

Alkali metals, halogens and noble gases

Chemistry grades 9-10 (GCSE · IGCSE · O Level · Class 9-10) · Lab

Name: _____ Date: _____ Class: _____

Which halogen is the most reactive? You will mix three halogen solutions with three potassium halide solutions, record the colour changes, and use the pattern of displacement to place the halogens in order of reactivity.

Level: Chemistry grades 9-10 (GCSE · IGCSE · O Level · Class 9-10) · **Curriculum:** GCSE C1, IGCSE 9

Aim

To find the order of reactivity of chlorine, bromine and iodine by displacement reactions in solution.

Equipment

- Chlorine water, bromine water and iodine solution (dilute, prepared by the teacher)
- 0.1 mol/dm³ potassium chloride, potassium bromide and potassium iodide solutions
- Nine small test tubes and a rack, white tile
- Dropping pipettes and a marker

Safety

Safety

Wear goggles and gloves. Halogen solutions are toxic and irritate the skin and eyes, even when dilute. Work in a ventilated room, keep the tubes away from your face, and wash spills with plenty of water. Dispose of the waste as your teacher instructs.

Method

1. Label three tubes for each halogen.
2. Add 1 cm³ of potassium chloride, bromide and iodide solutions to the three tubes of each halogen.
3. Add 1 cm³ of one halogen solution to each of its three tubes. Shake gently.
4. Stand the tubes against the white tile and record any colour change.
5. Compare each tube with a control containing only the halogen solution and water.

	KCl	KBr	KI
chlorine water			
bromine water			
iodine solution			

1 cm³ potassium halide in each tube, then add 1 cm³ of the halogen solution

A 3 × 3 grid of tubes: halogen solutions down the side, potassium halides across the top.

Results

Halogen added	Potassium chloride	Potassium bromide	Potassium iodide
Chlorine water (pale green)	No change	Orange solution	Brown solution
Bromine water (orange-yellow)	No change	No change	Brown solution
Iodine solution (brown)	No change	No change	No change

Analysis questions

Question 1 Which reactions occurred

State which mixtures showed a reaction and which did not.

Question 2 Write the equations

Write balanced equations for the three reactions that occurred.

Question 3 Order of reactivity

Use the results to place the three halogens in order of reactivity, with the most reactive first.

Question 4 Explain with electrons

Use the number of shells to explain why chlorine is more reactive than iodine.

Question 5 Why use a control

Explain why a control tube with the halogen and water only is needed to judge a result such as iodine with potassium iodide.

Question 6 Make the tests fairer

Suggest two changes that would make the colour judgements more reliable.

Question 7 Predict for astatine

Predict whether iodine would displace astatine from sodium astatide, and explain your reasoning.