

Flame Tests Observations

Metal Chloride	Observations	Order (Brightest to Least Bright)
potassium chloride		
calcium chloride		
lithium chloride		
sodium chloride		
copper chloride		

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potassium chloride		
calcium chloride		
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sodium chloride		
copper chloride		

Making a Flare Method **Answers**

Your task is to work out which metal chloride is the best for use in a flare.

Equipment List

Bunsen burner

heatproof mat

wooden splint

metal chlorides

Method

Students' methods will vary. If self- or peer-assessing their methods, students should check that the method is clear and could be followed easily and safely.

Example:

1. Dip a wooden splint into a test tube of a metal chloride solution, e.g. copper chloride.
2. Turn the Bunsen burner to the blue flame and carefully place the end of the splint with the metal chloride solution into the flame.
3. Write down any observations/colours in the results table.
4. Repeat with different metal chloride solutions.

Risk Assessment

Hazard	Harm it Can Do	How You Will Minimise the Risk
metal chloride solutions	It could cause irritation to the eyes or skin. It could be harmful to the environment.	Wear eye protection. Use a low concentration. Avoid contact with skin.
Bunsen burner	It could cause burns.	Turn the Bunsen burner to the safety flame when not being used. Tie hair back.
glassware	If broken, it could cause cuts.	Tell the teacher if something is broken.

This is not an exhaustive list of hazards, risks and precautions to minimise them. You and your students may wish to add to the suggestions given above.

Observations

Metal Chloride	Observations	Order (Brightest to Least Bright)
potassium chloride	purple	Answers will vary.
calcium chloride	red-orange	Answers will vary.
lithium chloride	crimson red	Answers will vary.
sodium chloride	orange-yellow	Answers will vary.
copper chloride	green	Answers will vary.

My Conclusion

Which metal chloride would you use in a flare and why?

Answers will vary.

Class Conclusion

Answers will vary.

Making a Flare Method

Your task is to work out which metal chloride is the best for use in a flare.

Equipment List

B _____ b _____

h _____ m _____

w _____ s _____

m _____ c _____

Method

Step 1 _____

Step 2 _____

Step 3 _____

Step 4 _____

Step 5 _____

Risk Assessment

Hazard	Harm it Can Do	How You Will Minimise the Risk
metal chloride solutions	It could cause irritation to the e_____ or s_____. It could be harmful to the e_____.	Wear eye p_____. Use a l_____ concentration. Avoid contact with s_____.
Bunsen burner	It could cause b_____.	Turn the Bunsen burner to the s_____ f_____ when not being used. Tie h_____ back.
glassware	If broken, it could cause c_____.	Tell the t_____ if something is broken.

Observations

Metal Chloride	Observations	Order (Brightest to Least Bright)
potassium chloride		
calcium chloride		
lithium chloride		
sodium chloride		
copper chloride		

My Conclusion

The metal chloride I would use to make a flare is _____

because _____

Class Conclusion

As a class, the most popular metal chloride to use in a flare would be _____

Making a Flare Method

Your task is to work out which metal chloride is the best for use in a flare.

Equipment List

Method

Risk Assessment

Hazard	Harm it Can Do	How You Will Minimise the Risk

Observations

Metal Chloride	Observations	Order (Brightest to Least Bright)
potassium chloride		
calcium chloride		
lithium chloride		
sodium chloride		
copper chloride		

My Conclusion

Which metal chloride would you use in a flare and why?

Class Conclusion



Making a Flare

Learning Objective

To carry out flame tests and identify the best metal chloride to be used in a flare.

Success Criteria

- **To use a Bunsen burner safely during a practical.**
- **To carry out flame tests safely and make observations.**
- **To write a detailed method, including a risk assessment and come to a conclusion based on the recorded observations.**

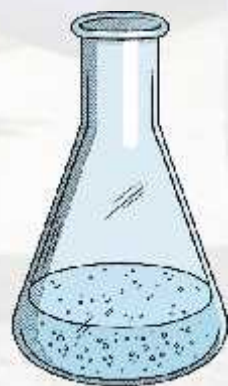
Chemical Reactions

How can you tell if a chemical reaction has taken place?

Fizzing/bubbles – a gas is produced.

A change in temperature (up or down).

A change in colour.



Everyday Uses of Chemistry



Chemistry is used in every day life, there are many examples including: cooking, fireworks and recycling. Can you give any more examples?

One of the uses of chemistry is in a flare.

What is a flare?

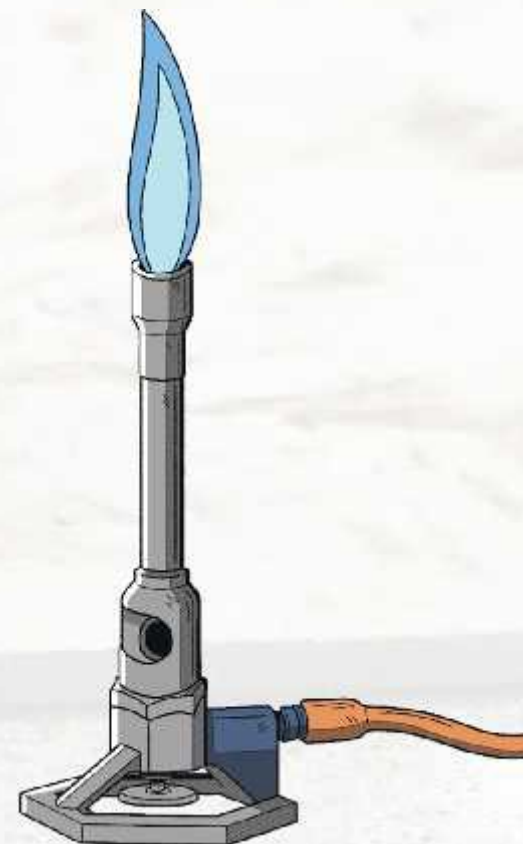
A flare is something used by people who are lost, stranded or generally in trouble, for signalling to rescue services.

What properties do you want a flare to have?
bright and colourful

Demonstration: How to Carry Out a Flame Test

Your task is to work out which metal chloride is the best for use in a flare.

1. Dip a wooden splint into a test tube of a metal chloride solution, e.g. copper chloride.
2. Turn the Bunsen burner to the blue flame and carefully place the end of the splint with the metal chloride solution into the flame.
3. Write down any observations/colours in the results table.
4. Repeat with different metal chloride solutions.



Making a Flare Method

From the demonstration, make a list of the equipment you will need to carry out the flame tests and decide which metal chloride would make the best flare.

Equipment List

- Bunsen burner
- heatproof mat
- wooden splints
- metal chloride samples

Write a clear and detailed step-by-step method for how to carry out a flame test.

Peer-Assess Method

Write down what they have done well.

Suggest improvements they can make.

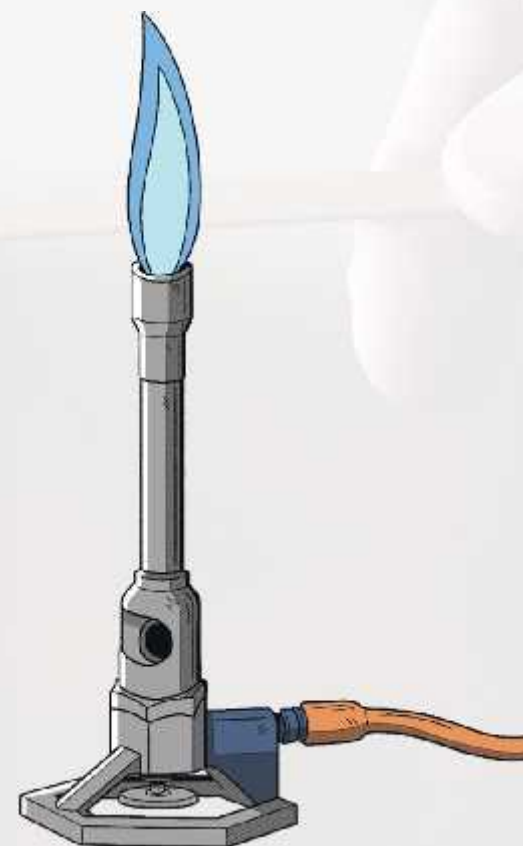
Things to look for:

- 1. Have they written the method step by step?**
- 2. Could you follow their method?**
- 3. Is it detailed?**

Self-Assess Method

Did you remember all of the steps? Is your method clear and easy to follow?

1. Dip a wooden splint into a test tube of a metal chloride solution, e.g. copper chloride.
2. Turn the Bunsen burner to the blue flame and carefully place the end of the splint with the metal chloride solution into the flame.
3. Write down any observations/colours in the results table.
4. Repeat with different metal chloride solutions.



Risk Assessment

What do these hazard symbols mean?

health hazard



harmful to the environment



Containers of some concentrated metal chloride solutions would show these symbols.

What harm could chemicals with these symbols cause?

Chemicals with these symbols could cause irritation to the eyes or skin and could kill or harm living things in the environment.

What precautions should we take to make sure that no harm is caused when using these chemicals?

wear eye protection, use only a small amount of the solution, use a low concentration (dilute the solutions)

Risk Assessment

Before we carry out a practical we must assess the risks and think about how we will minimise them.

This is called a risk assessment.

Hazard	Harm it Can Do	How You Will Minimise the Risk
metal chloride solutions	<p>It could cause irritation to the eyes or skin.</p> <p>It could be harmful to the environment.</p>	<p>Wear eye protection.</p> <p>Use a low concentration.</p> <p>Avoid contact with skin.</p>

Risk Assessment

What other hazards could there be when carrying out flame tests?

e.g. Bunsen burner, broken glassware

What harm could these hazards cause?

Bunsen burners could cause burns.

Broken glassware could cause cuts.

How could we minimise these risks?

Use the safety flame when not using the Bunsen burner.

Tie hair back.

Tell the teacher if glassware is broken.

Important: Always tell the teacher straight away about cuts, burns or spills.

Risk Assessment

Complete the risk assessment.

Hazard	Harm it Can Do	How You Will Minimise the Risk
metal chloride solutions	It could cause irritation to the eyes or skin. It could be harmful to the environment.	Wear eye protection. Use a low concentration. Avoid contact with skin.
Bunsen burner	It could cause burns.	Turn the Bunsen burner to the safety flame when not being used. Tie hair back.
glassware	If broken, it could cause cuts.	Tell the teacher if something is broken.

Making a Flare

Carry out the flame tests and record your observations.

1. Dip a wooden splint into a test tube of a metal chloride solution, e.g. copper chloride.
2. Turn the Bunsen burner to the blue flame and carefully place the end of the splint with the metal chloride solution into the flame.
3. Write down any observations/colours in the results table.
4. Repeat with different metal chloride solutions.

Important: Wear eye protection.

Tell the teacher straight away about cuts, burns or spills.



Flame Tests Observations

Metal Chloride	Observations	Order (Brightest to Least Bright)
potassium chloride		
calcium chloride		
lithium chloride		
sodium chloride		
copper chloride		

Important: Wear eye protection.

**Tell the teacher straight away
about cuts, burns or spills.**



Conclusion

Which metal chloride should you use in the flare?



Why?

Class Results Tally Chart

Vote for your choice of metal chloride. Create a tally in the chart below.

Metal Chloride	Number of students who think this is the best for a flare.
potassium chloride	
calcium chloride	
lithium chloride	
sodium chloride	
copper chloride	

Which metal chloride does the class prefer? Why?

Plenary

Metal Chloride

Colour

**potassium
chloride**

crimson red

calcium chloride

orange-yellow

lithium chloride

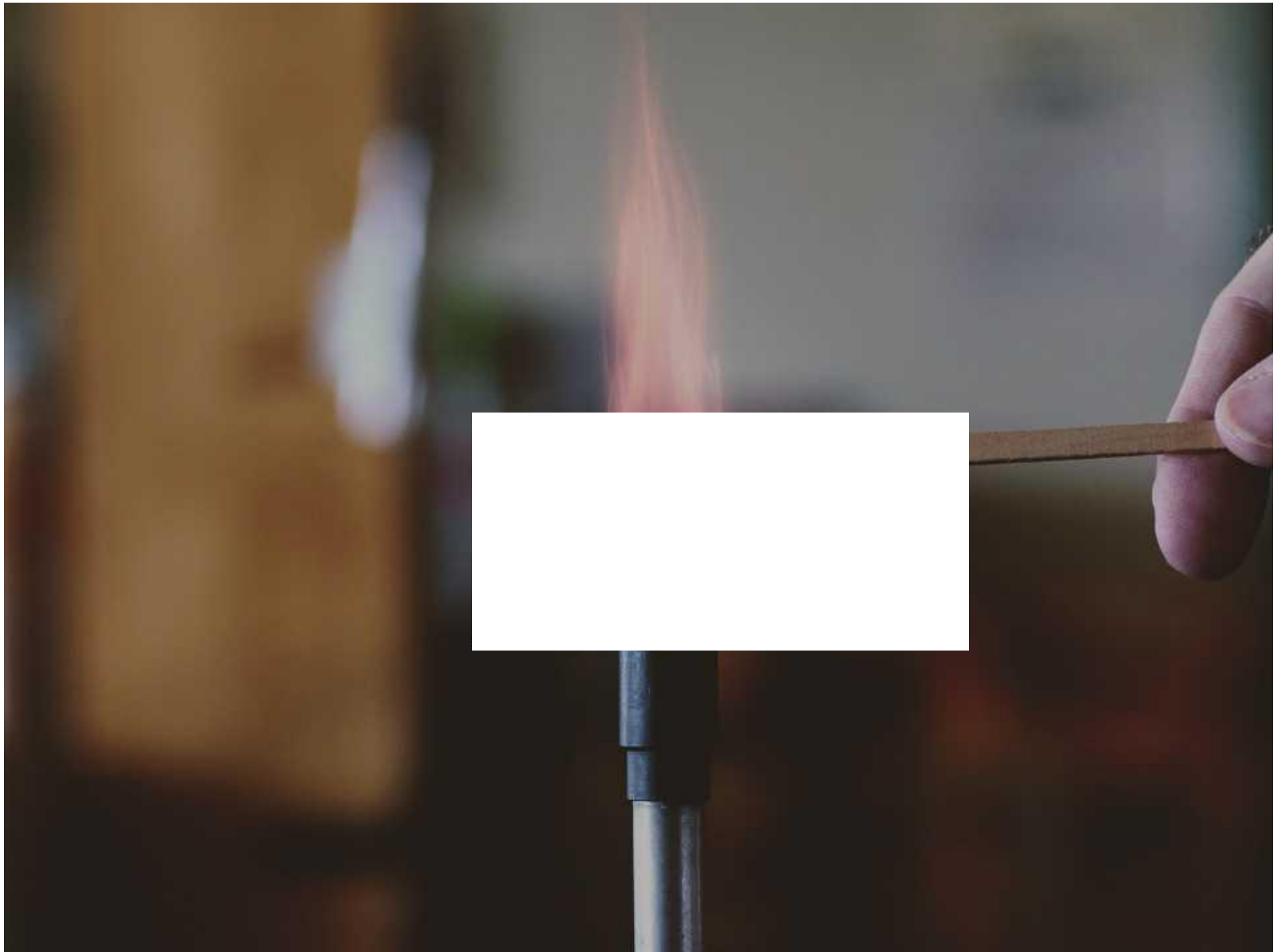
purple

sodium chloride

green

copper chloride

red-orange



Making a Flare

Teacher and Technician Notes

In the Making a Flare lesson within the Introduction to Science unit of work for year 7, students will carry out flame tests to identify the metal chloride which would make the best flare.

Safety Information

Some concentrated metal chloride solutions are irritants and harmful to the environment. For this reason, we suggest that you use metal chloride solutions with a concentration of 0.5 mol dm^{-3} . At this concentration, the metal chlorides we have suggested pose a low risk.

As with any practical activity you should remind students of the laboratory safety rules and ensure that students wear eye protection throughout this practical.

Equipment per Group

Bunsen burner

heatproof mat

wooden splints

test tube rack

test tubes containing small amounts of:

- 0.5 mol dm^{-3} calcium chloride solution
- 0.5 mol dm^{-3} copper chloride solution
- 0.5 mol dm^{-3} lithium chloride solution
- 0.5 mol dm^{-3} potassium chloride solution
- 0.5 mol dm^{-3} sodium chloride solution

Notes

Other metal salt solutions could be used if the above are not available but you should always check the suitability of the chemicals you plan to use.

The risk assessment example answers included within this lesson is not an exhaustive list of hazards, risks and precautions to minimise them. You and your students may wish to add to the suggestions provided in the PowerPoint and Answer Sheet for this lesson.

Disclaimer

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Making a Flare Teaching Ideas

Learning Objective:

To carry out flame tests and identify the best metal chloride to make a flare.

Success Criteria:

- To use a Bunsen burner safely during a practical.
- To carry out flame tests safely and make observations.
- To write a detailed method, including a risk assessment and come to a conclusion based on recorded observations.

Context

This lesson is part of the Introduction to Science unit of work for year 7 students. The lesson focuses on chemistry and using Bunsen burners to carry out flame tests. Students need to know how to use a Bunsen burner safely, so it is recommended that this lesson takes place after the [Using a Bunsen Burner](#) lesson in this unit of work.

Resources per group:

Bunsen burner, heatproof mat, five wooden splints, test tubes containing solutions of:

- potassium chloride
- calcium chloride
- lithium chloride
- sodium chloride
- copper chloride

eye protection

mini whiteboards (optional)

Starter

Chemical Reactions

How can you tell if a chemical reaction has occurred? Ask your students to write their answers on mini whiteboards or in their books. They can work in groups or independently. Ask them what they would see; what they would hear, what they would smell.

Main Activities

Everyday Uses of Chemistry

In groups, students discuss the uses of chemistry. Do they come up with examples that are related to biology or physics – can they explain the difference? Introduce them to flares and when/why they are used.

Demonstration: How to Carry Out a Flame Test

Demonstrate how to carry out a flame test. Remind students to pay close attention as they will be writing a plan including a method in their next activity of the lesson.

Method

After watching the demonstration of how to carry out a flame test, students identify the equipment needed for their investigation and write a method using the [Making a Flare Method Worksheet](#). A support version of this worksheet is available if appropriate for your students. The students could peer- or self-assess their methods using the prompts in the PowerPoint.

Risk Assessment

Students should be guided through identifying the hazards, the harm they can do and the precautions which should be taken in this practical activity. A recap of hazard symbols and a discussion of how to use equipment safely should take place. The lesson PowerPoint includes prompts to assist students in completing the risk assessment on the [Making a Flare Method Worksheet](#).

Making a Flare

Students carry out the practical in groups. Ensuring that all students are listening, make them aware of the health and safety rules. Students can record their observations on the [Making a Flare Method Worksheet](#), or alternatively, a separate [Flame Tests Observations Table](#) is provided.

Conclusion and Class Results

Ask each student to choose a metal chloride for a flare, giving a reason. As a class, students vote for their choice of metal chloride to be used in the flare. The class comes to a joint conclusion as to which metal chloride is the best for a flare.

Plenary

Everyday Uses of Chemistry

Complete the match-up activity on the PowerPoint matching metal chlorides to their flame test colours. Students could complete this activity on mini whiteboards or in their books.

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