



The secret of Kilauea

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Topic: Geology

Level: Secondary education (13 years old)

Concepts: Types of volcanoes, tectonic plates, materials and composites

Time required: +/- 45 min

Summary of the activity: You and your classmates are going on a field trip today to the Hawaiian Volcanoes National Park, where Leo, the guide, will show you around and tell you about the history of the Kilauea volcano. Don't forget to be mindful of the dangers it hides... you never know what can happen if the volcano "wakes up".

Material needed: Knowledge about geology and interest in volcanoes!

1



Today is the day you've been waiting for: the school trip to Volcanoes National Park. You love volcanoes and have read a lot about them. You want to see the Kilauea volcano, the most active volcano in the world, with your own eyes and feel its power and beauty.

You fill your backpack with everything you need: water, food, a camera, a compass, a flashlight and a raincoat. You put on comfortable clothes and hiking shoes. You say goodbye to your parents and leave the house. You head to the school, where the bus is waiting to take you to the park.

 **Go to paragraph 8.**

2

You raise your hand and quickly answer: "The arc of islands!". The guide responds with a small smile but tells you that you are mistaken. The island arc is a geographical shape formed by volcanic activity in subduction zones, but it is not the name of the area where the plates collide around the Pacific. You realise you've confused the terms, but you're sure you know the answer. Try again!

- The ring of fire  **Go to paragraph 3.**
- The magma circle  **Go to paragraph 20.**

3

You raise your hand and quickly answer: "The ring of fire!" The guide answers with a big smile and congratulates you on your knowledge - you got it right! "The Ring of Fire is a string of volcanoes and sites of seismic activity, or earthquakes, around the edges of the Pacific Ocean", he says. You feel proud of yourself and what you have learned in class.

 **Go to paragraph 23.**

4




That's right, Vesuvius! This volcano is near Naples, and its most famous eruption occurred in 79 AD, when it destroyed the Roman cities of Pompeii and Herculaneum. It is still active and its last eruption was in 1944, still posing a great risk to the people living around it.

 **Go to paragraph 26.**

5

While you are telling him what happened to the goddess Pele, the bus stops dead. A crack in the side where lava was coming out had cut the road, and the heat is unbearable. The driver has slammed on the brakes, but one of the wheels went flat when it went over a sharp stone. "Damn!" exclaims the driver. "We have to change the wheel, but we can't get too close to the crack. We have to be careful of the exhaust fumes around it."



You look out of the window and see several plumes of gases coming out of the ground. They are dangerous, as they are spewing sulphur dioxide and carbon dioxide from the heart of the volcano. What are these gas plumes called?

- Fumarole  **Go to paragraph 11.**
- Chimney  **Go to paragraph 14.**
- Geyser  **Go to paragraph 22.**



6




Oops, that's not it! Cinder cones have a conical shape, as the name suggests, with gentle slopes. They are formed by the accumulation of volcanic material at the margins of a volcanic vent. Their lava is not very fluid and fragments on its way out. An example of this type of volcano is Paricutin in Mexico. Try again!

- Shield volcano  **Go to paragraph 19.**
- Stratovolcano  **Go to paragraph 10.**

7

At last, the bus is able to start again, with the wheel changed and all the passengers on board, including Leo and the young man, who found the path leading to the village. The driver drives carefully, avoiding the obstacles and cracks that the volcano caused on the road. Everyone breathes a sigh of relief as they drive away from the smoking mountain, which is still threatening to explode. You think about what would happen to the villagers if the volcano erupted - it would be a catastrophe!

Suddenly you remember a documentary you saw on TV about a volcano that erupted in Pompeii in southern Italy almost two thousand years ago. Its inhabitants could not escape and were "turned into statues" after being covered by volcanic substances. You will never forget the images of the positions in which these people were left forever, but you can't remember the name of the volcano. What was it called?

- Etna  **Go to paragraph 24.**
- Vesuvius  **Go to paragraph 4.**
- Teide  **Go to paragraph 16.**



8

On the bus, you sit with your best friends. During the trip, the science teacher gives you a talk about volcanoes and their characteristics. He shows you a map of the park and explains the route you will follow. When you arrive at the park, you get off the bus and meet the guide who will accompany you to the crater. He is a young and friendly man called Leo. He greets you with a smile and encourages you to follow him, starting to walk along the path that will lead you to the volcano.

 **Go to paragraph 25.**

9



"Incorrect! You know nothing about volcanoes. You have been fooled by appearances. The substances discharged during a volcanic eruption are more intricate and diverse than you might realise. I'll allow you another opportunity, though it could be your final one. Exercise caution in your deliberation before responding. What materials does a volcano expel when it erupts?"

- Water, steam and salt  **Go to paragraph 18.**
- Ash, lava, and gases  **Go to paragraph 13.**

10

Oops, that's not it! This type of volcano is characterised by a high, conical shape with steep slopes, very different from Kilauea. Stratovolcanoes have viscous lava and solidify quickly; an example is Cotopaxi in Ecuador.

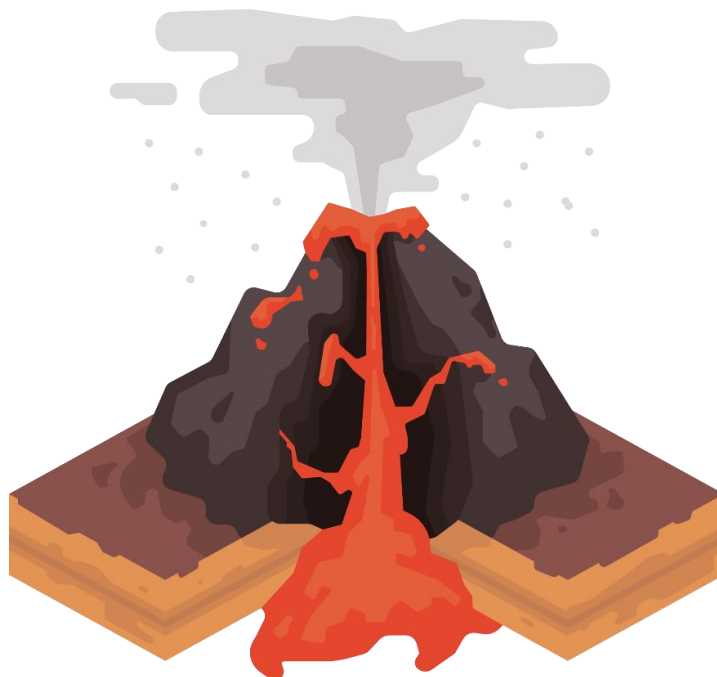
Try again!

- Shield volcano  **Go to paragraph 19.**
- Cinder cone  **Go to paragraph 6.**

11

That's right! Fumaroles are openings in the surface of a volcano through which high-temperature gases and vapours escape. Watch out for them!

 **Go to paragraph 21.**



12

You stare at the crater in fascination. You find it incredible that the Earth is capable of creating something so beautiful and powerful. You take out your mobile phone and take a picture of the crater. You want to have a memory of this moment and share it with your friends. You don't think the goddess is going to be angry about a simple photo. Besides, Leo is busy talking to other tourists and doesn't notice what you are doing.

However, when you look at your mobile screen, you see something strange. The photo shows not only the crater, but also a human figure that appears to be emerging from it. She has long black hair, red eyes and skin covered in ash. She wears a red dress and a crown of flowers. She is the goddess Pele.

 **Go to paragraph 15.**



13



"That's right, you have proven to know something about volcanoes. I grant you a chance to escape my wrath. Run and save your life".

You don't think for a moment and run to the bus to try to escape. The bus pulls away from the volcano, which is still erupting. You sit down next to Leo, who was looking at you with disbelief and concern. "What happened to you, where were you, are you OK?". You don't quite know what to say to him, until finally you say, "I'll tell you everything, but I don't know if you'll believe me."

 → **Go to paragraph 5.**

14

Oh no, that's incorrect! The chimney of a volcano is the conduit through which magma rises from the magma chamber to the outside of the volcano, expelling lava, ash, rocks and gases. Try again!

- Fumarole  → **Go to paragraph 11.**
- Geyser  → **Go to paragraph 22.**

15

You freeze as you look at the image on your phone, until you feel a tremor beneath your feet. The ground shakes and the crater begins to roar. You watch as lava rises and spills over the rims. The volcano is erupting!

You hear the screams of Leo and the other tourists. They are all running towards the bus, looking for a safe place. You realise you have to do the same, but you can't take your eyes off the crater. You are mesmerised by the figure of the goddess, who seems to be smiling mischievously at you.

Suddenly, you hear a voice in your head. It is a female voice, deep and powerful. It says to you: "You have dared to photograph me without my permission. You have offended the goddess of fire and volcanoes. Now you must pay the price. If you want to save your life, you will have to answer one question: What materials does a volcano spew out when it erupts?" What do you answer?

- Water, steam and salt

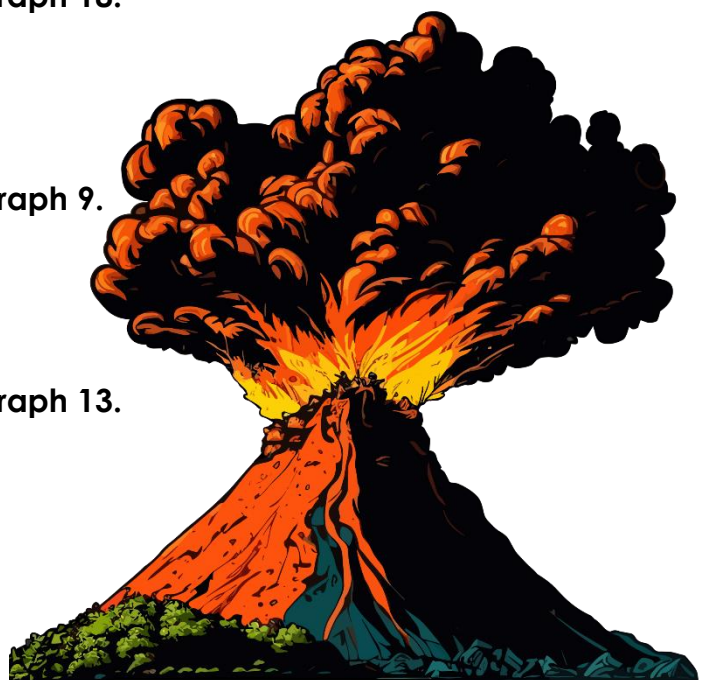
➡➡➡ → **Go to paragraph 18.**

- Metal, glass and diamond

➡➡➡ → **Go to paragraph 9.**



- Ash, lava and gases

➡➡➡ → **Go to paragraph 13.**



16




Not that one! Teide is a volcano located in the Canary Islands and is the highest peak in Spain (3718 metres). Although it is active, its last eruption was in 1909. You have another try!

- Etna  **Go to paragraph 24.**
- Vesuvius  **Go to paragraph 4.**

17



As you continue towards the crater, you see the vegetation change. It goes from a lush green landscape to an arid, rocky one. Leo explains that the volcano creates its own ecosystem and that many plants and animals have adapted to live near it.

He also tells you that the volcano formed when the Pacific tectonic plate passed over the Hawaiian hot spot, a hot spot in the underlying mantle of the Earth. In your mind's eye, you visualise that map of the world you studied in class, with all the tectonic plates colliding and rubbing against each other, and you realise that you are in one of the most seismically active areas in the world. Then the guide asks his question: "Do any of you know the name of the area where the plates collide around the Pacific?" What do you answer?

- The arc of islands  **Go to paragraph 2.**
- The ring of fire  **Go to paragraph 3.**
- The magma circle  **Go to paragraph 20.**

18

"That answer is false. You know nothing about volcanoes. You have been fooled by appearances. The materials ejected from a volcano are more complex and varied than you think. I'll give you one more chance, but it may be your last. Think carefully before you answer: What materials does a volcano expel when it erupts?"

- Metal, glass and diamond  **Go to paragraph 9.**
- Ash, lava and gases  **Go to paragraph 13.**

19



That's right! Shield volcanoes are characterised by their rounded, low, shield-like shape. Their lava is fluid and spreads over great distances, as is the case with Kilauea or Mauna Loa, also in Hawaii.

 **Go to paragraph 17.**



20

You raise your hand and quickly answer: "The magma circle!". The guide responds with a small smile but tells you that you are mistaken. As far as he knows, there is no such geological term. You must have mistaken it for something else, but you are sure you know the right answer. Try again!

- The arc of islands  **Go to paragraph 2.**
- The ring of fire  **Go to paragraph 3.**

21





Tongues of lava are starting to surround the bus and people are getting more and more nervous. Meanwhile, the driver and Leo are trying to change the flat tyre. It is a difficult task, as the heat and smoke made visibility and breathing difficult. In addition, they have to watch out for the movements of the lava, which could reach them if it got too close. "Come on, quickly!" shouts the driver. "We don't have time to lose! The volcano could explode at any moment".

 **Go to paragraph 7.**

22

Oh no, that's incorrect! Although they can also be dangerous, geysers expel very hot steam and water into the air, practically boiling due to the heat of the volcano. Try again!

- Fumarole  **Go to paragraph 11.**
- Chimney  **Go to paragraph 14.**

23



You reach the edge of the crater, and you are breathless. Before your eyes, a huge hole filled with bubbling lava opens up. You watch as the lava jumps and slides down the crater walls. The deep red colour contrasts with the blue sky and white clouds. You feel the heat on your face and the smell of sulphur in your nose. You hear the sound of lava hitting the rocks. It is both an impressive and terrifying scene.

Leo explains that the crater is called Halema'uma'u and that it is the home of the goddess Pele, the goddess of fire and volcanoes according to Hawaiian mythology. He tells you to be respectful of the goddess and not to disturb her with your shouting or photos. He warns you that you can observe the crater from a safe distance, but not to get too close or separate from the group. He gives you a few minutes to admire the volcano and then you will continue on your way.

 **Go to paragraph 12.**




24

Although Etna is also located in southern Italy, specifically in Sicily, it is not near Pompeii. It is the highest active volcano on the Eurasian plate and erupts several times a year - try again!

- Vesuvius  **Go to paragraph 4.**
- Teide  **Go to paragraph 16.**

25

As you approach the volcano, you see that it has a rounded, low-hanging shape; it does not look particularly imposing, but you are well aware of the danger it could create should it erupt. You remember that the science teacher told you about some types of volcanoes according to their morphology. What type of volcano do you think Kilauea is?

- Shield volcano  **Go to paragraph 19.**
- Stratovolcano  **Go to paragraph 10.**
- Cinder cone  **Go to paragraph 6.**

The bus arrives in the village, where a rescue helicopter is waiting for you. The guide explains that he contacted the authorities and that they sent you an alternative means of transport, as the road is blocked by lava. You and your companions get off the bus and board the helicopter, thanking the driver for his help. From the air, you can see the majesty of the volcano roaring in the distance.

In the end, the big eruption didn't come and it was all just a small warning from the volcano, which served as a reminder to all the locals that disaster can strike any day without warning. That day you all learned that the Earth can be as dangerous as it is wonderful and was also the one in which you may have been threatened by a goddess.... but who could believe that?

The End



Designed by 6 European organisations, the project intends to create efficient, engaging pedagogical materials and tools for teachers in order to implement an innovative gamified Homework methodology with pupils. In doing so, we wish to contribute to boosting their efficiency and engagement rate in remote work and, more specifically, in Homework.

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