

Introduction

Secrets of the Ice is a new practical activity. The context is the search for alien life. The activity focuses on pollution and environmental change. Pupils carry out chemical and physical tests to analyse an ice sample from another planet. Having drawn conclusions from their results they discover what conditions on the alien planet are like, and decode a message from the extra-terrestrials.

Requirements (for the class as a whole)

Aluminium soft drinks can (330ml) or baked bean can, with top cut off, to make the alien ice container. Avoid using cans with highly curved sides at top and bottom, which make it difficult to remove the ice core.

Ice core in alien container

- Basically a soft drinks can containing two layers of frozen water, to which different chemicals have been added before freezing.
- Pour 180ml of layer two into the drinks can and then freeze it.
- Put a circular piece of tissue paper on top, then carefully add 120ml of layer one. Finally, re-freeze.

Layer one solution

These quantities are for each litre of solution required, which is enough for five sets.

- 500 ml carbonated sparkling water plus 500 ml tap water, to put lots of CO₂ into solution.
- Stir in gently 5g of china clay or powder paint or ground up cat litter, to make the solution look dusty for objective 3. Let it settle. Decant liquid to remove sediment at bottom
- Add 50ml of 0.1M copper chloride solution, to put lots of heavy metal ions into solution.

Layer two solution

These quantities are for each litre of solution required, which is enough for three sets.

- 100 ml carbonated sparkling water plus 900ml tap water to put a little CO₂ into solution.
- Stir in gently 2g per litre of china clay or powder paint or ground up cat litter, to make the solution a little bit dusty for objective 3. Let it settle. Decant liquid to remove sediment at bottom
- Add 10ml of 0.1M copper chloride solution, to put a few heavy metal ions into solution.
- Add enough *Chlorella* for pupils to be able to see evidence of plant life. Alternatively you could try ground grass or leaves. The amount required varies depending on your *Chlorella* stock.

The quantities of chemicals are not critical. They are designed to give easily observable differences between the layers.

Requirements per group

Objective 1

- Alien container with can painted black or covered with paper to hide the label.
- Access to hot water bath or tub containing water from a kettle.
- Dinner knife
- Paper towels

Objective 2

- Ruler

To melt the ice cores:

- Access to hot water bath
- 2 x 250ml beaker

Objective 3

- Small beaker
- 1 piece white paper

Objective 4

- Small beaker
- 1 piece white paper
- Sodium hydroxide solution (0.4M – 1.0M, depending on your own risk assessment)

Objective 5

- Small beaker
- Phenolphthalein indicator solution and pipette
- Fresh, dilute sodium hydroxide solution (0.1M) in a burette or supplied with a graduated pipette so pupils can measure start/end volumes

Objective 6

- Optical microscope and two slides

Safety

- 1M sodium hydroxide is corrosive and dangerous to eyes and skin.
- Eye protection must be worn at all times.
- Warn pupils that the solutions of sodium hydroxide are corrosive and dangerous to eyes and skin. Ensure that eye wash facilities are available.