Firework colours

**Aim** To identify elements by the coloured flames they produce.

**Equipment**
- Bunsen burner, bench mat and matches; tongs;
- safety glasses; wooden icy-pole sticks soaked overnight in distilled water and solutions of barium chloride, copper chloride, potassium chloride, sodium chloride and strontium chloride;
- spectroscope (optional)

The original Chinese fireworks burned yellow/white only. Today fireworks include metal salts to colour them. The colours come from electrons jumping back and forth from shell to shell.

**Method**
1. Copy the following table into your workbook. List all the solutions used.

<table>
<thead>
<tr>
<th>Solution</th>
<th>Compound formula</th>
<th>Colour of flame</th>
<th>Metallic element in solution</th>
<th>Non-metallic element in solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distilled water</td>
<td>H₂O</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Barium chloride</td>
<td>BaCl₂</td>
<td></td>
<td>Ba</td>
<td>Cl</td>
</tr>
</tbody>
</table>

2. Briefly place the stick soaked in water in a blue Bunsen flame, then remove it. Record any colour that it gave the flame.

3. Briefly place each of the other sticks in the flame and record the colour you see.

4. **Optional:** Point a spectroscope towards a bright portion of the sky (not the Sun). Draw the spectrum you see. Observe each of the coloured flames through the spectroscope, recording what you see.

**Questions**
1. **Clarify** the purpose of the stick soaked in water only.
2. **Explain** why the water needs to be distilled and not from the tap.

3. The non-metallic element did not add colour to the flame. **Describe** any proof you have.

4. **Identify** which of the solutions you tested would be best to colour a firework:
   - a. red
   - b. green
   - c. blue/green