Chlorine

Introduction

The method described here can be used to determine the free chlorine content of unknown solutions such as swimming pool water and is sensitive enough to measure the chlorine content of most domestic tap water

Background

When water is treated by chlorination, either in swimming pools or in the treatment of drinking water, it is present mainly as hypochlorous acid (HOCl). Depending on the pH there are also varying amounts of chlorine (Cl_2) and hypochlorite ions (ClO^-). These are the *free active chlorine* compounds in the water as opposed to the bound chlorine that has reacted with other compounds such as ammonia.
The free chlorine compounds react with potassium iodide to release iodine.

$$Cl_2 + 2KI \rightarrow I_2 + 2KCl$$

The intensity of the colour produced can be measured using the colorimeter (blue light) and compared with standards of known concentration to measure free chlorine.
The sensitivity of this method is increased by adding soluble starch solution which reacts with the iodine released giving an intense blue colour that can be measured using the green or red light on the colorimeter.

Preparing standard solutions of known chlorine concentration

Standard solutions can be prepared from household chlorine bleaches which typically contain 3-6% sodium hypochlorite (NaClO). We used 'Milton' sterilising fluid which is 2% sodium hypochlorite. To prepare a solution containing 8ppm (8mg/l) chlorine we diluted the Milton 1/100 then added 4.2cm^3 of this to 80 cm^3 distilled water. This was acidified by the addition of 0.5cm^3 of ethanoic acid and made up to a final volume of 100cm^3.
For other sources of chlorine divide 0.084 by the percentage concentration of sodium hypochlorite. This volume (cm^3) in 100cm^3 of distilled water acidified with 0.5cm^3 ethanoic acid will give a chlorine concentration of 8ppm (8mg/l). (This is best done in two steps, initially a 1% dilution so that a reasonable volume can be measured in preparing the final dilution.)

Test method

Add 2cm^3 of the sample to be tested to 0.2cm^3 of a 2% solution of soluble starch in 0.1M potassium iodide solution.
Read the absorbance with green light. *(See* Sample results *on the toolbar)*

More details, suggestions for investigations and sample results can be viewed on the Mystrica website, www.mystrica.com