InkChemistry

QUESTION WORKBOOK

Finding orders from initial rates, half-lives and graphs

Rate equations · Unit C09

AQA 3.1.9.2, RP7 · OCR A 5.1.1 (b) to (e); PAG 9, PAG 10

14 questions · 42 marks

NAVY SCREEN EDITION

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SECTION A · Short, 1 to 2 marks

A1 FOI-Q8
Explain why samples withdrawn from the propanone and iodine reaction are run into sodium hydrogencarbonate solution before they are titrated. [2]

A2 FOI-Q12
Suggest why two runs of the same initial-rates experiment, one done in the morning and one in a warm afternoon laboratory, gave different values of k, and how the method could be improved. [2]

A3 FOI-Q17
Give two methods of continuous monitoring, naming the quantity measured in each. [2]

A4 FOI-Q19
Suggest a continuous-monitoring method for the hydrolysis $(CH_3)_3CCl(aq) + H_2O(l) \rightarrow (CH_3)_3COH(aq) + H^+(aq) + Cl^-(aq)$, and why it would follow the reaction. [2]

SECTION B · Standard, 3 to 5 marks

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B1 FOI-Q14 Compare following the iodine concentration in the propanone reaction with a colorimeter and by titration of quenched samples. [4]

B2 FOI-Q2 Calculate the rate constant of a first-order reaction whose half-life is 34 s, and the time taken for the reactant's concentration to fall to one eighth of its starting value. [3]

B3 FOI-Q6 Explain why 1/t, where t is the time for the colour to appear in a clock reaction, can be used as a measure of the initial rate. [3]

B4 FOI-Q7 Explain why propanone and hydrochloric acid are used in large excess when the reaction of propanone with iodine is followed with a colorimeter. [3]

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B5 FOI-Q9 Explain why a run of the acid-catalysed reaction of propanone with iodine, in which the iodine concentration falls by the same amount in every minute until the iodine is used up, shows that the reaction is zero order with respect to iodine. [3]

B6 FOI-Q11 Suggest how the decomposition of hydrogen peroxide, catalysed by manganese(IV) oxide, could be followed by continuous monitoring to find the order with respect to hydrogen peroxide. [3]

B7 FOI-Q13 Suggest why a student who doubled [A] and [B] together in a second run could not deduce either order from those two runs alone, and what further run is needed. [3]

B8 FOI-Q18 Calculate the rate constant k in rate = $k[CH_3COCH_3][H^+]$ at 35 °C, given that a run with propanone at 1.00 mol dm^{-3} and H^+ at 0.500 mol dm^{-3}, both in large excess, loses iodine at a steady 2.5×10^{-5} mol dm^{-3} s^{-1}. [3]

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B9 FOI-Q20 Explain why a reaction with rate = k[A][B] shows a constant half-life for A when B is present in a hundredfold excess, although the reaction is second order overall. [3]

SECTION C · Long, 6 marks or more

C1 FOI-Q10 Describe how to find the order with respect to propanone in the acid-catalysed reaction of propanone with iodine, using a colorimeter. [6]

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