Mandatory Experiment 7.5

The oxidation of phenylmethanol (benzyl alcohol) to benzoic acid with potassium manganate (VII) solution in alkaline conditions.

Student Material

Theory

A basic solution of potassium manganate (VII) solution can be used to oxidise benzyl alcohol to benzoic acid.

$$C_6H_5CH_2OH \xrightarrow{KMnO_4} C_6H_5COOH$$

The balanced equation for the reaction is:

$$3C_6H_5CH_2OH + 4KMnO_4 \longrightarrow 3C_6H_5COOH + 4MnO_2 + H_2O + 4KOH$$

Chemicals and apparatus

Potassium manganate (VII) Benzyl alcohol  Anhydrous sodium carbonate  Sodium sulfite  Hydrochloric acid conc  Deionised water	Safety glasses PVC gloves Water bath Conical flask Graduated cylinder Graduated disposable pipettes Buchner funnel

Procedure

<u>NB</u>: Wear safety glasses

To 1 ml of phenylmethanol in a conical flask add 25 ml saturated potassium permanganate solution and 0.5 g sodium carbonate. Heat on a water bath for 20 minutes. Cool the solution a little and acidify with concentrated hydrochloric acid. Add 20% sodium sulphite solution until the brown precipitate of manganese dioxide dissolves. Cool to room temperature, when a white crystalline precipitate of benzoic acid separates out.

Filter the crystals on a Buchner funnel. Wash the crystals with a small amount of cold water.

Teacher Material

Preparation

- Benzyl alcohol is flammable so a hot plate or mantle should be used as a heat source.
- The benzoic acid can be further purified by recrystallisation, and the purity of the salt can be tested by melting point.

Safety considerations

- Safety glasses must be worn.
- The use of gloves is essential.
- Hair should be tied back if necessary.

Chemical hazard notes

Potassium manganate (VII)  **:** Solid potassium manganate (VII) is a powerful oxidising agent and should be kept clear of any oxidisable substances. It is harmful and should not be allowed to be inhaled, ingested or come into contact with the skin.

Sodium sulphite.  Harmful if swallowed. Serious risk of damage to the eyes.

Sodium carbonate  is irritating to the eyes and skin, and its dust irritates the lungs. Wear eye protection.

Benzyl alcohol:  Hazardous in case of skin contact (irritant), of eye contact (irritant), of inhalation.

Hydrochloric acid:  May cause burns. The vapour is very irritating to the respiratory system. Solutions equal to and stronger than 6.5 M are **CORROSIVE** and those equal to and stronger than 2 M but weaker than 6.5 M are **IRRITANT**. It could be deemed sensible to label 1 M solutions as irritant as well.