

# The formation of 2,4,6-trichlorohydroxybenzene by the reaction between hydroxybenzene and chlorine gas – teacher notes

## Topic

Reactions of organic molecules, reactions using chlorine.

## Timing

20 minutes

## Apparatus

- Eye protection
- Clear plastic sheet (eg OHP sheet)
- Plastic Petri dish (eg 5.5 cm diameter)
- Plastic pipette

## Chemicals

Solutions contained in plastic pipettes, see our standard health and safety guidance here <https://rsc.li/3LNbkfo>

- Bleach
- Hydrochloric acid, 1 mol dm<sup>-3</sup>
- Sodium hydroxide, 1 mol dm<sup>-3</sup>
- Hydroxybenzene (phenol)

## Method

Students cut off the end of the plastic pipette to make a reaction vessel for generating the chlorine gas using bleach and hydrochloric acid.

After about 15 min the lid is taken off the Petri dish and a strong antiseptic smell should be detected.

At the end of the experiment students add drops of sodium hydroxide solution to the hydroxybenzene (phenol)/TCP residue to dissolve it and then mop up the contents of the Petri dish with a tissue.

## Health, safety and technical notes

- Students must wear suitable eye protection (Splash resistant goggles to BS EN166 3).
- Hydroxybenzene (phenol) is toxic, corrosive and a mutagen: gloves should be worn (see CLEAPSS Hazard [HC070a](#)).
- Sodium hydroxide solution, NaOH (aq), 1 mol dm<sup>-3</sup>, is corrosive (see CLEAPSS Hazcard [HC091a](#)).
- Hydrochloric acid, HCl(aq), 1 mol dm<sup>-3</sup>, is low hazard (see CLEAPSS Hazcard [HC047a](#)).
- 2,4,6-trichlorohydroxybenzene is harmful if swallowed, irritant to skin, eyes and respiratory system and a probable carcinogen (category 2) – care should be taken to inhale only the smallest amount needed for identification.

- Household bleach solutions (containing sodium chlorate(I)/sodium hypochlorite) sold for the domestic market may be corrosive but is commonly more dilute and irritant. Check the label. Even quite dilute bleach is irritant if more than 0.15 M NaOCl. Some bleaches also contain detergents and thickening agents, which may cause excessive frothing in this experiment so choose a thin bleach.

Note that nowadays some commercially available bleaches do not contain any chlorine and are based on peroxy-compounds. They should not be used here.