Exercise 1.55 – Further titration
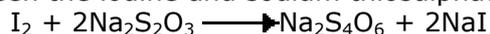
Q155-01 In an experiment to determine the concentration of chlorine dissolved in a sample of water, $50cm^3$ of 0.5 mol dm^{-3} potassium iodide solution was added to $25cm^3$ of chlorine solution. The chlorine reacted with the iodide ions releasing iodine. The iodine released was titrated by adding 0.02 mol dm^{-3} sodium thiosulphate solution using starch as an indicator near the end-point. 15.2 cm^3 was needed for complete reaction. Calculate the mumber of moles of sodium thiosulphate used.

Q155-02 If the reaction between the iodine and sodium thiosulphate is as follows:
$$I_2 + 2Na_2S_2O_3 \longrightarrow Na_2S_4O_6 + 2NaI$$
Calculate the moles of iodine reacting using the data from question 1

Q155-03 The iodine in question 2 was released from potassium iodide by reaction with chlorine according to the equation:
$$Cl_2 + 2KI \longrightarrow 2KCl + I_2$$
Using the data from the previous questions 1 and 2 calculate the moles of chlorine reacting with the iodide ions, and hence the concentration of the original chlorine solution.

Q155-04 If $20cm^3$ of 5.0 mol dm^{-3} sulphuric acid is added to 1.2 g of magnesium oxide, calculate the moles of sulphuric acid remaining after the reaction is complete:
$$MgO + H_2SO_4 \longrightarrow MgSO_4 + H_2O$$
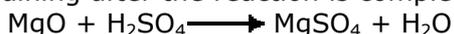
Q155-05 If $360cm^3$ of 2.0 mol dm^{-3} hydrochloric acid is added to 10.0 g of calcium oxide, calculate the moles of hydrochloric acid remaining after the reaction is complete:
$$CaO + 2HCl \longrightarrow CaCl_2 + H_2O$$
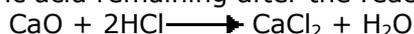
Q155-06 If $50cm^3$ of 2.0 mol dm^{-3} hydrochloric acid is added to 1.2 g of iron (Mr = 56), calculate the moles of hydrochloric acid remaining after the reaction is complete:
$$FeO + 2HCl \longrightarrow FeCl_2 + H_2O$$
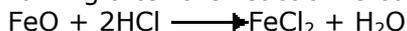
Q155-07 If the acid remaining in question 6 above, is diluted to $250cm^3$ in a volumetric (graduated) flask, calculate the volume of 0.1 mol dm^{-3} potassium hydroxide needed to completely neutralise a $25cm^3$ sample of the solution from the volumetric flask.

Q155-08 12.6 g of a copper/iron alloy was stirred into $100cm^3$ of 2 mol dm^{-3} sulphuric acid until no further reaction occurred. The iron dissolved in the sulphuric acid whereas the copper remained unreacted. The resultant solution was filtered and diluted to $250cm^3$ carefully ensuring that all of the washings were collected. $25cm^3$ samples of the resulting solution were titrated using 0.1 sodium hydroxide solution and the average titre was recorded as 18.0 cm^3. Calculate the mass of iron in the original sample.

Q155-09 A marble chip (mostly calcium carbonate) of mass 2.50g was reacted with $40cm^3$ of 1.50 mol dm^{-3} hydrochloric acid and the excess acid was titrated against 0.1 mol dm^{-3} sodium hydroxide solution, which required $15.4cm^3$ for neutralisation. Calculate the mass of calcium carbonate in the marble chip.

Q155-10 An unknown metal oxide sample of mass 2.06g was reacted with $50cm^3$ of 1.2 mol dm^{-3} hydrochloric acid and the excess acid titrated against 0.1 mol dm^{-3} sodium hydroxide solution. $81.8cm^3$ of the sodium hydroxide was required for neutralisation. Find the identity of the metal.