

Kitchen



Eruptions!

**Mimic volcanic
eruptions from the
comfort of your own
home**



Department of
**Earth
Sciences**



Ingredient List

Experiment 1:

- 200 ml water
- 200 ml cooking oil
- 5 drops of food colouring
- 2 effervescent tablets (denture tablets work well)
- 1 clear cup

Experiment 2:

- 200 ml white vinegar
- 5 drops of food colouring
- 50 g baking powder
- 2 clear cups

Experiment 3:

- 500 ml cola
- 5 mints (extra strong mints work well)
- 2 clear cups

When you've completed the experiments fill out the Volcano Report on the last page.

You can then check this against the answer sheet!

(no peeking beforehand...)

BACKGROUND

Did you know that volcanic processes are essentially just chemistry?

Geologists use chemistry to understand what volcanic rocks (igneous) are made of. Fun fact: Most magma is made of just 10 elements; oxygen (O), silicon (Si), aluminium (Al), iron (Fe), magnesium (Mg), titanium (Ti), calcium (Ca), sodium (Na), potassium (K), and phosphorous (P).

Even more importantly, chemistry can tell us how explosive (and therefore dangerous) a volcanic eruption will be. For example:

- ❖ A high gas content will produce an explosive eruption
- ❖ A high-viscosity (sticky) magma will stop gas escape and therefore produce a more explosive eruption
- ❖ Underwater eruptions will involve more volatiles (like water vapour) and produce a more explosive eruption

You, as scientists, have been asked to help geologists by investigating four different volcanos around the world to see how explosive the eruptions would be.

In the first challenge, you will see what happens when you release Carbon Dioxide into a beaker filled with oil floating on water.

In the second challenge you will mix baking powder and vinegar to see what happens when we increase volatiles by a chemical reaction.

In the third challenge you will drop mints into a diet soda to assess what happens when you add a catalyst into an eruption.

You can then have a go at matching these 'model eruptions' to known volcanoes around the world.

Remember to measure your ingredients carefully!



Challenge One! The lava lamp

This challenge will not only show you what happens below a volcano, it will also introduce you to one of the most exciting interior design inventions of the 1960's.

Handy Hints!

- ❖ Make sure you add the ingredients in the correct order to get the best reaction
- ❖ Make sure the beaker you are using is clean and dry before starting the experiment
- ❖ Try not to get the tablets wet!

What to do:

1. Measure out 200 ml of water into your straight beaker
2. Add 5 drops of food colouring into the water, then stir until the solution is fully mixed
3. Measure out 200 ml of oil into another beaker, before pouring it (very carefully) on top of the water
4. Add one of the large effervescent tablets and allow it to sink to the bottom of the beaker

Observe what happens in the beaker, especially at the oil-water contact surface

- a. Can you describe what happens to the water when the tablet is added?
 - b. What can you see forming on the top of the oil?
 - c. What is happening to the volume of the water?
5. When the reaction slows down, add the second effervescent tablet. Repeat the above questions (a-c) do you see any changes?
 6. Look at the pictures below. What do you think your experiment most closely resembles (look at the end product of the experiment)?



**A. Nyiragongo Lava Lake,
DC Congo**



**B. Stromboli, Aeolian
Islands, Italy**



**C. Anak Krakatoa,
Indonesia**

Challenge Two: The Classic

A favourite experiment to show what the creation of gases (volatiles) does to the volume of a mixture. When the baking powder mixes with the vinegar, it releases carbon dioxide causing the mixture to bubble.

Handy Hints!

- ❖ Use a thinner cup to get the best reaction!
- ❖ Make sure everything is dry before mixing (otherwise the reaction will start too early)
- ❖ Get ready! You might want to time the duration of the eruption event, so make sure you convince someone else in your household to be ready with a stop watch as soon as the solution is mixed

What to do:

1. Carefully weigh 50 g of baking powder
2. Add this to the bottom of a conical flask and make sure it evenly covers the base
3. In a second flask, measure out 200 ml of white vinegar
4. Add food colouring to the vinegar and mix carefully until fully combined
5. Get ready to time the experiment! Pour the vinegar into the container with the baking powder (start the stopwatch as soon as mixing occurs)

Observe what happens in the beaker. Use your observations to answer the below questions:

- a. What happens to the volume of the mixture in the beaker?
- b. How long does the reaction take from start to finish? Hint: Time from initial mixing until the bubbling stops.
- c. What is the new volume of the mixture in the beaker?

Look at the pictures below. What type of eruption does this experiment most closely resemble?



**A. Mount St. Helens,
Washington, USA**



B. Kilauea, Hawaii, USA

Challenge Three: The 'Get Out the Way'

An experiment often used to create rockets, the 'cola and mints' experiment can also be used to understand volcanoes. In this case, we're introducing a catalyst (physical reaction) instead of creating a chemical reaction.

Handy Hints!

- ❖ Be prepared to take a step back from the experiment as soon as it's mixed (sometimes it gets a bit lively). We recommend doing this outside or in a bathtub!
- ❖ Cola can be sticky – be careful not to spill it on your clothes
- ❖ Make sure your flask is placed in the middle of your tray to avoid any overspill

What to Do:

1. Measure out 250 ml of cola into a (clean and dry) conical flask
2. Take ONE mint and drop it into the flask

Observe the reaction. Can you describe what happened in the flask?

3. Clean the flask and make sure it's dried well
4. Again, measure out 250 ml of cola into the conical flask
5. Take FOUR mints and drop them into the flask

What are the main differences between one mint and four mints?

Can you think of the reasons for these differences?

Which of the volcano pictures below best matches the reaction with **one** mint and which one matches best with **four** mints?



A. Ijen, Java, Indonesia



B. Sinabung, Sumatra, Indonesia

Volcano Report

(To be completed after completion of all the practical work)

Name.....

Challenge One: The Lava Lamp

The volcano that best matches the eruption is.....

Did the second effervescent tablet make the reaction **BIGGER** or **SMALLER** **

After the experiment was the volume of the water **MORE** or **LESS** **

Challenge Two: The Classic

The volcano that best matches the eruption is.....

Did the reaction take (a) **0 – 10**, (b) **10 – 20**, (c) **20 – 30**, or (d) **30 – 40** seconds ** from start to finish?

After the experiment was the volume of mixture **MORE** or **LESS** **

Challenge Three: The 'Get Out the Way'

The volcano that best matches the eruption with one mint is.....

The volcano that best matches the eruption with four mints is.....

Does adding more mints make the reaction **BIGGER** or **SMALLER** **?

**Circle the appropriate answer