Summary Quiz (Chapter 42)

Section A: Multiple Choice

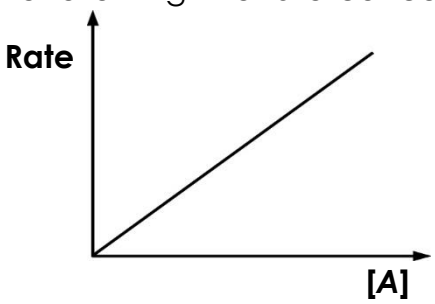
1. Which of the following statements about the rate constant is INCORRECT?
   A. It is a constant value at a certain temperature.
   B. The value of rate constant increases with the temperature of the system.
   C. The value of rate constant increases with the concentration of reactants.
   D. A larger value of rate constant indicates a faster reaction.

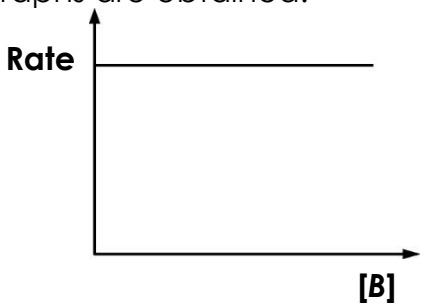
2. Which of the following statements about a zeroth order reaction is INCORRECT?
   A. The rate of reaction is equal to the rate constant.
   B. The concentration of the reactant decreases uniformly over time.
   C. The rate-concentration graph gives a horizontal line.
   D. An increase in concentration of reactant increases the rate of reaction.

3. A student carried out experiments to find the rate equation of the following reaction:

   $A(aq) + 2B(aq) \longrightarrow C(aq)$

   The following two rate-concentration graphs are obtained.



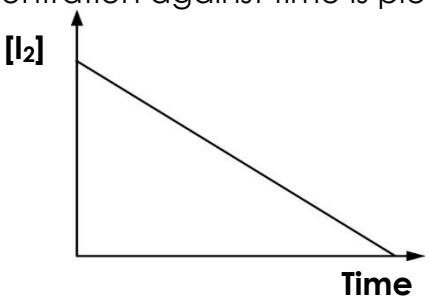


   Which of the following is the rate equation for the reaction?
   A. Rate = $k[A][B]$
   B. Rate = $k[A]$
   C. Rate = $k[A]^2[B]$
   D. Rate = $k[A]^2$

Questions 4 and 5 refer to the following reaction:

$CH_3COCH_3 + I_2 \longrightarrow CH_3COCH_2I + HI$

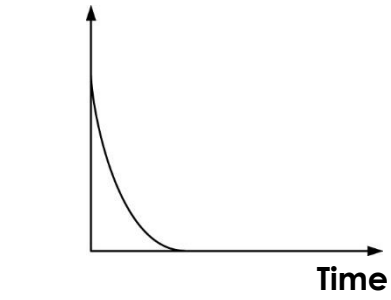
The change of iodine concentration against time is plotted as follows:



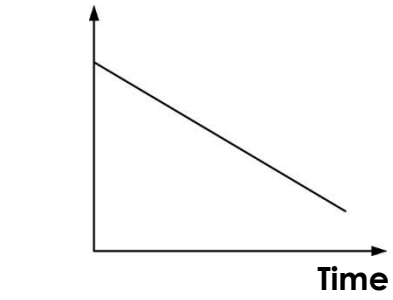
4. The graph shows that the rate of the above reaction is
   A. directly proportional to $[I_2]$.
   B. inversely proportional to $[I_2]$.
   C. directly proportional to log $[I_2]$.
   D. independent of $[I_2]$.

5. When fixing the concentration of iodine but varying the concentration of propanone, it is found that the reaction is first order with respect to propanone. Which of the following graphs is correct?

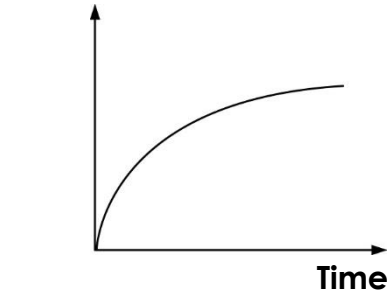
A.



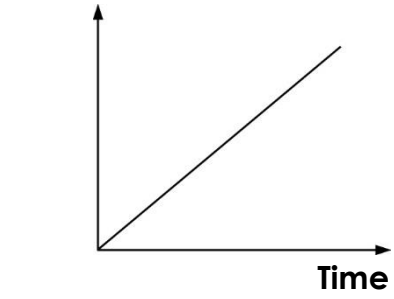
B.



C.



D.



Questions 6 and 7 refer to the following reaction:

$2Na_2S_2O_3 + I_2 \longrightarrow Na_2S_4O_6 + 2NaI$

6. Which of the following methods can be used to follow the progress of the reaction?
   A. Measure the change in mass of the reaction mixture
   B. Measure the change in pressure of the reaction system
   C. Measure the change in colour intensity of the reaction mixture
   D. Measure the change in pH of the reaction mixture

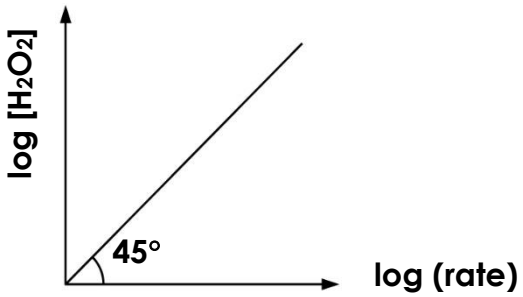
7. You are given some information about the above reaction at 298 K:

Experiment	Initial concentration (mol dm^{-3})		Initial rate (mol dm^{-3} s^{-1})
	[I_2]	[$S_2O_3^{2-}$]	
1	0.01	0.01	0.0004
2	0.01	0.02	0.0004
3	0.02	0.01	0.0008

Which of the following is the rate equation for the reaction?

A. Rate = $k[I_2]$
B. Rate = $k[I_2][S_2O_3^{2-}]$
C. Rate = $k[S_2O_3^{2-}]$
D. Rate = $k[I_2]^2[S_2O_3^{2-}]$

8. A student investigated the rate of decomposition of H_2O_2. He varied the initial concentration of H_2O_2 and measured the initial rate of reaction. The result was plotted below:



What is the rate equation for the decomposition?

A. Rate = k
B. Rate = $k[H_2O_2]$
C. Rate = $k[H_2O_2]^2$
D. Rate = $[H_2O_2]^3$

Section B: Structural Question

You are given some information about the following reactions at 273 K.

$A \longrightarrow$ products

Experiment	Initial [A] (mol dm^{-3})	Initial rate (× 10^{-4} mol dm^{-3} s^{-1})
1	0.5	1.5
2	1.0	6.0
3	2.0	13.5

(a) Deduce the order of reaction with respect to A and write the rate equation for the reaction.

(b) Calculate the rate constant of the reaction at 273 K.

(c) Sketch a graph to show the change in rate against [A].

(d) State and explain the effect of increasing the concentration of A on the value of the rate constant.

The End

Suggested Answer

Section A

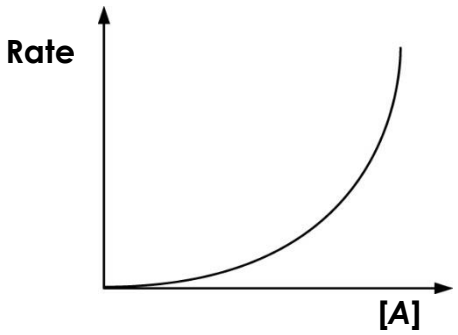
1.	C	5.	A
2.	D	6.	C
3.	B	7.	A
4.	D	8.	B

Section B

(a) From experiments 1 and 2, the initial rate quadrupled when [*A*] was doubled.
Hence, the order of reaction with respect to *A* is 2.
Rate equation of the reaction is rate = $k[A]^2$

(b) Use the information given from experiment 1,
k = 1.5 x 10^{-4} mol dm^{-3} s^{-1} / (0.5 mol dm^{-3})^2 = 6.0×10^{-4} mol^{-1} dm^3 s^{-1}

(c)



(d) The value of rate constant remains unchanged.
The rate constant depends on temperature but not the concentration of *A*.

The End