CHEMISTRY

BOOKS - SHARAM PUBLICATION

CHEMICAL KINETICS

Exercise

1. Which of the following is correct for a first order reaction ?

A. $\frac{t_1}{2}\alpha\alpha$

B. $\frac{t_1}{2}\alpha\alpha$

C. $\frac{t_1}{2}\alpha\alpha^{\circ}$

D. $\frac{t_1}{2}\alpha\alpha^2$

Answer:

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2. Consider the reaction $2A + b \rightarrow Products$ When concentration of B alone was doubled, the rate did not change. When the conc. Of A alone was doubled, the rate increased by two times. The unit of the rate constant for the reaction is

A. $mollit^{-1}\sec^{-1}$

B. s^{-1}

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

D. no unit

Answer:

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3. The rate of first order reaction is $1.5 \times 10^{-2}\ \text{mol}\ \text{L}^{-1}\ \text{min}^{-1}$ at 0.5M concentration of the reactant. The half-life of the reaction is

A. `23.1 minutes

B. $8.73\ \text{min}\ utes$

C. $7.53\ \text{min}\ utes$

D. `0.383 minutes.

Answer:

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4. 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 2.4×10^{-5} M sec^{-1}, the concentration of N_2O_5 is

A. 1.4

B. 1.2

C. 0.04

D. 0.8

Answer:

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5. In a first order reaction, $A \rightarrow B$, if k is rate constant and the initial concentration of the reactant A is 0.5 M, then half-life is

A. $\frac{\log 2}{k}$

B. $\frac{\log 2}{k}\sqrt{0.5}$

C. $\frac{\ln 2}{k}$

D. $\frac{0.693}{0.5}k$

Answer:

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6. If 60% of a first order reaction was completed in 60 minutes. 50% of the same reaction would be completed in approximately.

A. 45 min

B. 60 min

C. 40 min

D. 50 min

Answer:

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7. For the reaction of the type $A + B \rightarrow$ product , $-d\frac{A}{dt}$ is equal to

A. $-d\frac{B}{dt}$

B. $-\frac{b}{d}d\frac{B}{dt}$

C. $-\frac{a}{b}d\frac{B}{dt}$

D. $-\frac{b}{a}d\frac{B}{dt}$

Answer:

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8. The half life of a reaction is halved as the initial concentration is doubled. The order of the reaction is

A. 0.5

B. 1

C. 2

D. 0

Answer:

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9. The half life period of a first order reaction is 30 minutes. The time required for completion of 99.9 % of the reactants is

A. 1 hr

B. 2 hr

C. 4 hr

D. 5 hr

Answer:

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10. Which is correct for zero order reaction ?

A. Rate of reaction depends upon decay constant.

B. Rate of reaction is independent of concentration

C. Unit of rate constant is con^(-1)`

D. Unit of rate constant is $conc^{-1}time^{-1}$

Answer:

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11. Temperature dependent equation can be written as

A. $1nK = 1nA - \frac{E_\alpha}{R}T$

B. $1nK = 1nA + (e)^{-\frac{E_\alpha}{R}T}$

C. $1nK = 1nA - (e)^{k\frac{I}{E_\alpha}}$

D. All of these

Answer:

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12. In the reaction $2N_2O_5 \rightarrow 4NO_2 + O_2$, the initial pressure is 500 atm and the rate constant k is $3.38 \times 10^{-5}\,\text{sec}^{-1}$. After 10 minutes the final pressure of N_2O_5 is

A. $490atm$

B. $250atm$

C. $480atm$

D. $420atm$

Answer:

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13. A reaction $P \rightarrow Q$ completed 25% in 25 minutes , 50% is completed in 25 minutes. If P is halved , 25% is completed in 50 minutes. If P is doubled, the order of the reaction is

A. 1

B. 0

C. 2

D. 3

Answer:

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14. A reaction involving two different reactants can never be

A. unimolecular reaction

B. first order reaction

C. second order reaction

D. bimolecular reaction

Answer:

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15. The rate of a reaction can be expressed by Arrherius equation as : $k = \underset{A}{e}^{E_\alpha / (RT)}$ .In this equation E_α represents.

A. The energy above which all the colliding molecules will react.

B. The energy below which all the colliding molecules will not react.

C. The total energy of the reacting molecules at a temperature T.

D. The fraction of the molecules with energy greater than the activation energy of the reaction.

Answer:

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16. $\frac{t_1}{4}$ can be taken as time taken for the concentration of the reactant to drop to $\frac{3}{4}$ of the initial value. If the rate constant for a first order reaction is k, the $\frac{t_1}{4}$ can be written as :

A. $\frac{0.10}{k}$

B. $\frac{0.29}{k}$

C. $\frac{0.69}{k}$

D. $\frac{0.75}{k}$

Answer:

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17. The rate equation for the reaction $2A + B \rightarrow C$ is found to be : rate = R[A] [B]. The correct statement in relation to this reaction is that the

A. unit of k must be s^{-1}

B. $\frac{t_1}{2}$ is constant.

C. the rate of formation of C is twice the rate of disapperance of A.

D. The value of k is independent of the initial concentration of A and B

Answer:

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18. In a first order reaction, the reactant concentration decreases from 0.8 M to 0.4 M in 15 min. What is the time taken for the concentration to change from 0.1 M to 0.025 M?

A. 30 minutes

B. 15 minutes

C. 7.5 minutes

D. 6 minutes

Answer:

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19. The rate law for a reaction between the substances A and B is given by rate $=k(A)^n(B)^m$ .On doubling the conc. Of A and halving the conc.of B. The ratio of the new rates to the earlier rate of the reaction will be as

A. $\frac{1}{2^m}+n$

B. $m+n$

C. $n-m$

D. $2^n - m$

Answer:

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20. In respect to the equation $k = A \times e^{-E}{}_{-} \frac{a}{R}T$ in chemical kinetics which one of the following statement is correct.

A. k is the equilibrium constant

B. A is the adsorption factor

C. E_a is the energy of activation

D. R is Rydberg Constant

Answer:

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21. The differential rate law for the reaction $H_2 + I_2 \rightarrow 2HI$ is

A. $-d\frac{H_2}{dt} = -d\frac{I_2}{dt} = \frac{1}{2}d\frac{HI}{dt}$

B. $d\frac{H_2}{dt} = d\frac{H_2}{dt} = \frac{1}{2}d\frac{HI}{dt}$

C. $\frac{1}{2}d\frac{H_2}{dt} = \frac{1}{2}d\frac{I_2}{dt} = -d\frac{HI}{dt}$

D. $-2d\frac{H_2}{dt} = -2d\frac{I_2}{dt} = +d\frac{HI}{dt}$

Answer:

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22. For the reaction $A + 2B \rightarrow C$, the rate is given by $R = [A][B]^2$. Thus the order of the reaction is

A. 3

B. 6

C. 5

D. 7

Answer:

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23. The integrated rate equation is $kt = \log C_0 - \log C_t$. The straight line graph is obtained by plotting

A. $timevs. \log C_t$

B. $\frac{1}{t} imevs. C_1$

C. $timevsC_1$

D. $\frac{1}{t} imevs. \frac{1}{C_t}$

Answer:

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24. The energies of activation for forward and reverse reaction $A_2 + B_2 \leftrightarrow 2AB$ are $180KJmol^{-1}$ and $200KJmol^{-1}$ respectively. The pressure of a catalyst lowers the energy of acvtivation of both (forward and backward) reactions by $100KJmol^{-1}$. The enthalpy change of the reaction $(A_2 + B_2) \rightarrow 2AB$ in the presence of catalyst will be (in $KJmol^{-1}$)

A. 280

B. 20

C. 300

D. 120

Answer:

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25. The rate constant for a reaction is $1.5 \times 10^7 \sec^{-1}$ at $50^\circ C$ and $4.5 \times 10^7 s^{-1}$ at $100^\circ C$. What is the value of activation energy /

A. $2.2 \times 10^3 jmol^{-1}$

B. $2300 jmol^{-1}$

C. $2.2 \times 10^4 jmol^{-1}$

D. $220 jmol^{-1}$

Answer:

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26. In the first order reaction , the concentration of reactant decrease from $800 mol/dm^3$ to $50 mol/dm^3$ in 2×10^4 sec. The rate constant for the reaction is

A. 2×10^{-4}

B. 3.45×10^{-5}

C. 1.386×10^{-4}

D. 2×10^{-4}

Answer:

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27. If $3A \rightarrow 2B$, than rate $d\frac{B}{dt}$ is equal to

A. $-\frac{1}{3}.d\frac{|A|}{dt}$

B. $+2d\frac{|A|}{dt}$

C. $-\frac{2}{3}.d\frac{|A|}{dt}$

D. $-\frac{3}{2}.\, d\frac{|A|}{dt}$

Answer:

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28. In the reaction $BrO^{-}(aq) + 5Br^{-}(aq) + 6H^{+} \rightarrow 3Br_2(l) + 3H_2O$ the rate of apperance of (Br_2) is related to the rate of disapperance of Br^{-} as follows

A. $d\frac{Br_2}{dt} = -\frac{5}{3}d\frac{Br^{-}}{dt}$

B. $d\frac{Br_2}{dt} = \frac{5}{3}d\frac{Br^{-}}{dt}$

C. $d\frac{Br_2}{dt} = \frac{3}{5}d\frac{Br^-}{dt}$

D. $d\frac{Br_2}{dt} = -\frac{3}{5}d\frac{Br^-}{dt}$

Answer:

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29. Consider a reactions $aG + bH \rightarrow Products$ when the concentration of G of both reactants G and H is doubled, the rate increases by eight times. However, when concentration of G is doubled, keeping the concentration of H fixed, the rate is doubled. The over all order of the reaction is

A. 0

B. 1

C. 2

D. 3

Answer:

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30. In the synthesis of NH_3, by Haber process of 60 moles of ammonia is obtained in one hour, then the rate of disapperance of nitrogen is

A. $30 mol / \text{ min}$

B. $6 mol / \text{ min}$

C. $0.5 mol / \text{ min}$

D. $60 mol / \text{ min}$

Answer:

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31. For the reaction $Cl_2 + 2I^- \rightarrow I_2 + 2Cl^-$, the initial concentration of I was $0.20 mol L^{-1}$ and the conc. After 20 min. way $0.18 mol L^{-1}$. Then the rate of formation of I_2 in $mol L^{-1}$ would be

A. 1×10^{-4}

B. 5×10^{-4}

C. 1×10^{-3}

D. 5×10^{-3}

Answer:

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32. For a reaction $\frac{1}{2}A \rightarrow 2B$, the rate of disapperance of 'A' is related to the rate of apperance of B by the expression.

A. $-d\frac{A}{dt} = \frac{1}{2}d\frac{B}{dt}$

B. $-d\frac{A}{dt} = \frac{1}{4}d\frac{B}{dt}$

C. $-d\frac{A}{dt} = d\frac{B}{dt}$

D. $-d\frac{A}{dt} = 4d\frac{b}{dt}$

Answer:

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33. The rate of the reaction $A \rightarrow Products$ at the initial conc. Of $3.24 \times 10^{-2}M$ is nine times its rate at another initial concentration of $1.2 \times 10^{-3}M$. The order of the reaction is

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

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

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

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

Answer:

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34. The concentration of R in the reaction $R \rightarrow P$ was measured on a function of time and the following data is obtained

[R] (molar)	1.0	0.75	0.40	0.10
t (min.)	0.0	0.05	0.12	0.18

The order of the reaction is

A. Zero

B. first

C. Second

D. Third

Answer:

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35. For the reaction $2A + B \rightarrow A_2B$, the rate law given is

A. $k[2A](B)$

B. $k[A]^3[B]$

C. $k[A][B]^3$

D. $k[A]^2[B]$

Answer:

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36. The half - life period of a first order reaction is $69.3s$.What is the rate constant.

A. $0.01s^{-1}$

B. $0.1s^{-1}$

C. $1s^{-1}$

D. $10s^{-1}$

Answer:

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37. The reaction $2N_2O_5 \leftrightarrow 2N_2O_4 + O_2$ is

A. bimolecular and second order

B. Unimolecular and first order

C. Bimolecular and first order

D. bimolecular and zero order

Answer:

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38. For the following homogeneous reaction, the unit of rate constant is $A + B \xrightarrow{K} C$

A. $mol^{-1}Ls^{-1}$

B. s^{-1}

C. s

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

Answer:

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39. Which one of the following statement for the order of a reaction is incorrect?

A. Order can be determined experimentally

B. Order of reaction is equal to the sum of the power of the concentration terms in differential rate law

C. It is not affected with stoichiometric coefficient of reactants

D. Order cannot be fractioned.

Answer:

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40. A reaction involves two different reactants can never be

A. bimolecular and second order

B. second order

C. first order

D. unimolecular reaction.

Answer:

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41. $\frac{t_1}{4}$ can be taken as time taken for the concentration of the reactant to drop to $\frac{3}{4}$ of the initial value. If the rate constant for a first order reaction is k, the $\frac{t_1}{4}$ can be written as :

A. $\frac{0.75}{K}$

B. $\frac{0.69}{K}$

C. $\frac{0.29}{K}$

D. $\frac{0.10}{K}$

Answer:

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42. The rate of a chemical reaction doubles for every $10^{\circ} C$ rise of temperature. If the temperature is raised by $50^{\circ} C$, the rate of reaction increases by about.

A. 10 times

B. 24 times

C. 32 times

D. 64 times

Answer:

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43. The activation energy of exothermic reaction $A \rightarrow B$ is $80KJMOL^{-1}$. The heat of reaction is $200KJMOL^{-1}$. The activation energy for the reaction $B \rightarrow A$ (in KJ mol^-1`) with the

A. 80

B. 120

C. 40

D. 280

Answer:

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44. The rate of reaction increases with temperature due to

A. decrease in activation energy

B. increase in activation energy

C. increase in collision frequency

D. increase in concentration

Answer:

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45. A chemical reaction proceeds following formula $k = P.Z.e^{-Ea/RT}$ Which of the following process will increase the rate of reaction ?

A. Lowering of E_a

B. Lowering of P

C. Lowering of Z

D. independent of all the above factors.

Answer:

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46. The rate constant of a reaction is $2 \times 10^{-2} litmol^{-1} \sec^{-1}$.What is the order of the reaction ?

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47. Out of zero , first and second order reaction which has the same unit for rate of the reaction and rate constant.

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48. Rate constant of which order reaction is independent of the concentration of the reactant.

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49. A reaction is 50 % complete in 2 hrs and 75% complete in 4 hrs what is the order of the reaction.

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50. Under what condition does the rate of a reaction equal to rate constant ?

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51. Rate constant of which order reaction is independent of the concentration of the reactant.

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52. What is threshold energy ?

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53. How does half life period of a first order reaction vary with temperature ?

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54. Why the rate of a reaction increases with increase in temperature ?

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55. Write the order of reaction for

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

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56. Write the order of reaction for

rate = $k[SO_2]^2[O_2]$

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57. What is zero order reaction? Give one example.

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58. Write the relationship between rate constant and temperature of a reaction.

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59. For a single step reaction , $x + 2y \rightarrow Products$, what is the molecularity of the reaction ?

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60. What is the reaction order if the unit of rate constant is litre mol^{-1} s^{-1} ?

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61. The overall order of reaction which has rate expression, Rate=$K[A]^{1/2}[B]^{3/2}$ is_____

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62. What is the half-life period of a reaction having rate constant 6.93×10^{-4} s?

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

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64. What is order of reaction ?

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65. The Arrhenius equation is

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66. Write the Arrhenius equation at two different temperature.

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67. What is the molecularity and order of reaction of acid hydrolysis of ethyl acetate ?

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68. Give example of zero order reaction

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69. The order for the reaction given below is ..... .

$$N_2O_5(g) \Leftrightarrow N_2O_4(g) + \frac{1}{2}O_2(g)$$

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70. Define molecularity of a reaction.

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71. What is the unit of first order rate constant?

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

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

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74. For the reaction $3H_2(g) + N_2(g) \rightarrow 2NH_3(g)$. Compute and equate the reaction rates.

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75. What is the relation between half - life time and initial concentration of a zero order reaction ?

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76. What is the energy possessed by the activated complex ?

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77. Reaction $A + B \rightarrow C$ has zero order .Write the rate equation for the reaction ?

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78. Write relationship between the rate constant and its activation energy.

Watch Video Solution

79. Give one example of a reaction where order and molecularity are same.

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80. Fill in the blanks : The inversion of cane sugar is a ..... Reaction though its molecularity is .....

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81. The number of collisions per second per unit volume of the reaction mixture is called ..... (Fill in the blank)

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82. Fill in the blanks : The rate of a reaction ..... With increase in temperature.

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83. Fill in the blanks : Hydrolysis of ethylacetate in alkaline medium is a ..... Order reaction while hydrolysis in acid medium is a .....order reaction.

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84. Fill in the blanks : For a reaction $A \rightarrow Product$. The rate of the reaction doubles when the concentration of the reactant is doubled. The order of the reaction is ..... .

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85. Fill in the blanks : The time required for 99.9 % completion of a first order reaction is ..... times the halflife time of the reaction.

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86. Fill in the blanks : All radioactive decomposition reactions are ..... Order reaction.

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87. Fill in the blanks : Rate of a chemical reaction is proportional to .....

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88. Fill in the blanks : The value of temperature coefficient is usually .....

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89. Fill in the blanks : Lower is the ..... Energy of a reaction faster is its .....

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90. Fill in the blanks : The rate of a reaction .....as the reaction proceeds.

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91. Fill in the blanks : If the plot of log $(a-x)vs$ t is a straightline the order of the reaction is .....

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92. Fill in the blanks : IF $\frac{t_1}{2} = 1/ka^2$, then the order of the reaction is .....

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93. Fill in the blanks : The half life period is $\frac{[A]_0}{2}k$, the order of the reaction is .....

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94. Fill in the blanks : The reaction $rate = R[A][B]^2$. The order of the reaction is .....

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95. Fill in the blanks : Alkali hydrolysis of ester is of ..... Order reaction.

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96. A first order reaction is 25% complete in 30 minutes. Calculate the specific reaction rate.

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97. A first order reaction is 25% complete in 30 minutes. Calculate the

half life time

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98. A first order reaction is 25% complete in 30 minutes. Calculate the time required for $\frac{3}{4}$ completion of the reaction.

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99. In the reaction $4NH_3 + 5O_2 \rightarrow 4NO + 6H_2O$. The rate of formation of NO IS

$3.6 \times 10^{-3} mollit^{-1} s^{-1}$. Find the rate of disapperance of oxygen gas.

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100. Show that in a first order reaction, the time taken for the completion of some fraction of change or any fraction of change is independent of the initial concentration of the reactant.

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101. The rate of reaction is doubled when the temperature changes from $27^{\circ}C$ to $37^{\circ}C$. Calculate the energy of activation.

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102. Show that the time required for 99.9% completion of a first order reaction is 10 times the time required for 50% completion of the reaction.

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103. Show that the time required for 75% completion of a first order reaction is twice the time required for 50% completion of the reaction.

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104. The half life of a substance is 30 years. What amount of it will be left after 120 years.

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105. What is the order of a reaction if its unit of the rate constant is $\sec^{-1}$?

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106. Calculate the rate constant of a first order reaction which is 90 % complete in 20 minutes .

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107. The rate constant of a first order reaction is $k = 6.93 \times 10^{-5} \sec^{-1}$. Find the half life of the

reaction.

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108. The rate of a chemical reaction decreases as reaction proceeds. Explain.

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109. For a first order reaction, it takes 16 min to complete 50% reaction. How much time does it take to complete 75% reaction?

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110. What are the various factors affecting the rate of reaction.

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111. Derive the half life period from the zero order rate equation.

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112. The half life period of a first order reaction is 30 minutes. Calculate the time required for 99% and 99.9% of the reaction.

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113. The reaction $A \rightarrow B$ has $\Delta H = -10kcal$ and $E_a = 30kcal$. Find Ea^1 for the reverse reaction.

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114. If the rate constant of reaction is $2S^{-1}$ at 700 k and $32S^{-1}$ at 800 k, what is the activation energy ?

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115. Calculate the activation energy of a reaction whose reaction rate at 300k gets doubled for 10° rise in temperature.

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116. What is the difference between order and molecularity of a reaction ?

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117. What is zero order reaction? Give one example.

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

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119. Define order and molecularity of a reaction .

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120. Why hydrolysis of ethyl acetate with $NaOH$ is 2nd order while the hydrolysis with `HCl is first order ?

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121. Define rate of a reaction. Write the expression for the rate of reactions of the following :

$PCl_5 \rightarrow PCl_3 + Cl_2.$

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122. Define rate of a reaction. Write the expression for the rate of reactions of the following :

$4NH_3(g) + 5O_2(g) \rightarrow 4NO(g) + 6H_2O(g).$

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123. Distinguish between specific reaction rate and rate of a reaction.

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124. For a reaction $2A + B \rightarrow 3C$, the rate of appearance of C at time 't' is $1.3 \times 10^{-4} molL^{-1}s^{-1}$. At this time calcukate : The rate of reaction.

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125. For a reaction $2A + B \rightarrow 3C$, the rate of appearance of C at time 't' is $1.3 \times 10^{-4} molL^{-1}s^{-1}$. At this time calcukate : Rate of disapperance of A.

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126. $A + 2B \rightarrow 3C + 2D$. In this reaction the rate of disapperance of B is $1 \times 10^{-3} molL^{-1}S^{-1}$. What will be

Rate of reaction.

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127. $A + 2B \rightarrow 3C + 2D$. In this reaction the rate of disapperance of B is $1 \times 10^{-3} molL^{-1}S^{-1}$. What will be

Rate of change of concentration of A and C ?

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128. A chemical reaction $2A \rightarrow 4B + C$, in gas phase occurs in a closed vessel. The concentration of B is found to be increased by $5 \times 10^{-3} molL^{-1}$ in 10 seconds. Calculate

the rate of appearance of B

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129. A chemical reaction $2A \rightarrow 4B + C$, in gas phase occurs in a closed vessel. The concentration of B is found to be increased by $5 \times 10^{-3} mol L^{-1}$ in 10 seconds. Calculate

the rate of disappearance of A.

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130. Derive an expression for the rate constant of first order reaction. The rate constant of first order reaction is $0.346 \ \ \min^{-1}$. What is the half-life?

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131. Write short notes on :

activation energy

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132. Derive an expression for first order rate constant. What is its unit ? For a reaction $A + BC \rightarrow AB + C$ give a diagrammatic representation of the activated complex.

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133. Derive an expression for the rate constant of first order reaction. Give an example of first order reaction.

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134. What do you mean by molecularity and order of reaction? Give one example each of the first and second order reaction.

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

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136. Derive an expression for the rate constant of a zero order reaction and prove that the half life of a zero order reaction is directly proportional to initial concentration.

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