

What makes the colours in fireworks? experiment

Teacher sheet

Equipment

Apparatus

For each group of students:

- Eye protection
- A copy of, or access to, the periodic table
- Flame test wires (these can be placed with the chemicals)
- Small beaker or test tube
- Bunsen burner
- Heatproof mat

If used as a demonstration, prepare:

- Pump action spray bottles, one for each chemical

Chemicals

For each group of students:

- Samples of firework chemicals to be tested, including:
 - Sodium chloride (yellow)
 - Potassium chloride (lilac)
 - Copper(II) carbonate (HARMFUL) (blue-green)
 - Strontium chloride (red)
 - Calcium chloride (IRRITANT) (red-orange)
 - Barium chloride (TOXIC) (green)
 - Lithium chloride (IRRITANT) (red)
 - Zinc chloride (CORROSIVE) (white-green)
 - Magnesium chloride (no colour)
 - Iron filings (gold)
- Distilled water

If used as a demonstration, prepare:

- Ethanol (HIGHLY FLAMMABLE), about 10 cm³ per chemical

Health, safety and technical notes

- [Read our standard health and safety guidance.](#)
- Wear eye protection.
- It is the responsibility of the teacher to carry out appropriate risk assessments.
- Chlorides are best to use. Prepare each in a Petri dish, labelling both the top and base of the dishes to ensure these don't get muddled. Preparing two or three of each

would ensure that there is sufficient to go round a class comprising 7-8 groups of four students. Wires should be kept with each dish. Teachers are advised to demonstrate barium and zinc salts as these are toxic/corrosive.

- The water is used to help the solid stick to the wire. Very little solid is required. The edge of the Bunsen flame is the best place to put the wire. Dimming laboratory lights will help heighten the effects.

If used as a demonstration:

- Make saturated solutions of each of the solids in ethanol where possible. Only very small quantities of the solids are required.
 1. Place each solution in a separate spray bottle. Label each bottle.
 2. Set the nozzles of the bottles to give a fine spray, not a jet.
 3. The prepared bottles can be kept for several weeks without deterioration of the plastic or solution.

Principal hazards

- Spraying chemicals

Procedure for students

1. Place the Bunsen burner on the heatproof mat.
2. Light the yellow safety flame.
3. Put about 20 cm³ water in the beaker or test-tube.
4. Open the air hole on the Bunsen to get a strong blue flame.
5. Dip the wire in the water, then into the first firework chemical. Only a small amount is needed.
6. Hold the wire at the edge of the flame just above the cone.
7. Look at the flame colour. There may also be sparks and the chemical may melt.
8. When the colour has gone, put the wire back with the chemical dish.
9. Test all the firework chemicals in the same way.
10. Write down the colours you get in the results table.
11. Answer the questions.

Procedure notes if used as a demonstration

1. Darken the room.
2. Set the Bunsen burner to a roaring flame.
3. Spray each solution in turn into the flame. Take care not to spray towards the audience.

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Possible observations

Firework chemical	Colour in flame	Other observations
Sodium chloride	Yellow / orange	Compare to street lights
Potassium chloride	Lilac	Pink when viewed through blue glass
Copper(II) carbonate (HARMFUL)	Green / blue	White flares may also appear
Strontium chloride	Red	
Calcium chloride (IRRITANT)	Brick red	Transparent crystals tend to melt and drip easily
Barium chloride (TOXIC)	Apple green	Colour is short-lived
Lithium chloride (IRRITANT)	Red	
Zinc chloride (CORROSIVE)	None	
Magnesium chloride	White/ none	
Iron filings	Gold sparks	High temperature needed to get sparks