CHEMISTRY

BOOKS - SURA CHEMISTRY (TAMIL ENGLISH)

CHEMICAL KINETICS

Evaluation Choose The Correct Answer

1. For a first order reaction $A \rightarrow B$ the rate constant is $\mathrm{x\ min}^{-1}$. If the initial concentration of A is 0.01 M, the concentration of A after one hour is given by the expression.

A. $0.01e^{-x}$

B. $1 \times 10^{-2}\left(1 - e^{-60x}\right)$

C. $\left(1 \times 10^{-2}\right)e^{-60x}$

D. none of these

Answer: C

Watch Video Solution

2. Azero order reaction $X \rightarrow$ Product, with an initial concentration 0.02 M has a half life of 10 min. If one starts with concentration 0.04 M, then the half life is

A. 10 s

B. 5 min

C. 20 min

D. cannot be predicted using the given information

Answer: C

Watch Video Solution

3. Among the following graphs showing variation of rate constant with temperature (T) for a reaction the one that exhibits Arrhenius behavior over the eniture temperature range is .....

A. 

B. 

C. 

D. 

Answer: B

Watch Video Solution

4. For a first order reaction $A \rightarrow$ product with initial concentration $xmolL^{-1}$, has a half life period of 2.5 hours. For the same reaction with initial concentration $\left(\frac{x}{2}\right)\mathrm{mol\ L^{-1}}$ the half life is

A. (2.5×2) hours

B. $\left(\frac{2.5}{2}\right)$ hours

C. 2.5 hours

D. Without knowing the rate constant, $t_{1/2}$ cannot be determined from the given data

Answer: D

Watch Video Solution

5. For the reaction, $2NH_3 \rightarrow N_2 + 3H_2$

if $\frac{-d[NH_3]}{dt} = k_1[NH_3]$,

$\frac{d[N_2]}{dt} = k_2[NH_3]$, $\frac{d[H_2]}{dt} = k_3[NH_3]$

then the relation between k_1, k_2 and k_3 is

A. $k_1 = k_2 = k_3$

B. $k_1 = 3k_2 = 2k_3$

C. $1.5k_1 = 3k_2 = k_3$

D. $2k_1 = k_2 = 3k_3$

Answer: C

Watch Video Solution

6. The decomposition of phosphine (PH_3) on tungsten at low pressure is a first order reaction. It is because the

A. rate is proportional to the surface coverage

B. rate is inversely proportional to the surface coverage

C. rate is independent of the surface coverage

D. rate of decomposition is slow

Answer: A

Watch Video Solution

7. For a reaction Rate $= \mathrm{k}\,[\mathrm{acetone}]^{\frac{3}{2}}$ then unit of rate constant and rate of reaction respectively is

A. $\left(\mathrm{mol\,L^{-1}}s^{-1}\right), \left(\mathrm{mol}^{\frac{-1}{2}}L^{\frac{1}{2}}s^{-1}\right)$

B. $\left(\mathrm{mol}^{\frac{-1}{2}}L^{\frac{1}{2}}s^{-1}\right), \left(\mathrm{mol\,L^{-1}}s^{-1}\right)$

C. $\left(\mathrm{mol}^{\frac{1}{2}}L^{\frac{1}{2}}s^{-1}\right), \left(\mathrm{mol\,L^{-1}}s^{-1}\right)$

D. $\left(\mathrm{mol\,L\,s^{-1}}\right), \left(\mathrm{mol}^{\frac{1}{2}}L^{\frac{1}{2}}s\right)$

Answer: B

Watch Video Solution

8. The addition of a catalyst during a chemical reaction alters which of the following quantities ?

A. Enthalpy

B. Activation energy

C. Entropy

D. Internal energy

Answer: B

Watch Video Solution

9. Consider the following statements :

(i) increase in concentration of the reactant increases the rate of a zero order reaction.

(ii) rate constant k is equal to collision frequency A if $E_a = 0$

(iii) rate constant k is equal to collision frequency A if $E_a = ^\circ$

a plot of ln (k) vs T is a straight line.

(v) a plot of ln (k) vs $\left(\frac{1}{T}\right)$ is a straight line with a positive slope.

Correct statements are

A. (ii) only

B. (ii) and (iv)

C. (ii) and (v)

D. (i), (ii) and (v)

Answer: A

View Text Solution

10. In a reversible reaction, the enthalpy change and the activation energy in the forward direction are respectively $-\mathrm{x}\ \mathrm{kJ\ mol^{-1}}$ and $\mathrm{y\ kJ\ mol^{-1}}$. Therefore, the energy of activation in the backward direction is

A. $(y-x)\mathrm{kJ\ mol^{-1}}$

B. $(x+y)\mathrm{J\ mol^{-1}}$

C. $(x-y)\mathrm{kJ\ mol^{-1}}$

D. $(x+y)\times 10^{3}\mathrm{J\ mol^{-1}}$

Answer: D

Watch Video Solution

11. What is the activation energy for a reaction if its rate doubles when the temperature is raised from 200 K to 400 K ? $\left(R = 8.314 JK^{-1} mol^{-1}\right)$

A. $234.65 \text{kJ mol}^{-1} K^{-1}$

B. $434.65 \text{kJ mol}^{-1} K^{-1}$

C. $434.65 \text{J mol}^{-1} K^{-1}$

D. $334.65 \text{J mol}^{-1} K^{-1}$

Answer: C

Watch Video Solution

12. For a first order reaction, the rate constant is 6.909min^{-1}, the time taken for 75% conversion in minutes is

A. $\left(\frac{3}{2}\right)\log 2$

B. $\left(\frac{2}{3}\right)\log 2$

C. $\left(\frac{3}{2}\right)\log\left(\frac{3}{4}\right)$

D. $\left(\frac{2}{3}\right)\log\left(\frac{4}{3}\right)$

Answer: B

Watch Video Solution

13. In a first order reaction $x \rightarrow y$, if k is the rate constant and the initial concentration of the reactant x is 0.1 M, then, the half life is

A. $\left(\frac{\log 2}{k}\right)$

B. $\left(\frac{0.693}{(0.1)k}\right)$

C. $\left(\frac{In2}{k}\right)$

D. none of these

Answer: C

Watch Video Solution

14. Assertion : rate of reaction doubles when the concentration of the reactant is doubles if it is a first order reaction.

Reason : rate constant also doubles

A. Both assertion and reason are true and reason is the correct explanation of assertion.

B. Both assertion and reason are true but reason is not the correct explanation of assertion.

C. Assertion is true but reason is false.

D. Both assertion and reason are false.

Answer: C

Watch Video Solution

15. The rate constant of a reaction is $5.8 \times 10^{-2} s^{-1}$. The order of the reaction is

A. First order

B. zero order

C. Second order

D. Third order

Answer: A

Watch Video Solution

16. For the reaction $N_2O_5(g) \rightarrow 2NO_2(g) + \frac{1}{2}O_2(g)$, the value of rate of disappearance of N_2O_5 is given as $6.5 \times 10^{-2} \text{mol L}^{-1}s^{-1}$. The rate of formation of NO_2 and O_2 is given respectively as

A. $\left(3.25 \times 10^{-2} \text{mol L}^{-1}s^{-1}\right)$ and $\left(1.3 \times 10^{-2} \text{mol L}^{-1}s^{-1}\right)$

B. $\left(1.3 \times 10^{-2} \text{mol L}^{-1}s^{-1}\right)$ and $\left(3.25 \times 10^{-2} \text{mol L}^{-1}s^{-1}\right)$

C. $\left(1.3 \times 10^{-1} \text{mol L}^{-1}s^{-1}\right)$ and $\left(3.25 \times 10^{-2} \text{mol L}^{-1}s^{-1}\right)$

D. none of these

Answer: C

Watch Video Solution

17. During the decomposition of H_2O_2 to give dioxygen, 48 g O_2 is formed per minute at certain point of time. The rate of formation of water at this point is

A. 0.75mol min^{-1}

B. 1.5mol min^{-1}

C. 2.25mol min^{-1}

D. 3.0mol min^{-1}

Answer: D

Watch Video Solution

18. If the initial concentration of the reactant is doubled, the time for half reaction is also doubled. Then the order of the reaction is

A. Zero

B. one

C. Fraction

D. none

Answer: A

Watch Video Solution

19. In a homogeneous reaction

$A \rightarrow B + C + D$, the initial pressure was P_0 and after time t it was P. Expression for rate constant in terms of P_0, P and t will be .....

A. $k = \left(\frac{2.303}{t}\right)\log\left(\frac{2P_0}{3P_0 - P}\right)$

B. $k = \left(\frac{2.303}{t}\right)\log\left(\frac{2P_0}{P_0 - P}\right)$

C. $k = \left(\frac{2.303}{t}\right)\log\left(\frac{3P_0 - P}{2P_0}\right)$

D. $k = \left(\frac{2.303}{t}\right)\log\left(\frac{2P_0}{3P_0 - 2P_0}\right)$

Answer: A

Watch Video Solution

20. If 75% of a first order reaction was completed in 60 minutes, 50% of the same reaction under the same conditions would be completed in

A. 20 minutes

B. 30 minutes

C. 35 minutes

D. 75 minutes

Answer: B

Watch Video Solution

21. The half life period of a radioactive element is 140 days. After 560 days, 1 g of element will be reduced to

A. $\left(\frac{1}{2}\right)g$

B. $\left(\frac{1}{4}\right)g$

C. $\left(\frac{1}{8}\right)g$

D. $\left(\frac{1}{16}\right)g$

Answer: D

Watch Video Solution

22. The correct difference between first and second order reactions is that

A. A first order reaction can be catalysed , a second order reaction cannot be catalysed.

B. The half life of a first order reaction does not depend on $[A_0]$, the half life of a second order reaction does depend on $[A_0]$.

C. The rate of a order reaction does not depend on reactant concentrations, the rate of a second order reaction does depend on reactant concentrations.

D. The rate of a first order reaction does depend on reactant concentrations , the rate of a second order reaction does not depend on reactant concentrations.

Answer: B

Watch Video Solution

23. After 2 hours, a radioactive substance becomes $\left(\frac{1}{16}\right)^{th}$ of original amount. Then the half life (in min) is

A. 60 minutes

B. 120 minutes

C. 30 minutes

D. 15 minutes

Answer: C

Watch Video Solution

Answer The Following Questions

1. Introduction: average rate and instantaneous rate

Watch Video Solution

2. Define Rate law and Rate constant.

Watch Video Solution

3. Derive integrated rate law for a zero order reaction $A \rightarrow$ product.

Watch Video Solution

4. Define half life of a reaction, Show that for a first order reaction half life is independent of initial concentration.

Watch Video Solution

5. What is an elementary reaction ? Given the differences between order and molecularity of a reaction.

Watch Video Solution

6. Explain the rate determining step with an example.

Watch Video Solution

7. Describe the graphical representation of first order reaction.

Watch Video Solution

8. Write the law for the following reactions.

A reaction that is 3/2 order in x and zero order in y.

Watch Video Solution

9. Write the law for the following reactions.

A reaction that is second order in NO and first order in Br_2.

Watch Video Solution

10. Explain the effect of catalyst on reaction rate with an example.

Watch Video Solution

11. The rate law for a reaction of A, B and C has been found to be rate $= [A]^2[B][L]^{\frac{3}{2}}$. How would the rate of reaction change when

Concentration of [L] is quadrupled

Watch Video Solution

12. The rate law for a reaction of A, B and C has been found to be rate $= [A]^2[B][L]^{\frac{3}{2}}$. How would the rate of reaction change when

Concentration of both [A] and [B] are doubled

Watch Video Solution

13. The rate law for a reaction of A, B and C has been found to be rate $= [A]^2[B][L]^{\frac{3}{2}}$. How would the rate of reaction change when

Concentration of [A] is halved

Watch Video Solution

14. The rate law for a reaction of A, B and C has been found to be rate $= [A]^2[B][C]^{\frac{3}{2}}$. How would the rate of reaction change when Concentration of [A] is reduced to $\left(\frac{1}{3}\right)$ and concentration of [C] is quadrupled.

A. $\frac{2}{3}$

B. $\frac{4}{3}$

C. $\frac{4}{9}$

D. $\frac{8}{9}$

Answer: c

Watch Video Solution

15. The rate of formation of a dimer in a second order reaction is $7.5 \times 10^{-3} \text{mol L}^{-1} s^{-1}$ at 0.05mol L^{-1} monomer concentration. Calculate the rate constant.

A. 0.15

B. 3

C. 0.3

D. 1.5

Answer: b

Watch Video Solution

16. For a reaction $x + y + z \rightarrow$ products the rate law is given by rate $k = [x]^{\frac{3}{2}}[y]^{\frac{1}{2}}$ what is the overall order of the reaction and what is the order of the reaction with respect to z.

Watch Video Solution

17. Explain briefly the collision theory of bimolecular reactions.

Watch Video Solution

18. Write Arrhenius equation and explains the terms involved.

Watch Video Solution

19. The decomposition of Cl_2O_7 at 500 K in the gas phase to Cl_2 and O_2 is a first order reaction. After 1 minute at 500 K, the pressure of Cl_2O_7 falls from 0.08 to 0.04 atm. Calculate the rate constant in s^{-1}.

Watch Video Solution

20. Hydrolysis of methyl acetate in aqueous solution has been studied by titrating the liberated acetic acid against sodium hydroxide. The concentration of an ester at different temperatures is given below.

$t\ (min)$	0	20	40	60	$\propto$
$v\ (mL)$	20.2	25.6	29.5	32.8	50.4

Show that the reaction is the first order reactions.

View Text Solution

21. Explain pseudo first order reaction with an example.

Watch Video Solution

22. Identify the order for the following reactions

Rusting of Iron

Watch Video Solution

23. Identify the order for the following reactions

Radioactive disintegration of $._{92}U^{238}$

Watch Video Solution

24. Identify the order for the following reactions

$2A + 3B \rightarrow$ products , rate $= k[A]^{1/2}[B]^2$

Watch Video Solution

25. A gas phase reaction has energy of activation 200kJ mol^{-1}. If the frequency factor of the reaction is $1.6 \times 10^{13} s^{-1}$. Calculate the rate constant at 600 K. $\left(e^{-40.09} = 3.8 \times 10^{-18}\right)$.

Watch Video Solution

26. For the reaction $2x + y \rightarrow L$. Find the rate law from the following data.

$[X]$ (min)	$[Y]$ (min)	rate (Ms^{-1})
0.2	0.02	0.15
0.4	0.02	0.30
0.4	0.08	1.20

Watch Video Solution

27. How do concentrations of the reactant influence the rate of reaction ?

Watch Video Solution

28. How do nature of the reactant influence rate of reaction ?

Watch Video Solution

29. The rate constant for a first order reaction is $1.54 \times 10^{-3} s^{-1}$. Calculate its half life time.

Watch Video Solution

30. The half life of the homogeneous gaseous reaction $SO_2Cl_2 \rightarrow SO_2 + Cl_2$ which obeys first order kinetics is 8.0 minutes.

How long will it take for the concentration of SO_2Cl_2 to be reduced to 1% of the initial value ?

Watch Video Solution

31. The time for half life change in a first order decomposition of a substance A is 60 seconds. Calculate the rate constant. How much of A will be left after 180 seconds ?

View Text Solution

32. A zero order reaction is 20% complete in 20 minutes. Calculate the value of the rate constant. In what time will the reaction be 80% complete ?

Watch Video Solution

33. The activation energy of a reaction is 22.5 k Cal mol^{-1} and the value of rate constant at $40^{\circ}C$ is $1.8 \times 10^{-5} s^{-1}$. Calculate the frequency factor, A.

Watch Video Solution

34. Benzene diazonium chloride in aqueous solution decomposes according to the equation $C^6H^5N^2Cl \rightarrow C_6H_5Cl + N_2$ Starting with an initial concentration of $10gL^{-1}$, the volume of N_2 gas obtained at $50^{\circ}C$ at different intervals of time was found to be as

under :

t (min):	6	12	18	24	30	∞
Vol. of $N_2(ml)$:	19.3	32.6	41.3	46.5	50.4	58.3

Show that the above reaction follows the first order kinetic. What is the value of the rate constant ?

Watch Video Solution

35. From the following data, show that the decomposition of hydrogen peroxide is a reaction of the order :

t (min)	0	10	20
V (ml)	46.1	29.8	19.3

Where t is the time in minutes and V is the volume of standard $KMnO_4$ solution required for titrating the same volume of the reaction mixture.

Watch Video Solution

36. A first order reaction is 40% complete in 50 minutes. Calculate the value of the rate constant. In what time will the reaction be 80% complete ?

View Text Solution

Evaluate Yourself

1. Write the rate expression for the following reactions, assuming them as elementary reactions.

$3A + 5B_2 \rightarrow 4CD$

Watch Video Solution

2. Write the rate expression for the following reactions, assuming them as elementary reactions.

$X_2 + Y_2 \rightarrow 2XY$

Watch Video Solution

3. Find the individual and overall order of the following reaction using the given data.

$2NO_{(g)} + Cl_{2(g)} \rightarrow 2NOCl_{(g)}$

View Text Solution

4. In a first order reaction A products 60% of the given sample of a decomposes in 40 min. What is the half of the reaction ?

Watch Video Solution

5. The rate constant for a first order reaction is $2.3 \times 10^{-4} s^{-1}$. If the initial concentration of the reactant is 0.01m. What concentration will remain after 1 hour ?

View Text Solution

6. For a first order reaction the rate constant at 500 k is $8 \times 10^{-4} s^{-1}$. Calculate the frequency, if the energy of activation for the reaction is 190kJ mol^{-1}.

Watch Video Solution

Additional Questions And Answers Choose The Correct Answer

1.

$2N_2O_5 \rightarrow NO_2 + O_2, \frac{d[N_2O_5]}{dt} = k_1[N_2O_5], \frac{d[NO_2]}{dt} = k_2[N_2O_5]$

and $\frac{dO_2}{dt} = k_3[N_2O_5]$, the relation between k_1, k_2 and k_3 is

A. $2k_1 = 4k_2 = k_3$

B. $k_1 = k_2 = k_3$

C. $2k_1 = k_2 = 4k_3$

D. $2k_1 = k_2 = k_3$

Answer: C

Watch Video Solution

2. What would be the rate of disappearance of oxygen, if the rate of formation of nitric oxide (NO) is $3.6 \times 10^{-3} \text{mol L}^{-1} s^{-1}$?

A. $4 \times 10^{-3} \text{mol L}^{-1} s^{-1}$

B. $4 \times 10^{-3} mol^{-1} L^{-1} s^{-1}$

C. $4.5 \times 10^{-3} \text{mol L}^{-1} s^{-1}$

D. $4.5 \times 10^{-3} mol^{-1} L^{-1} s^{-1}$

Answer: C

Watch Video Solution

3. For a reaction, $2A + B \rightarrow 3C$, The rate of appearance of C at time 't' is $1.2 \times 10^{-4} \text{mol L}^{-1} s^{-1}$. Identify the rate of reaction.

A. $4 \times 10^{-5} \text{mol L}^{-1} s^{-1}$

B. $4.5 \times 10^{-1} \text{mol L}^{-1} s^{-1}$

C. $3.6 \times 10^{-4} \text{mol L}^{-1} s^{-1}$

D. None of these

Answer: A

Watch Video Solution

4. For the reaction, $2N_2O_5 \rightarrow 4NO_2 + O_2$, select the correct statement.

A. Rate of formation of O_2 is same as rate of formation of NO_2

B. Rate of disappearance of N_2O_5 is two times the rate of formation of O_2.

C. Rate of formation of O_2 is 0.5 times rate of disappearance of N_2O_5,

D. Rate of formation of NO_2 is equal to rate of disappearance of N_2O_5

Answer: C

View Text Solution

5. In pseudo - order reactions

A. The actual order of reaction is different from that expected using rate law expression

B. The concentration at least one reactant is taken in large excess.

C. The concentration of reactant taken in excess may be taken as constant

D. All of these

Answer: D

Watch Video Solution

6. The depletion of ozone involves the following steps :

Step 1 : $O_2 + O \underset{k_2}{\overset{k_1}{\rightleftharpoons}} O_3$ (fast)

Step 2 : $O_3 + O \xrightarrow{k} 2O_2$ (slow)

The predicted order of the reaction will be

A. I

B. II

C. III

D. Zero

Answer: A

View Text Solution

7. What would be the activation energy of a reaction when the temperature is increased from $27^{\circ}C$ to $37^{\circ}C$?

A. 534kJ mol^{-1}

B. 53.4kJ mol^{-1}

C. 5.34kJ mol^{-1}

D. None of these

Answer: B

Watch Video Solution

8. $A + B \rightarrow C, \Delta H = +60\text{kJ mol}^{-1}$. $Ea_f = 150kJ$. What is the activation energy of the backward reaction ?

A. 210 kJ

B. 105 kJ

C. 90 kJ

D. 145 kJ

Answer: C

Watch Video Solution

9. The Unit of rate constant and rate of reaction are same for

A. First order

B. second order

C. Third order

D. zero order

Answer: D

Watch Video Solution

10. Which of the following does not affect the rate of reaction ?

A. Amount of the reactant taken

B. Physical state of the reactant

C. ΔH of reaction

D. Size of vessel

Answer: C

Watch Video Solution

11. Which of the following statement is not correct ?

A. Molecularity of a reaction cannot be fractional

B. Molecularity of a reaction cannot be more than three

C. Molecularity of a reaction can zero.

D. Molecularity is assigned for each elementary step of mechanicsm.

Answer: C

Watch Video Solution

12. Which order reaction obeys the expression $t_{1/2} \propto \frac{1}{[A]}$?

A. First

B. Second

C. Third

D. zero

Answer: B

View Text Solution

13. For an exothermic chemical process occuring in 2 steps as

(i) $A + B \rightarrow X$ (slow) ,

(ii) $X \rightarrow AB$ (fast)

The progress of the reaction can be best described by (x - intermediate).

A. 

B. 

C. 

D. None of these

Answer: C

View Text Solution

14. The graph between. The log K verrus $\frac{1}{T}$ is a straight line. The slope of the line is

A. $\frac{-2.303R}{Ea}$

B. $\frac{-Ea}{2.303R}$

C. $\frac{2.303R}{Ea}$

D. $\frac{Ea}{2.303R}$

Answer: B

Watch Video Solution

15. Nitric oxide (NO) reacts with oxygen to produce nitrogen dioxide

$2NO_{(g)} + O_{2(g)} \rightarrow 2NO_{2(g)}$

If the mechanism of reaction is

$NO + O_2 \overset{K}{\Longleftrightarrow} NO_3$ (fast)

$NO_3 + NO \overset{K_1}{\Longleftrightarrow} NO_2 + NO_2$ (slow)

A. Rate $K'[NO][O_2]$

B. Rate $= K'[NO][O_2]_2$

C. Rate $= K'[NO]^2[O_2]$

D. Rate $K'[NO]^3[O_2]$

Answer: C

View Text Solution

16. The addition of a catalyst during a chemical reaction alters which of the following quantities ?

A. Activation energy

B. Entropy

C. Internal energy

D. Enthalpy

Answer: A

Watch Video Solution

17. A reaction having equal activation energies for forward and reverse reactions has

A. $\Delta G = 0$

B. $\Delta H = 0$

C. $\Delta H = \Delta G = \Delta S = 0$

D. $\Delta S = 0$

Answer: B

Watch Video Solution

18. The given reaction $2FeCl_3 + SnCl_2 \rightarrow 2FeCl_2 + SnCl_4$ is an example of

A. I order

B. II order

C. III order

D. None of these

Answer: C

Watch Video Solution

19. Enzymes increase the rate of reactions.

A. By lowering activation energy

B. By increasing activation energy

C. By changing equilibrium constant

D. By forming enzyme substrate complex

Answer: A

Watch Video Solution

20. Activation energy of a chemical reaction can be determined by

A. Evaluating rate constants at two different temperatures

B. Evaluating velocities of reaction at two different temperatures

C. Evaluating rate constant at standard temperature

D. Changing concentration of reactants

Answer: A

View Text Solution

21. $2A \rightarrow B + C$. It would be a zero order reaction when.

A. The rate of reaction is proportional to square of conc. of A

B. The rate of reaction remains same at any conc. of A.

C. The rate of remains unchanged at any conc. of B and C

D. The rate of reaction doubles if conc. of B is increased to double.

Answer: B

View Text Solution

22. What will be the rate constant of a I order reaction, if its half life is given to be 20 min ?

A. 13.86min^{-1}

B. 28.86min^{-1}

C. $3.47 \times 10^{-2}\text{min}^{-1}$

D. None of these

Answer: A

Watch Video Solution

23. How much time will be taken for 20 gm to reduce 5 g ? [$R = 2 \times 10^{-3}s^{-1}$ (I order reaction)] [log4=0.6021]

A. $693.1s$

B. $693.1s^{-1}$

C. $6.931s$

D. $6.931s^{-1}$

Answer: A

Watch Video Solution

24. From the rate expression for the following reactions, determine their order of reaction and the dimensions of the rate constants.

$H_2O_{2(aq)} + 3I^-_{(aq)} + 2H^+ \rightarrow 2H_2O_{(l)} + I_3^- \quad \text{Rate} = K[H_2O_2]\left[I^-\right]$

A. $2, \text{L mol}^{-1}s^{-1}$

B. $1, s^{-1}$

C. $\frac{3}{2}, L^{1/2}mol^{-1/2}s^{-1}$

D. None of these

Answer: A

Watch Video Solution

25. During decomposition of an activated complex

A. energy is always released

B. energy is always absorbed

C. energy does not change

D. products may be formed

Answer: A

Watch Video Solution

26. A first order reaction is 50% completed in 1.26×10^{14}. How much time would is take for 100 % completion ?

A. $1.26 \times 10^{15} s$

B. $2.52 \times 10^{14} s$

C. $2.52 \times 10^{28} s$

D. Infinite

Answer: D

View Text Solution

27. Concentration is expressed in ?

A. $\frac{\text{number of moles / litre}}{\text{time in sec}}$

B. $\frac{\text{time in sec}}{\text{number of moles / litre}}$

C. $\frac{\text{number of moles / litre}}{\text{volume}}$

D. $\frac{\text{volume}}{\text{number of moles / litre}}$

Answer: A

View Text Solution

28. During a chemical reaction, the concentration of reaction

A. increases

B. decreases

C. remains constant

D. first increases and then decreases

Answer: B

View Text Solution

29. For the second order reaction $t_{\frac{1}{2}} \propto$

A. $\frac{1}{a^2}$

B. $\frac{1}{a}$

C. constant

D. a

Answer: B

View Text Solution

30. The unit of zero order rate constant is

A. litre $mol^{-1}\,\sec^{-1}$

B. $\text{mol litre}^{-1}\,\sec^{-1}$

C. $\sec^{-1}$

D. $\text{litre}^2\,\sec^{-1}$

Answer: B

Watch Video Solution

31. The excess energy which a molecule must possess to become active is known as

A. kinetic energy

B. threshold energy

C. potential energy

D. activation energy

Answer: D

Watch Video Solution

32. Arrhenius equation is

A. $k = Ae^{-1/RT}$

B. $k = Ae^{RT/E_a}$

C. $k = Ae^{-E_a/RT}$

D. $k = Ae^{E_a/RT}$

Answer: C

View Text Solution

33. The term A in Arrhenius equation is called as

A. Probability factor

B. Activation energy

C. Collision factor

D. Frequency factor

Answer: D

Watch Video Solution

34. The half life period of a first order reaction is 10 minutes. Then its rate constant is

A. $6.93 \times 10^{2} \mathrm{min}^{-1}$

B. $0.693 \times 10^{-2} \mathrm{min}^{-1}$

C. $6.932 \times 10^{-2} \text{min}^{-1}$

D. $69.3 \times 10^{-1} \text{min}^{-1}$

Answer: C

Watch Video Solution

35. For a reaction : $aA \rightarrow bB$, the rate of reaction is doubled when the concentration of A is increased by four times. The rate of reaction is equal to

A. $k[A]^{a}$

B. $k[A]^{\frac{1}{2}}$

C. $k[A]^{\frac{1}{a}}$

D. $k[A]$

Answer: B

Watch Video Solution

Watch Video Solution

36. Compound A reacts by first order kineties. At $25^{\circ}C$, the rate constant of the reaction is $0.60\,\sec^{-1}$. What is the half life of A ?

A. 1.15 sec

B. 0.4158 sec

C. 0.093 sec

D. 1.29 sec

Answer: A

Watch Video Solution

37. Pick out the odd one.

A. $._{92}U^{238} \Rightarrow ._{90}Th^{234} + ._{2}He^{4}$

B. $SO_2Cl_2 \rightarrow SO_2 + Cl_2$

C. $CH_3COOCH_3 + H_2O \xrightarrow{H^+} CH_3COOH + CH_3OH$

D. $C_{12}H_{22}O_{11} + H_2O \xrightarrow{H^+} C_6H_{12}O_6 + C_6H_{12}O_6$

Answer: C

Watch Video Solution

38. If the initial concentration of the reactants is doubled in a zeroth order reaction, then rate

A. remains constant

B. doubled

C. is reduced to half of its value

D. is increased by four times of initial rate

Answer: C

View Text Solution

39. The rate of a reaction is expressed as $k[A]^2[B]^1$,the reaction is said to be

A. second order with respect to A

B. first order with respect to B

C. overall order of the reaction is third order

D. all the above

Answer: D

Watch Video Solution

40. Which one of the following is an example of pseudo first order reaction ?

A. Acid hydrolysis of ester

B. Decomposition of HI

C. Synthesis of NH_3

D. All radioactive transformations

Answer: A

Watch Video Solution

41. The rate constant of a first order reaction is $2.0 \times 10^{-6} s^{-1}$. The initial concentration of the reactant is 0.10mol dm^{-3} . What is the value of the initial rate ?

A. $2.0 \times 10^{-7} \text{mol dm}^{-3} s^{-1}$

B. $2.0 \times 10^{-6} \text{mol dm}^{-3} s^{-1}$

C. $2.0 \times 10^{-5} \text{mol dm}^{-3} s^{-1}$

D. $2.0 \times 10^{-7} \text{mol dm}^{-3} s^{-1}$

Answer: A

Watch Video Solution

42. If the activation energy is high, then the rate of the reaction is

A. high

B. moderate

C. low

D. cannot be predicted

Answer: C

View Text Solution

43. Pick out the effect of catalyst on activation energy ?

A. Catalyst lowers the activation energy

B. Catalyst provides alternate path to the reaction

C. Both (a) and (b)

D. None of these

Answer: C

Watch Video Solution

Additional Questions And Answers Fill In The Blanks

1. In Arrhenius equation, If EA is positive and $T_2 > T_1$, then _____

A. $k_1 = k_2$

B. $k_2 < k_1$

C. $k_1 = \frac{1}{k_2}$

D. $k_2 > k_1$

Answer: D

View Text Solution

2. For the reaction $A \rightarrow C$, it is found that the rate of the reaction quadruples when the concentration of A is doubled. The rate for the reaction is Rate $= [A]^n$. The value of n is _____

A. 1

B. 2

C. 0

D. 3

Answer: B

View Text Solution

3. In the graph showing Maxwell, Boltzamann distribution of energy _____

A. area under the curve must not change with increase in temperature.

B. area under the curve increases in temperature.

C. area under the curve decreases with increase in temperature.

D. None of these above

Answer: A

View Text Solution

4. For a complex reaction _____

A. Order of overall reaction is same as molecularity of the slowest step.

B. Order of overall reaction is less than the molecularity of the slowest step.

C. Order of overall reaction is greater than molecularity of the slowest step.

D. None of these above.

Answer: A

Watch Video Solution

5. In any unimolecular reaction _____

A. Only two reacting species is involved in the rate determining step.

B. The order and the molecularity od slowest step are equal to one.

C. The molecularity of the reaction is one and order is zero.

D. Both molecularity and order of the reaction are one.

Answer: B

Watch Video Solution

6. Rate law cannot be determined from balanced chemical equation if _____

A. Reverse reactions is not involved

B. It is an elementary reaction

C. It is a sequence of elementary reactions

D. All of the reactants is in excess. Rate law can be determined from balanced chemical equation if it is an elementary reaction.

Answer: C

View Text Solution

7. The value of rate constant of a pseudo first order reaction _____.

A. Independent on the concentration of reactants present in small amount

B. Depends on the concentration of reactants present in excess

C. Independent of the concentration of reactants

D. Depends only on temperature.

Answer: B

Watch Video Solution

8. $CH_3COOCH_3 + H_2O \xrightarrow{H^+} CH_3COOH + CH_3OH$ is an example of _____ order reaction.

A. first

B. zero

C. third

D. pseudo

Answer: D

Watch Video Solution

9. When the E_a of a reaction zero then the rate constant of the reaction is equal to _____

A. $2.303K$

B. $\frac{K}{2.303}$

C. $\left(t_{\frac{1}{2}}\right)$

D. A

Answer: D

View Text Solution

10. By the order of reaction we mean _____

A. the sum of powers to which the concentration terms are raised in the rate equation

B. the number of reactants take part in the reaction

C. the number of concentration terms in the velocity equation for the reaction

D. the least number of product molecule needed for the reaction

Answer: A

Watch Video Solution

11. The oxidation of potassium iodide by potassium persulphate as per the rate law, rate $k[K_2S_2O_8][Kl]$. The order with respect to potassium iodide is _____

A. two

B. one

C. three

D. four

Answer: B

Watch Video Solution

12. If the rate law for a reaction is $A + B \rightarrow$ is $C\frac{d[A]}{dt} \times \frac{1}{2} = k[A]^n[B]^m$ then the order of a reaction is _____

A. n

B. m

C. $n + m$

D. $m - n$

Answer: C

Watch Video Solution

13. For a reaction $2A + B \rightarrow 3C$, express the rate of reaction in terms of formation of the product _____

A. $\frac{1}{2}\frac{d[A]}{dt}$

B. $\frac{-1}{3}\frac{d[C]}{dt}$

C. $\frac{1}{3}\frac{d[C]}{dt}$

D. $\frac{-1}{2}\frac{d[B]}{dt}$

Answer: C

Watch Video Solution

14. Energy of activation of a reactant is reduced by _____

A. reduced pressure

B. increased pressure

C. reduced temperature

D. increased temperature

Answer: D

View Text Solution

15. Activation energy is equal to _____

A. Threshold energy + Energy of colloding molecules

B. Threshold energy

C. Threshold energy $\times$ Energy of colloiding molecules

D. Threshold energy - Energy of colloiding molecules

Answer: A

Watch Video Solution

16. For the reaction $N_{2(g)} + 3H_{2(g)} \rightarrow 2NH_{3(g)}$ the rate of the reaction in terms of ammonia is _____

A. $+\frac{1}{2}\frac{d[NH_3]}{dt}$

B. $-\frac{1}{2}\frac{d[NH_3]}{dt}$

C. $\frac{-d[NH_3]}{dt}$

D. $\frac{+d[NH_3]}{dt}$

Answer: A

Watch Video Solution

17. The magnitude of order of a reaction may be _____

A. fractional

B. zero

C. integral values

D. All of these

Answer: D

Watch Video Solution

18. For a reaction, $E_a = 0$ and $k = 4.2 \times 10^5 \sec^{-1}$ at 300 K, the value of k at 310 K will be _____

A. $4.2 \times 10^5 \sec^{-1}$

B. $8.4 \times 10^5 \sec^{-1}$

C. $8.4 \times 10^{-5} \sec^{-1}$

D. unpredictable

Answer: A

Watch Video Solution

19. For an elementary reaction, its order is never _____ since it is a _____ step process.

A. integral, single

B. fractional, single

C. zero, one

D. fractional, zero

Answer: B

Watch Video Solution

20. In the acid hydrolysis of an ester what is the time taken for complete hydrolysis ?

A. 8 hours

B. 45 minutes

C. Both (a) and (b)

D. None

Answer: A

Watch Video Solution

21. $CH_3COOCH_3 + H_2O \xrightarrow{H^+} CH_3COOH + CH_3OH$ is an example of _____ order reaction.

A. first

B. zero

C. third

D. pseudo

Answer: D

Watch Video Solution

22. The minimum energy that all colliding molecules must possess so as to make the collisions more effective and successful is _____.

A. Activation energy

B. colliding energy

C. threshold energy

D. kinetic energy

Answer: C

Watch Video Solution

23. For a general reaction $aA + bB \rightarrow$ Products, the rate of the reaction is equal to _____.

A. $k[A]^p[B]^q$

B. $k[A][B]$

C. k

D. $\frac{1}{k}$

Answer: A

Watch Video Solution

24. The time required for 50% completion of the reaction is known as _____.

A. Average life period

B. Half - life period

C. Rate

D. None of these

Answer: B

Watch Video Solution

25. In a second order reaction, if one of the concentration is excess, the order of the reaction is _____ order reaction.

A. first

B. pseudo first

C. third

D. zero

Answer: B

Watch Video Solution

26. The half - life period of a first order reaction is 69.3 seconds. Its rate constant is _____.

A. $10^{-2}s^{-1}$

B. $10^{-4}s^{-1}$

C. $10s^{-1}$

D. $10^{2}s^{-1}$

Answer: A

Watch Video Solution

27. If [A] is the concentration of A at any time t and $[A_0]$ is the concentration at t = 0, then for the first order reaction, the rate equation can be written as _____.

A. $k = \frac{2.303}{t} \log\left[\frac{A}{A_0}\right]$

B. $k_t = 2.303 \log\left[\frac{A_0}{A}\right]$

C. $k = \frac{2.303}{t} \log\left[\frac{A_0}{[A_0] - [A]}\right]$

D. $k = \frac{2.303}{t} \log\left[\frac{A_0}{A}\right]$

Answer: B

Watch Video Solution

28. All radioactive transformations follow _____ order kinetics.

A. zero

B. first

C. second

D. third

Answer: B

View Text Solution

29. Activation energy of a reactant is reduced by _____.

A. increased temperature

B. reduced temperature

C. increased perssure

D. reduced pressure

Answer: A

Watch Video Solution

Additional Questions And Answers Assertio Reason

1. Assertion : If temperature does not affect the rate of reaction, Ea = 0.

Reason : Lesser the activation energy, slower will be the reaction.

A. Both assertion and reason are true and reason is the correct explanation of assertion.

B. Both assertion and reason are true but reason is not the correct explanation of assertion.

C. Assertion is true but reason is false.

D. Both assertion and reason are false.

Answer: C

Watch Video Solution

2. Define the rate of a reaction.

A. Both assertion and reason are true and reason is the correct explanation of assertion.

B. Both assertion and reason are true but reason is not the correct explanation of assertion.

C. Assertion is true but reason is false.

D. Both assertion and reason are false.

Answer: A

Watch Video Solution

3. Assertion : Order and molecularity of a reaction are always equal.

Reason : Complex reactions takes place in steps and fastest step determine the molecularity of reaction.

A. Both assertion and reason are true and reason is the correct explanation of assertion.

B. Both assertion and reason are true but reason is not the correct explanation of assertion.

C. Assertion is true but reason is false.

D. Both assertion and reason are false.

Answer: D

Watch Video Solution

4. Assertion : Hydrolysis of ester in acidic medium follows pseudo first order kinetics.

Reason : Hydrolysis of ester is independent of the concentration of acid used.

A. Both assertion and reason are true and reason is the correct explanation of assertion.

B. Both assertion and reason are true but reason is not the correct explanation of assertion.

C. Assertion is true but reason is false.

D. Both assertion and reason are false.

Answer: A

Watch Video Solution

5. Assertion : In presence of positve catalyst, activation energy & threshold energy decreases.

Reason : Minimum energy required to permit a reaction is known as threshold energy.

A. Both assertion and reason are true and reason is the correct explanation of assertion.

B. Both assertion and reason are true but reason is not the correct explanation of assertion.

C. Assertion is true but reason is false.

D. Both assertion and reason are false.

Answer: B

View Text Solution

6. Assertion : Rate constant determined from Arrhenius equation are fairly accurate for simple as well as complex molecule.

Reason : Reactant molecules undergo chemical change irrespective of their orientation during collision.

A. Both assertion and reason are true and reason is the correct explanation of assertion.

B. Both assertion and reason are true but reason is not the correct explanation of assertion.

C. Assertion is true but reason is false.

D. Both assertion and reason are false.

Answer: C

View Text Solution

7. Assertion : All collision of reactant molecule lead to product formation.

Reason : Product formation is independent of oriendation of the reactant moleucles.

A. Both assertion and reason are true and reason is the correct explanation of assertion.

B. Both assertion and reason are true but reason is not the correct explanation of assertion.

C. Assertion is true but reason is false.

D. Both assertion and reason are false.

Answer: D

Watch Video Solution

8. Assertion : The enthalpy of reaction remains constant in the presence of catalyst.

Reason : A catalyst participating in the reaction forms different activated complex and lowers down the activation energy of reactant and product remains the same.

A. Both assertion and reason are true and reason is the correct explanation of assertion.

B. Both assertion and reason are true but reason is not the correct explanation of assertion.

C. Assertion is true but reason is false.

D. Both assertion and reason are false.

Answer: A

View Text Solution

9. Assertion : Order and molecularity are same.

Reason : Order is determined experimentally and molecularity is the sum of the stoichiometric coeddicient of rate determining elementary step.

A. Both assertion and reason are true and reason is the correct explanation of assertion.

B. Both assertion and reason are true but reason is not the correct explanation of assertion.

C. Assertion is true but reason is false.

D. Both assertion and reason are false.

Answer: D

View Text Solution

10. Assertion : Order of the reaction can be zero or fractional.

Reason : We cannot determine order from balanced chemical equation.

A. Both assertion and reason are true and reason is the correct explanation of assertion.

B. Both assertion and reason are true but reason is not the correct explanation of assertion.

C. Assertion is true but reason is false.

D. Both assertion and reason are false.

Answer: B

Watch Video Solution

11. Assertion : Rate constant of zero order reaction has same units as the rate reaction.

Reason : Rate constant of zero order reaction does not depend upon unit of concentration.

A. Both assertion and reason are true and reason is the correct explanation of assertion.

B. Both assertion and reason are true but reason is not the correct explanation of assertion.

C. Assertion is true but reason is false.

D. Both assertion and reason are false.

Answer: C

View Text Solution

12. Assertion : The order of reaction can have fractional value.

Reason : Order cannot be determined from a stiochiometrically balance equation.

A. Both assertion and reason are true and reason is the correct explanation of assertion.

B. Both assertion and reason are true but reason is not the correct explanation of assertion.

C. Assertion is true but reason is false.

D. Both assertion and reason are false.

Answer: B

Watch Video Solution

13. Assertion : A catalyst is a substance which alters the rate of a reaction.

Reason : In the presence of catalyst the energy of activation is increased.

A. Both assertion and reason are true and reason is the correct explanation of assertion.

B. Both assertion and reason are true but reason is not the correct explanation of assertion.

C. Assertion is true but reason is false.

D. Both assertion and reason are false.

Answer: C

Watch Video Solution

14. Assertion : Hydrolysis of methyl acetate by HCl is a pesudo first order reaction.

Reason : HCl is used as catalyst in the above reaction.

A. Both assertion and reason are true and reason is the correct explanation of assertion.

B. Both assertion and reason are true but reason is not the correct explanation of assertion.

C. Assertion is true but reason is false.

D. Both assertion and reason are false.

Answer: B

Watch Video Solution

Additional Questions And Answers Correct Statement S

1. Which one of the following statements regarding order is correct ?

A. Order should be determined only by experiment.

B. Order of complex reaction are less than 3.

C. Order can be determined from stoichiometric equation.

D. Order must be a whole number.

Answer: A

Watch Video Solution

2. Two reaction $A \rightarrow B$ and $C \rightarrow D$ has the energy of activation 40 kJ and 60 kJ respectively. Which of the following statement is correct ?

A. Comparison of rate cannot be determined

B. The reaction $A \rightarrow B$ proceeds at a faster rate compared to the reaction $C \rightarrow D$

C. The reaction $A \rightarrow B$ proceeds at a slower rate compared to the reaction $C \rightarrow D$.

D. Comparison of the cannot be determined

Answer: B

View Text Solution

Additional Questions And Answers Incorrect Statement S

1. Mark the incorrect statements.

A. Catalyst provides an alternative pathway to reaction mechanism.

B. Catalyst raises the activation energy.

C. Catalyst lowers the activation energy.

D. Catalyst not alters enthalpy change of the reaction.

Answer: A

Watch Video Solution

2. Consider the following statements and identify theincorrect statement(s).

(i) Decomposition of H_2O_2 is an II order reaction

(ii) $t_{1/u}$ is independent of initial concentration of a reaction.

(iii) Fractional order reactions are observed depending on their rates.

(iv) Rate $= k[A]^p[B]^q, p+q =$ order.

A. only (ii)

B. both (ii) and (iii)

C. only (i)

D. None of these

Answer: C

View Text Solution

3. Mark the incorrect statements.

A. The rate of a reaction increase with increasing temperature.

B. The rate of a reaction increases with the increase in the concentration of the reactants

C. Gas phase reactions are slower than reactions involving solid reactants

D. The rate of a reaction is affected by the surface are of the reactant.

Answer: C

Watch Video Solution

4. About "Collision theory"

A. Collision theory used to predict the rates of chemical reactions for gases.

B. This theory is based on the kinetic theory of gases

C. Chemical reactions occur as a result of collision between the reacting molecules

D. Decrease in concentration of the reactant brings about more collisions.

Answer: D

Watch Video Solution

5. Mark the incorrect statements.

A. Rate of a reaction depends on the initial concentration of reactants

B. Rate constant of a reaction does not depend on the initial concentration of reactants

C. Concentration and surface area decreases the number of collision

D. The molecularity of a reaction is the no. of molecules or ions that participate in the rate determining step.

Answer: C

Watch Video Solution

Additional Questions And Answers Very Short Answer

1. What is the study of chemical kinetics used for ?

Watch Video Solution

2. For a reaction $A + B \rightarrow C$, the rate of the reaction is denoted $\frac{-dA}{dt}$ or $\frac{-dB}{dt}$ or $\frac{+dC}{dt}$. State the significance of plus and minus sign.

Watch Video Solution

3. Rate of chemical reaction is not uniform throughout. Justify you answer.

View Text Solution

4. $H_{2(g)} + Cl_{2(g)} \xrightarrow{h\nu} 2HCl_{(g)}$ The reaction proceeds with a uniform rate throughout. What do you conclude ?

View Text Solution

5. Why is instaneous rate preferred over average rate ?

View Text Solution

6. For a chemical reaction, Variation in the concentration In [A] vs time in seconds is given as

What is the order of the reaction ?

View Text Solution

7. For a chemical reaction, Variation in the concentration In [A] vs time in seconds is given as

Given the relationship between k and $t_{\left(\frac{1}{2}\right)}$

View Text Solution

8. The decomposition reaction of ammonia gas on platinum surface has a rate constant $R = 2.5 \times 10^{-4} \text{mol L}^{-1}$. What is the order of the reaction.

View Text Solution

9. The reaction $A + 2B \rightarrow C$ obeys the rate equation. Rate $= K[A]^{\frac{1}{2}}[B]^{\frac{3}{2}}$ What is the order of the reaction ?

Watch Video Solution

10. For the reaction

$Cl_{2(g)} + 2NO_{(g)} \rightarrow 2NOCl(g)$

The rate law is expressed as

rate $= K[Cl_2][NO]^2$

What is the overall order of this reaction

Watch Video Solution

11. How does the value of rate constant vary with reactant constant.

View Text Solution

12. Why does the rate of any reacting genergally decreases during the course of the reaction ?

View Text Solution

13. Answer the following :

Effect the adding catalyst on activation energy and Gibb's energy (ΔG).

View Text Solution

14. Answer the following :

Why do we heat the solution of oxalic acid in redox tetration against $KMnO_4$?

View Text Solution

15. Write the units of zeroth, first, second and third order rate constants.

Watch Video Solution

16. A first order reaction has a specific reaction rate of $10^{-3}s^{-1}$. How muchtime will it takes for 10 gm of the reactant to reduce to 2.5 gm ?

Watch Video Solution

17. What would be the activation energy of a reaction when the temperature is increased from $27^{\circ} C$ to $37^{\circ} C$?

Watch Video Solution

18. In a reaction, $2A \rightarrow$ products, the concentration of A decreases from $0.5 \mathrm{mol} \, \mathrm{L}^{-1}$ to $0.4 \mathrm{mol} \, \mathrm{L}^{-1}$ in 10 minutes. Calculate the rate during this interval ?

View Text Solution

19. Mention the factor that affected the rate of a chemical reaction.

Watch Video Solution

Additional Questions And Answers Short Answer

1. Prove that the time required for the completion $\frac{3^{th}}{4}$ of the reaction of a fitst order is twice the time required for the completion of a half of the reaction.

View Text Solution

2. Molecularity of any reaction is not equal to zero. Why ?

Watch Video Solution

3. For which type of reactions, order and molecularity have the same value ?

Watch Video Solution

4. A reaction is of second order in A and first order in B.

Write the differential rate equation.

Watch Video Solution

5. A reaction is of second order in A and first order in B.

How is the rate affected on increasing the concentration of A three times ?

Watch Video Solution

6. A reaction is of second order in A and first order in B.

How is the rate affected when the concentration of both A and B is doubled ?

View Text Solution

7. Given examples for first order reaction.

Watch Video Solution

8. Give the characteristics of first order reaction.

View Text Solution

9. The rate constant, the activation energy and frequency factor of a chemical reaction at $25^{\#}C$ are $3.0 \times 10^{-4} s^{-1}$, 104.4kJ mol^{-1} and $6.0 \times 10^{14} s^{-1}$ respectively. What is the value of the rate constant when $T \to \infty$?

View Text Solution

10. The energy of achivation for the formation of hydrogen iodide is 150 kJ mol^{-1}. The rate constant of this reaction at 673 K is

2.3×10^{-3}. Calculate the rate constant 773 K.

Watch Video Solution

11. A first order reaction is found to have a rate constant $k = 7.39 \times 10^{-5} s^{-1}$. Find the half life of this reaction.

View Text Solution

12. The rate constant k for the first order gas phase decomposition of ethyl iodide, $C_2H_5I \rightarrow C_2H_4 + HI$ is $1.60 \times 10^{-5} s^{-1}$ at 600 k and $6.36 \times 10^{-3} s^{-1}$ at 700 K. Calculate the energy of activation for this reaction.

Watch Video Solution

13. The activation energy for the reaction, $2HI_{(g)} \rightarrow H_{2(g)} + I_{2(g)}$ is 209.5 KJ mol^{-1} at 581 K. Calculate the fraction of molecules of reactants having energy equal to or greater than activation energy.

View Text Solution

14. From the rate expression for the following reactions, determine their order of reaction and the dimensions of the rate constants.

$3NO_{(g)} \rightarrow N_2O_{(g)} \quad \text{Rate} = K[NO]^2$

Watch Video Solution

15. From the rate expression for the following reactions, determine their order of reaction and the dimensions of the rate constants.

$H_2O_{2(aq)} + 3I^-_{(aq)} + 2H^+ \rightarrow 2H_2O_{(l)} + I_3^- \quad \text{Rate} = K[H_2O_2]\left[I^-\right]$

Watch Video Solution

16. From the rate expression for the following reactions, determine their order of reaction and the dimensions of the rate constants.

$CH_3CHO_{(g)} \rightarrow CH_{4(g)} + CO_{(g)} \quad \text{Rate} = K[CH_3CHO]^{3/2}$

Watch Video Solution

17. From the rate expression for the following reactions, determine their order of reaction and the dimensions of the rate constants.

$C_2H_5Cl_{(g)} \rightarrow C_2H_{2(g)} + HCl_{(g)} \quad \text{Rate} = K[C_2H_5Cl]^1$

Watch Video Solution

18. The decomposition of NH_3 on platinum surface is zero order reaction what are the rates of production of N_2 and H_2 if $k = 2.5 \times 10^{-4} mol^{-1} Ls^{-1}$.

View Text Solution

19. A reaction is second order with respected to a reactant. How is the rate of reaction affected if the concentration of the reactant is doubled

Watch Video Solution

20. A reaction is second order with respected to a reactant. How is the rate of reaction affected if the concentration of the reactant is reduced to half

Watch Video Solution

21. What is the effect of temperature on the rate constant of a reaction ? How can this temperature effect on rate constant be represented quantitatively ?

View Text Solution

22. Reaction is first order in A and second in B.

Write the different rate equation.

Watch Video Solution

23. Reaction is first order in A and second in B.

How is the rate affected on increasing the concentration of B three times ?

Watch Video Solution

24. Reaction is first order in A and second in B.

How is the rate affected when the concentrations of both A and B are doubled ?

Watch Video Solution

25. Calculate the half - life of a first order reaction from their rate constants given below.

$200s^{-1}$

Watch Video Solution

26. Calculate the half - life of a first order reaction from their rate constants given below.

$2\ \text{min}^{-1}$

Watch Video Solution

27. Calculate the half - life of a first order reaction from their rate constants given below.

$4\ \text{years}^{-1}$

Watch Video Solution

28. The rate constant for a first order reaction is $60s^{-1}$. How much time will it take to reduce the initial concentration of the reactant to its $\frac{1^{th}}{16}$ values ?

Watch Video Solution

29. Write the differences between rate and rate constant of a reaction.

Watch Video Solution

Additional Questions And Answers Long Answer

1. For the reaction $2A + B \rightarrow A_2B$. The rate $= k[A][B]^2$ with $2.0 \times 10^{-6} mol^{-2} L^2 s^{-1}$. Calculate the initial rate of the reaction,

when $[A] = 0.1 \text{mol L}^{-1}$, $[B] = 0.2 \text{mol L}^{-1}$. Calculate the rate of reaction after [A] is reduced to 0.06mol L^{-1}.

View Text Solution

2. In a pesudo first order hydrolysis of ester in water, the following results were obtained.

1	0	30	60	90
$[\text{Ester}] \text{mol L}^{-1}$	0.55	0.31	0.17	0.085

Calculate the average rate of reaction between the time interval 30 to 60 seconds.

View Text Solution

3. In a pesudo first order hydrolysis of ester in water, the following results were obtained.

1	0	30	60	90
$[\text{Ester}] \text{mol L}^{-1}$	0.55	0.31	0.17	0.085

Calculate the pseudo first order rate constant for the hydrolysis of ester.

View Text Solution

4. Write an account of the Arrhenius equation for rates of chemical reactiobns. (or) Write an account of the Arrhenius equation for the effect of temoerature on the rates of chemical reactions.

View Text Solution

5. State the characteristics of order of reactions. (OR) Give the characteristics of orderr of a reactions.

View Text Solution

Hots

1. Explain how will you find activation energy of a reaction by graphical method. (or) Draw the graph between log k vs $\frac{1}{T}$. What is the relationship between its slope and acitivation energy.

View Text Solution

2. How will you determine the rate constant for the decomposition of nitrogen pentaoxide in CC_4.

Decomposition of nitrogen pentoxide in CCl_4.

View Text Solution

Numerical Problems

1. For the reaction R - P, the concentration of a reactant changes from 0.03 M to 0.02 M in 25 minutes. Calculate the average rate of reaction using of time both in minutes and second.

View Text Solution

2. The conversion of molecules x to y follows second order kinetics. It concentration of x is increased to three times how will it affect the rate of formation of y ?

For the reaction $x \rightarrow y$ as it follows second order kinetics wherefore the rate of formation of y ?

View Text Solution

3. A first order reaction laws on rate constant $1.15 \times 10^{-3} s^{-1}$. How long will 5 g of this reactant take to reduce to 3 g ?

Watch Video Solution

4. The decomposition of NH_3 on platinum surface is zero reaction.

What are the rate of production of N_2 and H_2 is

$K = 2.5 \times 10^{-4} \text{mol L}^{-1} s^{-1}$?

View Text Solution

5. Reaction is first order in A and second in B.

Write the different rate equation.

Watch Video Solution

6. Reaction is first order in A and second in B.

How is the rate affected on increasing the concentration of B three times ?

Watch Video Solution

7. Reaction is first order in A and second in B.

How is the rate affected when the concentrations of both A and B are doubled ?

Watch Video Solution

8. The specific reaction rates of a chemical reaction are $2.45 \times 10^{-5} \sec^{-1}$ at 273 K and $1.62 \times 10^{-4} \sec^{-1}$ at 303 K. Calculate the activation energy.

Watch Video Solution

9. Rate constant of a first order reaction is $0.45 \sec^{-1}$, calculate its half life.

Watch Video Solution

10. A first order reaction completes 25% of the reaction in 100 mins. What are the rate constant and half life values of the reactions ?

Watch Video Solution

11. If 30% of a first order reaction is completed in 12 mins, what percentage will be completed in 65.33 mins?

Watch Video Solution

12. Show that for a first order reaction the time required for 99.9% completion is about 10 times its half life period.

Watch Video Solution

13. The half life period of a first order reactions is 10 mins. What percentage of the reactant will remain after one hour ?

Watch Video Solution

14. The initial rate of a first order reaction is $5.2 \times 10^{-6} \text{mol lit}^{-1} s^{-1}$ 298 K. When the initial concentration of reactant is $2.6 \times 10^{-3} \text{mol lit}^{-1}$, calculate the first order rate constant of the reaction at the same temperature.

Watch Video Solution

Unit Test Choose The Correct Answer

1. Consider the following statements :

(i) increase in concentration of the reactant increases the rate of a

zero order reaction.

(ii) rate constant k is equal to collision frequency A if $E_a = 0$

(iii) rate constant k is equal to collision frequency A if $E_a = 0$

(iv) a plot of ln (k) Vs T is a straight line.

(v) a plot of ln (k) Vs $\left(\frac{1}{T}\right)$ is a straight line with a positive slope.

Correct statement are _____.

A. (ii) only

B. (ii) and (iv)

C. (ii) and (v)

D. (i) (ii) and (v)

Answer: A

View Text Solution

2. Azero order reaction $X \rightarrow$ Product, with an initial concentration 0.02 M has a half life of 10 min. If one starts with concentration 0.04

M, then the half life is

A. 10 s

B. 5 min

C. 20 min

D. cannot be predicted using the given information

Answer: C

Watch Video Solution

3. The rate constant of a reaction is $5.8 \times 10^{-2} s^{-1}$. The order of the reaction is

A. First order

B. zero order

C. Second order

D. Third order

Answer: A

Watch Video Solution

4. If the initial concentration of the reactant is doubled, the time for half reaction is also doubled. Then the order of the reaction is

A. zero

B. one

C. Fraction

D. none

Answer: A

Watch Video Solution

5. The half life period of a radioactive element is 140 days. After 560 days, 1 g of element will be reduced to

A. $\left(\frac{1}{2}\right)g$

B. $\left(\frac{1}{4}\right)g$

C. $\left(\frac{1}{8}\right)g$

D. $\left(\frac{1}{16}\right)g$

Answer: D

Watch Video Solution

Unit Test Short Answer

1. The reaction $A + 2B \rightarrow C$ obeys the rate equation. Rate $= K[A]^{\frac{1}{2}}[B]^{\frac{3}{2}}$ What is the order of the reaction ?

Watch Video Solution

2. Define average rate and instantaneous rate.

Watch Video Solution

Unit Test Answer In A Paragraph

1. A first order reaction is found to have a rate constant $k = 7.39 \times 10^{-5} s^{-1}$. Find the half life of this reaction.

Watch Video Solution

Unit Test Answer The Following In Detail

1. Describe the graphical representation of first order reaction.

Watch Video Solution

2. A first order reaction is 40% complete in 50 minutes. Calculate the value of the rate constant. In what time will the reaction be 80% complete ?

Watch Video Solution