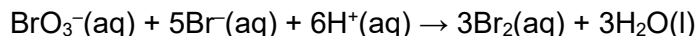


Testing for unsaturation with bromine – student sheet

Preparing a solution of bromine in hexane

Elemental bromine is formed by a reverse disproportionation reaction between bromate ions, bromide ions and acid:



The bromine is extracted into hexane in a plastic pipette which serves as a separating funnel. The resulting solution is decanted into a well-plate chamber and can then be used to test for unsaturation in organic compounds.

Instructions

1. Put ten drops of potassium bromate(V) solution into one well in a well-plate.
2. Add 20 drops of potassium bromide solution.
3. Add five drops of hydrochloric acid.
4. Leave for five minutes to allow the bromine to form fully.
5. Add hexane to the well until it is about half-full.
6. Using your plastic pipette, take up all the liquid in the well and invert the pipette. You should see two layers – the lower (aqueous) layer which should be coloured red-yellow by the bromine and the upper layer which should be colourless. Notice, too, the shape of the meniscus at the interface.
7. Gently flick the bulb of the pipette. This will mix the liquids and allow the bromine to be extracted into the upper hexane layer. Why?
8. When the upper layer is coloured red-yellow and the lower layer is colourless your extraction is complete.
9. Very carefully invert the pipette again and decant the lower aqueous layer into a well in your wellplate.
10. Into another well decant the upper layer of bromine dissolved in hexane. This is the solution you will use for carrying out tests for unsaturation.

Testing for unsaturation using bromine

The solution of bromine in hexane is used to detect whether an organic compound is unsaturated. The solution easily mixes with non-polar organic compounds such as cyclohexane, cyclohexene and limonene.

Instructions

1. Using a plastic pipette, add three drops of the bromine solution to each of the three wells in the well-plate.
2. Put three drops of each of the organic liquids under test in the wells and observe any changes.

Question

Which types of liquid decolourise bromide?

Health, safety and technical notes

1. Wear eye protection throughout. Gloves would be sensible.
2. Care should be taken to ensure the solvents do not shoot out of the pipettes when inverted.
3. Cyclohexane is highly FLAMMABLE, a skin and respiratory IRRITANT and TOXIC to aquatic life.
4. Cyclohexene is a highly FLAMMABLE liquid and vapour, HARMFUL if ingested, TOXIC in contact with skin and for aquatic life.
5. Limonene is FLAMMABLE as liquid and vapour, a skin IRRITANT and sensitiser and TOXIC to aquatic life.
6. Hexane is highly FLAMMABLE liquid and vapour, a skin and respiratory IRRITANT, and TOXIC to the reproductive system. It is also a specific target organ toxin for the heart, CNS and respiratory system.
7. Ensure the laboratory is well-ventilated.
8. To dispose of the bromine solution, add 2 mol dm^{-3} sodium carbonate solution until the colour is discharged – the solution can then be washed to waste with plenty of running water.