

## Acid Rain – Teacher Notes

When plants and animals use food to create energy, carbon dioxide is released into the air as a by-product. Carbon dioxide released by living things and from volcanic activity forms part of the Greenhouse Effect. Without carbon dioxide causing warming of our atmosphere life could not exist. Indeed those few “Snowball Earth” occasions when our planet was almost completely covered with ice and snow were also periods of mass extinction. Life needs to be warm but not too warm. Our present concerns about global warming are because we seem to have excess carbon dioxide (and other Greenhouse gases) being released into the atmosphere and temperatures are rising very quickly.

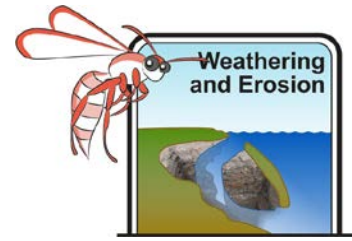
Carbon dioxide will dissolve in water and form a mild acid, carbonic acid. Sulphur dioxide dissolves to form sulphuric acid. Since the Industrial Revolution, people have burned fossil fuels that release much more carbon dioxide and sulphur dioxide which can dissolve in moisture in the atmosphere to produce **acid rain**. This acid rain will have an impact on local environments.

### Investigation

#### Materials per student or group



- A lump of limestone, marble or chalk.  
**NOTE:** Limestone is the whitish rock found near most coasts in WA. It is made of calcium carbonate, sand and often contains fossil fragments. If you live inland, calcrete can be substituted. Calcrete is the hard whitish material found on ridges jutting out of sand near salt lake country. If you choose to use chalk please be aware that modern “blackboard chalk” is really mostly gypsum, another mineral that leaves a white streak on the board but will not produce the correct “fizzing” reaction. The large sticks of “art chalk” have a higher chalk content and provide a much better reaction or broken pieces of marble can be acquired from kitchen and bathroom outfitters.
- A Petri dish or saucer.
- A nail or metal scraper.
- A dropper/pipette or drinking straw.  
**NOTE:** To use the straw as a pipette, place the straw into the liquid, seal the top end with a finger and lift the partly filled straw still sealed with your finger to where it is needed. The straw (still sealed) can be squeezed to release drops of acid.
- Acetic acid (household vinegar).
- Option – magnifying glass or hand lens/jeweller’s loupe or electronic microscope. Watching the reaction through a hand lens/magnifying glass is great fun, as is electronically displaying the reaction through a microscope on the Smart Board or screen.



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### Method

1. Place the rock onto the Petri dish or saucer. (I used sand to hold it in place)
2. Scrape a depression into the top of the rock to hold some acid
3. Drop a little acid (5 drops) into the depression and observe what happens
4. Repeat until dropper is empty

### Observations

What happened when acid was dropped into the depression in the limestone/chalk? **The limestone dissolved/was eaten away. The vinegar fizzed/effervesced. The hollow increased. If your limestone was sandy, sand will start to appear on the bottom of the dish.**

### Discussion

Draw what would happen if mild acid rain fell on a chalk or limestone mountain over a long period of time. What changes would happen to the surface of the Earth?

**The rock would be weathered/eaten away. The rock would develop caves and subterranean river systems. This is called karst scenery and can be seen in the southwest of our state near Margaret River. Rainfall before the Industrial Revolution was likely not acidic and if so any acidity would be from natural sources, like volcanoes.**

**Interesting Fact:** Fizzy drinks get their effervescence from injecting carbon dioxide into water at low pressure. Some of the gas dissolves and turns the water into carbonic acid whilst the rest is held as gas bubbles to be released when the bottle is uncapped.

