Senior High School

Department of Education
National Capital Region
SCHOOLS DIVISION OFFICE
MARIKINA CITY

Disaster Readiness and Risk Reduction

Module 13
Signs of Impending Volcanic Eruption

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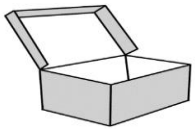
City of Good Character
DISCIPLINE • GOOD TASTE • EXCELLENCE



What I Need to Know

This module was designed and written with you in mind. It is here to help you understand the signs of impending volcanic eruption. 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 signs of impending volcanic eruption.

After going through this module, you are expected to recognize signs of an impending volcanic eruption (DRR11/12-Ih-i-24).

Specifically, you should be able to

1. identify signs of an impending volcanic eruption; and
2. describe the different parameters used to monitor volcanic activities.

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 is **NOT** included in the signs of impending volcanic eruption?
   A. Rising magma
   B. Increase in the number of earthquakes
   C. Increase in the fertility of soil in the area
   D. Increase in the amount of steam released

2. Which of the following will happen when there is an increase in magma activity underground?
   A. Ground inflation
   B. Ground deformation
   C. Caused an earthquake
   D. All of the above

3. All analogies about signs of impending volcanic eruption are correct **EXCEPT** one. Which one is it?
    A. Rising magma: causing crater to glow
    B. Water formation: drying up of these water forms
    C. Volcanic steam: change of the color of the steam from red to yellow
    D. Ground deformation: landslides, rockfalls and debris flows to occur

4. What do you call the swelling of ground due to magma intrusion?
    A. Landslide
    B. Debris flow
    C. Ground inflation
    D. Ground deformation

5. What phenomena is being described by frequent volcanic tremor?
    A. Lava flow
    B. Earthquake
    C. Sulfur release
    D. Magma movement

6. What do you call a fumarole that releases a significant amount of sulfur?
    A. Vent
    B. Steam
    C. Solfatara
    D. Hot spring

7. Which of the following is the reason for the change in the color of steam released by volcano?
    A. Ashes
    B. Sulfur
    C. Magma rising
    D. Volcanic Debris

8. Which of the following is **NOT** a sign of an impending volcanic eruption?
    A. Glowing crater
    B. Debris avalanche
    C. Increase of steam emission
    D. Drying up of wells and hot springs

9. All of the following analogies are correct **EXCEPT** one. Which one is it?
    A. Geochemistry: GPS
    B. Ground deformation: GPS
    C. Seismic activity: seismometer
    D. Visual observation: spectrometer

10. Which of the following observations by people living in the community may **NOT** be observed premonitory event before an eruption?
    A. Increasing number of earthquakes are being felt.
    B. Changing of steam from white to gray until it becomes black.
    C. Smelling of sulfur like the smells of rotten egg and hearing of rumbling sound.
    D. Vegetation are well grown and have an abundant supply of water everywhere.

11. Which of the following is defined as any set of physical properties whose values determine the characteristics or behavior of something?
    A. Parameter
    B. Seismometer
    C. Thermometer
    D. Global Positioning System (GPS)

12. All of the following can be observed by people living near volcano without using any instruments, **EXCEPT** one. Which one is it?
    A. Hear rumbling sound
    B. Smell of sulfur or rotten eggs
    C. Intensified steaming activity
    D. Sulfur dioxide (SO2) from base levels of 100 tons/day jump to 4,000 tons/day.

13. Which of the following is **NOT** an example of parameter?
    A. PH meter
    B. Geochemistry
    C. Seismic activity
    D. Ground deformation

14. Which of the following is **NOT** a sign of impending volcanic eruption?
    A. Crater glow
    B. Increase in steam emission with change in color
    C. Increase in seismic activity with rumbling sound
    D. Abundant vegetation and have a good supply of water everywhere

15. Which of the following is the equipment used to detect occurrence of volcanic earthquake?
    A. Parameter
    B. Seismometer
    C. Thermometer
    D. Global Positioning System (GPS)

Lesson Signs of Impending Volcanic Eruption

Can you predict when a volcanic eruption can occur? (Quizlet nd) states that volcanologists can predict eruptions if they have a thorough understanding of a volcano's eruptive history. Also, if they can install the proper instrumentation on a volcano well in advance of an eruption, and if they can continuously monitor and adequately interpret data coming from that equipment.

What's In

In module 12, you learned about various volcano-related hazards. You learned that any kind of volcano can create harmful events in any form of living things. Knowing the characteristics of volcanoes is very important in lessening the 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.

Furthermore, you also learned the impact of various volcano-related hazards such as lahar, ashfall, pyroclastic flow, ballistic projectile, volcanic glasses, and lava flow to the different exposed elements like human being.

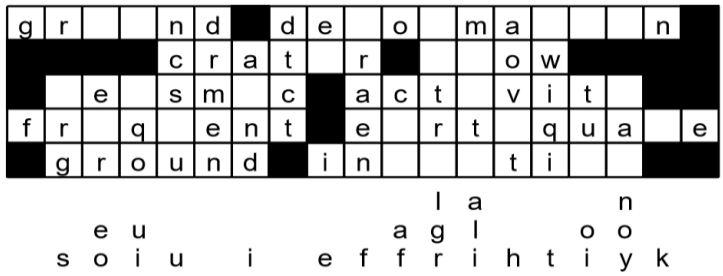
What's New

Signs of Impending Volcanic Eruption

To understand more about this lesson, accomplish the activity below called "New Fallen Phrase". Write your decoded phrases on a separate sheet of paper.

Activity 1. NEW FALLEN PHRASE

Find the hidden phrases by using the letters directly below each of the blank squares. Each letter is used once.



Decoded Phrases:

1.
2.
3.
4.
5.
6.
7.
8.
9.
10.
11.
12.

What Is It

Decoded words in the previous activity are some of the signs of an impending volcanic eruption. For now, read the additional information below about this topic before accomplishing your next activity.

A volcanic eruption is a process of releasing of molten rocks and gas from the mantle of the earth to the above surface and it cannot be accurately predicted. (United States Geological Survey or USGS 2019) states that most volcanoes provide warnings before an eruption. United States Geological Survey or USGS also added that magmatic eruptions involve the rise of magma toward the surface, which normally generates detectable earthquakes. In addition, it can also deform the ground surface and cause irregular or abnormal heat flow or changes in the temperature and chemistry of the groundwater and spring waters. However, steam-blast eruptions happen with little or no warning as superheated water flashes to steam.

Signs of impending volcanic eruption

1. **Volcanic earthquake**
   - The most common sign of an impending volcanic eruption is an increase in the number of volcanic earthquakes.
   - It is also accompanied by rumbling sounds.
   - These volcanic tremors also last longer than a usual earthquake. The time occurrence of tremors becomes longer from minutes to an hour. These seismic activities are indicators of the underground magma movement.

Figure 1. Observable shake of an earthquake

Figure 2. Earthquake

Source:

(1) *Accessed August 22, 2020. https://frontlearners.com/blended/pluginfile.php/6579/mod_resource/content/4/index.html.The most common sign of an impending volcanic eruption is an increase*

(2) *"Earthquake house." OpenClipart. Accessed August 22, 2020. https://freesvg.org/earthquake-house.*

2. **Volcanic steams**

- A noticeable increase in the amount of steam released from volcanic vents and crater also indicates an increase in volcanic activity.
- This is usually accompanied by a change in the color of released steam. This change in color, from white to gray, is caused by ashes being trapped during steam emission.

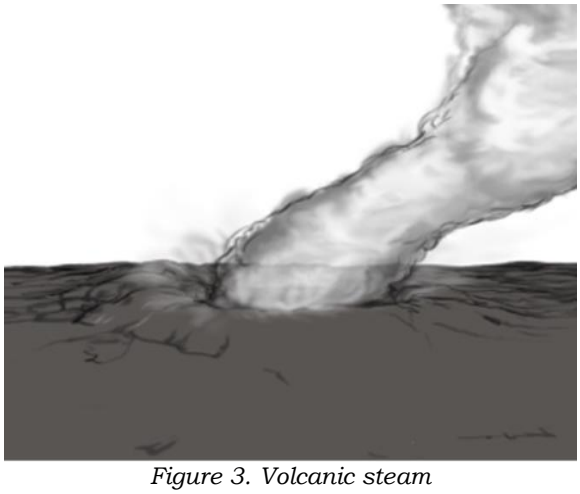


Figure 3. Volcanic steam

Figure 4. Lava Lake Nyiragongo Steaming

Source:

(3) *Accessed August 22, 2020. https://frontlearners.com/blended/pluginfile.php/6579/mod_resource/content/4/index.html.The most common sign of an impending volcanic eruption is an increase*

(4) Tjeenk Willink, Cai. "Lava Lake Nyiragongo 2.jpg." 2011. Accessed August 22, 2020. https://commons.wikimedia. org/wiki/File:Lava_Lake_Nyiragongo_2.jpg.

3. Rising magma

- Rising magma can reach the crater without an explosion, which is a clear sign of an impending volcanic eruption.
- The magma in the summit causes the crater to glow.

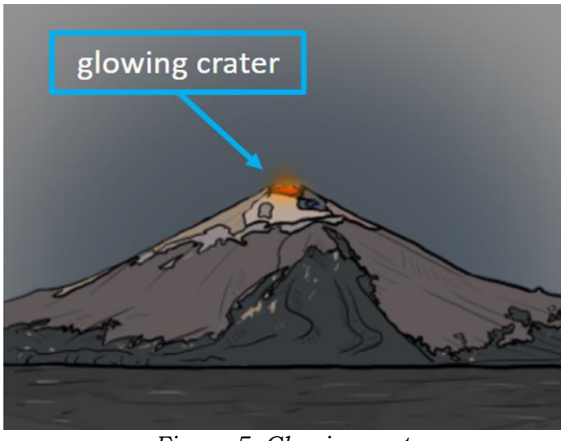


Figure 5. Glowing crater
The most common sign of an impending volcanic eruption is an increase

Figure 6. Pu'u 'O'o, a Volcanic cone on Kilauea, Hawaii.

Source:

(5) *Accessed August 22, 2020. https://frontlearners.com/blended/pluginfile.php/6579/mod_resource/content/4/index.html*
(6) "Puu oo.jpg." 1983. Accessed August 22, 2020. https://commons.wikimedia.org/wiki/File:Puu_oo.jpg.

4. Ground deformation

- The increase in magma activity underground causes ground deformations which can be measured to predict volcanic eruptions.
- Ground inflation, tilting, and fissuring can happen when magma forcibly enters between other rock formations underground.
- Ground inflation is a swelling of the ground due to an increase in the volume of rock materials underground.
- Ground tilting is a change of slope of the land area near the crater.
- Ground fissuring is an opening or cracking of a land section.

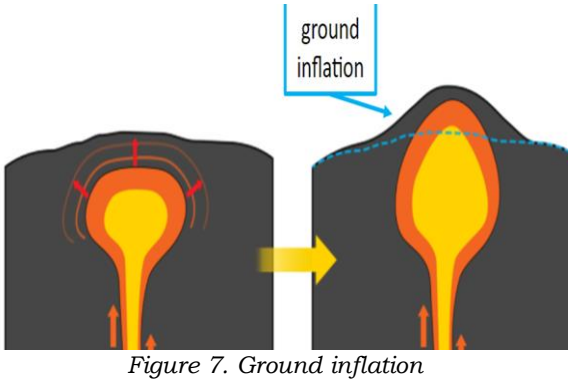


Figure 7. Ground inflation

Figure 8. Ground deformation

Source:

(7) *Accessed August 22, 2020. https://frontlearners.com/blended/pluginfile.php/6579/mod_resource/content/4/index.html.The most common sign of an impending volcanic eruption is an increase*

(8) *"Rupturing of ground - February 22 earthquake Christchurch.jpg." 2011. Accessed August 22, 2020. https://commons.wikimedia.org/wiki/File: Rupturing_of_ground_-_February_22_earthquake_Christchurch.jpg.*

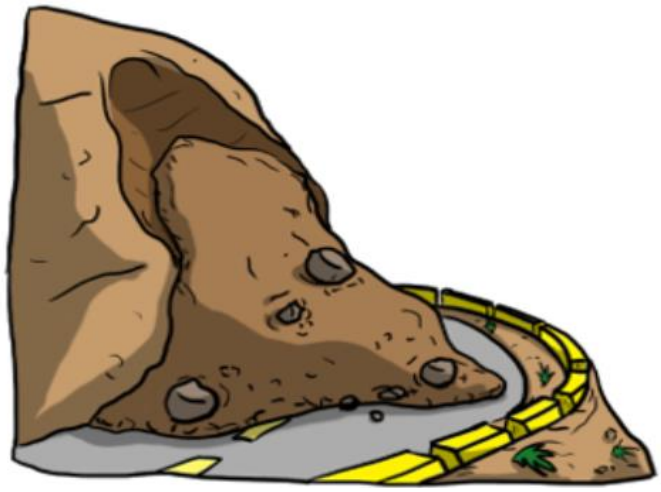


Figure 9. Ground deformation

Source: *Accessed August 22, 2020. https://frontlearners.com/blended/pluginfile.php/6579/mod_resource/content/4/index.html.*
The most common sign of an impending volcanic eruption is an increase

- Volcanic seismic activity and ground deformations cause landslides, rockfalls, and debris flows to occur.
- These landmass movements happen in the area even without heavy rainfalls.

5. **Water formations**
   - Impending volcanic eruption causes an increase in water temperature in various water forms in the area.
   - A decrease in the waterflow of streams and rivers can also be observed, even during the rainy season.
   - There will also be a change in the water chemical contents in spring and wells.
   - The most extreme sign is the drying up of these water forms.

Figure 10. Drying up of these water forms.

Figure 11. Dry river

Source:

(10) *Accessed August 22, 2020. https://frontlearners.com/blended/pluginfile.php/6579/mod_resource/content/4/index.html.The most common sign of an impending volcanic eruption is an increase*

(11) Nguru Kamau, John. "Dry river, Kitui County, Kenya.jpg." 2019. Accessed August 22, 2020. https://en.wikipedia.org/wiki/File: Dry_river,_Kitui_County,_Kenya.jpg.

6. **Geothermal systems**

- The increase in volcanic activity causes geothermal systems to be active. Active geothermal systems can cause the formation of new thermal areas where hot springs and fumaroles can exist. Fumaroles are vents where underground volcanic gas escape to the surface. Fumaroles that release a large amount of sulfur is called solfataras.
- An impending volcanic eruption is accompanied by the rise of gasses, specifically sulfur, resulting in the formation of **solfataras**.

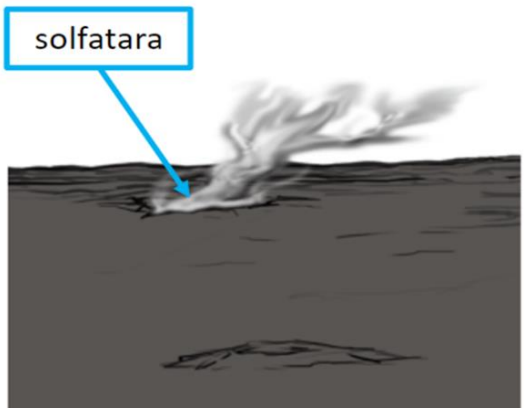


Figure 12. Solfatara

Figure 13. Sulfur Fumarole

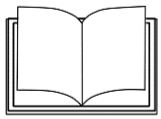
Source:

(12) *Accessed August 22, 2020. https://frontlearners.com/blended/pluginfile.php/6579/mod_resource/content/4/index.html.The most common sign of an impending volcanic eruption is an increase*

(13) Reston. "Sulfur Fumarole (23998018863).jpg." 2018. Accessed August 23, 2020.

The following are signs of an impending volcanic eruption:

1. crater glow
2. increase in seismic activity with rumbling sound
3. increase in steam emission with a change in color
4. formation and reactivation of new thermal areas
5. ground deformations (inflation, tilt, and fissuring)
6. landslides, rockfalls, and debris flows without rain
7. drying up of water formations and change in water chemical contents



What's More

Activity 2

Read and analyze the following information and answer the questions below.

Merriam Webster states that parameter is any of a set of physical properties whose values determine the characteristics or behavior of something. And these are the following parameters on how to determine the impending volcanic eruption.

PARAMETERS	EQUIPMENT/INSTRUMENTS/ TOOLS	WHAT TO OBSERVE
Ground deformation	-(Gabatan 2020) states that precise engineering methods of surveying using the instrument Electronic Distance Meter (EDM) to measure accurately to millimeter changes on ground (if the slope for the volcano swells. - (Gabatan 2020) states that swelling of the ground surface can be detected by using precision instruments and techniques that measure minute changes in slope, distance, or elevation at the ground surface. - Deformation on ground is also measured using data of repeated measurements from permanent Global Positioning System (GPS) installed around the volcano - Use of Remote sensing images also help compare before and after features.	Some subtle (in millimeters) ground movements may be detected only by sensitive instruments/ equipment.

Geochemistry (Gas, Water, temperature)	-Direct measurement of temperature and chemistry ground water, spring water or lakes (using a thermometer /thermocouple, pH meter) -Gas being emitted by volcano can be measured directly by gas monitoring equipment. -Collect gas and water samples from vents and fumaroles and analyze in the laboratory (X-Ray Flourescence XRF). -Remote monitoring -Gas monitoring equipment (COSPEC- correlation spectrometer for FlySPEC/ ScanDOAS for SO2; and CO2 flux meter for CO2)	•Changes in temperature •Seismic activity/ Seismicity/ volcanic earthquakes. •Water becomes more acidic Some gas, for example sulfur dioxide (SO2) from base levels of 100 tons/day jump to 4,000 tons/day.
Seismic activity/ Seismicity/ volcanic earthquakes	-Seismometer is the equipment used to detect occurrence of volcanic earthquakes	Increase in number of volcanic earthquakes recorded
People living near volcanoes may observe premonitory events before an eruption		
Visual, observations		• Intensified steaming activity • What used to be white steam slowly or drastically change to gray to dark (suggests increasing presence of ash) • Drying up of vegetation, drying up of streams, water wells • Crater glow at the summit area • Increasing frequency of rolling rocks from the summit; localized landslides not related to heavy rains

		• Summit area appears to glow or becomes incandescent at night
Auditory observations		Hear rumbling sound
Olfactory		Smell of sulfur (rotten eggs
Feel (Tactile)		Ground movement/ volcanic earthquake increasingly become felt

The information above came from CHED 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 84-86.

Describe the different parameters used to monitor volcanic activities. Write your answer on a separate sheet of paper explaining the instrument used/ visual observation (observation premonitory events before an eruption) and what to observe in each parameter before a volcanic eruption.

1. **Ground Deformation**

_____
_____
_____
_____

2. **Geochemistry of the volcano**

_____
_____
_____
_____

3. **Seismic activity of the volcano**

_____
_____
_____
_____

4. **Visual observations by people living near volcanoes**

_____
_____
_____
_____

5. **Auditory, olfactory and feel or tactile observations by people living near volcanoes**

_____
_____
_____
_____

SCORING RUBRIC:

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

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&

What I Have Learned

Activity 3

Fill in the blanks with phrase to check what you have learned in this lesson. Choose your answer on the words inside the box. Write your answer on a separate sheet of paper.

volcanic seismic activity	rumbling sounds	drying up
crater to glow	ground inflation	solfataras
volcanic earthquakes	amount of steam	white to gray
geothermal systems	gray to white	rising magma
water chemical	ground deformation	water flow
water temperature		

The most common sign of an impending volcanic eruption is an increase in the number of _____ (1) _____ also accompanied by ___ (2) ____. Noticeable increase in the _____ (3) _____released from volcanic vents and crater also indicate an increase in volcanic activity. This is usually accompanied by change in color of released steam. This change in color___ (4) _____is caused by ashes being trapped during steam emission. __ (5) _____ can reach the crater without an explosion which is a clear sign of an impending volcanic eruption. The magma in the summit causes the ____ (6) _____. The increase in magma activity underground causes ___ (7) ___

which can be measured to predict volcanic eruption. ___ (8) ____, tilting, and fissuring can happen when magma forcibly enter between other rock formations underground. _____ (9) _____ and ground deformations cause landslides, rockfalls, and debris flows to occur. These land mass movements happen in the area even without heavy rain falls. Impending volcanic eruption causes an increase in ____ (10) _____in various water forms in the area. A decrease in ___ (11) ____ of streams and rivers can also be observed, even during rainy season. There will also be a change in the _____ (12) _____ contents in spring and wells. The most extreme sign is the _____ (13) _____of these water forms. The increase in volcanic activity causes _____ (14) _____ to be active. Active geothermal systems can cause the formation of new thermal areas where hot springs and fumaroles can exist. Fumaroles are vents where underground volcanic gas escape to the surface. Fumaroles that release a large amount of sulfur is called solfataras. Impending volcanic eruption is accompanied by the rise of gasses, specifically sulfur, resulting in the formation of _____ (15) _____.

What I Can Do

Activity 4

Since you know already about the different signs or parameters used to monitor volcanic activities, let us check if you can transfer your new knowledge or skills into real-life situations or concerns.

You will do it by pair. Ask any members of your family like mother, father, sister, brother, etc. to be your partner in doing this activity. Write your answer on the importance of knowing the different signs or parameters used in monitoring volcanic activities in real-life situations. Write your answer on a separate sheet of paper.

IMPORTANCE OF KNOWING DIFFERENT SIGNS OR PARAMETERS USED IN MONITORING VOLCANIC ACTIVITIES

	TO THE PEOPLE LIVING NEAR VOLCANOES	TO YOU AS STUDENT	TO YOUR SCHOOL	TO YOUR COMMUNITY
YOUR PARTNER				
YOU				
Conclusion				

SCORING RUBRIC:

NOTE: This rubric will be used in checking each column including the conclusion part of the lesson.

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.
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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 observations by people living in the community may **NOT** be observed premonitory event before an eruption?
   A. Increasing number of earthquakes is being felt
   B. Changing of steam from white to gray until it becomes black
   C. Smelling of sulfur like the smells of rotten egg and hearing of rumbling sound.
   D. Vegetation are well grown and have an abundance supply of water everywhere

2. All analogies about signs of impending volcanic eruption are correct **EXCEPT** one. Which one is it?
   A. Rising magma: causing crater to glow
   B. Water formation: drying up of these water forms
   C. Volcanic steam: change of the color of the steam from red to yellow
   D. Ground deformation: landslides, rockfalls and debris flows to occur

3. What do you call a fumarole that releases a significant amount of sulfur?
   A. Vent
   B. Steam
   C. Solfatara
   D. Hot spring

4. Which of the following is **NOT** a sign of an impending volcanic eruption?
   A. Glowing crater
   B. Debris avalanche
   C. Increase of steam emission
   D. Drying up of wells and hot springs

5. What phenomena is being described by frequent volcanic tremor?
   A. Lava flow
   B. Earthquake
   C. Sulfur release
   D. Magma movement

6. What do you call the swelling of ground due to magma intrusion?
   A. Landslide
   B. Debris flow
   C. Ground inflation
   D. Ground deformation

7. Which of the following is **NOT** included in the signs of impending volcanic eruption?
    A. Rising magma
    B. Increase in the number of earthquakes
    C. Increase in the fertility of soil in the area
    D. Increase in the amount of steam released

8. Which of the following will happen when there is an increase in magma activity underground?
    A. Ground inflation
    B. Ground deformation
    C. Caused an earthquake
    D. All of the above

9. Which of the following is the reason for the change in the color of steam released by volcano?
    A. Ashes
    B. Sulfur
    C. Magma rising
    D. Volcanic Debris

10. All of the following analogies are correct **EXCEPT** one. Which one is it?
    A. Geochemistry: GPS
    B. Ground deformation: GPS
    C. Seismic activity: seismometer
    D. Visual observation: spectrometer

11. Which of the following is the equipment used to detect occurrence of volcanic earthquake?
    A. Parameter
    B. Seismometer
    C. Thermometer
    D. Global Positioning System (GPS)

12. Which of the following is **NOT** an example of parameter?
    A. PH meter
    B. Geochemistry
    C. Seismic activity
    D. Ground deformation

13. Which of the following is **NOT** a sign of impending volcanic eruption?
    A. Crater glow
    B. Increase in steam emission with change in color
    C. Increase in seismic activity with rumbling sound
    D. Abundant vegetation and have a good supply of water everywhere

14. All of the following can be observed by people living near volcano without using any instruments, **EXCEPT** one. Which one is it?
    A. Hear rumbling sound
    B. Smell of sulfur (rotten eggs)
    C. Intensified steaming activity
    D. Sulfur dioxide (SO2) from base levels of 100 tons/day jump to 4,000 tons/day.

15. Which of the following is defined as any set of physical properties whose values determine the characteristics or behavior of something?
    A. Parameter
    B. Seismometer
    C. Thermometer
    D. Global Positioning System (GPS)

Additional Activities

Write reflection on your learning on signs of impending volcanic eruption by answering the questions inside the box. Have fun and enjoy!

Signs of impending volcanic eruption

Guides me to reflect on_____

What learnings have I found from this lesson?

_____
_____

What other examples can I contribute

_____
_____

What learning can I share with my family and peers?

_____
_____

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 answers in additional activities.

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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