Weathering experiments

Weathering processes are going on all around us, but they generally happen very slowly, so we don't usually notice. However, if you look at an old stone wall, or the tombs in a graveyard, you can easily see the effects of weathering. The following experiments aim to show how two important weathering processes work.

1. Heating and cooling granite chips (expansion & contraction of mineral grains)**:**

You will need: A Bunsen burner, heatproof mat, tongs, some granite chips, and a beaker of cold water. Safety glasses *must* be worn.

Hold a granite chip firmly in the tongs and, with the burner on a roaring blue flame, hold the corner of the chip in the hottest part of the flame for a minute or so. Then remove it from the flame and dip it into the cold water.
Take great care when you do this, as the chip will be *very* hot and will burn anything it touches if you drop it! *Keep the water close to the burner.*
Repeat the process two or three times more to see what happens to the granite as it is repeatedly heated and cooled.

Discuss and explain your observations. ……..

……

……..

Make sure tongs are left on the heatproof mat to cool before putting them away

2. Dissolving limestone in water (solution weathering)**:**

You will need: A boiling tube and bung, some spring water, a straw, a dropper bottle with Universal Indicator, a small spatula and some powdered limestone (eg. crushed chalk). Safety glasses should be worn.

(i) Fill the boiling tube about ¼ full of water and add a couple of drops of Universal Indicator solution.
It should remain green – what does this tell you? ……..

(ii) *Carefully* blow bubbles through the straw (avoid the bubbles blowing back at yourself!) for a minute or so, and see what happens to the colour of the solution.

What colour is the solution now? ……

Is the solution now acid or alkaline? ……

What gas from your breath has caused this effect? ……

(iii) Now add a *small* pinch of powdered limestone using the spatula, put the bung in the tube, shake it, and let it settle.

What colour is the solution now? ……..

What do you think has happened? ……

……*(continue overleaf)*

Teacher/Technician Notes:

1. ***Background:***
   See web pages on Weathering and accompanying notes in Teachers' Zone.

2. ***Apparatus & samples:***
   Granite chips can easily be obtained from a variety of suppliers, or you can get a supply from a local monumental mason or worktop supplier and bash it with a lump-hammer (wearing safety glasses)! However, if you do this make sure that what they give you *is* granite, since masons tend to call any ornamental stone either granite or marble, irrespective of its origin! Powdered limestone is available from most lab suppliers, or you could crush your own chalk (not blackboard chalk though, which is *not* chalk but gypsum!). The apparatus (see "What you need" above) should be straightforward.
   Ensure that the "spring water" given to students *does* have neutral pH by "doctoring" if necessary. Lab-produced distilled water is often *not* neutral!

3. ***Preparation for experiment:***
   Some preparatory discussion is clearly required to introduce students to the experiment, which could easily follow on from their own web research on weathering processes. A simple demonstration of freeze-thaw weathering could also be incorporated into the lesson.
   Safety is a particular issue with the granite chips experiment – hot chips can burn holes in bench-tops, let alone students!

4. ***Follow-up:***
   Questions based on the experiments can go much further than those included above, which leave further room for class discussion.
   For example:
   "Is the heating and cooling of granite chips a good model for what happens in hot deserts?"
   "Did some of the powdered limestone dissolve in the acidified water?" and,
   "If so, how could we prove it?"
   A follow-up on solution weathering could include discussion of how caves and cave formations are formed, or could lead on to further work on acids, bases and salts.