: It is a giant sea wave caused by the displacement of water due to volcanic earthquakes or eruptions underwater. It is also a primary volcanic hazard, like debris avalanches and pyroclastic flows, entering bodies of water can also cause a tsunami.

Figure 8. Impact of tsunami

Source: *Ministry of Land, Infrastructure, Transport and Tourism (MLIT) (Japan). "Sendai Airport after the tsunami.jpg." 2014. Accessed August 16, 2020. https://commons.wikimedia.org/wiki/File:Sendai_Airport_after_the_tsunami.jpg.*

Read additional information below from CHED, The Teaching Guide for Senior High School DISASTER READINESS AND RISK REDUCTION (2016) or you may access this link file:///C:/Users/user/Desktop/Module/DRRR.pdf and read information on pages 74-75

NAME OF VOLCANO	IMPACT	VOLCANIC RELATED HAZARDS
Pinatubo	• 1991 eruption • The volcano slope turned into gray desert, vegetation was covered and destroyed, the Aetas were displaced • Roof of houses collapsed, killing people in Zambales • Flights cancelled • During the rainy season weeks or months after June eruption, houses were buried, bridges destroyed	• Pyroclastic flow • Ashfall • Lahars (lahar occurrences continued to be a problem for the succeeding 5 years after the 1991 eruption)
Taal	• 1754, 1911, 1965 eruption • Ash covered the communities on the island as well as those nearby • Whole island was devastated	• Ashfall/ tephra fall • Pyroclastic flow • Lava flow (1968-1969)
Mayon	• 1814,1984, 1993, 2000-2001, • 2014-sudden phreatic explosion killed some tourists/hikers • 1993- about 70 people mostly tending their vegetable farms were killed • 1984- a Typhoon brought heavy rains that caused lahars to be generated and buried communities near a river • Areas covered by molten lava flows have been rendered useless and could not be used for farming anymore	• Ballistic projectiles • Ashfall • Pyroclastic flows • Lahars • Lava flow
Bulusan	• Small eruptions caused ashfall	• Ashfall
Kanlaon	• 1993- phreatic event killed a tourist/hiker	• Ashfall
Hibok-hibok	• 1951- about 500 casualties from the town of Mambajao when pyroclastic flows swept the area	• Pyroclastic flows

For those students who have internet connection, you can access the link below for enrichment part of the activity:
https://www.youtube.com/watch?v=DEtRC35ln94

What's More

Activity 2

Read and analyze the information about some volcano related hazards common in the Philippines and answer the questions that below.

VOLCANIC PHENOMENA	NEGATIVE IMPACTS / WHY IT IS HAZARDOUS
(Quizlet nd) states that lava flows are stream-like flows of incandescent molten rock erupted from a crater or fissure and when lava is degassed and/or very viscous, it tends to extrude extremely slowly, forming lava domes.	(Fisher 1997) states that lava flows rarely threaten human life because it usually moves slowly, a few centimeters per hour for silicic flows to several km/hour for basaltic flows. Most characterize this as the quiet emission of lava. Major hazards of lava flow include burying, crushing, covering, and burning everything in their path. **Lavas can burn:** Intense heat makes lavas melt and burn. (Scribd nd) states that as lava flows are hot and incandescent, areas it covers are burned (forest, built-up areas, houses), and collapsing viscous lava domes can trigger dangerous pyroclastic flows. **Lavas can bury:** Bañas 2019) states that lavas can bury homes and agricultural areas under meters of hardened rock. He also added that areas affected by lava flows once solidified are also rendered useless and will not be useful anymore (for agriculture, etc) for years due to the solid nature of the lava deposit. (Yurong 2019) added that lavas can also block bridges and highways, affecting mobility and accessibility of people and communities.

(Fontelo 2020) states that ashfall or tephra fall are showers of airborne fine- to coarse-grained volcanic particles that fallout from the plumes of a volcanic eruption; ashfall distribution/ dispersal and is dependent on prevailing wind direction.	(Radislao 2019) states that ashfall endangers life and property during peak of eruption with excessive ash, can cause poor or low visibility (driving, slippery roads). (Fisher 1997) added that producing suspensions of fine-grained particles in air and water which clogs filters and vents of motors, human lungs, industrial machines, and nuclear power plants. (Course nd) states that ash suspended in air is also dangerous for aircraft as the abrasive ash can cause the engines to fail if the suspended ash is encountered by the airplane. (Fisher 1997) states that "burial by tephra can destroy roofs of buildings, break power and communication lines, and damage or kill vegetation". Even thin (<2 cm) falls of ash can damage such critical facilities as hospitals, electric-generating plants, pumping stations, storm sewers, and surface-drainage systems and sewage treatment plants, and short circuit electric-transmission facilities, telephone lines, radio and television transmitters
(Esteban 2017) states that pyroclastic flows and surges (Pyroclastic density current) are a turbulent mass of ejected fragmented volcanic materials (ash and rocks), mixed with hot gases that flow downslope at very high speeds (>60kph). He added that surges are the more dilute, more mobile derivatives, or pyroclastic flows.	(Fisher 1997) states that pyroclastic flows and surges are potentially highly destructive owing to their mass, high temperature, high velocity, and great mobility. (Radislao 2019) states that pyroclastic flows can • Burn sites with hot rocks debris • Burn forests, farmlands, destroy crops and buildings
(Sumayang 2019) states that lahars are rapidly flowing thick mixture of volcanic sediments and water, usually triggered by intense rainfall during typhoons, monsoons, and thunderstorms. (Marco 2020) states that lahar can occur immediately after an eruption or can become a long-term problem if there are voluminous pyroclastic materials erupted such as the case of the 1991 Pinatubo	(Radislao 2019) states that lahars have destroyed many communities in the vicinity of Pinatubo and Mayon Volcano because most people live in valleys where lahars flow. • He also added that lahars can destroy by direct impact (bridges, roads, houses), and it can bury valleys and communities with debris.

eruption. He also added that lahars can also occur long after an eruption has taken place such as the lahars at Mayon Volcano after the 1984 eruption.	• (Marco 2020) states that lahars can block tributary streams and form a lake. He also added that this can submerge villages within the valley of the tributary that was blocked. There is also the danger of the dammed lake breaching or lake breakout and if this happens, this makes people in the community in danger.
(Cyberrangers 2018) states that volcanic gases are gases and aerosols released into the atmosphere, which include water vapor, hydrogen sulfide, sulfur dioxide, carbon monoxide, hydrogen chloride, and hydrogen fluoride.	Sulfur dioxide (SO2), carbon dioxide (CO_2), and hydrogen fluoride (HF) are some volcanic gases that pose hazards to people, animals, agriculture, and property. SO2 can lead to acid rain. (Magararu 2020) states that high concentrations of CO2 which is colorless and odorless can be lethal to people, animals, and vegetation. (Radislao 2019) states that fluorine compounds can deform and kill animals that grazed on vegetation covered with volcanic ash.
(Cyberrangers 2018) states that debris avalanche or volcanic landslide is a massive collapse of a volcano, usually triggered by an earthquake or volcanic eruption. (Radislao 2019) states that an example of a recent debris avalanche event occurred during the 1980 eruption of Mt. St Helens. In addition, based on present morphology of volcanoes, Banahaw Volcano, Iriga Volcano in Camarines Sur, and Quezon Province and Kanlaon Volcano had pre-historic debris avalanche events.	(Cezar 2019) states that when a huge portion of the side of a volcano collapses due to slope failure will result in massive destruction like what happened in Mt. St. Helens in the USA in 1980 (Radislao 2019). (Cezar 2019) added that the huge volcanic debris avalanche typically leaves an amphitheater-like feature and at the base of volcanoes with debris avalanche event, a hummocky topography (small hills all over).
(Quizlet nd) states that ballistic projectiles are volcanic materials directly ejected from the volcano's vent with force and trajectory.	(Coursehero nd) states that ballistic projectiles endanger life and property by the force of impact of falling fragments, but this occurs only close to an eruption vent.
(Quizlet nd) states that tsunami- sea waves or wave trains that are generated by sudden displacement of water (could be generated during undersea eruptions or debris avalanches)	(Radislao 2019) states that an eruption that occurs near a body of water may generate tsunamis if the pyroclastic materials enter the body of water and cause it to be disturbed and displaced, forming huge waves

The information above came from CHED Teaching Guide for Senior High School DISASTER READINESS AND RISK REDUCTION (2016).

Match **Column A** (types of related hazard) to its' description in **Column B**. Write only the letter of the correct answer. Write your answer on a separate sheet of paper.

COLUMN A	**COLUMN B**
_____1. Tsunami	A. Rapidly flowing thick mixture of volcanic sediments and water, usually triggered by intense rainfall during typhoons, monsoons, and thunderstorms
_____2. Lava flow	B. Massive collapse of a volcano, usually triggered by an earthquake or volcanic eruption
_____3. Ah fall or tephra fall	C. Volcanic materials directly ejected from the volcano's vent with force and trajectory
_____4. Pyroclastic flows and surge	D. Showers of airborne fine- to coarse-grained volcanic particles that fallout from the plumes of a volcanic eruption; ashfall distribution/ dispersal is dependent on prevailing wind direction
_____5. Volcanic gases	E. Generated by sudden displacement of water
_____6. Debris avalanche or volcanic landslide	F. Gases and aerosols released into the atmosphere, which include water vapor, hydrogen sulfide, sulfur dioxide, carbon monoxide, hydrogen chloride, hydrogen fluoride
_____7. Ballistic projectiles	G. A turbulent mass of ejected fragmented volcanic materials (ash and rocks), mixed with hot gases that flow downslope at very high speeds (>60kph)
_____8. Lahar	H. stream-like flows of incandescent molten rock erupted from a crater or fissure and when lava is degassed and/or very viscous, it tends to extrude extremely slowly, forming lava domes

What I Have Learned

Activity 3

To check what you have learned in this lesson, identify which type of volcano related hazards are present in the six (6) most active volcanoes of the Philippines when it erupted. Your answer in numbers 1-3, 4-6 and 7-11 can be in any order.

NAME OF VOLCANO	VOLCANO RELATED HAZARDS
Pinatubo	1. _____ 2. _____ 3. _____
Taal	4. _____ 5. _____ 6. _____
Mayon	7. _____ 8. _____ 9. _____ 10. _____ 11. _____
Bulusan	12. _____
Kanlaon	13. _____
Hibok- hibok	14. _____

What I Can Do

Activity 4

Since you know already about the danger of volcano related hazards, let us check if you can transfer your new knowledge or skills into real life situations or concerns. Read and analyze the situation below. Explain and write your answer on a separate sheet of paper.

SITUATION:

If you were the Mayor of a province near any volcano in the Philippines, present your plan on how to lessen the impact of volcano related hazards in your community in preparation for the possible volcanic eruption."

SCORING RUBRIC

NOTE: This rubric will be used in checking your essay.

Criterion	Excellent (4 pts)	Good (3 pts)	Approaching Standard (2 pts)	Needs Improvement (1pt)
Ideas and Content	What you are writing about is clear and well-expressed, including specific examples to demonstrate what you learned. Well done	What you are writing is clear. You answered the question. Some support may be lacking, or your sentences may be a bit awkward. Overall a decent job.	You put thought into this, but there is no real evidence of learning. More specific information is needed, or you need to follow the directions more closely.	There is no clear or specific explanation in answer to the question.
Use of terms	Your answer included all the terms from the lesson that applied to the question asked. All terms are fully defined and used in the proper context.	Your answer included several terms from the lesson, demonstrating adequate understanding of the material.	Only one term from the lesson is used in the answer. Try for a few more, next time.	No terms from the lesson are used.

Sentence fluency	Sentences are complete and they are read out loud. Your writing flows.	Sentences are complete and able to be understood.	Some sentences are complete and easy to understand. Others require some work.	Sentences are incomplete or too long. It makes reading them difficult.
Conventions	No punctuation or structural mistakes. No spelling errors. Your writing shows full awareness of the rules of English use.	Use of punctuation marks and capitals as well as spelling is mostly correct. Few errors exist in your answer.	Mistakes using end marks or capitals as well as spelling mistakes make writing hard to read.	Few end marks or capital letters. Answers contain numerous spelling or structural errors.

Source: Reazon System, Inc. 2020. Accessed August 9, 2020. https://www.rcampus.com/rubricshowc.cfm?code=U66W43&sp=yes&

Assessment

Choose the letter of the best answer. Write the chosen letter on a separate sheet of paper.

1. Which of the following statements describe volcanic gases?
   A. It can bury homes and agricultural areas under meters of hardened rock.
   B. High concentrations of CO_2 which is colorless and odorless can be lethal to people, animals, and vegetation.
   C. It endangers life and property by the force of impact of falling fragments, but this occurs only close to an eruption vent.
   D. Producing suspensions of fine-grained particles in air and water which clogs filters and vents of motors, human lungs, industrial machines, and nuclear power plants.

2. Which of the following analogies about tephra is **INCORRECT**?
   A. Lapilli: 2-64 mm in diameter
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4. Which of the following volcano related hazards is described as showers of airborne fine- to coarse-grained volcanic particles that fallout from the plumes of a volcanic eruption; ashfall distribution/ dispersal is dependent on prevailing wind direction?
    A. Tephra fall
    B. Pyroclastic flow
    C. Volcanic glasses
    D. Ballistic projectile

5. Which of the following volcano related hazards is described as a mudflow of volcanic debris and water?
    A. Lahar
    B. Pyroclastic flow
    C. Volcanic glasses
    D. Ballistic projectile

6. Which of the following volcano related hazards is described as generated by sudden displacement of water?
    A. Tsunami
    B. Volcanic glasses
    C. Debris avalanche
    D. Ballistic projectile

7. Which of the following statements best describes lava flow?
    A. It can bury homes and agricultural areas under meters of hardened rock.
    B. High concentrations of CO_2 which is colorless and odorless can be lethal to people, animals, and vegetation.
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8. Which of the following volcano related hazards is described as massive collapse of a volcano, usually triggered by an earthquake or volcanic eruption?
    A. Tsunami
    B. Volcanic glasses
    C. Debris avalanche
    D. Ballistic projectile

9. Which of the following statements describe ballistic projectile?
    A. It can bury homes and agricultural areas under meters of hardened rock.
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    D. Mayon eruption on 1814, 1984, 1993, 2000-200, and 2014: ballistic projectile, ashfall, pyroclastic flow, lahars, lava flow

11. Which of the following volcano related hazards is described as a turbulent mass of ejected fragmented volcanic materials (ash and rocks), mixed with hot gases that flow downslope at very high speeds (>60kph)?
    A. Ashfall
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12. Which of the following volcano related hazards is described as gases and aerosols released into the atmosphere, which include water vapor, hydrogen sulfide, sulfur dioxide, carbon monoxide, hydrogen chloride, and hydrogen fluoride?
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13. It is a volcano-related hazard described as a rapidly flowing thick mixture of volcanic sediments and water, usually triggered by intense rainfall during typhoons, monsoons, and thunderstorms.
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    C. Lava flow
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14. Which of the following volcano related hazards is described as molten materials or molten volcanic rock flowing out of the erupting crater or fissure?
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    D. Volcanic glasses

15. Which of the following volcano related hazards is described as volcanic materials directly ejected from the volcano's vent with force and trajectory?
    A. Ashfall
    B. Pyroclastic flow
    C. Volcanic glasses
    D. Ballistic projectile

Additional Activities

Write your reflection on various related hazards by answering the questions inside the box. Have fun and enjoy!

Volcano- related hazards

Guides me to reflect on_____

_____

_____

_____

What learnings have I found from this lesson?

_____

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_____

What other examples can I contribute to explore and think more?

_____

_____

_____

What learning can I share with my family and peers?

_____

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_____

What good character have I developed from this lesson?

_____

_____

_____

What is my conclusion on the lesson?

_____

_____

_____

_____

SCORING RUBRIC

NOTE: This rubric will be used in checking your essay.

Criterion	Excellent (4 pts)	Good (3 pts)	Approaching standard (2 pts)	Needs Improvement (1pt)
Ideas and Content	What you are writing about is clear and well-expressed, including specific examples to demonstrate what you learned. Well done	What you are writing is clear. You answered the question. Some support may be lacking, or your sentences may be a bit awkward. Overall a decent job.	You put thought into this, but there is no real evidence of learning. More specific information is needed, or you need to follow the directions more closely.	There is no clear or specific explanation in answer to the question.
Use of terms	Your answer included all the terms from the lesson that applied to the question asked. All terms are fully defined and used in the proper context.	Your answer included several terms from the lesson, demonstrating adequate understanding of the material.	Only one term from the lesson is used in the answer. Try for a few more, next time.	No terms from the lesson are used.
Sentence fluency	Sentences are complete and they are read out loud. Your writing flows.	Sentences are complete and able to be understood.	Some sentences are complete and easy to understand. Others require some work.	Sentences are incomplete or too long. It makes reading them difficult.
Conventions	No punctuation or structural mistakes. No spelling errors. Your writing shows full awareness of the rules of English use.	Use of punctuation marks and capitals as well as spelling is mostly correct. Few errors exist in your answer.	Mistakes using end marks or capitals as well as spelling mistakes make writing hard to read.	Few end marks or capital letters. Answers contain numerous spelling or structural errors.

Source: Reazon System, Inc. 2020. Accessed August 9, 2020. https://www.rcampus.com/rubricshowc.cfm?code=U66W43&sp=yes&

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