Exercise 5.11 – Reaction rate

Q511-01 Under certain conditions, the average rate of appearance of oxygen gas in the reaction:

$$2O_3(g) \longrightarrow 3O_2(g)$$

is 1.2 x 10-3 dm^3 sec^{-1}. What is the average rate, expressed in units of dm^3 sec^{-1}, for the disappearance of O_3?

Q511-02 For a specific reaction, A + 2B ⟶ 2C + D. The initial rate for the disappearance of reactant A was 2.0 x 10^{-2} mol dm^{-3} s^{-1}. What is the initial rate in terms of reactant B, in mol dm^{-3} s^{-1}?

Q511-03 For a specific reaction, AY_3 ⟶ 3Y + A. The initial rate for the disappearance of reactant AY_3 was 2.0 x 10^{-2} mol dm^{-3} s^{-1}. What is the initial rate of appearance of product Y, in mol dm^{-3} s^{-1}?

Q511-04 In a reaction to investigate the decomposition of hydrogen peroxide, 100cm^3 of oxygen was collected in exactly 20 seconds. What is the average rate of the reaction in terms of the oxygen gas (cm^3 s^{-1}).

Q511-05 In an experiment to determine the effect of temperature on reaction rate, 2-chloropropane was hydrolysed in a water/ethanol mixture according to the equation:

$$C_3H_7Cl + H_2O \longrightarrow C_3H_7OH + HCl$$

and the pH measured electronically. After 10 minutes the pH of a 100cm^3 water/ethanol sample had changed from 7.00 to pH 3.00. Calculate the average rate of disappearance of the 2-chloropropane over the first 10 minutes.

Q511-06 If the average rate of a reaction with respect to a reactant A, over the first 100s is 1.2 x 10^{-3} mol dm^{-3} s^{-1}, calculate the concentration of A after 100 seconds if the initial concentration of A was 0.2 mol $dm^{-3.}$

Q511-07 In an iodine clock reaction the iodine formed in a slow reaction is absorbed by a fixed amount of sodium thiosulphate solution until all the thiosulphate ions are used up. At this point the iodine can form a deep blue/black complex with the starch indicator that is present. If 20cm^3 of 0.2 mol dm^{-3} sodium thiosulphate is used up in 80 seconds, what is the average rate of disappearance of the thiosulphate?

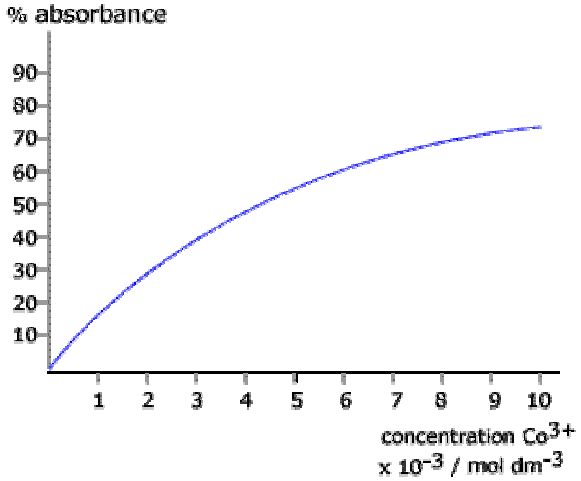
Q511-08 In the clock reaction in question 7 above the iodine reacts with the sodium thiosulphate according to the equation:

$$2S_2O_3^{2-} + I_2 \longrightarrow S_4O_6^{2-} + I^-$$

What is the average rate of production of iodine in the reaction discussed in question 7?

Exercise 5.11 – Reaction rate

Q511-09 The formation of green cobalt (III) ions in the cobalt (II) catalysed reaction between sodium potassium tartrate and hydrogen peroxide was followed by colorimetry using a calibration curve. After 60 seconds the absorbance of the solution was recorded at 50%. Use the calibration curve below to calculate the average rate over the first 60 seconds.



Q511-10 In an experiment to investigate the effect of particle size on rate of reaction, some marble chips were placed in 200cm^3 of 2M hydrochloric acid on a balance and readings taken every 10 seconds. The reaction produced carbon dioxide gas and the balance reading fell as the reaction proceeded. After 100 seconds the balance reading had fallen by 2.74g. Use this infomation to calculate the rate of reaction in terms of the concentration of hydrochloric acid over the first 100 seconds.
