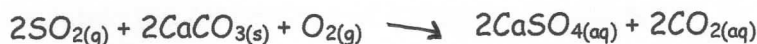


Further titration questions

1. What volume of 0.250molL^{-1} sodium hydroxide solution is required to neutralise 25.0mL of 0.150molL^{-1} sulfuric acid. 30 mL

2. A 25.0g measure of household ammonia was dissolved in water and made up to 500mL . A 25.0mL portion of this solution required 29.4mL of 0.250molL^{-1} sulfuric acid for neutralisation. What is the percentage by mass of ammonia in the cleaning fluid? $\text{Dilution} = 1.0\%$ $\text{Original solution} = 20.0\%$

3. Power stations emit exhaust gases containing the pollutant sulfur dioxide. One way of tackling the pollution is to pass the exhaust gases through an aqueous suspension of powdered limestone. The reaction can be represented by the following equation -



Gypsum is allowed to crystallise out as $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$

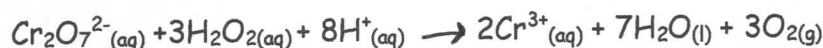
- a. A power station produces 55000 tonnes of gypsum per year ($1\text{ tonne} = 1000\text{kg}$). How many moles of gypsum is this? $3.20 \times 10^8 \text{ mol}$
- b. How many moles of sulfur dioxide were used in the formation of this amount of gypsum? $3.20 \times 10^8 \text{ mol}$

4. Bronze is an alloy of copper and tin. The problem is to find the percentage by mass of tin in the alloy. Potassium manganate(VII) oxidises tin(II) ions to tin(IV) ions. A 9.4g sample of powdered bronze was warmed with an excess of dilute sulfuric acid to convert the tin into tin(II) sulfate. After filtration, the solution was made up to 250mL .

In a titration 25.0mL of the solution of tin(II) sulfate required 19.0mL of 0.0200molL^{-1} potassium manganate(VII) solution for oxidation.

- a. Write a half equation for the oxidation of tin(II) to tin(IV).
 b. Write a half equation for the reduction of manganate(VII) to manganese(II).
 c. Combine the equations to give the equation for the reaction.
 d. Calculate the percentage by mass of tin in the alloy. 12.0%

5. Hydrogen peroxide reacts with acidified potassium dichromate(VI) as follows -



A solution containing 14.7gL^{-1} of potassium dichromate(VI) is reacted with 20.0mL of a 0.100mol L^{-1} solution of hydrogen peroxide. Calculate the volume of potassium dichromate(VI) solution required.

9.7 mL

