

TEMPLATE for BEST PRACTICE EXAMPLES



- 1. Name of the project:**
Fireworks
- 2. Subjects covered from STEAM areas:**
Science, engineering, art
- 3. Target group (age range and size of the group):**
13-16 y.o.
- 4. Duration of the activity:**
1-3 h
- 5. Key words:**
Atom electron excitation, ion flame color, oxidizing agent, combustible
- 6. Key sentence describing context of the activity, followed by short description (200 words):**
Students fabricate a fireworks display combining a combustible chemical, oxidizing agent and an ion that produces a flame color.
Students learn about ion flame colors and oxidizing agents, and then use the knowledge to make colored fireworks. Ion flame color is tested with a bunsen burner. Explosive is manufactured from the oxidizing agent and the combustible chemical and tested.
Students design the fireworks by choosing the colors of their liking. The fireworks ignition is filmed preferably with a high speed camera.
- 7. Description of the activity environment, including the list of materials and tools needed:**
Chemistry lab for the manufacturing and testing of the substances. Fireworks should be ignited outside far away from any flammable materials.
Materials: Ions that produce a flame color (e.g. sodium chloride, lithium chloride, copper chloride, potassium chloride ...), oxidizing agent (e.g. potassium nitrate), combustible chemical (black powder is reasonably easy to make), (High speed) camera. In addition a closed container if you want the fireworks to explode and not just burn.
- 8. Step by step, detailed description of the activity, including teaching and learning strategies:**
Students are divided into groups. Students should already know about oxidizing agents and combustible substances. Teacher teaches about ion flame colors.
 - 1. Testing different ion flame colors**
Students test different ion flame colors using a bunsen burner. They decide which flame colors they want to use in their own fireworks.
 - 2. Manufacturing the explosive**

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Students manufacture the explosive by combining an oxidizing agent with a combustible chemical. Black powder is reasonably easy to make and safe. Students should test the explosive by igniting a small amount on a fireproof platform.

3. Making the fireworks

Students mix the chosen flame color producing substance with the explosive. The safest is not to put the fireworks in a closed container. The mixture on a fireproof platform should work fine. In a closed container the explosion is more violent and thus more like a real fireworks.

4. The final product

Students film the ignition of their fireworks preferably with a high speed camera. The students can also be tasked to film the different stages of making the fireworks. Alternatively they can be tasked to film an educational film explaining how the fireworks work. Students combine this to the fireworks ignition video in post production.

9. Learning objectives/competencies:

Work safety, learning about chemistry concepts ion flame color, oxidizing agent and combustible.

10. Evaluation/Assessment guidelines:

The final video can be evaluated by the teacher. The final grade can be a combination of the practical and artistical sides of the work.

11. Lessons learned:

The fineness of the black powder and the adequate mixing has a big impact on the explosivity. Students should wear protection when manufacturing and handling black powder.

12. Additional information/Links:

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13. Contact person:

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