Disappearing ink – teacher notes

Introduction
Students produce a solution in which the colour disappears due to an acid/base reaction.

Equipment
Apparatus
- Eye protection
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- Beaker, 100 cm^3
- Measuring cylinder, 10 cm^3
- Small paint brush to test the ink

Chemicals
- Ethanol
- Sodium hydroxide 0.4 mol dm^{-3}
- Thymolphthalein solution (50 per cent water, 50 per cent ethanol)

Health, safety and technical notes
- Read our standard health and safety guidance here https://rsc.li/3OEFuTD
- Always wear eye protection.
- Ethanol is highly flammable, see CLEAPSS Hazcard HC040a.
- Sodium hydroxide is an irritant, see CLEAPSS Hazcard HC091a.
- Thymolphthalein soluiton is flammable, see CLEAPSS Hazcard HC032.

Notes
- This ink is the same as those sold in trick and joke shops.
- The amount of indicator can be adjusted to give a deep blue colour.
- The compound produced, Na_2CO_3, is commonly called washing soda.
- Sodium hydroxide reacts with carbon dioxide in the air to form sodium carbonate.
- $2NaOH(aq) + CO_2(g) \rightarrow Na_2CO_3(aq) + H_2O(l)$
- Sodium carbonate is less basic than sodium hydroxide and causes the indicator to change from blue to colourless.
- The colourless range for thymolphthalein is below pH 9.3.
- The blue range is above pH 10.5 and the colour change takes place between these two.
- The alcohol evaporates and leaves a clear and colourless residue.

Answers
1. Carbon dioxide
2. Sodium hydroxide + carbon dioxide → sodium carbonate + water
3. $2NaOH + CO_2 \rightarrow Na_2CO_3 + H_2O$