

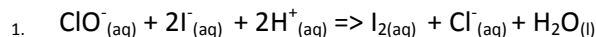
Friday Worksheet

Name:

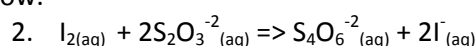
Volumetric analysis worksheet 8 chlorine investigation

A household cleaner was analysed for its available chlorine as hypochlorite (OCl^-)

A 20.0 mL sample of the bleach was placed in a 250 mL volumetric flask and made to the mark with distilled water. A 20.0 mL aliquot was taken from the volumetric flask and transferred to a conical flask. To the volumetric flask about 5 mL of acidified KI solution was added upon which the solution turned a dark brown colour due to the formation of I_2 according to the reaction below. The KI was added in excess.



The solution in the conical flask was titrated against a 0.100 M $\text{S}_2\text{O}_3^{2-}$ and an average titre of 8.51 mL was obtained. The thiosulfate ($\text{S}_2\text{O}_3^{2-}$) reacts with the iodine molecule according to the equation below.



- 1) Calculate the amount, in mol, of thiosulfate ($\text{S}_2\text{O}_3^{2-}$) in the average titre.

$$n_{\text{thiosulfate}} = C \times V = 0.100 \times 0.00851 = 8.51 \times 10^{-4}$$

- 2) Calculate the amount of I_2 present in the conical flask.

$$n_{\text{iodine}} = 8.51 \times 10^{-4} / 2 = 4.26 \times 10^{-4}$$

- 3) Calculate the amount of ClO^- in the 20.0 mL aliquot of the diluted bleach in the volumetric flask.

According to equation 1 for every mol of I_2 formed one mol of ClO^- is present.

$$\text{Mol of } \text{ClO}^- = 4.26 \times 10^{-4}$$

- 4) Calculate the amount, in mol, of OCl^- in the volumetric flask

$$4.26 \times 10^{-4} \times 250/20 = 5.33 \times 10^{-3}$$

- 5) Calculate the amount, in mol, of OCl^- in a 1 litre container of the bleach.

Keep in mind that all the OCl^- that was in the volumetric flask came from 20.0 mL of the bleach

The mol per litre of OCl^- is

$$\Rightarrow 5.33 \times 10^{-3} / 0.0200 = 0.266 \text{ M}$$

- 6) Find the mass of chlorine atoms present as OCl^- ions in one litre of bleach.

Mole of Cl atoms is equal to the mol of OCl^- ions

Mole of Cl atoms in one litre is 0.266

$$\text{Mass of chlorine atoms} = 0.266 \times 35.5 = 9.44 \text{ grams}$$

- 7) Calculate the amount of chlorine as a percentage (weight/volume)

The percentage weight per volume is the mass in grams of chlorine in 100 mL of solution.

$$(9.44/1000) \times 100 = 0.944\% \text{ w/v}$$