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ANALYSIS OF BLEACH

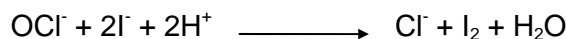
This activity assesses:

Unit: 6345 *Analyse spontaneous oxidation - reduction reactions* (Level 3).
Element: 1 Determine the concentration of an oxidant or reductant by titration.

CONDITIONS: Practical activity.

INSTRUCTIONS:

Commercial bleaches contain hypochlorite ions, OCl^- , which react with iodide ions, I^- , according to the equation below:



In the experiment excess potassium iodide is added to diluted bleach solution and the iodine formed is then titrated with standardised sodium thiosulfate solution. It reacts according to the equation below.



The concentration of hypochlorite ion in the bleach can be determined from the results of the titrations.

You will need the following:

25 mL pipette	diluted bleach
solid potassium iodide	conical flasks
starch indicator	dilute sulfuric acid (2 mol L^{-1})
wash bottle	pipette
pipette filler	standardised sodium thiosulfate (approx. 0.1 mol L^{-1})

Method

- A
1. Pipette 25 mL of the diluted bleach into a conical flask.
 2. Add about 0.5 g (an excess) of potassium iodide. Swirl well to dissolve.
 3. Add 5 mL of dilute sulfuric acid and mix.
 4. Titrate the liberated iodine with the standardised sodium thiosulfate solution until a pale yellow colour is obtained.
 5. Add starch solution and continue until the blue-black colour just disappears. Record your titre volume.
 6. Repeat this procedure until you have 3 concordant results.

Results

Volume of bleach = _____ mL

Concentration of sodium thiosulfate = _____ mol L⁻¹

Volume of sodium thiosulfate solution used (burette):

	Titration 1	Titration 2	Titration 3	Titration 4
Final burette reading, mL				
Initial burette reading, mL				
Volume used, mL				

1.1

Calculations

- B
1. Calculate the average volume of sodium thiosulfate solution used in the titration.
 2. Calculate the concentration (in mol L⁻¹) of OCl⁻ in the diluted bleach sample. (Show all working including how you have used the given equations to determine the relationship between the amount of S₂O₃²⁻ (mol) and amount of OCl⁻ (mol). Give your answer to three significant figures).

3 The diluted bleach has been prepared by taking 25 mL of commercial bleach and making up to 250 mL. Calculate the concentration of hypochlorite ions, OCl⁻, in the original undiluted bleach.

Assessment Schedule: Analysis of bleach

Unit Standard 6345

Task Number	Element and Performance Criteria	Evidence (The answers or performance expected from the students)	Judgement (A statement that defines the standard to be achieved)
A	1.1	If $0.100 \text{ mol L}^{-1} \text{ S}_2\text{O}_3^{2-}$ used and bleach is not old, volume range of $20.7\text{mL} < V < 21.7\text{mL}$ is expected.	Volume in range, ie accurate to plus or minus 0.5mL of known volume.
B	1.2	<p>1. eg $\text{av. vol S}_2\text{O}_3^{2-} = \frac{(21.10 + 21.15 + 21.20)}{3}$ $= 21.15 \text{ mL}$</p> <p>2. $n_{\text{I}_2} = n_{\text{OCl}^-}$ $n_{\text{I}_2} = \frac{1}{2} n_{\text{S}_2\text{O}_3^{2-}}$ So $n_{\text{OCl}^-} = \frac{1}{2} n_{\text{S}_2\text{O}_3^{2-}}$ $c \times 0.025 = \frac{1}{2} \times 0.100 \times 0.02115$ $c = 0.0423 \text{ mol l}^{-1}$ (diluted)</p> <p>3. Undiluted bleach conc. = 0.423 mol L^{-1} This gives 31.5g NaOCl per litre (manufacturers claimed minimum). Expected concentration range $0.414 \text{ mol L}^{-1} < \text{conc.} < 0.434 \text{ mol L}^{-1}$.</p>	<p>Calculation of average uses only concordant results.</p> <p>Correct ratio has been used in calculation and calculated answer (to 3 st) is correct for student titration volume used.</p>