Exercise 5.44 – Factors affecting reaction rate - summary

Q544-01 For irreversible reactions, the rate will be affected by changes in all of these factors except

A. temperature.
B. concentration of reactants.
C. presence of a catalyst.
D. concentration of products.

Q544-02 The rate of the reaction: $2NO + Cl_2 \longrightarrow 2NOCl$ is given by the rate equation, rate = $k[NO]^2[Cl_2]$. The value of the rate constant can be increased by:

A. increasing the concentration of the NO.
B. increasing the concentration of the Cl_2.
C. increasing the temperature.
D. doing all of these.

Q544-03 A small increase in temperature often causes a large increase in the rate of a chemical reaction. This effect is best attributed to:

A. a decrease in the activation energy of the reaction
B. more frequent collisions at the higher temperature
C. the occurrence of more collisions with the needed energy
D. different reaction pathways at the higher temperature

Q544-04 Zinc metal reacts with excess HCl according to the equation:

$$Zn(s) + 2H^+(aq) + 2Cl^-(aq) \longrightarrow Zn^{2+}(aq) + 2Cl^-(aq) + H_2(g)$$

Which of the following change will increase the rate of evolution of H_2?

I. using zinc dust in place of chunks
II. using 2 M HCl in place of 1 M HCl
III. using 200 mL of 1 M HCl in place of 100 mL

A. I only
B. I and II only
C. II and III only
D. I, II, and III

Q544-05 Ingold was awarded a Nobel Prize for his investigations into the kinetics of the hydrolysis of bromoalkanes in alkaline aqueous ethanol.

$$RBr + OH^- \longrightarrow ROH + Br^-$$

He obtained the following rate constants for the hydrolysis of bromoalkanes.

-	CH_3Br	C_2H_5Br	$CH_3CHBrCH_3$	$(CH_3)_3CBr$
First order	-	-	2.4×10^4	1.0×10^2
Second order	2.1×10^2	7.1×10^3	4.7×10^5	-

Deduce the initial rate of hydrolysis of bromoethane, if 50 cm^3 of a 0.1 mol dm^{-3} ethanolic solution of bromoethane is completely mixed with 50 cm^3 of alkaline aqueous ethanol, which has a concentration of 0.05 mol dm^{-3} with respect to hydroxide ions.

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Q544-06 A small increase in temperature often produces a large increases in the rate of a chemical reaction because it:

A. decreases the activation energy of the reaction.
B. increases the effectiveness of the collisions between the reactant molecules
C. decreases the number of collisions per second between the reactant molecules
D. decreases the volume of the solution, altering the concentrations of the reactants.

Q544-07 The reaction between nitrogen and oxygen in the atmosphere under normal conditions is extremely slow. Which statement best explains this?

A. The concentration of oxygen is much lower than that of nitrogen
B. The molar mass of nitrogen is less than that of oxygen
C. The frequency of collisions between nitrogen and oxygen molecules is lower that that between nitrogen molecules themselves
D. Very few nitrogen and oxygen molecules have sufficient energy to react

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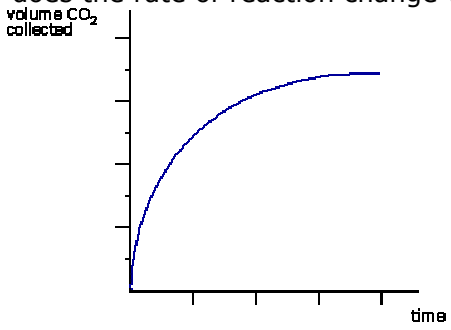
Q544-08 The rate of the reaction of a strip of magnesium ribbon and 50cm3 of 1.0 mol dm^{-3} HCl is determined at 25ºC. In which case would both new conditions contribute to an increase in rate?

A. Mg powder and 100cm^3 of 1 mol dm^{-3} HCl
B. Mg powder and 100cm^3 of 0.8 mol dm^{-3} HCl
C. 100cm^3 of 1 mol dm^{-3} HCl at 30ºC
D. 50cm^3 of 1.2 mol dm^{-3} HCl at 30ºC

Q544-09 Doubling which of the following will double the rate of a first order reaction?

A. Concentration of the reactant
B. Size of the solid particles
C. Volume of the solution in which the reaction is carried out
D. Activation energy

Q544-10 The curve in the diagram is obtained for the reaction of an excess of $CaCO_3$ with hydrochloric acid. How and why does the rate of reaction change with time?



	Rate of reaction	Reason
A.	decreases	HCl becomes more dilute
B.	decreases	The pieces of $CaCO_3$ become smaller
C.	increases	The temperature increases
D.	increases	The CO_2 produced acts as a catalyst