The Chemistry of Everyday Life

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These are a series of experiments done over a term in the 7th or 8th Classes. They show a connection between everyday life and the laboratory, familiarize the students with the apparatus and techniques used in the lab, and expose them to the terminology before the start of a formal chemistry course.

1. Acids, Bases and Indicators

This experiment gives an idea of how chemicals are classified. Tell the students that one of the ways is to classify them as acids, bases and neutral substances. Demonstrate the changes they bring about in indicators.

Make your own indicator: Collect flowers of a particular kind (you could try flowers of different colours like hibiscus, vinca plumbago, jacaranda or marigolds), crush them with a little water and extract the juice. Divide the extract into two parts. Add lemon juice or vinegar to the first part, and chuna water to the second. Observe the colour changes if any.

Having found the flower extract that gives the best changes, make a large quantity of the indicator and ask students to bring in things to be tested. Suggested test materials are milk, curd, orange juice, soap, washing powder, shampoo, oil, tea, coffee and so on.

One class discovered that acids are sour and bases are bitter. They further extended the experiment to find out if sour substances are acidic and bitter substances are basic.

Talking Points:

- Everything is a chemical, not only things we consider 'bad'!
- Acids are not 'bad' for you.
- Classification is the basis of the scientific method.
- Scientific observation begins with seeing patterns.

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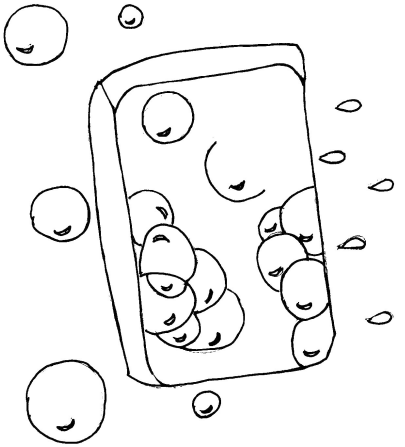
2. Making Soap

Discuss the need for soap—since water and oil do not mix, soap should have the property that it can mix with both oil and water. Use coconut oil and sodium hydroxide solution. For every 100 grams of oil, add a solution of 9 grams of NaOH. Take the mixture in a steel or glass vessel and boil while stirring, till the foaming stops. The mixture will become thick (if you over-boil you will get soap powder). Rinse out the soap with water and give some amount to each student to mould and shape. The basic soap is cream coloured and has a mild 'soap' smell. You can discuss how to add colour and scent using food colours and essences. The soap can be used for washing hands.



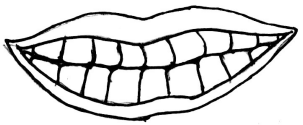
Talking Points:

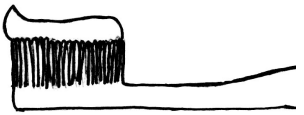
- Why do we use ash for cleaning?
- How was soap discovered?
- How do natural cleaners like Shikakai and Reetha work?

3. Making Toothpaste

Toothpaste is a mild abrasive, with foaming agents, taste, colour and scents added. A precipitate of calcium carbonate makes a good toothpaste.

Make a concentrated solution of washing soda. Add lime water from the lab (or chuna water) till no more precipitate forms. About 50 grams per student gives an adequate amount of toothpaste. Filter the precipitate, dry it and add glycerin to make a paste. Add colours and flavours. This can be really used!





Talking points:

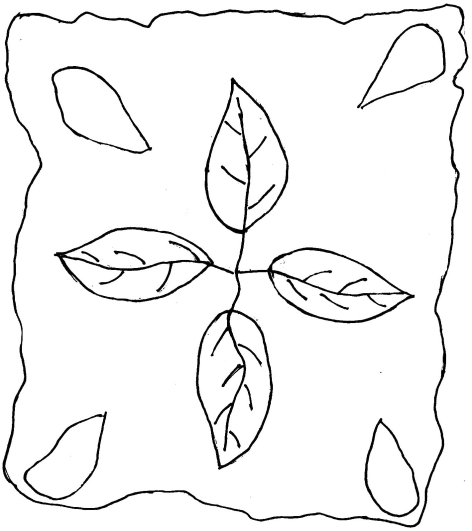
- Why teeth need cleaning!
- What role do the particles of precipitate play in cleaning?
- What is the role of colour and flavour?
- Discuss advertisements for toothpaste.

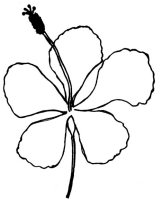
4. Model for Photography

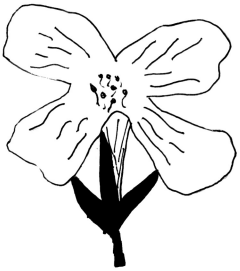
This experiment gives the essentials of photography and acts as a good introduction to chemical reactions. Best results are obtained by using cloth, but paper can also be used. Take the laboratory reagent silver nitrate solution and dip small cloth or paper sheets in it. Dry them in the dark between sheets of newspaper. Give each student one or two sheets of the treated cloth or paper for them to expose to sunlight, to demonstrate the effect of light on silver nitrate. They can arrange objects like nuts, springs, leaves, etc., to make a picture on the sheet, and then expose to the sun. After the background darkens (it takes about 10 to 15 minutes), lift off the objects. Discuss how to 'fix' the 'photo'—this can be done by washing off the unreacted silver nitrate. Some very beautiful prints result, and students usually want to try different compositions.

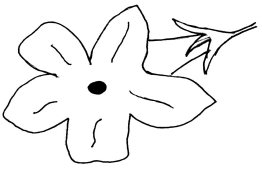
Talking point:

- The history of photography







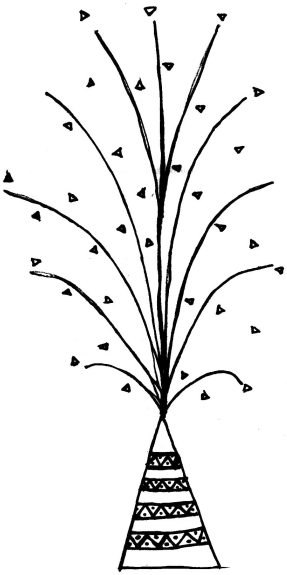


5. Gunpowder

Around Deepavali, make gunpowder in the lab and make fireworks! You need an oxidant (potassium nitrate or potassium perchlorate), charcoal and sulphur. Discuss combustion and explosions. Point out that fireworks don't have air inside and so need a source of oxygen (oxidant). Grind charcoal and sulphur very fine and sieve them through a cloth. Mix the powders in the ratio 1:1.5 and store. Grind the oxidant, sieve and STORE SEPARATELY (important!). When needed, mix the powders in the ratio: 3 of oxidant to 1 of the charcoal-sulphur mix. Add salts, iron and magnesium filings for colour and sparkles (barium gives green, lithium and calcium give red, copper gives green-blue). Fuses are made by soaking thread or cotton wicks in a concentrated solution of the oxidant and drying. 'Flower pots' are the easiest to construct. Make a clay pot, fill with gunpowder, put in a wick. Students have attempted to make Vishnu chakras and sparklers (using gum). No bombs!!

Talking points:

- Rates of reaction.
- History of gunpowder.
- Social issues during Deepavali like noise pollution, child labour, money burnt, fun had and so on.
- Techniques of packing gunpowder for different effects.



Have fun. I always do.