InkChemistry

QUESTION WORKBOOK

Measuring the rate of a reaction

Kinetics · Unit C05

AQA 3.1.5.3 (RP3) · OCR A 3.2.2; PAG 9, PAG 10

15 questions · 46 marks

NAVY SCREEN EDITION

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SECTION A · Short, 1 to 2 marks

A1 MR-Q10

Suggest an improvement to the disappearing-cross method that removes the need to judge the end point by eye, and explain how it works. [2]

A2 MR-Q12

Suggest why the reaction between bromine water and methanoic acid, in which the orange colour of bromine fades, could be followed with a colorimeter. [2]

A3 MR-Q15

Explain why a loose plug of cotton wool is placed in the neck of the flask when following the reaction of marble with acid by mass loss. [2]

A4 MR-Q20

Calculate the percentage uncertainty in a mass loss of 0.18 g found as the difference between two readings on a digital balance that reads to 0.01 g. [2]

SECTION B · Standard, 3 to 5 marks

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B1 MR-Q5 Calculate 1/t for two runs of the disappearing-cross experiment in which the cross disappeared after 47 s and after 18 s, and the factor by which the rate increased, explaining why 1/t can be used as a measure of the rate. [4]

B2 MR-Q19 Explain why, when the effect of thiosulfate concentration is investigated by the disappearing-cross method, water is added so that the total volume is the same in every run, and give the volumes of 0.050 mol dm^{-3} sodium thiosulfate solution and of water needed to make 50 cm^3 of solution of concentration 0.020 mol dm^{-3}. [4]

B3 MR-Q2 Identify the precipitate and the hazardous gas formed when sodium thiosulfate solution reacts with dilute hydrochloric acid, and give one precaution against the gas. [3]

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B4 MR-Q4 Explain why the reaction of 0.10 g of magnesium with excess hydrochloric acid cannot be followed by mass loss on a balance that reads to 0.01 g. $Mg(s) + 2HCl(aq) \rightarrow MgCl_2(aq) + H_2(g)$. [3]

B5 MR-Q6 Calculate the volume of carbon dioxide, at room temperature and pressure, given off when 0.500 g of calcium carbonate reacts with excess hydrochloric acid, and state whether it fits in a 100 cm^3 gas syringe. Mr of $CaCO_3$ = 100.1; molar volume 24.0 $dm^3\ mol^{-1}$. [3]

B6 MR-Q9 Explain why, in the thiosulfate practical, both solutions are brought to temperature separately before mixing, and why the temperature of the mixture is measured at the end of each run. [3]

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B7 MR-Q11 Suggest a method for following how the rate of reaction between zinc granules and dilute sulfuric acid changes with time, naming the apparatus and the measurements. [3]

B8 MR-Q16 Give three variables that must be controlled when investigating the effect of temperature on the rate of the thiosulfate and acid reaction. [3]

B9 MR-Q17 Outline the difference between continuous monitoring and a method timed to an end point, giving an example of each. [3]

B10 MR-Q23 Show that the mean rate of production of hydrogen is 5.0×10^{-5} mol s^{-1} when 48.0 cm^3 of the gas, measured at room temperature and pressure, is collected in the first 40 s of the reaction of magnesium with hydrochloric acid. Molar gas volume = 24.0 dm^3 mol^{-1}. [3]

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SECTION C · Long, 6 marks or more

C1 MR-Q8

Describe how to investigate the effect of temperature on the rate of the reaction between sodium thiosulfate solution and dilute hydrochloric acid. [6]

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