# Fireworks: the art and science

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Fireworks rely fundamentally on two process: the combustion of the gunpowder and the metallic compounds contained in the stars releasing coloured light. Both can be understood within the confines of the GCSE combined science course.

## How fireworks work

1. The firework contains gunpowder, which is a mixture of different chemicals. One of the chemicals is potassium nitrate. It reacts with sulfur (S) and carbon (C) to produce nitrogen gas, potassium sulfide and carbon dioxide. Write a word equation for this reaction.
2. Use ionic charges to derive the formulas for potassium nitrate and potassium sulfide.
3. Construct a balanced symbol equation for this reaction.
4. The reaction is a combustion reaction which requires oxygen. When potassium nitrate is heated, it produces potassium nitrite (KNO2) and oxygen gas. Write a word and symbol equation for this reaction.
5. This reaction is called a thermal decomposition reaction. Use the information above to fully explain why this reaction is a thermal decomposition.
6. 10.0 g of potassium nitrate is heated until it fully decomposes. What mass of oxygen is produced? Give your answer to three significant figures.
7. GCSE chemistry only: at room temperature, what volume will that oxygen occupy? Give your answer to two significant figures.

## Flame colours

1. From memory, state the flame colours for compounds containing:
   1. Lithium
   2. Sodium
   3. Potassium
   4. Calcium
   5. Copper
2. Making reference to how fireworks are made, explain why you cannot always identify what metal compounds are in a firework just by looking at the colour produced.