



CHEMISTRY

BOOKS - USHA CHEMISTRY (ODIA ENGLISH)

CHEMICAL KINETICS

Exercise

1. The Arrhenius equation is

A. $K = Ae^{\frac{E_a}{RT}}$

B. $K = e^{\frac{E_a}{RT}}$

C. $K = Ae^{-\frac{E_a}{RT}}$

D. $K = Ae^{-(RT)/(E_a)}$

Answer: C



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2. Considering an exothermic reaction, with activation energy E_a and E'_a for the forward and backward reactions respectively, Now we can say

A. $E_a = E'_a$

B. $E_a > E'_a$

C. $E_a < E'_a$

D. can't be predicted which is more

Answer: C



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3. When $\log K$ is plotted Vs $\frac{1}{T}$ for a 1st order reaction we get a straight line. The slope of the line is equal to

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

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

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

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

Answer: A

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4. For a reaction $K = 2 \times 10^{-2} \text{ mole lit}^{-1} \text{ sec}^{-1}$. If the concentration of the reactant is 1M, the half life period of the reaction is

A. 20 sec

B. 25 sec

C. 34.6 sec

D. 50 sec

Answer: B



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5. The rate of a reaction $A \rightarrow$ product, increases by a factor of 100, when concn. of 'A' is increased 10 fold. The order of the reaction is

A. 3

B. 2

C. 1

D. 0.5

Answer: B



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6. The rate constant of a reaction is $2 \times 10^{-5} \text{ sec}^{-1}$. If the initial concentration is 0.1 M, the initial rate is

A. $2 \times 10^{-4} \text{ M sec}^{-1}$

B. $2 \times 10^{-5} M \text{ sec}^{-1}$

C. $2 \times 10^{-6} M \text{ sec}^{-1}$

D. $2 \times 10^{-7} M \text{ sec}^{-1}$

Answer: C

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7. For a 1st order reaction, the time required for 99.9% completion is

A. ten times the time required for half completion of reaction

B. three times the time required for 90% completion of reaction

C. five times the time required for 75% completion of reaction

D. all are correct

Answer: D

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8. The half life period for a 1st order reaction is 6.93 sec., its rate constant is

A. 10 sec^{-1}

B. 100 sec^{-1}

C. 0.1 sec^{-1}

D. 1 sec^{-1}

Answer: C



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9. Alkaline hydrolysis of ester is an example of

A. 1st order reaction

B. 2nd order reaction

C. zero order reactin

D. pseudo 1st order reaction

Answer: B

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10. The rate of a reaction depends upon

A. concentration of reactant

B. temperature

C. catalyst

D. all of these

Answer: D

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11. The rate constant of a reaction depends upon

A. temperature

B. catalyst

C. nature of reactant

D. all of these

Answer: D



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12. For a reaction, $H_2O_2 \rightarrow H_2O + 1/2O_2$ ($\frac{d[H_2O_2]}{dt} = K_1[H_2O_2]$, $\frac{d[H_2O]}{dt} = K_2[H_2O_2]$, $\frac{d[O_2]}{dt} = K_3[H_2O_2]$) The relation between K_1 , K_2 and K_3 is

A. (a) $K_1 = K_2 = K_3$

B. (b) $K_1 = K_2 = 2K_3$

C. (c) $2K_1 = 4K_2 = K_3$

D. (d) $2K_1 = 2K_2 = K_3$

Answer: B



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13. The rate constant of a reaction is independent of

- A. temperature
- B. catalyst
- C. cone. of reactant
- D. none of these

Answer: C



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14. The unit of rate constant for 2nd order reaction is

- A. mole $lit^{-1} sec^{-1}$

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

C. $\text{mol}^{-1} \text{lit}^{-1} \text{sec}^{-1}$

D. $\text{mol}^2 \text{lit}^{-2} \text{sec}^{-1}$

Answer: B

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15. If the rate of formation of NH_3 for the reaction $\text{N}_2 + 3\text{H}_2 \rightarrow 2\text{NH}_3$ is $2 \times 10^{-4} \text{M sec}^{-1}$, the rate of disappearance of hydrogen is

A. $1 \times 10^{-4} \text{M sec}^{-1}$

B. $2 \times 10^{-4} \text{M sec}^{-1}$

C. $3 \times 10^{-4} \text{M sec}^{-1}$

D. $6 \times 10^{-4} \text{M sec}^{-1}$

Answer: C

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16. The half life period for a zero order reaction is equal to

A. $\frac{0.693}{K}$

B. $\frac{a}{2K}$

C. $\frac{1}{Ka}$

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

Answer: C



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17. For a 1st order reaction $\log K$ is plotted against $\frac{1}{T}$ and, the slope of the line is $-1.5 \times 10^2 K$. The activation energy for the reaction would be

A. 2872 J mol^{-1}

B. 28.72 J mol^{-1}

C. 1914 J mol^{-1}

D. 1200 J mol^{-1}

Answer: A

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18. Which of the following statements regarding molecularity is wrong ?

- A. it is the number of reactant molecules colliding in a single step of chemical reaction.
- B. it refers to individual step of the reaction.
- C. it may be whole number or fractional
- D. the rate of reaction is independent of molecularity.

Answer: C

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19. For a chemical change $2A + 3B \rightarrow$ Product's the rates w.r.t. 'A' is r_1 and w.r.t. 'B' is r_2 . The rates, r_1 and r_2 are related as

A. $r_1 = r_2$

B. $2r_1 = 3r_2$

C. $3r_1 = 2r_2$

D. $r_1 = 3r_2$

Answer: C



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20. The rate constant for the reaction $2N_2O_5 \rightarrow 2N_2O_4 + O_2$ is $3 \times 10^{-5} \text{ sec}^{-1}$. If the rate is $2.4 \times 10^{-5} \text{ M sec}^{-1}$, the concentration of N_2O_5 is

A. 1.4 M

B. 0.04M

C. 1.2 M

D. 0.8 M

Answer: D

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21. Which of the following curves represents 1st order reaction ?

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22. Which equation gives relationship between rate-constant and temperature ?

A. Ostwald's equation

B. Kirchoff's equation

C. Arrhenius equation

D. Nernst equation

Answer: C



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23. At $25^{\circ}C$ the half life of decomposition of H_2O_2 is 50 min. If initially $4MH_2O_2$ is present, amount of H_2O_2 left after 200 min is

A. 2M

B. 0.5 M

C. 0.25M

D. 1 M

Answer: C



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24. The rate constant is numerically same for three reactions of 1st, 2nd and 3rd order respectively. If conc, of the reactant is more than 1M,

which one is true for the rates of the three reactions ?

A. $r_1 = r_2 = r_3$

B. $r_1 < r_2 < r_3$

C. $r_1 > r_2 > r_3$

D. none of these

Answer: B



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25. In the above question if conc. of the reactant is less than 1 M, then

A. $r_1 = r_2 = r_3$

B. $r_1 < r_2 < r_3$

C. $r_1 > r_2 > r_3$

D. none of these

Answer: C



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26. A reaction $X \rightarrow$ product, completed 50% in 25 min. If concentration of 'X' is doubled, 50% completed in 50 min, the order of the reaction is

A. 0

B. 1

C. 2

D. 3

Answer: A



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27. A reaction involving two different reactants can never be

- A. first order reaction
- B. unimolecular reaction
- C. second order reaction
- D. bimolecular reaction

Answer: B

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28. A substance with half life period 4 days is taken to another place in 12 days. The amount of substance left now is

- A. $\frac{1}{4}$
- B. $\frac{1}{8}$
- C. $\frac{1}{16}$
- D. $\frac{1}{32}$

Answer: B



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29. For every $10^{\circ}C$ rise in temperature the rate of reaction increases nearly

A. 10 times

B. 2 times

C. 5 times

D. 8 times

Answer: B



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30. The reaction



of

- A. zero order reaction
- B. 1st order reaction
- C. 2nd order reaction
- D. fractional order reaction

Answer: B

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31. For a 1st order reaction $\log(a - x)$ is plotted Vs time, a straight line is obtained with slope

- A. $\frac{K}{2.303}$
- B. $\frac{2.303}{K}$
- C. $-\frac{K}{2.303}$
- D. $-2.303 K$

Answer: C



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32. The rate constant of a reaction is $2.5 \times 10^{-2} \text{ mo l}^{-1} \text{ sec}^{-1}$. The order of the reaction is

- A. zero
- B. 1st
- C. 2nd
- D. 3rd

Answer: C



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33. For a reaction, $A \rightarrow B + C$, activation energy is 15 kJ/mole and enthalpy of reaction is +5kJ/mole. The activation energy for the reaction $B + C \rightarrow A$ is

A. $10\text{kJ}/\text{mole} \leq$

B. $20\text{kJ}/\text{mole} \leq$

C. $30\text{kJ}/\text{mole} \leq$

D. $15\text{kJ}/\text{mole}$

Answer: A

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34. For the reaction $A \rightarrow B + C$, $\Delta H = + 25\text{kJ}$ mole The activation energy for the reaction is

A. $25\text{kJ}/\text{mole} \leq$

B. less than $25\text{kJ}/\text{mole} \leq$

C. more than $25\text{kJ}/\text{mole} \leq$

D. none of these

Answer: C



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35. A catalyst has no effect on

- A. rate of forward reaction
- B. activation energy
- C. threshold energy
- D. heat of reaction

Answer: D



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36. For the reaction, $A + 2B \rightarrow C$, the relative rate of reaction can be represented by

A. $\frac{d[A]}{dt} = + \frac{1}{2} \frac{d[B]}{dt} = - \frac{d[C]}{dt}$

B. $-\frac{d[A]}{dt} = -2 \frac{d[B]}{dt} = + \frac{d[C]}{dt}$

$$C. -\frac{d[A]}{dt} = -\frac{1}{2} \frac{d[B]}{dt} = +\frac{d[C]}{dt}$$

$$D. -\frac{d[A]}{dt} = +\frac{1}{2} \frac{d[B]}{dt} = -\frac{d[C]}{dt}$$

Answer: C

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37. The rate of reaction at different times are as follows :

<i>time(sec)</i>	0	10	20	30
<i>rate(M sec⁻¹)</i>	1.5×10^{-2}	1.48×10^{-2}	1.51×10^{-2}	1.49×10^{-2}

The reaction is

A. zero order

B. 1st order

C. 2nd order

D. 3rd order

Answer: A

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38. For a chemical reaction $A \rightarrow B$, it is found that the rate of reaction doubles when the conc, of 'A' is increased four times. The order of reaction is

A. 0

B. 0.5

C. 1

D. 2

Answer: B



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39. The unit of rate constant for a zero order reaction is _____

A. sec^{-1}

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

C. $mo \leq^{-1} lit \sec^{-1}$

D. $mo \leq^{-1} lit^{-1} \sec^{-1}$

Answer: B

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40. For a gaseous reaction the rate $= K[A][B]$. The volume of the vessel containing the gas is suddenly reduced to $\frac{1}{4}$ th of the initial volume. The rate of reaction relative to initial rate would be

A. $\frac{1}{16}$

B. 16

C. 8

D. same

Answer: B

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41. The half life period for a 1st order reaction is 10 min. The initial amount of the reactant was 0.08 M and concentration at any instant is 0.01 M. The time taken for the reaction is

- A. 10 min
- B. 20 min
- C. 30 min
- D. 40 min

Answer: C

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42. A large increase in rate of reaction for a rise of temperature is due to

- A. increase in number of molecular collisions.
- B. increase in number of activated molecules.

C. decrease in activation energy

D. lowering of threshold energy

Answer: B

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43. According to Arrhenius equation, rate of reaction increases with increase in temp. Give reasons.

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44. How is rate constant related to conc. of the reactant ?

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45. When $\log K$ is plotted Vs $\frac{1}{T}$ for a 1st order reaction we get a straight line. The slope of the line is equal to



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46. Write two factors which influence the rate of reaction.



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47. The unit of rate constant for 2nd order reaction is



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48. The overall order of reaction which has rate expression, Rate =

$K[A]^{1/2}[B]^{3/2}$ is _____



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49. Give an example of zero order reaction.



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50. Express the rate of reaction for the reaction $A_2 + 3B_2 \rightarrow 2A_3B_3$, in terms of reactants and products.

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51. Define rate of reaction.

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52. What is the relationship between activation energy and threshold energy ?

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53. Write the unit of rate of reaction.

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54. A substance with initial concentration $2M$ follows zero order kinetics with rate constant $2 \times 10^{-2} M \text{ sec}^{-1}$. How long will this reaction take to go to completion ?

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55. The rate of reaction is doubled for every $10^\circ C$ rise in temperature. If the temp is raised from $30^\circ C$ to $70^\circ C$ the rate of reaction will be increased by how many times ?

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56. Inversion of Cane Sugar is an example of —order reaction.

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57. What is the relationship between rate constant and half life period of a 1st order reaction ?

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58. Activation energy for a chemical reaction depends upon ____.

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59. For a 1st order reaction the time required for 75% completion is— times, the time required for 50% completion.

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60. In all reactions increase in concentration of reactants increases rate of reaction. Yes or No.

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61. The unstable intermediate compound formed by reactants after absorption of activation energy is called as

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62. Write the integrated rate equation for a 2nd order reaction of the type, $2A \rightarrow \text{product}$

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63. What is the effect of temperature on activation energy ?

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64. Define rate constant of a reaction .

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65. Hydrolysis of ester in presence of mineral acid is an example of ____ order reaction.

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66. Alkaline hydrolysis of ester is an example of

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67. If unit of rate constant is $\text{mol}^{-1} \text{lit sec}^{-1}$ order of the reaction is ____

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68. If for a reaction, the half life period is directly proportional initial concentration of reactant, what is the order of the reaction ?

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69. The Arrhenius equation is

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70. How does rate of reaction vary with activation energy ?

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71. How is heat of reaction related to activation energy ?

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72. What is the unit of rate constant for first order reaction ?

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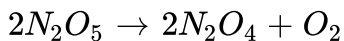
73. What is activated complex ?

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74. What is zero order reaction ?

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75. What is the order of the reaction given below ?



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76. Give an example of 1st order reaction

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77. Write the integrated rate equation for 1st order reaction.

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78. If the rate constant of a reaction is same as the rate of reaction at any concentration of reactant, what is the order of reaction ?

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79. Give an example of fractional order reaction

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80. For a reaction half life period is independent of initial concentration of reactant. What is the order of reaction ?

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81. The rate constant of a reaction depends upon

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82. The overall order of reaction which has rate expression, $\text{Rate} = k[A]^{1/2}[B]^{3/2}$ is _____

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83. What is photochemical reaction ?

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84. For a zero order of reaction the $t_{\frac{1}{2}}$ — concentration.

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85. How does rate of zero order reaction vary with progress of time ?

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86. For 'n' th order reaction, $t_{\frac{1}{2}} \propto$ —

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87. For a zero order reaction, the molecularity is zero. Yes or no

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88. In the equation $K = Ae^{-\frac{E_a}{RT}}$ what is A?

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89. How does rate of reaction vary with activation energy ?



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90. Can all molecular collisions yield the product ?



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91. What is the condition when all collisions between the molecules can be effective collision ?



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92. The unit of rate constant for a zero order reaction is _____



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93. The rate constant of a reaction depends upon



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94. The ratio between the rate constants at two different temperature differing by $10^{\circ}C$ is called as ___

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95. For a 1st order reaction when rate of reaction is plotted conc. of reactant a straight line is obtained whose slope is 2.5. What is its rate constant.

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96. Explain why H_2 and O_2 do not combine with each other at room temperature.

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97. Define catalyst. Give an example.

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98. The ratio between the rate constants at two different temperature differing by $10^{\circ}C$ is called as ____

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99. Explain, how a -ve catalyst decreases the rate of reaction, giving the reaction path way ?

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100. What do you mean by autocatalyst ?

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101. Why in most of the cases the rate of reaction decreases with progress of reaction ?

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102. On the basis of activation energy how can you explain slow and fast reaction ?

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103. Write the integrated rate equation for 1st order reaction.

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104. Give an example of 1st order reaction

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105. Give two characteristics of zero order reaction.

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106. Explain why powdered sugar dissolves faster in water than crystalline sugar.

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107. Define pseudofirst order reaction.

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108. Give a comparison between molecularity and order of a reaction.

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109. Define half life of a reaction.

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110. Explain, how a catalyst increases the rate of reaction, giving the reaction path way.

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111. Define threshold energy.

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112. What is life time of a reaction ?

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113. Why does 'Zn' dust react faster with dil. HCl than 'Zn' granules ?

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114. What is the effect of temperature on rate of a reaction ?

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115. Differentiate between rate of reaction and specific reaction rate.

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116. What is zero order reaction ?

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117. Write two characteristics of 1st order reaction.



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118. Why is the rate symbol w.r.t. the reactant taken as -ve and w.r.t. product taken as +ve ?



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119. A lump of coal burns at moderate rate in air while coal dust burns explosively, explain.



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120. Write short note on activation energy.



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121. What is the rate equation for a zero order reaction ? Also write the unit of rate constant for such reaction.

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122. Derive an equation for half life of a zero order reaction.

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123. What is difference between average rate and instantaneous rate of a chemical reaction.

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124. For the reaction, $2SO_2 + O_2 \rightarrow 2SO_3$ the rate of reaction w.r.t O_2 is $0.48 M \text{ sec}^{-1}$. Find the rate of reaction w.r.t. SO_2 and SO_3 .

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125. For a chemical reaction $A \rightarrow B$, it is found that the rate of reaction doubles when the conc, of 'A' is increased four times. The order of reaction is

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126. The initial concentration of a reactant is 0.5M with rate constant $1.5 \times 10^{-2} \text{ M sec}^{-1}$. Find half life of the reaction.

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127. For a forward reaction activation energy is 55 kJ/mole and for backward reaction is 70 kJ/ mole. Find heat of the reaction.

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128. The half life of a 1st order reaction is 200 sec. Calculate the rate constant of the reaction.

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129. For a reaction, $A \rightarrow B + C$, activation energy is 15 kJ/mole and enthalpy of reaction is +5kJ/mole. The activation energy for the reaction $B + C \rightarrow A$ is

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130. For a 1st order reaction $t_{\frac{1}{2}} = 2$ min. How long will it take to reach 25% of the initial conc. of the reactant ?

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131. For the reaction $N_2 + 3H_2 \rightarrow 2NH_3$, the rate of disappearance of H_2 is 0.18 M sec^{-1} . Find the rate of disappearance of N_2 and rate of formation of NH_3 .

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132. Calculate half life of a 1st order reaction, where the rate constant of the reaction is $6.93 \times 10^{-3} \text{ sec}^{-1}$.

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133. For a reaction $X \rightarrow \text{product}$, it was found the order of reaction is 2. How would the rate change if the conc. of 'X' is reduced to $\frac{1}{3}$ rd of the original value ?

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134. Show that for a 1st order reaction the time taken for 99.9% completion is 10 times the time required for half completion of the reaction.

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135. For a 1st order reaction the time required for 75% completion is— times, the time required for 50% completion.

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136. For a reaction the initial conc. of the reactant is 0.25 M. If the rate constant of the reaction is $2.5 \times 10^{-2} \text{ sec}^{-1}$, find the initial rate of the reaction.

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137. The rate constant of a reaction is increased by a factor of 2, when temp is changed from 290 K to 300 K. Find activation energy of the reaction.

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138. Prove that for a 1st order reaction, the time taken for 99% completion of the reaction is twice the time required for the completion of 90% of the reaction.

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139. When for a reaction $\log(a-x)$ is plotted Vs time a straight line is obtained, with slope $-0.03s^{-1}$. Find the rate constant of the reaction.

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140. Calculate natural life time of a 1st order reaction, whose rate constant is 0.25 sec^{-1} .

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141. Calculate rate constant of a 1st order reaction which is 90% completed in 10 min.

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142. For a 1st order reaction a substance is reduced to $\frac{1}{3}$ rd in 100 sec. In what time will it be reduced to $\frac{1}{9}$ th?

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143. Decomposition of A follows two parallel 1st order reactions with $K_1 = 1.3 \times 10^{-4} \text{ sec}^{-1}$ and $K_2 = 3.9 \times 10^{-5} \text{ sec}^{-1}$. Find %

distribution of the products.

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144. For a reaction $A \rightarrow \text{product}$, it was found that the rate of reaction is increased by a factor of 8 when conc. of 'A' is increased 4 times. Find the order of the reaction.

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145. Write two factors which influence the rate of reaction.

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146. Define half life of a reaction.

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147. Write short note on activation energy.

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148. The Arrhenius equation is

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149. Write short notes on : Order and Molecularity

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150. Derive an expression for rate constant of 1st order reaction. Write the unit of K. Show that for a 1st order reaction the time required for 99.9% completion is 3 times the time required for 90% completion.

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151. Derive an expression for rate constant of zero order reaction. For the reaction, $2NO + Cl_2 \rightarrow 2NOCl$, the rate of reaction is increased by a factor of 8, by doubling the conc. of both. Again doubling the conc. of Cl_2 only doubles the rate. Find order of the reaction w.r.t NO and Cl_2 .



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