



The Halogens

Teaching Ideas

Learning Objective:

To understand that there are patterns in the properties of the halogens.

Success Criteria:

- To identify the halogens on the periodic table.
- To describe how the properties of the halogens change as you move down the group.
- To predict the properties of a halogen based on its position in the periodic table.

Context

This is the sixth lesson in the KS3 Atoms and The Periodic Table unit of work. Previously, students have learnt about groups and trends in the periodic table. In lesson five, they applied that knowledge to look at trends in the alkali metals. In this lesson, they will use displacement reactions to identify the trend in the reactivity of the halogens.

Resources

Per group:

eye protection
pipettes ×6
white spotting tile
chlorine water
bromine water
iodine solution
potassium chloride
potassium bromide
potassium iodide

Starter

Group 7

The first slide of the PowerPoint presentation shows the periodic table and asks students to locate Group 7. If they cannot remember the location from the previous lessons they could look back through their notes.

The slide also asks them to make some predictions about the Group 7 elements. Students should be able to identify most of the elements in this group as non-metals. If they cannot remember specific properties, they should be able to tell you that they will all have similar properties since they are in the same group.

The following slides highlight Group 7 on the table and show that it is to the right of the stepped line, so the elements are non-metals. The slide asks them to recall the typical properties of non-metals as revision of the previous lessons. These properties are shown on the following slide. Students are then told that the elements in Group 7 are called the halogens.

Main Activities

Reactivity of Elements

The next couple of slides tell students what chemical reactions can tell us about the reactivity of elements. They are introduced to the fact that a chemical reaction is a process that involves rearrangement of atoms to produce new substances. They are then reminded how the reactivity of alkali metals changes as you move down the group and introduced to the aim of the practical. Students will investigate how reactivity changes as you move down Group 7.

The next few slides explain to students what a displacement reaction is. Diagrams are used to show clearly what happens when a more reactive element displaces a less reactive element. These are then linked to the solutions used in the practical.

Halogen Displacement Investigation

In this practical investigation, students will react chlorine water, bromine water and iodine solution with potassium halide salts and observe the colour change to identify when a reaction occurs. They can then order the three elements based on the trend in their reactivity.

The **Halogen Displacement Practical Pack** includes a **Method** sheet for students to use during the practical, along with **Teacher and Technician Notes** which includes safety information. A risk assessment is shown on the PowerPoint to facilitate discussion with students. However, it is the responsibility of the teacher to carry out an appropriate risk assessment for their class and setting.

The solutions that should be added to each well on the dimple tray are shown on a PowerPoint slide and you may want to go through this with students before they begin the practical. This slide also explains why you would not expect to see a reaction in the three wells where the same halogen is present in both solutions. The [Halogen Displacement Results Worksheet](#) describes how these can be used as colour controls, but you may also decide to go through this before the practical begins.

Students can record their results in the [Halogen Displacement Results Table](#), this is also shown on the PowerPoint. The expected results appear one at a time on each click, moving top to bottom down column one, then column two and three.

If this practical is not suitable for your group, then you could demonstrate the reactions under a visualiser. Alternatively, you can find videos of the reactions online by searching 'halogen/halide displacement reactions'. Students could complete the [Halogen Displacement Results Table](#) while watching the video.

Reactivity of Halogens

The results table is shown on the next slide and students are asked which halogen is the most reactive and how they know. These questions are also on the [Halogen Displacement Results Worksheet](#). An explanation is shown on a click. If students have found this difficult then it is worth spending some time supporting them to develop their answers. This will help them to describe their reasoning for the least reactive halogen on the next slide.

Trends in the Halogens

There are two versions of the [Trends in Group 7 Worksheet](#) for students to then complete. One version provides extra scaffolding for students. These sheets describe other trends in the group and ask students to make predictions using the data.

The answers to the questions are shown on the PowerPoint slides so that you can work through them afterwards if you choose. Students could self- or peer-assess their answers.

Plenary

Halogen Higher or Lower

Each slide shows a card for one halogen, starting with fluorine and moving down the group on the following slides. The card shows the symbol, atomic number and atomic mass at the top, then gives the atomic radius, melting point, boiling point and a description of the reactivity.

You will give students one of the categories, and they will indicate whether the next element you show will have a higher or lower value for that category. Students could shout out higher or lower, they could show thumbs up or thumbs down, or write higher on one side of a whiteboard and lower on the other. Move onto the next slide and see if they were correct.

For the first run-through, it will be useful to work through the elements in order, to reinforce the trends. However, you could repeat the game picking a card at random.

Disclaimer

We hope you find the information on our website and resources useful. This resource refers to the use of chemicals. The use of chemicals is potentially hazardous. It is your responsibility to assess whether it is safe to use chemicals in your classroom. You are responsible for ensuring the safe storage, usage, labelling and disposal of chemicals in accordance with COSHH regulations (or equivalent in the country in which you are teaching). We are not responsible for the health and safety of your group or environment and so, insofar as it is possible under the law, we cannot accept liability for any loss suffered by anyone due to the use, storage or disposal of chemicals or any other activity carried out as a result, whether directly or indirectly, of this resource. If you are unsure in any way, we recommend that you take guidance from a suitably qualified professional.