CHEMISTRY

BOOKS - CHETANA PUBLICATION

CHEMICAL KINETICS

Example

1. What is the influence of particle size of reacting solid on rate of a chemical reaction?

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2. Why is finely divided nickel used in hydrogenation of oil?

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3. What is the effect of change of temperature on the rate of reaction?

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4. Which are the three major aspects of chemical reactions?

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5. What is Chemical Kinetics?

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6. How does the study of rate of reaction help chemists? OR

State applications of Chemical Kinetics.

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7. Defin: rate of reaction OR

Explain the term rate of reaction.

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8. Define:Average rate of chemical reaction. OR

Explain : the term Average rate of chemical reaction

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9. Define Instantaneous Rate of reaction.

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10. How instantaneous rate of reaction is determined?

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11. Express the rate of a reaction in terms of concentration of each constituent in the following reaction.

$H_2(g) + I_2(g) \rightarrow 2HI_{(g)}$

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12. For the reaction, $N_{2(g)} + 3H_{2(g)} \rightarrow 2NH_3$, what is the reationship among $\frac{d[N_2]}{dt}$, $\frac{d[H_2]}{dt}$ and $\frac{d[NH_3]}{dt}$?

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13. What is rate law? Give an example.

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14. What is a rate constant?

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15. What is the relationshipbetween coefficientsof reactants in a balanced equation for an overall reaction and exponents in rate

law? In what case the coefficient are the exponents?

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16. Explain the term: order of a reaction with examples.

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17. Write characteristics of order of reaction.

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18. For a reaction: $2NO_g + 2H_{2\,(g)} \rightarrow N_{2(g)} + 2H_2O_g$ the rate law is $rate = k[NO]_2[H_2]$. What is the overall order with respect to NO and H_2O? What is the overall order?

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19. The equation $CHCl_{3(g)} + Cl_{2(g)} \rightarrow \mathbb{C}l_{4(g)} + HCl_g$ is first order in $CHCl_3$ and $\frac{1}{2}$ order in Cl_2. Write the rate law and overall order of reaction.

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20. From the reaction: $CH_3Br(aq) + OH_{aq}^{(-)} \rightarrow CH_3OH_{aq} + Br_{aq}^-$, the rate law is: $rate = k[CH_3Br]\left[OH^-\right]$.

How does reaction rate changes if $\left[OH^-\right]$ is decreased by a factor of 5?

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21. From the reaction: $CH_3Br(aq) + OH_{aq}^{(-)} \rightarrow CH_3OH_{aq} + Br_{aq}^{-}$, the rate law is: $rate = k[CH_3Br]\left[OH^-\right]$.

What is change in rate if concentrations of both reactants are doubled?

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22. Define and explain the term elementary reaction.

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23. Define and explain the term molecularity of a reaction. Give examples.

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24. For a reaction, $2NO_{2(g)} \rightarrow 2NO_g + O_{2(g)}$, the reaction is found to be second order with respect to NO_2. Write its rate law. Also find its overall order and its molecularity.

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25. What is a complex reaction?

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26. What is the determining step?

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27. What is Reaction intermdiate? Give example.

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28. A reaction takes palce in two steps.

$NO_g + Cl_{2(g)} \rightarrow$

$NOCl_{2(g)} + NO_g \rightarrow$

Write the overall reaction.

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29. A reaction takes palce in two steps.

$NO_g + Cl_{2(g)} \rightarrow$

$NOCl_{2(g)} + NO_g \rightarrow$

Identify reaction intermediate

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30. Distinguish between: Order and Molecularity.

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31. A reaction occurs in the following steps:

$NO_{2(g)} + F_{2(g)} \rightarrow NO_2F_g + F_g$

$F_g + NO_{2(g)} \rightarrow NO_2F_g$

Write the equation of overall reaction.

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32. A reaction occurs in the following steps:

$NO_{2(g)} + F_{2(g)} \rightarrow NO_2F_g + F_g$

$F_g + NO_{2(g)} \rightarrow NO_2F_g$

Write rate law.

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33. A reaction occurs in the following steps:

$NO_{2(g)} + F_{2(g)} \rightarrow NO_2F_g + F_g$

$F_g + NO_{2(g)} \rightarrow NO_2F_g$

Identify the reaction intermediate.

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34. A complex reaction takes place in two steps.

$NO_g + O_{3(g)} \rightarrow NO_{3(g)} + O_g$

$NO_{3(g)} + O_g \rightarrow NO_{2(g)} + O_{2(g)}$

The predicted rate law is: $rate = k[NO][O_3]$

Identify the rate determing step. Write overall reaction. Which is the reaction intermediate? Why?

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35. A reaction occurs in the following steps:

$NO_{2(g)} + F_{2(g)} \rightarrow NO_2F_g + F_g$

$F_g + NO_{2(g)} \rightarrow NO_2F_g$

Identify the reaction intermediate.

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36. Write molecularity of the following reaction:

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

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37. A certain reaction occurs in the following steps

$Cl_g + O_{3(g)} \rightarrow ClO_g + O_{2(g)}$

$ClO_g + O_g \rightarrow Cl_g + O_{2(g)}$

What is the molecularity of each of elementary steps?

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38. A certain reaction occurs in the following steps

$Cl_g + O_{3(g)} \rightarrow ClO_g + O_{2(g)}$

$ClO_g + O_g \rightarrow Cl_g + O_{2(g)}$

Identify the reaction intermediate and write the chemical equation for overall reaction.

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39. Find the overall order

$CHCl_{3(g)} + Cl_{2(g)} \rightarrow \mathbb{C}l_{4(g)} + HCl_g Rate = k[CHCl_3][Cl_2]$

$2NO_g + O(2(g)) \rightarrow 2NO_{2(g)} Rate = k[NO]^2[O_2]$

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40. Define integrated rate law.

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41. Derive the integrated rate law for first order reaction: A products OR

Derive the rate equation for first order reaction.

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42. The integrated rate equation for first order reaction $A \rightarrow$ products is given by

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43. Explain the exponential rate law expression for the first order reaction.

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44. What are the units of rate constant of first order reaction?

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45. How will you represent first order reactions graphically?

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46. Write any two examples of first-order reactions.

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47. Derive the integrated rate law for zero order reaction.

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48. Derive the integrated rate law for zero order reaction.

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49. What are the units of rate constant of zero-order reaction.

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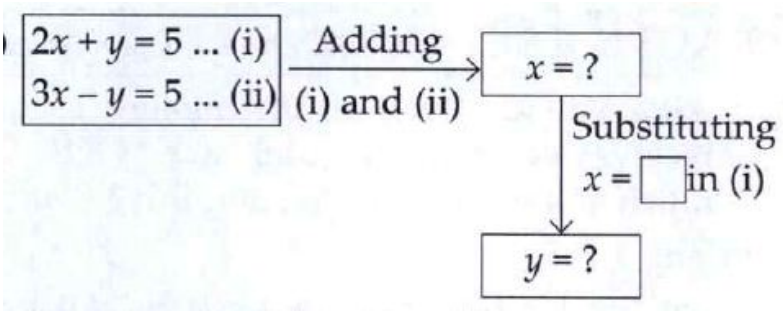
50.



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51. Write examples of zero-order reactions.

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52. Define half-life period.

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53. Derive the relation between half-life and rate constant of the first-order reaction.

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54. Give the graphical representation of half-life period reaction against concentration for first order reaction

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55. Derive the relation between half-life and rate constant of the zero-order reaction.

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56. How do half-lives of the first order and zero order reactions change with initial concentration of reactants?

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57. What are pseudo-first order reactions? Given one example and explain why it is pseudo-first order?

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58. The reaction $C_{12}H_{22}O_{11}(aq) + H_2O(excess) \rightarrow C_6H_{12}O_6(aq) + C_6H_{12}O_6(aq)$ can it be of pseudo first order type?

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59. What are the requirements for a bimolecular reaction to take place? OR

What are requirements for the collision reactant molecules to lead to products.

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60. Define Activation Energy.

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61. Explain the concept of potential energy barrier.

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62. If a gaseous reaction has activation energy $75kJmol^{-1}$at 298 k, find the fraction of successful collision.

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63. Why all collisions between reactant molecules do not lead to a chemical reaction?

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64. Write Arrhenius equation and explain the terms involved in it.

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65. Explain with the help of Arrhenius equation, how does the rate of reaction changes with-

activation energy.

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66. Explain with the help of Arrhenius equation, how does the rate of reaction changes with-

activation energy.

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67. How will you determine activation energy graphically using Arrhenius equation?

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68. How will you determine activation energy from rate constants at two different temperatures?

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69. What is the effect of change of temperature on the rate of reaction?

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70. What is catalyst? Explain with example.

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71. How catalyst increases the rate of reaction? Explain with help of potential energy diagram for catalyzed and unanalyzed reactions.

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72. Explain graphically the effect of catalyst on the rate of reaction.

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73. Consider the reaction $2A + 2B \rightarrow 2C$. Suppose that at a particular moment during the reaction, rate of disappearance of A is $0.076 M / s$

What is the rate of consumption of B?

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74. Consider the reaction $2A + 2B \rightarrow 2C$. Suppose that at a particular moment during the reaction, rate of disappearance of A is $0.076M/s$

What is the rate of the reaction?

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75. Consider the reaction

$3I_{aq}^{-} + S_2O_{8(aq)}^{2-} \rightarrow I_{3(aq)}^{-} + 2SO_{4(aq)}^{2-}$

At a particular time t, $\frac{d\left[SO_4^{2-}\right]}{dt} = 2.2 \times 10^{-2} M/s$ What are the values of

$-\frac{d[I^-]}{dt}$ at the same time?

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76. Consider the reaction

$3I_{aq}^{-} + S_2O_{8\,(aq)}^{2-} \rightarrow I_{3\,(aq)}^{-} + 2SO_{4\,(aq)}^{2-}$

At a particular time t, $\frac{d\left[SO_4^{2-}\right]}{dt} = 2.2 \times 10^{-2} M/s$ What are the values of

$-\frac{d\left[S_2O_8^{2-}\right]}{dt}$ at the same time?

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77. Consider the reaction

$3I_{aq}^{-} + S_2O_{8\,(aq)}^{2-} \rightarrow I_{3\,(aq)}^{-} + 2SO_{4\,(aq)}^{2-}$

At a particular time t, $\frac{d\left[SO_4^{2-}\right]}{dt} = 2.2 \times 10^{-2} M/s$ What are the values of

$\frac{d\left[I_3^{-}\right]}{dt}$ at the same time?

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78. For the rection $2NOBr(g) \rightarrow 2NO_2(g) + Br(g)$, the rate law is $rate = k[NOBr]^2$. If the rate of reaction is 6.5x10^(-6)mole L^(-1)$stheconcentrationof$NOBris2xx10^(-3) mole L^(-1)`. What be the rate constant for the reaction?

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79. The rate law for the reaction $C_2H_4Br_2 + 3I^- \rightarrow C_2H_4 + 2Br^- + I_3^-$ is $rate = k[C_2H_4Br_2]\left[I^-\right]$. The rate of the reaction is found to be $1.1 \times 10^{-4} M/s$ when the concentrations of $C_2H_4Br_2$ and I^- are 0.12M and 0.18M respectively. Calculate the rate constant of the reaction.

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80. Write the rate law for the reaction, $A + B \rightarrow P$ from the following data:

	[A] moles $dm^{-3} sec^{-1}$ (Initial)	[B] moles $dm^{-3} sec^{-1}$ (Initial)	Initial rate/ moles dm^{-3} sec^{-1}
(i)	0.4	0.2	4.0×10^{-5}
(ii)	0.6	0.2	6.0×10^{-5}
(iii)	0.8	0.4	3.2×10^{-4}

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81. The rate of the reaction, $A + B \rightarrow P$ is $3.6 \times 10^{-2} mol dm^{-3} s^{-1}$ when [A] = 0.2 moles dm^{-3} and [B] = 0.1 moles dm^{-3}. Calculate the rate constant if the reaction is firsr order in A and second order in B.

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82. For the reaction, $A + B \rightarrow P$, if [B] is doubled at constant [A], the rate of the reacton doubles. If [A] tripled and [B] is doubled, the reaction increases by a factor by a factor of 6. What is the order of the reaction with respect to each reactant and the overall of the reaction?

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83. The reaction $F_2(g) + 2ClO_2(g)$ is first order in each of the reactants. The rate of the reaction in each of the reactants. The rate of the reaction is $4.88 \times 10^{-4} M/s$ when $[F_2] = 0.015M$ and $[ClO_2] = 0.025M$. Calculate the rate constant of the reaction.

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84. Consider the reaction $2A + 2B \rightarrow 2C + D$. From the following data, calculate the order and rate constant of the reaction.

[A] / [M	[B] / M	r / Ms^{-1}
0.488	0.160	0.24
0.244	0.160	0.06
0.244	0.320	0.12

Write the rate law of the reaction.

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85. For the reaction $2A + B \rightarrow$ products, find the rate law from the following data

[A] / [M	[B] / M	rate/Ms^{-1}
0.3	0.05	0.15
0.6	0.05	0.30
0.6	0.20	1.20

What is the rate constant and order of the reaction?

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86. For the reaction : $2A + 2B \rightarrow 2C + D$, if concentration of A is doubled at constant [B], the rate increase by a factor of 4. If the concentration of B is doubled with [A] being constant the rate is double. Write the rate law of the reaction.

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87. For the reaction : $2A + 2B \rightarrow 2C + D$, if concentration of A is doubled at constant [B], the rate increase by a factor of 4. If the concentration of B is doubled with [A] being constant the rate is double. Write the rate law of the reaction.

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88. The rate law for the reaction $A + B \rightarrow C$ is found to be rate = $k[A]^2[B]$. The rate constant of the reaction at $25^\circ C$ is 6.25 $M^{-2}S^{-1}$. What is the rate of reaction, When $[A] = 0.1mol.\ dm^{-3}$ and $[B] = 0.2mol.\ dm^{-3}$?

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89. A complex reaction takes place in two steps.

$NO_g + O_{3(g)} \rightarrow NO_{3(g)} + O_g$

$NO_{3(g)} + O_g \rightarrow NO_{2(g)} + O_{2(g)}$

The predicted rate law is: $rate = k[NO][O_3]$

Identify the rate determing step. Write overall reaction. Which is the reaction intermediate? Why?

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90. The half life of first order reaction is 990 s. If the initial concentration of the reactant is 0.08 mol dm^3, what concentration would remain after 35 minutes?

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91. In a first order reaction 60% of the reactant decomposes in 45minutes.Calculate the half life for the reaction.

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92. The half life of a first order reaction is 0.5 min. Calculate time needed for the reactant to reduce to 20% and the amount decomposed in 55s.

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93. In a first order reaction, the concentration of reactant decreases from 20 mmol dm^{-3} to 8 mmol dm^{-3} in 38 minutes. What is the half life of reaction?

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94. The half life a first order reaction is1.7hr.How long will it take for 20% of the reactant to react?

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95. Show that time required for 99.9% completion of a first order reaction is three the time required for 90% completion.

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96. A first order reaction takes 40 minutes for 30% decomposition. Calculate its half life.

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97. The gaseous reaction $A_2 \rightarrow 2A$ is first order in A_2. After 12.3 minutes 65% of A_2 remains undecomposed. How long will it take to decompose 90% of A_2? What is the half life of the reaction?

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98. The rate constant of a first order reaction is $6.8 \times 10^{-4} s^{-1}$. If the initial concentration of the reactant is 0.04 M, what is its

molarity after 20 minutes? How long will it take for 25% of the reactant to react?

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99. The rate constants for a first order reaction are $0.6s^{-1}$ at 313 K and $0.045s^{-1}$ at 293 K. What is the activation energy?

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100. A first order gas phase reaction has activation energy of $240kJmol^{-1}$. If the pre-exponential factor is $1.6 \times 10^{13}s^{-1}$. What is the rate constant of the reaction at 600 K?

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101. The half life of a first order reaction is 900 min at 820 K.Estimate its half life at 720 K if the energy of activation of the reaction is $250kJmol^{-1}$

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102. The energy of activation for a first order reaction is $104kJ/mol$. The rate constant at $25^{\circ}C$ is $3.7 \times 10^{-5}s^{-1}$. What is the rate constant at $30^{\circ}C$? $(R = 8.314j/Kmol)$]

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103. What is the energy of activation of a reaction whose rate constant doubles when thetemperature changes from 303 K to 313 K?

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104. The rate constant of a reaction at $500^{\circ}C$ is $1.6 \times 10^{3} M^{-1} s^{-1}$. What is the frequency factor of the reaction if its activation energy is $56 kJ mol^{-1}$. $\left(9.72 \times 106 M^{-1} s^{-1}\right)$

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105. The rate constant for the first order reaction is given by $\log_{10} k = 14.34 - 1.25 \times 10^{4} T$. Calculate activation energy of the reaction $(239.3 kJ/mol)$

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106. What fraction of molecules in a gas at 300 K collide with an energy equal to activation energy of $50 KJ/mol$?

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107. A first order gas phase reaction has activation energy of $240kJmol^{-1}$. If the pre-exponential factor is $1.6 \times 10^{13}s^{-1}$. What is the rate constant of the reaction at 600 K?

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Exercise

1. In the reaction $2N_2O_{5(g)} \rightarrow 4NO_{2(g)} + O_2$ at a certain time. The rate of formation of NO_2 is $0.08Ms^{-1}$. Find the rate of consumption of N_2O_5, rate of formation of O_2 and the rate of the reaction.

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2. Find the rate constant , at 298 K temperature of a chemical reaction with rate law, rate = $k[X][Y]^2$. The rate of reaction is found to be $0.40M/s$ and [X] = 0.6 M and [Y] = 0.39 M.

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3. For a reaction $A + 2B \rightarrow C$, the rate law is, rate= $k \times [A] \times [B]^2$. If the rate constant of the reaction is $3.74 \times 10^{-2}M^{-2}s^{-1}$, calculate the rate of the reaction when

the concentrations of A and B are 0.126 M and 0.142 M respectively.

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4. The rate of chemical reaction would

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5. Find the rate constant of the following first order reaction $A \rightarrow B$, if the rate of reaction is $6.4 \times 10^{-4} Ms^{-1}$ and active mass of A is 0.20 M at room temperature.

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6. The rate of the reaction, $A \rightarrow$ products is $2.15 \times 10^{-3} Ms^{-1}$ when concentration of A is 0.35 M. Determine the rate constant if the reaction is (a) first order in A (b) second order in A.

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7. A first order takes 30 minutes to complete 20%. Calculate the rate constant for the reaction.

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8. % Relative humidity (for a given temperature)

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9. Half-life period of a firsr oder reaction is 56.5 min. Calculate rate constant in per second.

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10. If the half-life period of a zero order reaction with initial concentration 0.1 M is 32.4 min. What will be the half-life when the concentration is 0.5 M?

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11. Sucrose decomposes in acid solution to give glucose and fructose according to the first order rate law. The half life of the reaction 3 hours. Calculate fraction of sucrose which will remain after 8 hours.

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12. Calculate the activation energy of a reaction for which rate constant becomes four times when temperature changes from $30^{\circ}C$ to $50^{\circ}C$. Given : $R = 8.314 Jk^{-1}mol^{-1}$.

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13. What is the energy of activation of a chemical reaction, whose rate constant doubles, when the temperature is raised from $17^{\circ}C$ to $27^{\circ}C$. Given: $R = 8.314 Jk^{-1}mol^{-1}$.

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14. Find the frequency constant and half life period of a first order reaction, if its rate constant and activation energy are

$1.11 \times 10^{-4} s^{-1}$ and 39.3 kcal mol^{-1} at $300^{\circ} C$. $(R = 2Cal/mol.\ K)$.

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15. For a first order reaction, the frequency factor and rate constant at 600K are $1.6 \times 10^{13} s^{-1}$ and $2.05 \times 10^{-8} s^{-1}$ respectively. Find the energy of activation.

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16. The rate constant of a certain first order reaction is $3.12 \times 10^{-3}\ \text{min}^{-1}$

How many minutes does it make for the reactant concentration to deop to 0.02 M if the initial concentration of the reactant in 0.045 M?

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17. The rate constant of a certain first order reaction is $3.12 \times 10^{-3} \text{ min}^{-1}$

What is the molarity of the reactant after 1.5 hours , If initial concentration is 0.045 M ?

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18. In a first order reaction, the concentration of reactant decreases from 20 mmol dm^{-3} to 8 mmol dm^{-3} in 38 minutes. What is the half life of reaction?

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19. The rate constant of a first order reaction is $6.8 \times 10^{-4} s^{-1}$. If the initial concentration of the reactant is 0.04 M, what is its molarity after 20 minutes? How long will it take for 25% of the reactant to react?

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24. In a first order reaction 60% of the reactant decomposes in 45minutes.Calculate the half life for the reaction.

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25. The rate law for the reaction $A + B \rightarrow C$ is found to be rate = $k[A]^2[B]$. The rate constant of the reaction at $25^\circ C$ is 6.25 $M^{-2}S^{-1}$. What is the rate of reaction, When $[A] = 0.1mol.\, dm^{-3}$ and $[B] = 0.2mol.\, dm^{-3}$?

A. Concentrations of A and B are both dobuled.

B. [A] is doubled and [B] is kept constant

C. [B] is dobuled and [A] is halved

D. [A] is kept constant and [B} is halved.

Answer:

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26. The order of the reaction for which the units of rate constant are mol $dm^{-3}s^{-1}$ is

A. 1

B. 3

C. 0

D. 2

Answer:

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27. The rate coristant for the reaction $2N_2O_5(g) \rightarrow 2N_2O_4(g) + O_2(g)$ is $4.98 \times 10^{-4}s^{-1}$. The order of reaction is

A. 2

B. 1

C. 0

D. 3

Answer:

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28. Show that time required for 99.9% completion of a first order reaction is three the time required for 90% completion.

A. t

B. 2t

C. $\frac{t}{2}$

D. 3t

Answer:

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29. Slope of the graph In $[A]_t$- versus t for first order'reaction is

A. #NAME?

B. k

C. $k/2.303$

D. $-k/2.303$

Answer:

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30. What is the half life of a first.order reaction if time required to decrease concentration of reactant from.0.8M to 0.2 M is 12-h?

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31. The reaction, $3ClO^{\theta} \rightarrow ClO_3^{\theta} + 2Cl^{\theta}$ occurs in two steps,

$2ClO^{\theta} \rightarrow ClO_2^{\theta} + Cl^{\theta}$

$ClO_2^{\theta} + ClO^{\theta} \rightarrow ClO_3^{\theta} + Cl^{\theta}$

The reaction intermediate is

A. Cl^{Θ}

B. ClO_2^{θ}

C. ClO_3^{θ}

D. ClO^{θ}

Answer:

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32. The elementary reaction $O_3(g) + O(g) \rightarrow 2O_2(g)$ is

A. unimolecular and second order

B. biomolecular and first order

C. biomolecular and second order

D. unimolecular and first order

Answer:

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33. Rate law for the reaction, $2NO + Cl_2 \rightarrow 2NOCI$ is rate = $k[NO]^2[Cl_2]$. Thus of k would increase with

A. increase of temperature

B. increase of concentration of NO

C. increase of concentration of Cl_2

D. increase of concentrations of both Cl_2 and NO

Answer:

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34. For an endothermic reaction, $X \rightarrow Y$. If E_f is activation energy of the forward reaction and E_r that for reverse reaction, which of the following is correct ?

A. $E_f = E_r$

B. $E_f < E_r$

C. $E_f > E_r$

D. $\delta H = E_f - E_r$ is negative

Answer:

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35. The rate of a chemical reaction can be expressed in terms of_____

A. rate of consumption of catalyst

B. rate of consumption of reactants only

C. rate of consumption of reactants and formation of products both

D. rate of formation of products only.

Answer:

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36. The rate of a chemical reaction can be expressed in terms of_____

A. $Lmol^{-1}t(-1)$

B. $moldm^{-3}t^{-1}$

C. Ms

D. $M^{-1}s^{-1}$

Answer:

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37. In the reaction $A + 3B \rightarrow 2C$, the rate of formation of C is____

A. the same as rate of consumption of A

B. the same as the rate of consumption of B

C. twice the rate of consumption of A

D. $\frac{3}{2}$ times the rate of consumption of B`.

Answer:

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38. The instantaneous rate of reaction $2A + B \rightarrow C + 3D$ is given be_____

A. $\frac{dA}{dt}$

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

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

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

Answer:

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39. A reaction is first order with respect to reactant A and second order with respect to reactant B. The rate law for the reaction is given by

A. $rate = k[A][B]^2$

B. $rate = [A][B]^2$

C. $rate = k[A]^2[B]$

D. $rate = k[A]^0[B]^2$

Answer:

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40. Molecularity of an elementary reaction

A. may be zero

B. is always integral

C. may be semi-integral

D. may be integral,fractional or zero.

Answer:

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41. What are the units of rate constant of first order reaction?

A. $\min^{-2}$

B. s

C. s^{-1}

D. min

Answer:

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42. The integrated rate equation for first order reaction $A \rightarrow$ products is given by

A. $k = \frac{2.3030}{t} \frac{\ln[A]_0}{[A]_t}$

B. $k = \frac{1}{t} \frac{\ln[A]_0}{[A]_t}$

C. $k = \frac{2.303}{t} \frac{\log_{10}[A]_t}{[A]_0}$

D. $k = \frac{1}{t} \frac{\ln[A]_t}{[A]_0}$

Answer:

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43. The half life period for a first order reaction is _____.

A. 1800s

B. 60 min

C. 15 min

D. 900 s

Answer:

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44. The slope of the straight line obtained by plotting rate versus concentration of reactant for a first order reaction is

A. $-k$

B. $k/2.303$

C. $-k/2.303$

D. k

Answer:

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45. The reaction between $H_{2(g)}$ and ICI_g occurs in the following steps:

$H_2 + ICI \rightarrow HI + HCl$

$HI + ICI \rightarrow I_2 + HCl$

The reaction intermediate in the reaction is

A. HCl

B. HI

C. I_2

D. ICI

Answer:

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46. Consider the reaction $2NO_g + O_{2(g)} \rightarrow 2NO_{2(g)}$. If $\frac{d[NO_2]}{dt} = 0.052M/s$ then $-\frac{d[O_2]}{dt}$ will be

A. $0.052M/s$

B. $0.114M/s$

C. $0.026M/s$

D. $-0.026M/s$

Answer:

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47. The rate of the first order reaction $A \rightarrow$ products, is 0.01 M sr1, when reactant concentration is 0.2 M. The rate constant for the reaction is-

A. $0.05s^{-1}$

B. $0.05\ \min$

C. $0.1s^{-1}$

D. $0.01s^{-1}$

Answer:

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48. The rate constant of a reaction

A. decrease with increasing E_a

B. decreases with decreasing E_a

C. is independent of E_a

D. decreases with increasing temperature

Answer:

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49. The rate constant of a reaction is $2.1 \times 10^{-2} litremol^{-1}s^{-1}$. The order of reaction is

A. $5.76 \times 10^{-3}s^{-1}$

B. $1.086 \times 10^{-3}s^{-1}$

C. $-2.5 \times 10^{-3}s^{-1}$

D. $2.5 \times 10^{-3}s^{-1}$

Answer:

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50. A catalyst increases the rate of the reaction by

A. increasing E_a

B. increasing T

C. decreasing E_a

D. decreasing T

Answer:

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51. The formation of SO_3 from SO_2 and O_2 takes place in the following steps:

$2SO_2 + 2NO_2 \rightarrow 2SO_3 + 2NO$

$2NO + O_2 \rightarrow 2NO_2$

A. NO is intermediate

B. NO_2 is catalyst

C. NO_2 is catalyst and NO is intermediate

D. NO is catalyt and NO_2 is intermediate.

Answer:

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52. The Arrhenius equation is

A. $A = k^{-Ea/RT}$

B. $\frac{A}{k} = e^{Ea/RT}$

C. $k = Ae^{-(Ea/RT)}$

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

Answer:

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53. The rate of reaction at specific instant is called

A. integrated rate law

B. average rate

C. constant rate

D. instantaneous rate

Answer:

Watch Video Solution

54. Rate constant does not depend upon unit of concentration for reactant whose order is___.

A. zero

B. first

C. fractional

D. infinite

Answer:

Watch Video Solution

55. The rate of reaction depends on reactants

A. concentration

B. temperature

C. catalyst

D. above all

Answer:

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56. The rate of reaction is negative with respect to_____.

A. products

B. reactants

C. both (a) and (b)

D. catalyst

Answer:

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57. The order of the reaction $2NO_g + O_{2(g)} \rightarrow 2NO_{2(g)}$ having $Rate = k[NO_2]^2[O_2]$ is

A. one

B. two

C. four

D. three

Answer:

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58. What are the units of rate constant of first order reaction?

A. M or i^{-1}

B. s^{-1}

C. $S^{-1}Mol^{-1}dm^3$

D. Mols71dm3

Answer:

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59. Which order of reaction obeys the expression $t_{1/2} = \frac{1}{ka}$

A. zero

B. first

C. third

D. second

Answer:

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60. The relation between half life and initial concentration is given by

A. a^{n-1}

B. $\frac{1}{a^{n-1}}$

C. a^{-n}

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

Answer:

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61. Tritium undergoes radioactive decay giving _____.

A. third order reaction

B. second order reaction

C. first order reaction

D. zero order reaction

Answer:

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62. Time required to complete 90% of the first order reaction is

A. $\frac{2.303}{k}$

B. $\frac{2 \times 0.693}{k}$

C. $\frac{2 \times 693}{k}$

D. $\frac{0.301}{k}$

Answer:

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63. Half-life $t_{1/2}$ of first order reaction is_____

A. dependent of concentration

B. independent of concentration

C. dependent of time

D. dependent of molecularity

Answer:

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64. Some bimolecular reactions which follow the kinetics of first order are called

A. unimolecular reactions

B. pseudo unimolecular reactions

C. first order reactions

D. bimolecular reactions

Answer:

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65. In decomposition of $NH_{3(g)}$ _____surface is used.

A. cold Pt

B. hot Pt

C. Pt

D. Ni

Answer:

Watch Video Solution

66. Decomposition of NH_3 takes place in presence of_____

A. hot Pt

B. tungsten

C. hot tungsten

D. Pt

Answer:

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67. Decomposition of nitrous oxide takes place in presence of _____catalyst.

A. Ni

B. Pd

C. Pt

D. Zn-Cu

Answer:

Watch Video Solution

68. hydrolysis of nitrous oxide to nitrogen and oxygen is_____ order reaction.

A. first

B. second

C. pseudo

D. zero

Answer:

Watch Video Solution

69. The hydrolysis of ethyl acetate $CH_3COOC_2H_5 + H_2O \xrightarrow{H^+}, CH_3COOH + C_2H_5OH$ is_____

A. pseudo first order

B. second order

C. third order

D. zero order

Answer:

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70. Molecularity of reaction can be_____

A. negative

B. integral

C. zero

D. fractional

Answer:

Watch Video Solution

71. For a single step reaction : $A + 2B \rightarrow$ products the molecularity is_____

A. zero

B. one

C. two

D. three

Answer:

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72. The molecularity and order of the reaction $2NO_g + O_{2(g)} \rightarrow 2NO_{2(g)}$ are____respectively.

A. one and one

B. two and two

C. three and three

D. two and three

Answer:

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73. During breaking and making of bonds, the colloidal molecule must have_____

A. potential energy

B. vibrational energy

C. activation energy

D. proper orientation

Answer:

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74. The minimum kinetic energy required for a molecular collision to lead a reaction is called_____

A. potential energy

B. activation energy

C. total energy

D. translational energy

Answer:

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75. Average kinetic energy is proportional to _____

A. temperature

B. pressure

C. concentration

D. volume

Answer:

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76. Arrhenius mathemical expression shows the relationship between_____

A. E_a, k and T

B. E_a, P and T

C. T, P and V

D. T, E_a and V

Answer:

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77. A catalyst increases the rate of the reaction by

A. increasing Ea

B. increasing T

C. decreasing Ea

D. decreasing T

Answer:

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78. Decomposition of $KClO_3$ takes place in presence of catalyst_____

A. MnO_2

B. Pt

C. Pd

D. Ni

Answer:

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79. Decompositon of H_2O_2 takes place in presence of a catalyst_____

A. MnO_2

B. I-ions

C. CI-ions

D. Pt

Answer:

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80. Chemical kinetics a branch of physical chemistry, deals with

A. structure of molecules

B. heat changes in a reaction

C. physical changes in a reaction

D. rate of reactions

Answer:

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81. Under a given set of experimental conditions with increase in the concentration of the reactants, the rate of chemical reaction

A. decreases

B. increases

C. remians constant

D. first decreases and increases

Answer:

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82. K represents the rate constant of a reaction when $\log K$ is plotted against $1/T$ (T= temperature) the graph obtained is a

A. curve

B. a strainght line with a constant positive slope

C. a strainght line with constant negative slope

D. a straight line with no slope

Answer:

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83. With increase in temperature the value of the rate constant of a reaction generally

A. increases

B. decreases with decreasing E_a

C. may increase or decrease

D. may not change

Answer:

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84. In reactions involving gaseous reactants and gaseous products the units of rate are

A. Atm

B. Atm-sec

C. $Atm.\sec^{-1}$

D. $Atm^2 \sec t^2$

Answer:

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85. In the sequence of reaction $A \xrightarrow{k_1} B \xrightarrow{k_2} C \xrightarrow{k_3} DK_3 > K_2 > K_1$, then the rate determining step of the reaction is

A. $A \to B$

B. $C \to D$

C. $B \to C$

D. $A \to D$

Answer:

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86. The rate of chemical reaction would

A. increase as the reaction proceeds

B. decrease as the reaction proceeds

C. may increase or decrease during the reaction

D. remains constant as the reaction proceeds

Answer:

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87. The factor which does not influence the rate of reaction is

A. Nature of reactants.

B. Concentration of the reactants

C. Temperature

D. Molecular mass

Answer:

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88. The rate of chemical reaction depends on the nature of reactants because

A. The number of bonds broken in the reactant molecules and the number of bonds formed in product molecules changes

B. Some of the reactants are solids at the room temperature

C. Some of the reactants are coloured

D. Some of rectants are liquid at room temperature

Answer:

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89. The rate of reaction increases with increase of temperature because

A. the concentration of the reactants

B. temperature of the reaction

C. time of the reaction

D. with all the three

Answer:

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90. Dimensions of rate of reaction involves

A. concentration only

B. time only

C. both concentration and time

D. neither time nor concentration

Answer:

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91. A catalyst

A. Increase the heat of the reaction

B. Decrease the heat of the reaction

C. Does not alter the heat of the reaction

D. Increases the number of collisions

Answer:

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92. What are the units of rate constant of zero-order reaction.

A. $molL^{-1}s^{-1}$

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

C. $L^2mol^{-2}s^{-1}$

D. s^{-1}

Answer:

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93. The rate of the first order reaction $A \rightarrow$ products, is 0.01 M sr1, when reactant concentration is 0.2 M. The rate constant for the reaction is-

A. $0.05s^{-1}$

B. $0.05\ \text{min}^{-1}$

C. $0.1s^{-1}$

D. $0.01s^{-1}$

Answer:

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94. If a graph is plotted between Ln K and $1/T$ for the first order reaction, the slope of the strainght line so obtained is

given by-

A. $-\frac{E_a}{R}$

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

C. $-\frac{2.303}{E_a R}$

D. $-\frac{E_a}{2.303}$

Answer:

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95. The half life of a first order reaction is 30 min and the initial concentration of the reactant is 0.1 M. If the initial concentration of reactant is doubled, then the half life of the reaction will be

A. 1800s

B. 60 min

C. 15 min

D. 900 s

Answer:

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96. Derive the integrated rate law for zero order reaction.

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97. Identify the Molecularity of following reaction-

$Cl(g) + Cl(g) + N_{2(g)} \rightarrow Cl_2(g) + N_2(g)$

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98. The graph of temperature against time is

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99. Express the rate of the following reaction in terms of change in concentration of each substance:

$N_{2(g)} + 3H_2(g) \rightarrow 2NH_3(g)$

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100. Distinguish between: Order and Molecularity.

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101. What is the Molecualrity and order of the following examples -

$2NO_2 + F_2 \rightarrow 2NO_2F \; Rate = k[NO_2][F_2]$

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102. Find the overall order

$CHCl_{3(g)} + Cl_{2(g)} \rightarrow \mathbb{C}l_{4(g)} + HCl_g Rate = k[CHCl_3][Cl_2]$

$2NO_g + O(2(g)) \rightarrow 2NO_{2(g)} \; Rate = k[NO]^2[O_2]$

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103. For the reaction $2A + B \rightarrow$ products, find the rate law from the following data

[A] / [M	[B] / M	rate/Ms^{-1}
0.3	0.05	0.15
0.6	0.05	0.30
0.6	0.20	1.20

What is the rate constant and order of the reaction?

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104. Write a note on semen.

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105. Draw the graph of [A]t against time for a first order reaction.

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106. The rate constant of a first order reaction is $6.8 \times 10^{-4} s^{-1}$. If the initial concentration of the reactant is 0.04 M, what is its molarity after 20 minutes? How long will it take for 25% of the reactant to react?

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107. reaction has rate constant $1.73 \times 10^{-3} \text{ min}^{-1}$ and $4.86 \times 10^{-3} \text{ min}^{-1}$ at 300 K and 330 K respectively. Calculate the energy of activation of this reaction. [Given: R = 8.314 JK^(-1) mol^{-1}

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108. A catalyst increases the rate of the reaction by

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109. The rate law for the reaction $C_2H_4Br_2 + 3I^- \rightarrow C_2H_4 + 2Br^- + I_3^-$ is $rate = k[C_2H_4Br_2][I^-]$. The rate of the reaction is found to be $1.1 \times 10^{-4} M/s$ when the concentrations of $C_2H_4Br_2$ and I^- are 0.12M and 0.18M respectively. Calculate the rate constant of the reaction.

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110. For the reaction $NO_2 + CO \rightarrow NO + CO_2$, the rate of reaction if, experimentally found to be proportional to the square of the concentrations of NO_2, and independent of that of CO. Write rate law.

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111. A complex reaction takes place in two steps as follows. Write its overall reaction, identify the intermediate.

$NO + O_3 \rightarrow NO_2 + O_2$

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112. A complex reaction takes place in two steps as follows. Write its overall reaction, identify the intermediate.

$NO + O_3 \rightarrow NO_2 + O_2$

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