Chemistry the next generation
part of Chemistry for our future

8
ACTIVITY

Snap, crackle and snot

11-12 age group | 2 1/4 HRS | 75 STUDENTS | 25 STUDENTS PER GROUP | 7* SUPERVISORS | 600

background

This half day session is designed as an enrichment activity for 11–12 year old students. The event can be run at any time of the year but a good time is in November, often as part of *Chemistry Week*, providing the opportunity for 11–12 year olds to carry on their enthusiasm for science from primary school. The event consists of three 20 minute workshops with five minutes to change over, and finishes with a demonstration lecture for everyone.

pre-planning required

weeks before

Recruit staff to run the workshops and a presenter for the demonstration lecture. Order the chemicals and materials that you may require. Advertise the event and book in schools or other education groups. Design presentations for workshops or demonstration lecture to link activities if required.

days before

- Organise the equipment.
- Snap (solids): Make sure the silicone solution for growing the crystals is the correct strength and try it out. Divide the crystals for the gardens into smaller pots for the groups to access more easily.
- Crackle (liquid nitrogen): Buy the flowers and fruit that you want to use in the demonstration.
- Snot (slime): Label food bags with warning stickers containing the ingredients and advice if the bag leaks.
- Demonstration lecture: Preparation is the key to any lecture. It's important to do experiments that you understand so you can 'problem solve' as you go along. Experiments with a high visual or sound impact hold the students' interest, linking what they see to their 'known' world helps show them that science is closely linked to their everyday lives. Remember to always do a full risk assessment and to *practice!*

facilities required

- **Snap workshop** – students work in groups of two or three.
- **Crackle workshop** – demonstration area with floors and surfaces covered for easy cleaning.
- **Slime workshop** – best done in a lab or area that can be easily wiped down.
- **Demonstration lecture** – lecture theatre or hall with a gas supply (fixed or portable) and wipe clean surfaces.
- Access to a sink is useful for all workshops. AV equipment if using a presentation.

materials required

Snap Workshop

- small vial with lid [PG] containing sodium silicate solution in a 1:4 ratio of silicate:water
- three small pots of coloured crystals [PG] – eg any three from copper sulfate, nickel nitrate, nickel sulfate, cobalt chloride, cobalt nitrate
- three pairs of tweezers [PG]
- portion of 'magic sand' in a cup or beaker [PG]
- a second cup or beaker half filled with water [PG]
- two demonstration beakers, one containing 'self siphoning liquid'

Crackle Workshop

- table top insulated container for liquid nitrogen
- fruit or vegetables with a high water content
- disposable rubber tubing
- small hammer
- heat proof mats
- balloons
- glow sticks
- beaker of hot/warm water
- flowers with big petals/heads

Snot Workshop

- one polystyrene cup [PP]
- one wooden lolly stick [PP]
- one labelled food bag [PP]
- borax solution (4% solution of sodium borate in water)
- PVA solution (4% solution of PVA solid in water)
- food colouring and pipette per table

PER PERSON [PP] PER GROUP [PG]

SAFETY
A risk assessment must be done for this activity.

This activity is based on an event run by Dr Georgina Westbrook, Centre for Effective Learning in Science (CELS), Nottingham Trent University

* 3 WORKSHOP LEADERS, 3 HELPERS, 1 FOR EACH GROUP, 1 DEMONSTRATION LECTURE PROVIDER

The activity

Snap

This workshop looks at unusual solids and gels.

Crystal gardens

This should be done in groups of two or three

1. Using one pair of tweezers per pot, add a couple of grains of each colour crystal to the pot of silicone solution.
2. Place the lid on the pot and leave until the end of the workshop to view the growing crystal garden.

Magic sand

1. In small groups, pour the magic sand into the cup of water. Watch what happens.
2. Carefully pour the water back into the other cup. Why is the sand free flowing and not wet?

Explain how the sand is hydrophobic.

Self siphoning liquid

Do this as a demonstration.

1. Start with the gel liquid in one large beaker.
2. Pour carefully from a height into a second large beaker while trying to adjust the pouring speed and the angle of the beaker so liquid gives the appearance of defying gravity and climbing back up.

Explain how this happens.

SAFETY

Students should wear lab coats or disposable aprons, safety glasses and gloves.

Crackle

This workshop looks at the effects of liquid nitrogen on solids, liquids and gases. As an introduction you can discuss general information to avoid confusion between liquid nitrogen and solid carbon dioxide!

Solids

1. Take a length of rubber tubing and stick one end into the liquid nitrogen.
2. After a minute or so, remove it and show what happens to either end of the tubing when hit with a hammer (carefully)

> Explain how the cold affects how brittle the material becomes.

Liquids

1. Immerse the heads of large flowers in the liquid nitrogen for approximately 30 seconds.
2. Ask for a volunteer (wearing safety glasses) and very gently smash the flower over their heads.

> Ask someone to explain why this happens. They should mention that the flowers are made up of a lot of water and this freezes in the cold making the flowers very brittle. Slices of fruit (oranges especially) freeze well in liquid nitrogen. These are quite impressive to smash with a small hammer on a heat proof mat. Cherry tomatoes are also good.

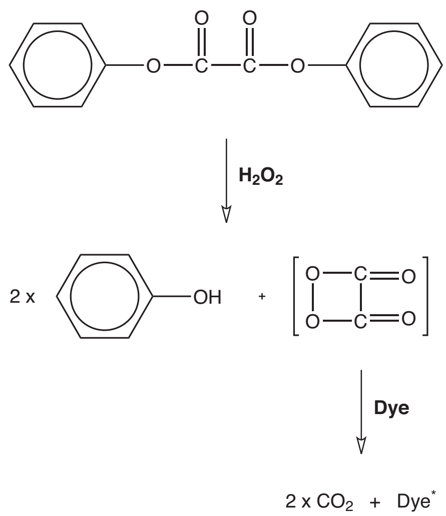
Gases

1. Blow up a couple of balloons and ask the audience what they think happens if you put the balloon in the liquid nitrogen
2. Push the balloon into the liquid nitrogen and lift it out again when it has completely shrunk.

> Explain that the volume of the gas has decreased as the temperature has decreased. The crackly nature of the balloon is down to the frozen water vapour on the inside of the balloon from your breath and the liquid inside the balloon is condensed gases.

Reaction rates

1. Crack a couple of glow sticks to activate them. Discuss what is happening to produce the light in the glow stick. There is no need to go into this in detail with this age group but the reaction that occurs is:



> Ask the audience to predict what will happen if you change the temperature of the glow stick.

2. Place one glow stick in the beaker of hot water and the other in the liquid nitrogen.
3. After a minute or so, remove the glow sticks and compare them.

> Explain the effect that temperature has on the rate of the reaction going on inside the glow stick to produce the light.

SAFETY

Wear a lab coat, safety glasses and the correct gloves for using with low temperatures.

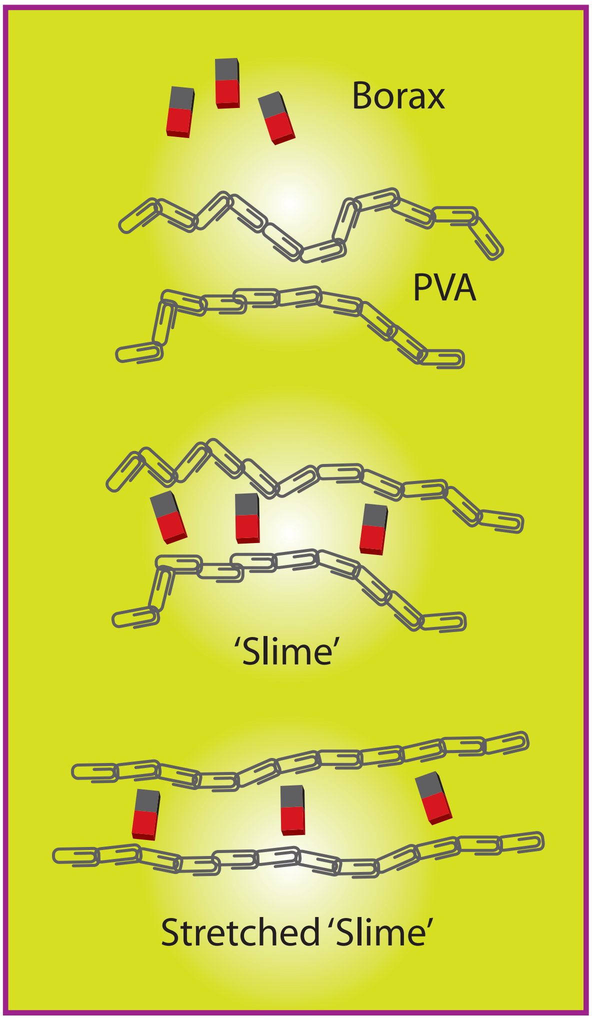
Snot

This workshop looks at making simple polymers.

Introduce the concept of polymers being long molecules where one section is repeated over and over again, a bit like a long chain of paper clips all linked together. Introduce PVA as the polymer you are going to use. This should be recognisable as glue to most students.

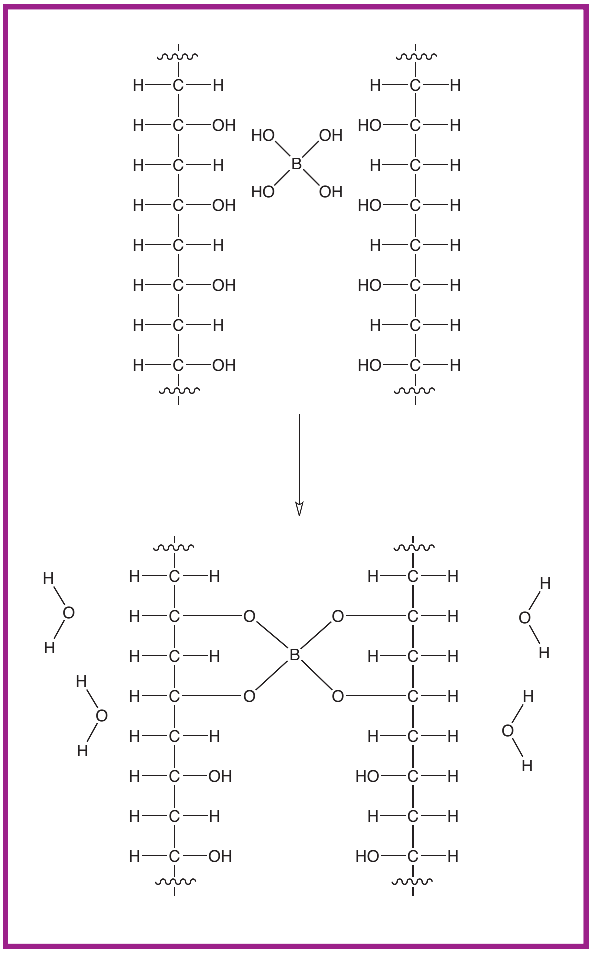
1. Pour the PVA into a polystyrene cup to a depth of approximately 3 cm.
2. Add three drops of green food colouring to make a good snot colour. **NB** – too much food colouring affects the consistency of the slime.
3. Stir with the lolly stick.
4. Add a small amount of borax solution to the mixture.

> Explain that this chemical behaves like tiny magnets. Ask them to predict what happens if tiny magnets are introduced into long chains of paperclips. This should give students an idea of what is going on at a molecular level to make the slime.



5. Stir in the Borax and add a little more if necessary to get a good snotty consistency. Too much Borax will make the mixture too runny.
6. When a good consistency is reached, the mixture can be transferred to the bags either by pouring it or by hand if the students want to get a bit messier!

On a molecular level:



When two PVA molecules and a borax molecule react, the OH groups on the borax react with the OH groups on the PVA molecules to make water (H_2O). The remaining oxygen atom forms a bond between the borax molecule and the PVA molecule, joining the two together to make slime. The water made in this reaction is trapped on the outside of the polymer, allowing the separate polymers to 'stick together' without needing a borax molecule.

SAFETY

Students should wear lab coats or disposable aprons, safety glasses and gloves.