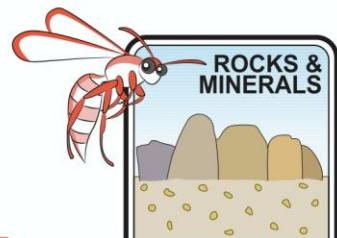
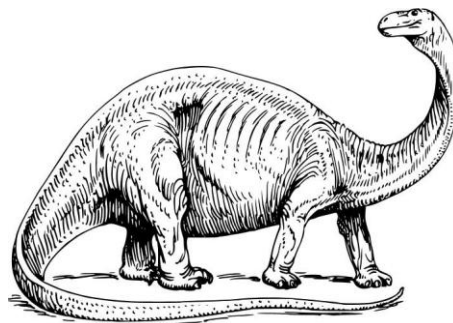


Acid Rain – Student Activity



Acid rain is produced when carbon dioxide, sulphur trioxide and nitrogen dioxide are dissolved in water vapour in the atmosphere.

1. Water + Carbon dioxide = Carbonic acid
2. Water + Sulphur trioxide = Sulphuric acid
3. Water + Nitrogen dioxide = Nitric acid



What is/are the reactant/s in the first equation?

What is/are the product/s in the second equation?

What is common to all the products?

Volcanoes are the major contributors to the gasses that form acid rain.

Since the Industrial Revolution when people stopped relying on energy from themselves and from pack animals and changed to using fossil fuels, large quantities of carbon dioxide, sulphur dioxide and nitrogen oxide have been released into the atmosphere where they are dissolved in water and fall as acid rain. Acid rain has badly affected vegetation down wind from factories. Rocks, houses and masonry have been also been damaged.

Indicators

We often cannot see what has happened in a chemical reaction. Indicators such as litmus paper and Universal Indicator solution allow us to *infer* a change has taken place because they change colour.

An **acid** turns Universal indicator **red**

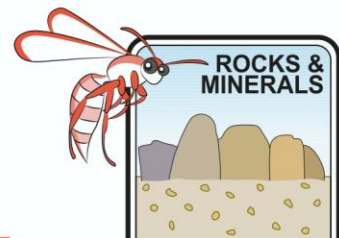
Vinegar and lemon juice are acids

Neutral solutions turn Universal indicator **green**

Water is a neutral solution

Bases or alkalis turn Universal Indicator **Blue**

Toothpaste is an alkali



Acid Rain – Student Activity

Using Carbon dioxide to create carbonic acid

Materials required per student or group

- A small beaker or container with 100mL water
 - A drinking straw for each student
 - A dropper bottle with Universal Indicator
 - One sheet of white paper
1. Place the beaker of water on a white sheet of paper and add a few drops of Universal indicator until it turns green
 2. Students take turns to blow into the water for one minute. Any water splattered over the edge of the beaker incurs a penalty of waiting 30 seconds.
 3. The process continues until the liquid turns red indicating an acid (carbonic acid) has been produced

Interesting Facts *The air we breathe in contains 0.39% carbon dioxide*

The air we breathe out contains 4.0% carbon dioxide

Tourists are only permitted to visit the cave paintings at Lascaux for a few days each year because their breath has made the damp cave air acidic and the paintings are becoming affected

NOTE in a chemical change **reactants** are mixed together to form a **product**

Answer the questions below using the results of this experiment

Which are the **reactants** (original materials)? _____

What is the **product**? _____

What is the purpose of Universal Indicator? _____

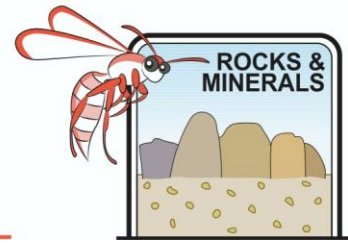
What colour was the water in the beaker immediately after adding Universal Indicator? _____

What happened to the colour of the water after blowing into it for ten minutes? _____

What did this change in colour indicate? _____

Is this a chemical or physical change? Explain your answer. _____

Acid Rain – Student Activity



Extension Kitchen Science

Students can create their own vegetable indicators by crushing colourful plants such as purple cabbage, nasturtium leaves and flowers and rose petals with a mortar and pestle with a little sand. Alternatively vegetable material can be placed into a blender with a little water and processed into liquid. Crushed purple cabbage can also be boiled. The spice turmeric can be boiled in water.

The liquid produced can then be passed through kitchen cloth (Chux?) to remove lumps. The filtrate can be reserved in a bottle or jam jar for experiments.



Small amounts of foods, drinks, household cleaners and toiletries can be placed in a clean saucer and tested using these indicators.