

Invisible Ink

Key stage 2

Scheme of work unit:	6C	Consolidates and extends children's understanding of what happens when a variety of solids dissolve
Intended learning:	6C	Investigate dissolving and saturating solutions whilst investigating the properties of invisible inks.

Introduction notes:

- Commonly acids and bases are used as invisible ink, and these are subsequently revealed by indicators.
- Indicators are chemical compounds which are different colours when in contact with either acids or bases.
- Indicators are also used in chemistry to show when chemical reactions are finished.
- An acid is traditionally considered any chemical compound that, when dissolved in water, gives a solution with a pH less than 7.0
- Common examples include acetic acid (in vinegar) and sulphuric acid (in car batteries).
- Generally acids have the following properties:
 - Taste: Acids generally have a sour taste.
 - Touch: Strong or concentrated acids often produce a stinging feeling.
 - Reactivity: Strong acids react aggressively with or corrode many metals.
 - Turn litmus paper (an indicator) red.
- Bases can be thought of as the chemical opposite of acids.
- A reaction between an acid and base is called neutralization.
- Bases react with acids to produce water and salts (or their solutions).
- Generally bases have the following properties:
 - Taste: Bitter taste
 - Touch: Slimy or soapy feel on fingers
 - Reactivity: Caustic on organic matter, react violently with acidic substances
 - Turn litmus paper (an indicator) blue.
- pH is a measure of the acidity or alkalinity of a solution. Aqueous solutions at 25°C with a pH less than seven are considered acidic, while those with a pH greater than seven are considered basic (alkaline). pH 7.00 is considered neutral at 25°C.

Resources required:

- Diced red cabbage
- Lemon
- Bicarbonate of soda
- Warm water
- Pestle and Mortar (or similar)
- Paper
- Plastic cups or containers
- Paint brushes

Practical notes:

Care needs to be taken to ensure the water is not too warm as to scald the pupils. Acids and bases are irritants, and if eye contact occurs the eye must be rinsed thoroughly.

Further Work:

Investigate the difference between pigments and dyes. Dyes will dissolve fully in solution whilst pigments will not. Explore how these properties make them useful for different purposes.

Investigate the use of other readily available materials as invisible inks. Explore which are acids and which are bases.

Answers:

1. Indicators are chemical compounds which are different colours when in contact with either acids or bases.
2. Lemon Juice – acidic, Bicarbonate solution – Alkaline/basic
3. An ideal invisible ink should be easily made, hard to detect and easily and safely revealed. Invisible inks are normally non-greasy and not visible under UV light (a common screening method for post).
4. In addition to indicators, heat can also be used to reveal messages. A substance applied to the paper burns at a lower temperature than the paper and the message is revealed.