CHEMISTRY

BOOKS - A2Z CHEMISTRY (HINGLISH)

CHEMICAL KINETICS

Rate Expression, Rate Of Appearance And Disappearance, Instaneous And Average Rate Of Reaction

1. For the reaction,

$$2NO(g) + 2H_2(g) \rightarrow N_2(g) + 2H_2O(g)$$

The rate expression can be written in the following ways:

$$\frac{d[N_2]}{dt} = k_1[NO][H_2], \frac{d[H_2O]}{dt} = k_2[NO][H_2]$$

$$-\frac{d[NO]}{dt} = k_3[NO][H_2], -\frac{d[H_2]}{dt} = k_4[NO][H_2]$$

The relationship between k_1, k_2, k_3, k_4 is

A. $k_2 = k_1 = k_3 = k_4$

B. $k_2 = 2k_1 = k_3 = k_4$

C. $k_2 = 2k_3 = k_1 = k_4$

D. $k_2 = k_1 = k_3 = 2k_4$

Answer: B

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2. In a catalytic conversion of N_2 to NH_3 by Haber's process, the rate of reaction was expressed as change in the concentration of ammonia per time is $40 \times 10^{-3} mol L^{-1} s^{-1}$. If there are no side reaction, the rate of the reaction as expressed in terms of hydrogen is (in mol $L^{-1} s^{-1}$)

A. 60×10^{-3}

B. 20×10^{-3}

C. 1.200

D. 10.3×10^{-3}

Answer: A

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3. Which of the following is the fastest reaction

A. $C + \frac{1}{2}O_2 \xrightarrow{250^\circ C} CO$

B. $C + \frac{1}{2}O_2 \xrightarrow{500^\circ C} CO$

C. $C + \frac{1}{2}O_2 \xrightarrow{750^\circ C} CO$

D. $C + \frac{1}{2}O_2 \xrightarrow{1000^\circ C} CO$

Answer: D

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

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

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

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

D. $-\frac{d[A]}{dt} = 4\frac{d[B]}{dt}$

Answer: B

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5. For the reaction $H_2(g) + I_2(g) \Leftrightarrow 2HI(g)$, the rate of reaction is expressed as

A. $-\frac{\Delta[I_2]}{\Delta t} = -\frac{\Delta[H_2]}{\Delta t} = \frac{1}{2}\frac{\Delta[HI]}{\Delta t}$

B. $\frac{\Delta[I_2]}{\Delta t} = -\frac{\Delta[H_2]}{\Delta t} = \frac{\Delta[HI]}{2\Delta t}$

C. $\frac{\Delta[H_2]}{\Delta t} = \frac{1}{2}\frac{\Delta[I_2]}{\Delta t} = -\frac{\Delta[HI]}{\Delta t}$

D. None of these

Answer: A

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6. The rate constant of the reaction

$2H_2O_2(aq) \rightarrow 2H_2O(l) + O_2(g)$ is 3×10^{-3} min^{-1}

At what concentration of H_2O_2, the rate of the reaction will be $2 \times 10^{-4} Ms^{-1}$?

A. $6.67 \times 10^{-3}(M)$

B. $2(M)$

C. $4(M)$

D. $0.08(M)$

Answer: C

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7. Observe the following reaction:

$A(g) + 3B(g) \rightarrow 2C(g)$

The rate of this reaction $\left\{\frac{-d[A]}{dt}\right\}$ is 3×10^{-3} mol litre^{-1}min^{-1}.

What is the value of $\frac{-d[B]}{dt}$ in mol litre^{-1}min^{-1} ?

A. 3×10^{-3}

B. 9×10^{-3}

C. 10^{-3}

D. 1.5×10^{-3}

Answer: B

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8. In the formation of sulphur trioxide by the contact process,

$2SO_2 + O_2 \Leftrightarrow 2SO_3$, the rate of reaction was measured as

$\frac{d[O_2]}{dt} = 3.0 \times 10^{-4} \text{mol} L^{-1} s^{-1}$.

The rate of reaction expressed in terms of SO_3 will be

A. $3.0 \times 10^{-4} molL^{-1}s^{-1}$

B. $6.0 \times 10^{-4} molL^{-1}s^{-1}$

C. $1.5 \times 10^{-4} molL^{-1}s^{-1}$

D. $4.5 \times 10^{-4} molL^{-1}s^{-1}$

Answer: B

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9. If $3A \rightarrow 2B$, then the rate of reaction of $+\frac{dB}{dt}$ is equal to

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

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

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

D. $-\frac{3}{2}\frac{d[A]}{dt}$

Answer: C

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10. The reduction of peroxydisulphate ion by I^- ion is expressed by $S_2O_8^{2-} + 3I^- \rightarrow 2SO_4^{2-} + I_3^-$,If rate of disappearance of I^- is $9/2 \times 10^{-3}$ mol $L^{-1}S^{-1}$, what is the rate of formation of SO_4^{2-} during same time ?

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

B. $2 \times 10^{-3}\text{mol}/L^{-1}s^{-1}$

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

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

Answer: C

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11. For the reaction $N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$, under certain conditions of temperature and partial pressure of the reactants, the rate of formation of NH_3 is $0.001 kg h^{-1}$. The same rate of converison of hydrogen under the same condition is.....$kg h^{-1}$.

A. $1.82 \times 10^{-4} kg/hr$

B. $0.0015 kg/hr$

C. $1.52 \times 10^{4} kg/hr$

D. $1.82 \times 10^{-14} kg/hr$

Answer: B

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12. The rate of formation of SO_3 in the following reaction: $2SO_2 + O_2 \rightarrow 2SO_3$ is $10g\,\sec^{-1}$. The rate of disappearance of O_2 will be

A. $5g\,\sec^{-1}$

B. $100g\,\sec^{-1}$

C. $20g\,\sec$

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

Answer: D

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13. The rate of a heterogeneous reaction (as iron (solid) any oxygen gas) does not depend on:

A. concentration of reactants

B. surface area of reactants

C. pressure of reactant gases

D. potential energy of reactant.

Answer: D

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14. A gaseous hypothetical chemical equation $2A \Leftrightarrow 4B + C$ is carries out in a closed vessel. The concentration of B is found to increase by $5 \times 10^{-3} molL^{-1}$ in 10 second. The rate of appearance of B is

A. $5 \times 10^{-4} molL^{-1} \sec^{-1}$

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

C. $6 \times 10 - 5 molL^{-1} \sec^{-1}$

D. $4 \times 10 - 4 molL^{-1} \sec^{-1}$

Answer: A

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15. For the reaction $2A + 3B \rightarrow 4C$ the rate of reaction may be represented as

A. $r = -2\frac{d[A]}{dt} = -3\frac{d[B]}{dt} = 4\frac{d[C]}{dt}$

B. $r = -6\frac{d[A]}{dt} = -4\frac{d[B]}{dt} = 3\frac{d[C]}{dt}$

C. $r = --\frac{1}{2}\frac{d[A]}{dt} = \frac{1}{3}\frac{d[B]}{dt} = \frac{1}{4}\frac{d[C]}{dt}$

D. $r = -\frac{1}{2}\frac{d[A]}{dt} = -\frac{1}{3}\frac{d[B]}{dt} = \frac{1}{4}\frac{d[C]}{dt}$

Answer: D

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16. The rate of disappearance of SO_2 in the reaction $2SO_2 + O_2 \rightarrow 2SO_3$ is $1.28 \times 10^{-3} g/\sec$ then the rate of formation of SO_3 is

A. $0.64 \times 10^{-3} g/\sec$

B. $0.80 \times 10^{-3} g/\sec$

C. $1.28 \times 10^{-3} g/\sec$

D. $1.60 \times 10^{-3} g/\sec$

Answer: C

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17. For the reaction, $2A + B \rightarrow 3C + D$, which of the following does not express the reaction rate

A. $\frac{d[D]}{dt}$

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

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

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

Answer: C

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18. The instataneous rate of disappearance of the MnO_4^- ion in the following reaction is $4.56 \times 10^{-3} Ms^{-1}$. Then the rate of appearance of I_2 is :

$$2MnO_4^- + 10I^- + 16H^+ \rightarrow 2Mn^{2+} + 5I_2 + 8H_2O$$

A. $1.14 \times 10^{-3} Ms^{-1}$

B. $5.7 \times 10^{-3} Ms^{-1}$

C. $4.56 \times 10^{-4} Ms^{-1}$

D. $1.14 \times 10^{-2} Ms^{-1}$

Answer: D

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19. The rate constant for the reaction, $2N_2O_5 \rightarrow 4NO_2 + O_2$ is $3.0 \times 10^{-5} s^{-1}$. If the rate is $2.40 \times 10^{-5} molL^{-1} s^{-1}$, then the initial concentration of N_2O_5 (in $molL^{-1}$) is

A. $1.4(M)$

B. $1.2(M)$

C. $0.04(M)$

D. $0.8(M)$

Answer: D

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20. The rate of reaction is expressed as :

$$\frac{1}{2}\frac{+d}{dt}[C] = \frac{1}{3}\frac{-d}{dt}[D] = \frac{1}{4}\frac{+d}{dt}[A] = -\frac{d}{dt}[B]$$

The reaction is:

A. $4A + B \rightarrow 2C + 3D$

B. $B + 3D \rightarrow 4A + 2C$

C. $4A + 2B \rightarrow 2C + 3D$

D. $B + (1/2)D \rightarrow 4A + 3$

Answer: B

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Rate Law, Law Of Mass Action, Order Of The Reaction, And Molecularity

1. The reaction $2N_2O_5 \Leftrightarrow 2NO_2 + O_2$ follows first order kinetics. Hence, the molecularity of the reaction is

A. Unimolecular

B. Pseudo unimolecular

C. Bimolecular

D. None of the above

Answer: C

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2. For a reaction $pA + qB \rightarrow$ Product, the rate law expresison is $r = k[A][B]^m$. Then

A. $(p + 1) < (1 + m)$

B. $(p + q) > (1 + m)$

C. $(p + q)$ may or may not be equal to $(1 + m)$

D. $(p + q) = (1 + m)$

Answer: C

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3. Show by uisng rate laws how much the rate of reaction $2NO(g) + O_2(g) \rightarrow 2NO(g)$ will change if the volume of the reaction vessel is diminished to $1/3$ of its initial volume.

A. $1/3$ times

B. $2/3$ times

C. 3 times

D. 6 times

Answer: C

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4. Which of the following is wrongly matched ?

A. Saponification of CH_3COOCH_3- Second order reaction

B. Hydrolysis of CH_3COOCH_3- Pseudo unimolecular reaction

C. Decomposition of H_2O_2-First order reaction

D. combination of H_2 and B_2 to give HBr- Zero order reaction

Answer: D

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5. In a reaction $2A + B \rightarrow A_2B$, the reactant A will disappear at

A. Half the rate that B will decrease

B. The same rate that B will decrease

C. Twice the rate that B will decrease

D. The same rate that A_2B will form

Answer: C

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6. For the reaction $A + B \rightarrow C + D$, doubling the concentration of both the reactants increases the reaction rate by 8 times and doubling the initial concentration of only B ismply doubles the reaction rate. What is the rate law for the reaction ?

A. $\gamma = k[A][B]^2$

B. $\gamma = k[A]^2[B]$

C. $\gamma = k[A][B]$

D. $\gamma = k[A]^2[B]^2$

Answer: B

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7. The reaction , $X + 2Y + Z \rightarrow N$ occurs by the following mechanism

(i) $X + Y \Leftrightarrow M$ (very rapid equilibrium)

(ii) $M + Z \rightarrow O$ (slow)

(iii) $O + Y \rightarrow N$ (very fast)

What is the rate law for this reaction

A. Rate $= k[Z]$

B. Rate $= k[X][Y]^2[Z]$

C. Rate $= k[N]$

D. Rate $= k[X][Y][Z]$

Answer: D

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8. Which of the following is an example of pseudo unimolecular reaction ?

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

B. $CH_3COOCH_3 + H_2O \xrightarrow{OH^-} CH_3COOH + CH_3OH$

C. $2FeCl_3 + SnCl_2 \rightarrow SnCl_4 + 2FeCl_2$

D. $NaOH + HCl \rightarrow NaCl + H_2O$

Answer: A

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9. The rate of a gaseous phase reaction becomes half if volume of container is doubled. Order of reaction is

A. 1

B. $1/2$

C. 2

D. $1/3$

Answer: A

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10. For a reactions $A + B \rightarrow$ product, it was found that rate of reaction increases four times if concentration of $'A'$ is doubled, but the rate of reaction remains unaffected. If concentration of $'B'$ is doubled. Hence, the rate law for the reaction is

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

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

C. rate $= k[A]^2[B]^1$

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

Answer: B

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11. Units of rate constant of first and zero order reactions in terms of molarity M are respectively:

A. $s^{-1}, ML^{-1}s^{-1}$

B. s^{-1}, M

C. $Ms^{-1}, s^{-1},$

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

Answer: A

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12. For the non-equilibrium process, $A + B \rightarrow$ Product, the rate is first-order w.r.t. A and second order w.r.t. B. If $1.0mol$ each of A and B were inrofuced into $1.0L$ vessel and the initial rate was $1.0 \times 10^{-2} molL^{-1}s^{-1}$, calculate the rate when half the reactants have been turned into Products.

A. $1.25 \times 10^{-3} molL^{-1}s^{-}$

B. $1.0 \times 10^{-2} molL^{-1}s^{-}$

C. $2.50 \times 10^{-3} molL^{-1}s^{-}$

D. $2.0 \times 10^{-2} molL^{-1}s^{-}$

Answer: A

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13. For a reaction $A + 2B \rightarrow C$, rate is given by $R = K[A][B]^2$. The order of reaction is:

A. 3

B. 6

C. 5

D. 7

Answer: A

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14. For the reaction $CH_3COOCH_3 + H_2O \xrightarrow{H^+} CH_3COOH + CH_3OH$. The progress of the process of reaction of reaction is followed by

A. Finding the amount of methanol formed at different intervals

B. Finding the amount of acetic acid formed at different intervals

C. Using a voltmeter

D. Using polarimeter

Answer: B

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15. Trimolecular reactions are uncommon because

A. The probability of three molecules colliding at an instant is low

B. The probability of three molecules colliding at an instant is high

C. The probability of three molecules colliding at an instant is zero

D. The probability of many molecules colliding at an instant is high

Answer: A

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16. For a reaction $A \rightarrow B$, the rate of reaction quadrupled when the concentration of A is doubled. The rate expression of the reaction is $r = K[A]^n$ when the value of n is

A. 1

B. 0

C. 3

D. 2

Answer: D

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17. The rate constant of a first order reaction is 3×10^{-6} per second. If the initial concentration is $0.10M$, the initial rate of reaction is

A. $3 \times 10^{-5} Ms^{-1}$

B. $3 \times 10^{-6} Ms^{-1}$

C. $3 \times 10^{-8} Ms^{-1}$

D. $3 \times 10^{-7} Ms^{-1}$

Answer: D

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18. For the reaction $H_2 + Br_2 \rightarrow 2HBr$ overall order is found to be $3/2$. The rate of reaction can be espressed as:

A. $[H_2][Br_2]^{\frac{1}{2}}$

B. $[H_2]^{1/2}[Br^2]$

C. $[H_2]^{3/2}[Br^2]^0$

D. All of these

Answer: D

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19. The rate of the reaction $CCl_3CHO + NO \rightarrow CHC_3 + NO + CO$ is given by Rate $= K[CCl_3CHO][NO]$. If concentration is expressed in moles/litre, the units of K are

A. $\text{litre}^2\text{mole}^{-2}\text{sec}^{-1}$

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

C. $\text{litre mole}^{-1}\text{ sec}^{-1}$

D. sec^{-1}

Answer: C

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20. The rate of the first-order reaction $X \rightarrow$ products is $7.5 \times 10^{-4} molL^{-1} \min^{-1}$. What will be value of rate constant when the concentration of X is $0.5 molL^{-1}$?

A. $3.75 \times 10^{-4} s^{-1}$

B. $2.5 \times 10^{-5} s^{-1}$

C. $1.5 \times 10^{-3} s^{-1}$

D. $8.0 \times 10^{-4} s^{-1}$

Answer: B

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21. Rate constant for a reaction $H_2 + I_2 \rightarrow 2HI$ is 49, then rate constant for reaction $2HI \rightarrow H_2 + I_2$ is

A. 7

B. $1/49$

C. 49

D. 21

Answer: B

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22. The rate of the reaction

$3A + 2B \rightarrow$ Products

is given by the rate expresison: Rate $= k[A][B]^2$

If A is taken in excess, the order of the reaction would be

A. 3

B. 2

C. 1

D. 5

Answer: B

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23. The reaction

N_2O_5 (in CCl_4 solution) $\rightarrow 2NO_2$ (solution) $+\frac{1}{2}O_2(g)$ is of first order in N_2O_5 with rate constant $6.2 \times 10^{-1}s^{-1}$. What is the value of rate of reaction when $[N_2O_5] = 1.25$ mole ?

A. $7.75 \times 10^{-1}\text{mole}^{-1}s^{-1}$

B. $6.35 \times 10^{-3}\text{mole}^{-1}s^{-1}$

C. $5.15 \times 10^{-5}\text{mole}^{-1}s^{-1}$

D. $3.85 \times 10 - 1\text{mole}^{-1}s^{-1}$

Answer: A

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24. The rate law for a reaction between A and B is given by rate $= k[A]^n[B]^m$. On doubling the concentration of A and halving the concentration of B, the ratio of the new rate to the earlier rate of the reaction becomes

A. $n - m$

B. 2^{n-m}

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

D. $m + n$

Answer: B

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25. For the reaction:

$$H_2 + Cl_2 \xrightarrow[\text{Sunlight}]{} 2HCl$$

taking place on water. Find the order of reaction.

A. 1

B. 2

C. 3

D. 0

Answer: D

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26. The rate of reaction between A and B increases by a factor of 100, when the concentration with respect to A is increased 10 folds, the order of reaction w.r.t. A is

A. 10

B. 1

C. 4

D. 2

Answer: D

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27. The rate of reaction between two A and B decreases by factor 4 if the concentration of reactant B is doubled. The order of this reaction with respect to B is

A. -1

B. -2

C. 2

D. 1

Answer: B

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28. For the reaction $NO_2 + CO \rightarrow CO_2 + NO$, the experimental rate expresison is $-dc/dt = k[NO_2]^2$. Find the number of molecules of CO involved in the slowest step.

A. 0

B. 1

C. 2

D. 3

Answer: A

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29. For the non-equilibrium process, $A + B \rightarrow$ Product, the rate is first-order w.r.t. A and second order w.r.t. B. If $1.0mol$ each of A and B were inrofuced into $1.0L$ vessel and the initial rate was

$1.0 \times 10^{-2} molL^{-1}s^{-1}$, calculate the rate when half the reactants have been turned into Products.

A. 1.25×10^{-3}

B. 1.2×10^{-2}

C. 2.5×10^{-4}

D. None of these

Answer: A

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30. For the reaction $2N_2O_5 \rightarrow 4NO_2 + O_2$ rate of reaction and rate constant are 1.02×10^{-4} and $3.4 \times 10^{-5} \sec^{-1}$ respectively. The concentration of N_2O_5 at that time will be

A. 1.732

B. 3

C. 1.02×10^{-4}

D. 3.4×10^{5}

Answer: B

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31. The rate equation for the reaction

$2A + B \rightarrow C$ is rate $= K[A][B]$.

The correct statement about this is:

A. K is independent of $[A]$ and $[B]$

B. $t_{1/2}$ is constant

C. Unit of K is $\sec^{-1}$

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

Answer: A

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32. Consider a gaseous reaction, the rate of which is given by $k[A][B]$. The volume of the reaction vessel containing these gases is suddenly reduced to $1/4th$ of the initial volume. The rate of the reaction as compared with original rate is

A. $1/10$

B. $1/8$

C. 8

D. 16

Answer: D

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33. Inversion of can sugar in dilute acid (conversion into glucose and fructose) is a

A. Unimolecular reaction

B. Bimolecular reaction

C. Trimolecualr reaction

D. Pseudo unimolecular reaction

Answer: D

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34. The rate constant of a reaction is found to be $3 \times 10^{-3} \text{mol} L^{-1} \text{min}^{-1}$. The order of the reaction is

A. zero

B. 1

C. 2

D. 1.5

Answer: A

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35. For reaction $RX + OH^- \rightarrow ROH + X^-$, rate expression is $R = 4.7 \times 10^{-5}[RX]\left[OH^-\right] + 2.4 \times 10^{-5}[RX]$.

What $\%$ of reactant react by S_N2 mechanism when $\left[OH^-\right] = 0.001$ molar?

A. 1.9

B. 66.2

C. 95.1

D. 16.4

Answer: A

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36. For an elementary reaction, $2A + B \rightarrow C + D$ the molecularity is

A. Zero

B. One

C. Two

D. Three

Answer: D

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37. A reaction involiving two different reactants can never be:

A. Unimolecular reaction

B. 1 order reaction

C. II order reaction

D. Bimolecular reaction

Answer: A

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38. For a hypothetical reaction $aA + bB \rightarrow$ Product, the rate law is: rate $= K[A]^x[B]^y$, then

A. $(a + b) = (x + y)$

B. $(a + b) < (x + y)$

C. $(a + b) > (x + y)$

D. All of these

Answer: D

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39. From the following which is a second-order reaction

A. $K = 5.47 \times 10^{-4} \sec^{-1}$

B. $K = 3.9 \times 10^{-3} molL \sec^{-1}$

C. $K = 3.94 \times 10^{-4} Lmol^{-1} \sec^{-1}$

D. (d) $K = 3.98 \times 10^{-5} Lmol^{-2} \sec^{-1}$

Answer: C

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40. The rate constant in numerically the same for the the reaction of first, second, and third order. Which reaction should be the fastest and it this true for all ranges of concentrations?

A. if $[A] = 1$ then $r_1 = r_2 = r_3$

B. if $[A] < 1$ then $r_1 > r_2 > r_3$

C. if $[A] > 1$ then $r_3 > r_2 > r_1$

D. All

Answer: D

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41. A reaction was found to be second order with respect to the concentration of carbon monoxide. If the concentration of carbon monoxide is doubled, with everything else kept the same, the rate of reaction will:

A. Double

B. Remain unchahged

C. Triple

D. Increase by a factor of 4

Answer: D

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42. Which of the following statement regarding the molecularity of a reaction is wrong ?

A. It is the number of molecules of the reactants taking part in a single step chemical reaction

B. It is caiculated from the reaction mechanism

C. It may be either a whole number of fractional

D. It depends on the rate determining step in the reaction

Answer: C

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43. In acidic medium, the rate of reaction between $BrO_3^{\ominus}$ and $Br^{\ominus}$ is given by the expression

$$\frac{-d\left[BrO_3^{\ominus}\right]}{dt} = k\left[BrO_3^{\ominus}\right]\left[Br^{\ominus}\right]\left[H^{\oplus}\right]^2$$

A. Rate constant of overall reaction is $4\sec^{-1}$

B. Rate of reaction is independent of the concentration of acid

C. The changes in pH of the solution will not affect the rate

D. Doubling the concentration of H^+ ions will increase the reaction rate by 4 times.

Answer: D

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44. For the reaction $H_2(g) + Br_2(g) \rightarrow 2HBr(g)$ the experimental data suggested that $r = k[H_2][Br_2]^{1/2}$

The molecularity and order of the reaction are respectively:

A. $2, 3/2$

B. $3/2, 3/2$

C. Not defined, $3/2$

D. $1, 1/2$

Answer: C

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45. The reaction $2Na + Cl_2 \rightarrow 2NaCl$ is found to follow III order kinetics. Its molecularity is

A. 1

B. 2

C. 3

D. (4) 4

Answer: C

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46. An example of a pseudo unimolecular reaction is

A. Dissociation of hydrogen iodide

B. Hydrolysis of methyl acetate in dilute solution

C. Dissociation of phosphorus pentachloride

D. Decompoition of hydrogen peroxide

Answer: B

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47. Diazonium salt decomposes as $C_6H_5N_2^+Cl^- \rightarrow C_6H_5Cl + N_2$. At $0^\circ C$, the evolution of N_2 becomes two times faster when the initial concentration of the salt is doubled. Therefore, it is

A. A first order reaction

B. A second order reaction

C. Independent of the initial concentration of the salt

D. A zero order reaction

Answer: A

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48. The raction $2FeCl_3 + SnCl_2 \rightarrow 2FeCl_2 + SnCl_4$ is an example of

A. First order reaction

B. Second order reaction

C. Third order reaction

D. None of these

Answer: C

Watch Video Solution

Integrated Rate Expression

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

A. $490atm$

B. $250atm$

C. $480atm$

D. $420atm$

Answer: A

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2. In a first order of reaction the concentration of reactant decreases from $800\text{mol}/dm^3$ to$50\text{mol}/dm^3$ in 2×10^2 sec. The rate constant of

reaction in $\sec^{-1}$ is

A. 2×10^4

B. 3.45×10^{-5}

C. 1.386×10^{-2}

D. 2×10^{-4}

Answer: C

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3. The rate constant fro a second order reaction is $8 \times 10^{-5} M^{-1} \min^{-1}$. How long will in take a $1M$ solution to be reduced to $0.5M$

A. 8×10^{-5} min

B. 8.665×10^3 min

C. 4×10^{-5} min

D. 1.25×10^4 min

Answer: D

Watch Video Solution

4. A reaction that is of the first order with respect to reactant A has a rate constant 6min^{-1}. If we start with $[A] = 0.05\text{mol}1^{-1}$, when would $[A]$ reach the value $0.05mol1^{-1}$

A. 0.384 min

B. 0.15 min

C. 3 min

D. 3.84 min

Answer: A

Watch Video Solution

5. ..... reaction obeys the expresison $t_{1/2} = 1/ka$ in chemical kinetics.

A. first

B. second

C. third

D. fourth

Answer: B

Watch Video Solution

6. The reaction $\left[Co(NH_3)_5Br\right]^2 + (H_2O) \rightarrow \left[Co(NH_3)_5(H_2O)\right]^{3+} + Br^-$ is followed by measuring a property of the solution known as the optical density of the solution which may be taken to be linearly related to the concentration of the reactant. The values of optical

density are $0.80, 0.35$ and 0.20 at the end of 20 minutes, 40 minutes and infinite time after the start of the reaction which is first order. Calculate the rate constant.

A. $6.93 \times 10^{-3} \text{min}^{-1}$

B. $3.51 \times 10^{-3} \text{min}^{-1}$

C. $6.93 \times 10^{-2} \text{min}^{-1}$

D. $3.51 \times 10^{-3} \text{min}^{-1}$

Answer: C

Watch Video Solution

7. The rate constant for the reaction $A \rightarrow B$ is $2 \times 10^{-4} mol^{-1}$. The concentration of A at which rate of the reaction is $(1/2) \times 10^{-5} M \sec^{-1}$ is -

A. $0.25M$

B. $(1/20)\sqrt{5/3}M$

C. $0.5M$

D. None of these

Answer: B

Watch Video Solution

8. In a I order reaction $A \rightarrow$ products, the concentration of the reactant decrease to $6.25\ \%$ of its initial value in 80 minutes. What is (i) the rate constant and (ii) the rate of the reaction, 100 minutes after the start, if the initial concentration is $0.2\text{mole}/\text{litre}$?

A. $2.17 \times 10^{-2}\text{min}^{-1}, 3.47 \times 10^{-4}\text{mol.litre}^{-1}\text{min}^{-1}$

B. $3.465 \times 10^{-2}\text{min}^{-1}, 2.166 \times 10^{-4}\text{mol.litre}^{-1}\text{min}^{-1}$

C. $3.465 \times 10^{-3}\text{min}^{-1}, 2.17 \times 10^{-3}\text{mol.litre}^{-1}\text{min}^{-1}$

D. (d) $2.166 \times 10^{-3}\text{min}^{-1}, 2.667 \times 10^{-4}\text{mol.litre}^{-1}\text{min}^{-1}$

Answer: B

Watch Video Solution

9. Which one of the following formula represents a first-order reaction?

A. $K = \frac{x}{t}$

B. $K = \frac{1}{2t}\left[\frac{1}{(a-x)^2} - \frac{1}{a^2}\right]$

C. $K = \frac{2.303}{t}\log_{10}\frac{a}{(a-x)}$

D. $K = \frac{1}{t}\frac{x}{a(a-x)}$

Answer: C

Watch Video Solution

10. In a first order reaction, the concentration of the reactant decreases form $0.8M$ to $0.4M$ in $15\ \min$. The time taken for the concentration to change form $0.1M$ to $0.025M$ is

A. 60 minutes

B. 15 minutes

C. 7.5 minutes

D. 30 minutes

Answer: D

Watch Video Solution

11. The rate constant k, for the reaction $N_2O_5(g) \rightarrow 2NO_2(g) + \frac{1}{2}O_2(g)$ is $2.3 \times 10^{-2}s^{-1}$. Which equation given below describes the change of $[N_2O_5]$ with time ? $[N_2O_5]_0$ and $[N_2O_5]_t$ correspond to concentration of N_2O_5 initially and at time, t ?

A. $[N_2O_5]_t = [N_2O_5]_0 + kt$

B. $[N_2O_5]_0 = [N_2O_5]_t e^{kt}$

C. $\log_{10}[N_2O_5]_t = \log_{10}[N_2O_5]_0 - kt$

D. $\text{In}\ \frac{[N_2O_5]_0}{[N_2O_5]_t} = kt$

Answer: D

Watch Video Solution

12. If the rate constant for the disintegration of a radioactive nucleus is λ. Therefore the probability, P of survival of a radioactive nucleus for one mean life is

A. e

B. (b) e^2

C. e^{-1}

D. e^{-2}

Answer: C

Watch Video Solution

13. A first-order reaction which is $30\,\%$ complete in 30 minutes has a half-life period of

A. $24.2\ \text{min}$

B. $58.2\ \text{min}$

C. $102.2\ \text{min}$

D. $120.2\ \text{min}$

Answer: B

Watch Video Solution

14. The half life for the reaction $N_2O_5 \Leftrightarrow 2NO_2 + \frac{1}{2}O_2$ in $24hr$ at $30^\circ C$. Starting with $10g$ of N_2O_5 how many grams of N_2O_5 will remain after a period of 96 hours ?

A. 1.25 g

B. 0.63 g

C. 1.7 g

D. 0.5 g

Answer: B

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15. Half-life of a reaction is found to be inversely proportional to the cube of its initial concentration. The order of reaction is

A. 2

B. 5

C. 3

D. 4

Answer: D

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16. The rate for a first order reaction is $0.6932 \times 10^{-2} molL^{-1}\min^{-1}$ and the initial concentration of the reactants is $1M, T_{1/2}$ is equal to

A. $6.932\ \min$

B. $100\ \min$

C. $0.6932 \times 10^{-3}\ \min$

D. $0.6932 \times 10^{-2}\ \min$

Answer: B

Watch Video Solution

17. $99\ \%$ of a first order reaction was completed in $32\ \text{min}$. When will $99.9\ \%$ of the reaction complete.

A. $48\ \text{min}$

B. $46\ \text{min}$

C. $50\ \text{min}$

D. $45\ \text{min}$

Answer: A

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18. For which order reaction a straight line is obtained along with x-axis by plotting a graph between half-life $\left(t_{1/2}\right)$ and initial concentration $'a'$

A. 1

B. 2

C. 3

D. 0

Answer: A

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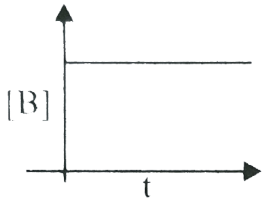
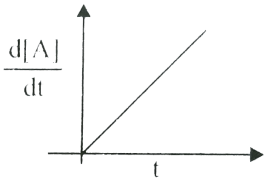
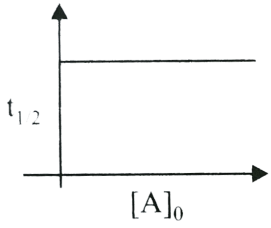
19. Which graph represents zero-order reaction $[A(g) \rightarrow B(g)]$?

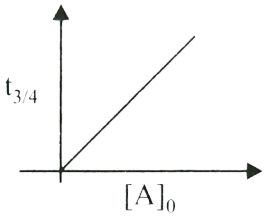
A.



B.



C. 

D. 

Answer: D

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20. ..... reaction obeys the expresison $t_{1/2} = 1/ka$ in chemical kinetics.

A. 1

B. 0

C. 3

D. 2

Answer: D

Watch Video Solution

21. $t_{1/4}$ can be taken as the time taken for concentration of reactant to drop to $.^{3}/_{4}$ of its initial value. If the rate constant for a first order reaction is K, then $t_{1/4}$ can be written as:

A. $0.10/K$

B. $0.29/K$

C. $0.69/K$

D. $0.75/K$

Answer: B

Watch Video Solution

22. A reaction that is of the first order with respect to reactant A has a rate constant 6min^{-1}. If we start with $[A] = 0.5\text{mol}1^{-1}$, when would $[A]$ reach the value $0.05mol1^{-1}$

A. 0.384 min

B. 0.15 min

C. 3 min

D. 3.84 min

Answer: A

Watch Video Solution

23. A first-order reaction was started with a decimolar solution of the reactant, 8 minutes and 20seconds later its concentration was found to $M/100$. So the rate of the raction is

A. $2.303 \times 10^{-5} \sec^{-1}$

B. $2.303 \times 10^{-4} \sec^{-1}$

C. $4.606 \times 10^{-3} \sec^{-1}$

D. $2.606 \times 10^{-5} \sec^{-1}$

Answer: C

Watch Video Solution

24. A first order reaction is half completed in 45 minutes. How long does it need 99.9% of the reaction to be completed

A. 5 hours

B. 7.5 hours

C. 10 hours

D. 20 hours

Answer: B

Watch Video Solution

25. The rate constant of reaction $2A + B \rightarrow C$ is $2.57 \times 10^{-5} L\text{mole}^{-1}\,\text{sec}^{-1}$ after $10\,\text{sec}$, $2.65 \times 10^{-5} L\text{mole}^{-1}\,\text{sec}^{-1}$ after $20\,\text{sec}$ and $2.55 \times 10^{-5} L\text{mole}^{-1}\,\text{sec}^{-1}$ after $30\,\text{sec}$. The order of the reaction is :

A. 0

B. 1

C. 2

D. 3

Answer: C

Watch Video Solution

26. Decay constant of a reaction is $1.1 \times 10^{-9}/\text{sec}$, then the half-life of the reaction is

A. 1.2×10^{8}

B. 6.3×10^{8}

C. 3.3×10^{8}

D. 2.1×10^{8}

Answer: B

Watch Video Solution

27. A follows first order reaction.

$(A) \rightarrow Product$

The concentration of A changes form $0.1M$ to $0.025M$ in 40 min . Find the rate of reaction of A when the concentration of A is $0.01M$.

A. $1.73 \times 10^{-5} M/$ min

B. $3.47 \times 10^{-4} M / \text{ min}$

C. $3.47 \times 10^{-5} M / \text{ min}$

D. $1.73 \times 10^{-4} M / \text{ min}$

Answer: B

Watch Video Solution

28. Gaseous N_2O_5 decomposes according to the following equation:

$$N_2O_5(g) \rightarrow 2NO_2(g) + \frac{1}{2}O_2(g)$$

The experimental rate law is $-\Delta[N_2O_5]/\Delta t = k[N_2O_5]$. At a certain temerature the rate constant is $k = 5.0 \times 10^{-4} \sec^{-1}$. In how seconds will the concentration of N_2O_5 decrease to one-tenth of its initial value ?

A. $2.0 \times 10^3 s$

B. $4.6 \times 10^3 s$

C. $2.1 \times 10^2 s$

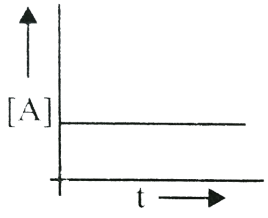
D. $1.4 \times 10^3 s$

Answer: B

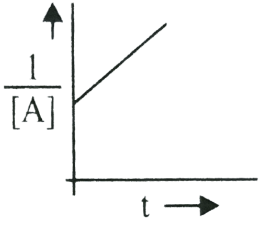
Watch Video Solution

29. Which of the following curve represent zero order reaction of $A \rightarrow$ products ?

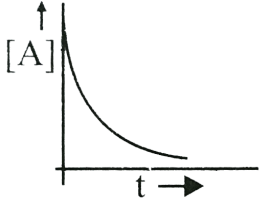
A.



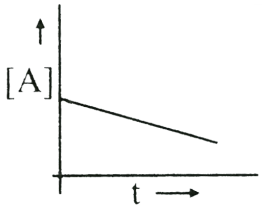
B.



C.



D.



Answer: D

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30. $t_{1/2} =$ constant confirms the first order of the reaction as one $a^2 t_{1/2} =$ constant confirms that the reaction is of

A. Zero order

B. First order

C. Second order

D. Third order

Answer: D

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31. In presence of HCl, sucrose gets hydrolysed into glucose and fructose. The concentration of sucrose was found to reduce form $0.4M$ to $0.2M$ in 1 hour and $0.1M$ in 2 hours. The order of the reaction is

A. Zero

B. One

C. Two

D. None of these

Answer: B

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32. Consider a reaction $A(g) \rightarrow 3B(g) + 2C(g)$ with rate constant is $1.386 \times 10^{-2}\text{min}^{-1}$ in a non-rigid closed container starting with 2 moles of A in $12.5L$ vessel initially, if reaction is allowed to take place at constant pressure and at $298K$ the conc. of after $100\ \text{min}$ is

A. $0.18M$

B. $0.03M$

C. $0.09M$

D. $0.01M$

Answer: C

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33. For the reaction $A + 2B \rightarrow$ products (started with concentration taken in stoichiometric proportion), the experimentally determined rate law is :

$$-\frac{d[A]}{dt} = k\sqrt{[A]}\sqrt{[B]}$$

The half life time of the reaction would be :

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

B. $\frac{0.693}{1/k}$

C. $\frac{0.693}{\sqrt{2k}}$

D. not defined

Answer: C

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34. A reaction $2A + B \xrightarrow{k} C + D$ is first order with respect to A and 2nd order with respect to B. Initial conc. $(t = 0)$ of A is C_0 while B is $2C_0$. If at t as 30 minutes the conc. of C is $C_0/4$, then rate expression at $t = 30$ minutes is:

A. $R = 7C_0^3 k/16$

B. $R = 27C_0^3k/32$

C. $R = 247C_0^3k/64$

D. $R = 49kC_0^3/32$

Answer: D

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35. The time for half-life period of a certain reaction, $A \rightarrow$ products is $1h$. When the initial concentration of the reactant $'A'$ is $2.0\text{mol}L^{-1}$, how much time does it take for its concentration to come from 0.50 to $0.25\text{mol}L^{-1}$, if it is zero order reaction ?

A. $4h$

B. $0.5h$

C. $0.25h$

D. $1h$

Answer: C

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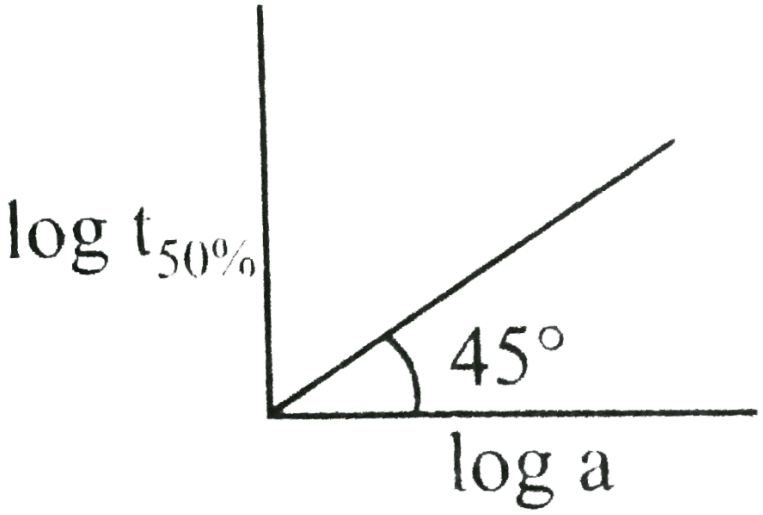
36. What will be the order of reaction and rate constant for a chemical change having $\log t_{50\%}$ versue log concentration of (a) curves as:



A. $0, 1/2$

B. $1, 1$

C. $2, 2$

D. $3, 1$

Answer: A

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37. If $75\ \%$ of a first order reaction completed in $15\ \text{min}$. Then $90\ \%$ of the same reaction completed in

A. $20\ \text{min}$

B. $25\ \text{min}$

C. $30\ \text{min}$

D. $150\ \text{min}$

Answer: B

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38. The half-life period of a first-order chemical reaction is $6.93\ \text{min}$. The time required for the completion of $99\,\%$ of the chemical reaction will be $(\log 2 = 0.301)$

A. $230.3\ \text{min}$

B. $23.03\ \text{min}$

C. $46.06\ \text{min}$

D. $460.6\ \text{min}$

Answer: C

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39. The half-life for a reaction at initial concentration of 0.5 and $1.0 \text{mole litre}^{-1}$ are $200\,\text{sec}$ and $100\,\text{sec}$ respectively. The order of the reaction is

A. 0

B. 1

C. 2

D. 3

Answer: C

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40. $75\ \%$ of a first-order reaction was completed in 32 minutes, when was $50\ \%$ of the reaction completed ?

A. 24 minute

B. 16 minute

C. 8 minute

D. 48 minute

Answer: B

Watch Video Solution

41. A drop of solution (volume $0.05mL$) contains $3 \times 10^{-6}\text{mole}H^{\oplus}$ ions. If the rate constant of disappearance of $H^{\oplus}$ ions is $1 \times 10^{7}molL^{-1}s^{-1}$, how long would it take for $H^{\oplus}$ ions in the drop of disappear?

A. $6 \times 10^{-8}\,\text{sec}$

B. $6 \times 10^{-7}\,\text{sec}$

C. $6 \times 10^{-9}\,\text{sec}$

D. $6 \times 10^{-10}\,\text{sec}$

Answer: C

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42. A certain zero order reaction has $k = 0.025 Ms^{-1}$ for the disappearance of A. What will be the concentration of A after 15 seconds if the initial concentration is $0.5M$?

A. $0.5M$

B. $0.32M$

C. $0.12M$

D. $0.06M$

Answer: C

Watch Video Solution

43. For a certain reaction the variation of rate constant with temperature is given by the equation

$$\ln k_t = \ln k_0 + \frac{(\ln 3)t}{10} (t \geq 0^\circ C)$$

The value of temperature coefficient of the reaction is

A. 0.1

B. 1

C. 10

D. 3

Answer: D

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44. A certain substance A is mixed with an equimolar quantity of substance B. At the end of an hour A is $75\,\%$ reacted. Calculated the time when A is $10\,\%$ unreacted. (Given order of reaction is zero).

A. 1.2 hours

B. 2.1 hours

C. 3.1 hours

D. 2 hours

Answer: A

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45. Thermal decomposition of compound x is a first order reaction. If $75\,\%$ of x is decomposed in $100\ \text{min}$. How long will it take for $90\,\%$ of the compound to decompose ? Given $\log 2 = 0.30$

A. $190\ \text{min}$

B. $176.66\ \text{min}$

C. $166.66\ \text{min}$

D. $156.66\ \text{min}$

Answer: C

Watch Video Solution

46. For a first order reaction, the reaction, the plot of $\log C$ against 't' (log C vs 't') gives a straight line with slope equal to:

A. $(k/2.303)$

B. $(-k/2.303)$

C. $(\ln k/2.303)$

D. $-k.$

Answer: B

Watch Video Solution

47. In a certain reaction, $10\,\%$ of the reactant decomposes in one hour, $20\,\%$ in two hours, $30\,\%$ in theee hours, and so on. The dimenison of the velocity constant (rate constant) are

A. hour^{-1}

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

C. $\text{litre mole}^{-1}\,\text{sec}^{-1}$

D. mole sec^{-1}

Answer: B

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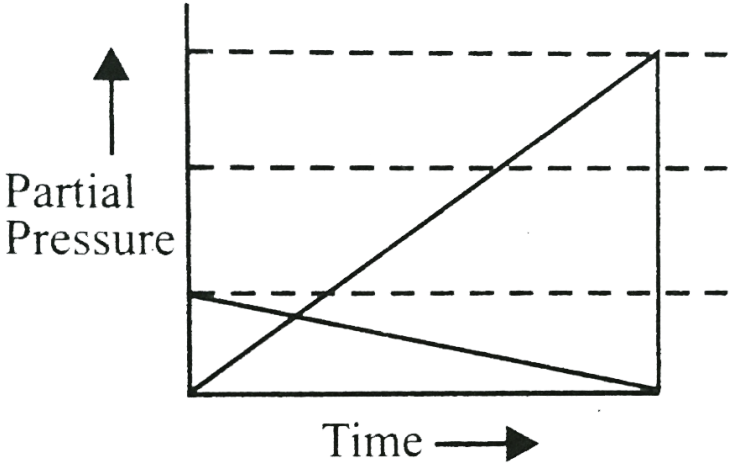
48. If for a reaction in which $A(g)$ converts to $B(g)$ the reaction carried out at const.

V & T results into the following grapg.



A. then the reaction must be $A(g) \rightarrow 3B(g)$ and is a first -order reaction.

B. then the reaction must be $A(g) \rightarrow 3B(g)$ and is a second-order reaction.

C. then the reaction must be $A(g) \rightarrow 3B(g)$ and is a zero-order reaction.

D. then the reaction must be $A(g) \leftrightarrow 3B(g)$ and is first-order reaction.

Answer: C

Watch Video Solution

49. In a first order of reaction the reacting substance has half-life period of ten minutes. What fraction of the substance will be left after an hour the reaction has occurred ?

A. $1/6$ of initial concentration

B. $1/64$ of initial concentration

C. $1/12$ of initial concentration

D. $1/32$ of initial concentration

Answer: B

Watch Video Solution

50. The reaction $A \xrightarrow{k}$ Products, is zero order while the reaction $B \xrightarrow{k}$ Products, is 1st order. For what initial concentration of A the half-lives of the two reactions are equal.

A. $2M$

B. $\ln 2M$

C. $2 \log 2M$

D. $2 \ln 2M$

Answer: D

Watch Video Solution

51. If a I-order reaction is completed to the extent of $60\,\%$ and $20\,\%$ in time intevals, t_1 and t_2, what is the ratio, $t_1 : t_2$?

A. 6.32

B. 5.58

C. 4.11

D. 8.33

Answer: C

Watch Video Solution

52. Which of the followoing expression is correct for first order reaction ? (CO) refers to initial concentration of reactant.

A. $t_{1/2} \propto CO$

B. $t_{1/2} \propto CO^{-1}$

C. $t_{1/2} \propto CO^{-2}$

D. $t_{1/2} \propto CO^{0}$

Answer: D

Watch Video Solution

53. For a reaction $A \rightarrow$ Products, the concentration of reactant are $C_0, aC_0, a^2C_0, a^3C_0$.....after time interval $0, t, 2t$.....where $'a'$ is constant. Then :

A. reaction is of 1st order and $k = (1/1)$ In a

B. reaction is of 2nd order and $K = (1/tC_0)(1-a)/a$

C. reaction is of 1st order and $K = \frac{1}{t}\ln\left(\frac{1}{a}\right)$

D. reaction is of zero order and $K = \frac{1}{t}\ln\left(\frac{1}{a}\right)$

Answer: C

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Initial Rate Method And Ostwaid Method

1. For a chemical reaction $A \to B$, the rate of reaction increases by a factor of 1.837 when the concentration of A is increased by 1.5 time. The order of reaction with respect to A is:

A. 1

B. 1.5

C. 2

D. -1

Answer: B

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2. The rates of a certain reaction (dc/dt) at different times are as follows

Time	$Rate\left(\text{mole litre}^{-1}\,\text{sec}^{-1}\right)$
0	2.8×10^{-2}
10	2.78×10^{-2}
20	2.81×10^{-2}
30	2.79×10^{-2}

The reaction is

A. Zero order

B. First order

C. Second order

D. Third order

Answer: A

Watch Video Solution

3. The conversion of $A \rightarrow B$ follows second-order kinetics. Doubling the concentration of A will increase the rate of formation of B by a factor

A. $1/4$

B. 2

C. $1/2$

D. 4

Answer: D

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4. For the reaction system $2NO(g) + O_2(g) \rightarrow 2NO(g)$ volume is suddenly produced to half its value by increasing the pressure on it. If the reaction is of first order with respect to O_2 and second order with respect to NO. The rate of reaction will

A. Diminish to one fourth of its initial value

B. Diminish to one eighth of its initial value

C. Increase to eighth times of its initial value

D. (d) Increase to four times of its initial value

Answer: C

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5. Rate constant of a reaction with a virsus is $3.1 \times 10^{-4} s^{-1}$. Time required for a virus to become $75\ \%$ inactivated is

A. $17.5\ \text{min}$

B. $40\ \text{min}$

C. $74.5\ \text{min}$

D. $30\ \text{min}$

Answer: C

Watch Video Solution

6. Consider a reaction, $2A + B \rightarrow$ Products

When concentration of B alone was doubled, the half-life did not change. When the concentration of A alone was doubled, the rate incresed by two times. The unit of rate constant for this reaction is :

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

B. No unit

C. $\text{mol}L^{-1}s^{-1}$

D. s^{-1}

Answer: A

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7. For reaction $aA \rightarrow xP$ when [A] =2.2 m M, the rate was found to be 2.4 m Ms^{-1} . On reducing concentration of A to half, rate changes to $0.06mMs^{-1}$. The order of reaction with respect to A is :

A. 1.5

B. 2.0

C. 2.5

D. 3.0

Answer: B

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8. The half life for a given reaction was doubled as the initial concentration of a reactant was doubled. What is the order of reaction.

A. three

B. zero

C. one

D. two

Answer: B

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9. For the decompoistion of HI at $1000K(2HI \rightarrow H_2 + I_2)$, following data were obtained:

$[HI](M)$	Rate of decomposition of $\mathrm{HI}\left(molL^{-1}s^{-1}\right)$
0.1	2.75×10^{-8}
0.2	11×10^{-8}
0.3	24.75×10^{-8}

The order of reaction is

A. 1

B. 2

C. 0

D. 1.5

Answer: B

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10. For the reaction $A + B \rightarrow$ products, doubling the concentration of A the rate of the reaction is doubled, but on doubling the concentration of B rate reamins unaltered. The overall order of the reaction is

A. 1

B. 0

C. 2

D. 3

Answer: A

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11. For a reaction $\frac{dx}{dt} = K\left[H^+\right]^n$. If pH of reaction medium changes from two to one rate becomes 100 times of value at $pH = 2$, The order of reaction is

A. 1

B. 2

C. 0

D. 3

Answer: B

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12. For a reaction $2NO(g) + Cl_2(g) \Leftrightarrow 2NOCl(g)$.When concentration of Cl_2 is doubled, the rate of reaction becomes two times of the original. When the concentration of NO is doubled the rate becomes four times. What is the order of the reaction

A. 1

B. 2

C. 3

D. 4

Answer: C

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13. The experiment data for the reaction $2A + B_2 \rightarrow 2AB$ is

Experiment	$[A]M$	$[B_2]M$	Initial rate$\left(molL^{-1}s^{-1}\right)$
I	0.50	0.5	1.6×10^{-4}
II	0.50	1.0	3.2×10^{-4}
III	1.00	1.0	3.2×10^{-4}

Write the most probable rate equation for the reacting giving reason for you answer.

A. rate $= k[B_2]^2$

B. rate $= k[B]$

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

D. (d) rate $= k[A]^2[B]$

Answer: B

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14. For the first-order reaction T_{av} (average life), T_{50} (half-life) and T_{75} (time $75\ \%$ reaction) are in the ratio of

A. $1.44:2:3$

B. $1.44:1:2$

C. $1:2:1.44$

D. $1:2:3$

Answer: B

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15. For the reaction $A+B \rightarrow C$, it is found that doubling the concentration of A increases the rate by 4 times, and doubling the concentration of B doubles the reaction rate. What is the overall order of the reaction ?

A. 4

B. $3/2$

C. 3

D. 1

Answer: C

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16. $nA \rightarrow$ Product

$$\frac{dx}{dt} = k[A]^n$$

For the reaction, rate constant and rate of the reaction are equal, then on doubling the concetration of A, rate becomes,

A. four times

B. halved

C. constant

D. doubled

Answer: C

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17. Number of natural life times (T_{av}) required for a first order reaction to achieve $99.9\ \%$ level of comletion is

A. 6.9

B. 1.5

C. 0.105

D. 9.2

Answer: A

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18. $A + B \rightarrow$ Product, $\frac{dx}{dt} = k[A]^a[B]^b$

If $\left(\frac{dx}{dt}\right) = k$, then order is:

A. 4

B. 2

C. 1

D. 0

Answer: D

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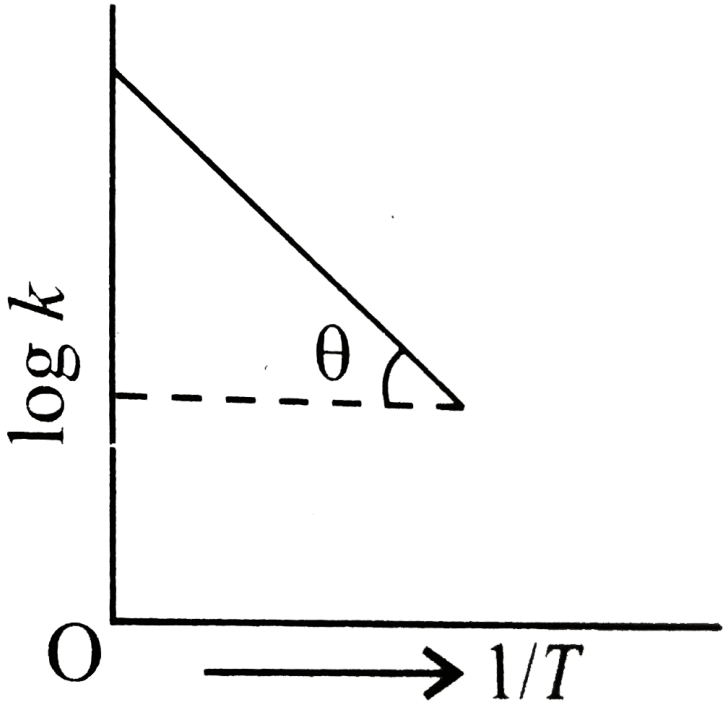
Arrhenius Equation, Effect Of Temprature And Effect Of Catalysts

1. Graph between $\log k$ and $1/T$ [k rate constant $\left(s^{-1}\right)$ and T and the temperature (K)] is a straight line with

$OX = 5, \theta = \tan^{-1}(1/2.303)$. Hence $-E_a$ will be



A. $2.303 \times 2cal$

B. $2/2.303cal$

C. $2cal$

D. None of these

Answer: C

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2. Rate of which reactions increases with temperature:

A. of any

B. of exothermic reaction

C. of endothermic

D. of none

Answer: A

Watch Video Solution

3. Which of the following statement is not true according to collision theory of reaction rates ?

A. Collision of molecules is percondition for any reaction to occur

B. All collisions result in the formation of the products

C. Only activated collisions result in the formation of the products

D. Molecules which have acquired the energy of activation can collide effectively

Answer: B

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4. The activation energies of two reactions are E_{a1} and E_{a2} with $E_{a1} > E_{a2}$. If the temperature of the reacting systems is increased from T to T', which of the following is correct?

A. $\frac{K'_1}{K_1} = \frac{K'_2}{K_2}$

B. $\frac{K'_1}{K_1} < 2\frac{K'_2}{K_2}$

C. $\frac{K'_1}{K_1} > \frac{K'_2}{K_2}$

D. $\frac{K'_1}{K_1} < \frac{K_2}{K_2}$

Answer: C

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5. Which one is correct for $K = Ae^{-E_a/RT}$?

A. E_a is energy of activation

B. R is Rydberg constant

C. K is equilibrium constant

D. A is adcorption factor

Answer: A

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6. The slope of the line graph of $\log k$ versus $1/T$ for the reaction $N_2O_5 \rightarrow 2NO_2 + 1/2O_2$ is -5000.Calculate the energy of activation

of the reaction (in $kJK^{-1}mol^{-1}$).

A. 95.7

B. 9.57

C. 957

D. None

Answer: A

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7. For a zero order reaction. Which of the following statement is false:

A. the rate is independent of the temperature of the reaction.

B. the rate is independent of the concentration of the reactants.

C. the half life is depends upon the concentration of the reactants.

D. the rate constant has the unit $\text{mole}L^{-1}\sec^{-1}$.

Answer: A

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

A. increase in the number of collisions

B. the increase in the number of activated molecules

C. The shortening of mean free path

D. the lowering of activation energy

Answer: B

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9. The rate constant (K') of one reaction is double of the rate constant (K") of another reaction. Then the relationship between the corresponding activation energies of the two reactions $(E_a' \text{and} E_a'')$ will be

A. $E'_a > E''_a$

B. $E'_a = E''_a$

C. $E'_a < E''_a$

D. $E'_a = 4E''_a$

Answer: C

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10. The energy of activations for forward and backward change for an endothermic reaction, $X \to Y$ are E_f and E_b respectively. Which of the following is correct ?

A. $E_b < E_f$

B. $E_b > E_f$

C. $E_b = E_f$

D. No relation between them

Answer: A

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11. The maximum value of activation energy is equal to:

A. zero

B. heat of the reaction

C. threshold energy

D. none of these.

Answer: D

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12. The rate constant, the activation energy, and the Arrhenius parameter of a chemical reaction at $25^{\circ}C$ are $3.0 \times 10^{-4}S^{-1}$, $104.4KJmol^{-1}$, and $6.0 \times 10^{14}S^{-1}$, respectively. The value of the rate constant as $T \to \infty$ is

A. $2.0 \times 10^{18}s^{-1}$

B. $6.0 \times 10^{14}s^{-1}$

C. Infinity

D. $3.6 \times 10^{30}s^{-1}$

Answer: B

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13. Which is incorrect from the theory of Arrhenius's equation ?

A. The number of effective collisions is proportional to the number of molecules above a certain threshold energy

B. As the temperature increases, the number of molecules with energies exceeding the threshold energy increases

C. The rate constant is a function of temperature

D. activation energy and pre-exponential factors are temperature-dependent

Answer: D

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14. Rate of a reaction can be expressed by Arrhenius equation as:

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

In this equation, E_a represents:

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

B. The erergy above which all the colliding molecules will react

C. The energy below which colliding molecules will not react

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

Answer: C

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15. The ΔH value of the reaction $H_2 + Cl_2 \Leftrightarrow 2HCl$ is -44.12 kcal. If E_1 is the activation energy of the products then for the above reaction

A. $E_1 > E_2$

B. $E_1 < E_2$

C. $E_1 = E_2$

D. ΔH is not related to E_1 and E_2

Answer: A

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16. The Activation energy for a chemical reaction mainly depends upon

A. Temperature

B. Nature of reacting species

C. Concentration of the reacting species

D. Collision frequency

Answer: B

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17. A molecule of gas is struck by another molecule of the same gas, the first molecule shows:

A. an exchange of potential energy

B. an exchange of kinetic energy

C. an exchange of chemical energy

D. no exchange of energy

Answer: B

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

A. Changing concentration of reactants

B. Evaluating rate constant at standard temperature

C. Evaluating rate constants at two different temperatures

D. Evaluating velocities of reaction at two different temperatures

Answer: C

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19. The energies of activation for forward and reverse reaction for $A_2 + B_2 \Leftrightarrow 2AB$ are $180 kJ mol^{-1}$ and $200 kJ mol^{-1}$ respectively. The presence of catalyst lowers the activation energy of both (forward and reverse) reactions by $100 kJ mol^{-1}$. The enthalpy change of the reaction $(A_2 + B_2 \rightarrow 2AB)$ in the presence of catalyst will be (in $kJ mol^{-1}$):

A. 300

B. 120

C. 280

D. -20

Answer: D

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20. $A \rightarrow B, \Delta H = -10KJmol^{-1}, E_{a(f)} = 50KJmol^{-1}$, then E_a of $B \rightarrow A$ will be

A. $40kJ\text{mol}^{-1}$

B. $50kJ\text{mol}^{-1}$

C. $-50kJ\text{mol}^{-1}$

D. $60kJ\text{mol}^{-1}$

Answer: D

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21. The rate of a reaction doubles when its temperature changes form $300K$ to $310K$. Activation energy of such a reaction will be:

$\left(R = 8.314JK^{-1}mol^{-1} \text{ and } \log 2 = 0.301\right)$

A. $53.6JK^{-1}\text{mol}^{-1}$

B. $48.6JK^{-1}\text{mol}^{-1}$

C. $58.5JK^{-1}\text{mol}^{-1}$

D. $60.5JK^{-1}\text{mol}^{-1}$

Answer: A

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22. 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 the reaction increases by about

A. 10 times

B. 24 times

C. 32 times

D. 64 times

Answer: C

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23. A reactant (A) forms two products

$A \xrightarrow{k_1} B$, Activation energy E_{a1}

$A \xrightarrow{k_2} C$, Activation energy E_{a2}

If $E_{a_2} = 2E_{a_1}$ then k_1 and k_2 are related as

A. $k_1 = 2k_2 e^{E_{a2}/RT}$

B. $k_1 = k_2 e^{E_{a1}/RT}$

C. $k_2 = k_1 e^{E_{a2}/RT}$

D. $k_1 = Ak_2 e^{E_{a1}/RT}$

Answer: B

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24. The first-order rate constant k is related to temperature as $\log k = 15.0 - \left(10^6/T\right)$. Which of the following pair of value is correct ?

A. $A = 10^{15}$ and $E = 1.9 \times 10^4 kJ$

B. $A = 10^{-15}$ and $E = 40kJ$

C. $A = 10^{15}$ and $E = 40kJ$

D. $A = 10^{-15}$ and $E = 1.9 \times 10^4 kJ$

Answer: A

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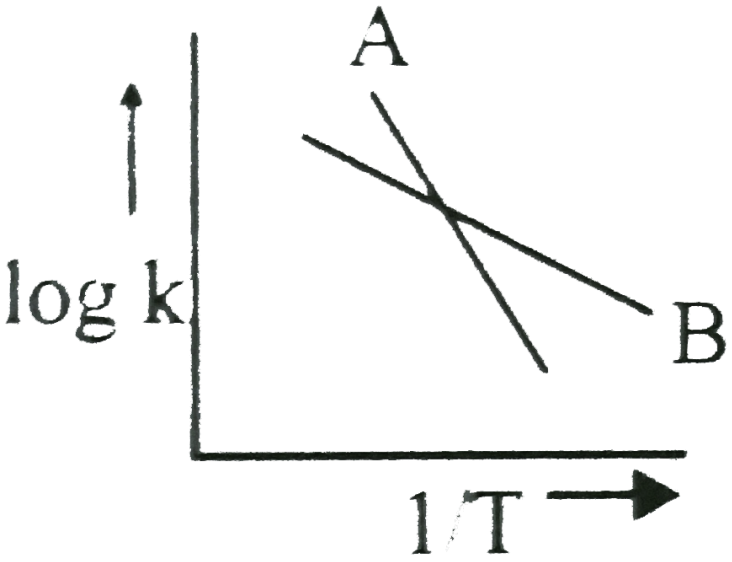
25. The Arrhenius relationship of two different reactions is shown below. Which reaction is faster at a lower temperature and which is more sensitive to changes of temperature ?



A. B faster, A more sensitive

B. B in both cases

C. A in both cases

D. A faster, B more sensitive

Answer: A

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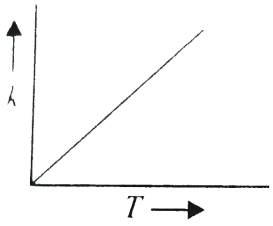
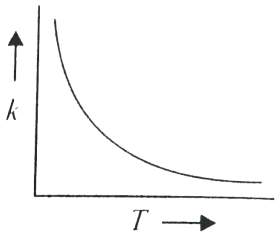
26. The rate constant of most of the reaction increases with increase in temperature. According to the Arrhenius equation,$k = Ae^{-E_a/RT}$. The curve of rate constant $'k'$ against temperature $'T'$ will be.

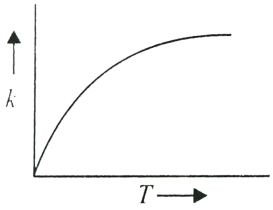
A.



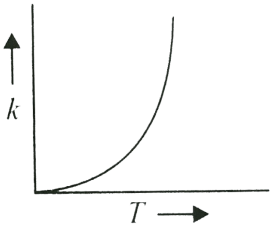
B.



C.



D.



Answer: D

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27. For a reaction, the rate constant is expressed as $k = Ae^{-40000/T}$.

The energy of the activation is

A. 40000 cal

B. 88000 cal

C. 80000 cal

D. 8000 cal

Answer: C

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28. The ratio of rate constant at $27^\circ C$ and $37^\circ C$ is Q_{10}. What should be the energy of activation of a reaction for which $Q_{10} = 2.5$?

A. $71kJ$

B. $212kJ$

C. $35kJ$

D. $12.1kJ$

Answer: A

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29. The decomposition of N_2O into N_2 & O_2 in presence of gaseous argon follow second order kinetics with $k = \left(5.0 \times 10^{11} L\text{mol}^{-1}s^{-1}\right)e^{-\frac{41570}{T}}$ (K stands for Kelvin units). The energy of activation of the reaction is

A. $5.0 \times 10^{11} J$

B. $41570 J$

C. $5000 J$

D. $345612.98 J$

Answer: D

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30. Given that the temperature coefficient for the saponification of ethylacetate by $NaOH$ is 1.75. Calculate the activation energy.

A. $10.7 \text{kcal mol}^{-1}$

B. $12.7 \text{kcal mol}^{-1}$

C. $14.7 \text{kcal mol}^{-1}$

D. $16.7 \text{kcal mol}^{-1}$

Answer: A

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31. A reaction takes place in three steps: the rate constant are $k_1, k_2,$ and k_3. The overall rate constant $k = \frac{k_1 k_3}{k_2}$. If $E_1, E_2,$ and E_3 (energy of activation) are $60, 30$ and $10kJ$, respectively, the overall energy of activation is

A. 40

B. 30

C. 400

D. 60

Answer: A

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32. How much faster would a reaction proceed at $25^{\circ}C$ than at $0^{\circ}C$ if the activation energy is $65kJ$?

A. 2 times

B. 5 times

C. 11 times

D. 16 times

Answer: C

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33. By increasing the temperature by $10^{\circ}C$, the rate of forward reaction at equilibrium is increased by a factor of 2. The rate of backward reaction by this increase in temperature

A. remains unaffected

B. increases by a factor gretaer than two

C. decreases by a factor lesser than two

D. is also increased by a factor of two

Answer: D

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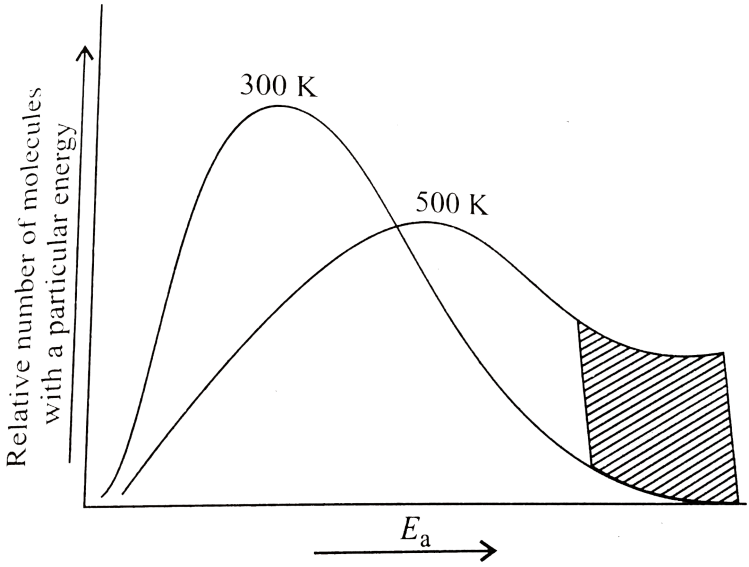
34. The distribution of molecular kinetic energy at two temperature is as shown in the following graph:



Which is the following concluison is/are correct?

A. The number of molecules with energy E or greater is proportional to the shaded area for each temperature

B. The number of molecules with energy E_a or less is proportional to the shaded area for each temperatures

C. The number of molecules with energy E_a is the mean of all temperatures

D. The graph is not according to the Maxwell-Boltzmann energy distribution law

Answer: A

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35. The rate of a reaction gets doubled when the temperature changes from $7^\circ C$ to $17^\circ C$. By what factor will it change for the temperature change from $17^\circ C$ to $27^\circ C$?

A. 1.81

B. 1.71

C. 1.91

D. 1.76

Answer: C

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Parallel Reaction, Consecutive Reaction, Special Cases Of First-Order Reactions

1. In a reaction, the threshold energy is equal to

A. Activation energy $+$ normal energy of reactants

B. Activation energy $-$ normal energy of reactants

C. Activation energy

D. Normal energy of reactants

Answer: A

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2. The following data are for the decomposition of ammonium nitrite in aqueous solution.:

$\text{Vol of} N_2 (cm^3)$	6.25	9.0	11.42	13.65	35.2
Time (min)	10	15	20	25	∞

The order of reaction is :

A. Zero

B. One

C. Two

D. Three

Answer: B

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3. For the reaction $H_2(g) + I_2(g) \Leftrightarrow 2HI(g)$, the rate of reaction is expressed as

A. $\frac{-d[H_2]}{dt} = \frac{-d[I_2]}{dt} = \frac{-d[HI]}{dt}$

B. $\frac{dh_2}{dt} = \frac{d[I_2]}{dt} = \frac{d[HI]}{dt}$

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

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

Answer: D

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4. For a reaction, $E_a = 0$ and $k = 3.2 \times 10^4 s^{-1}$ at $300K$. The value of k at $310K$ would be

A. $6.4 \times 10^4 s^{-1}$

B. $3.2 \times 10^4 s^{-1}$

C. $3.2 \times 10^8 s^{-1}$

D. $3.2 \times 10^5 s^{-1}$

Answer: B

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5. Mechanism of the reaction $2NO + Cl_2 \rightarrow 2NOCl$ may be written as

$2NO \overset{k}{\Longleftrightarrow} (NO)_2$.....(fast)

$(NO)_2 + Cl_2 \overset{k}{\longrightarrow} 2NOCl$.....(slow)

Rate equation would be

A. $kK\left[(NO)_2\right][Cl_2]$

B. $kK\left[(NO)^2\right][Cl_2]$

C. $kK[Cl_2]$

D. $kK[NO][Cl_2]$

Answer: B

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6. The acid catalysed ionisation of γ-hydroxy butyric acid proceeds as a reversible reaction. Which is I order in both the forward and backward steps:

$$\underset{(\text{Acid})}{A} \underset{K_1}{\overset{K_2}{\rightleftharpoons}} \underset{(\text{Lactose})}{B}$$

The rate $-\frac{d[A]}{dt}$ is given by:

A. $K_1[A]$

B. $-K_2[B]$

C. $K_1[A] - K_2[B]$

D. $\frac{K_1[A]}{K_2[B]}$

Answer: C

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7. Two reactions $A \rightarrow$ products and $B \rightarrow$ products have rate constants k_a and k_b respectively at temperature T and activation energies are E_a and E_b respectively.

If $k_a > k_b$ and $E_a < E_b$ and assuming the freuency factor A in both the reactions are same then

A. on increasing temperature k will be greater than k_b

B. At lower temperature k_a and k will differ more

C. As temperature rises k_a and k_b will be close to each other in magnitude

D. All of the above are correct

Answer: D

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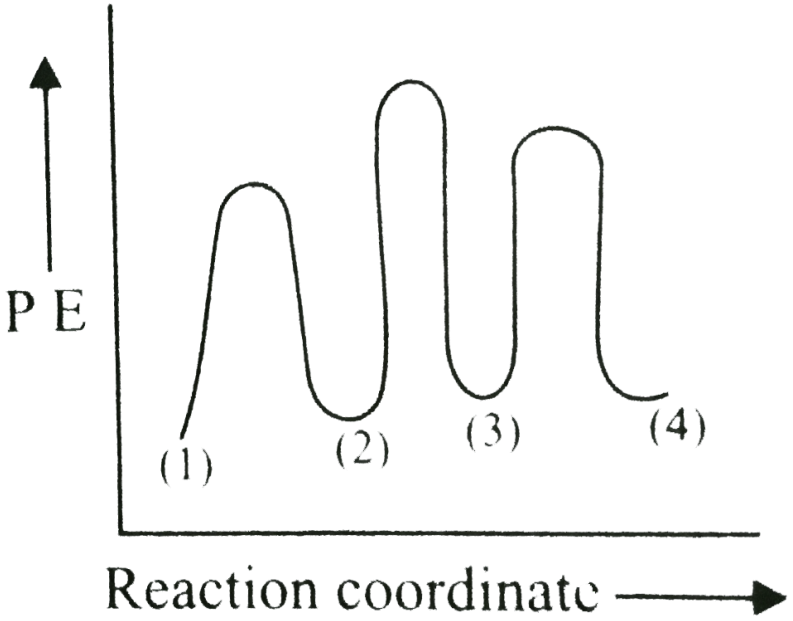
8. A simple mechanism for enzyme-catalyzed reaction is given by the folllwoing set of equations



$$\underset{\text{(enzyme)}}{E} + \underset{\text{(reactant)}}{S} \Longleftrightarrow \underset{\text{(intermediata 1)}}{ES}$$

$$\underset{\text{(intermediate 1)}}{ES} \Longleftrightarrow \underset{\text{(intermediate 2)}}{EP}$$

$$\underset{\text{(intermediate 2)}}{EP} \Longleftrightarrow \underset{\text{(enzyme)}}{E} + \underset{\text{(product)}}{P}$$

This is know as the Michaelis-Menten mechanism. The potential energy diagram is shown in the fig. Which of the following sets of identifications is correct ? (Assume that the temperature and pressure are constant).

A. $(1) = E + P.\,, (2) = EP, (3) = ES, (4) = E + S$

B. $(1) ES, \quad (2) \underset{\text{complex}}{\text{Activated}}, \quad (3) EP, \quad (4) \underset{\text{complex}}{\text{Activated}}$

C. $(1) EP \quad (2) \underset{\text{complex}}{\text{Activated}}, \quad (3) ES, \quad (4) \underset{\text{complex}}{\text{Activated}}$

D. $(1) E + S \quad (2) ES \quad (3) EP \quad (4) E + P$

Answer: D

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9. For a reaction, $A \rightarrow B + C$, it was found that at the end of 10 minutes from the start, the total optical rotation of the system was 50° and when the reaction is complete, it was 100°. Assuming that only B and C are optically active and dextrorotatory. Calculate the rate constant of this first order reaction

A. $k = 0.695 \text{min}^{-1}$

B. $k = 0.0693\,\text{sec}^{-1}$

C. $k - 0.0693 \text{min}^{-1}$

D. $k = 0.00693 \, \text{sec}^{-1}$

Answer: C

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10. Consider the reaction,

$Cl_2(aq) + H_2S(aq) \rightarrow S(s) + 2H^+(aq) + 2Cl^-(aq)$

The rate equation for this reaction is,

Rate $= k[Cl_2][H_2S]$

Which of these mechanisms is/are consistent with this rate equation ?

(I) $Cl_2 + H_2S \rightarrow H^+ + Cl^- + Cl^+ + HS^-$ (slow)

$Cl^+ + HS^- \rightarrow H^+ + Cl^- + S$ (fast)

(II) $H_2S \Leftrightarrow H^+ + HS^-$ (fast equilibrium)

$Cl^+ + HS^- \rightarrow 2Cl^- + H^+ + S$ (slow)

A. (II) only

B. Both (I) and (II)

C. Neither (I) nor (II)

D. (I) only

Answer: D

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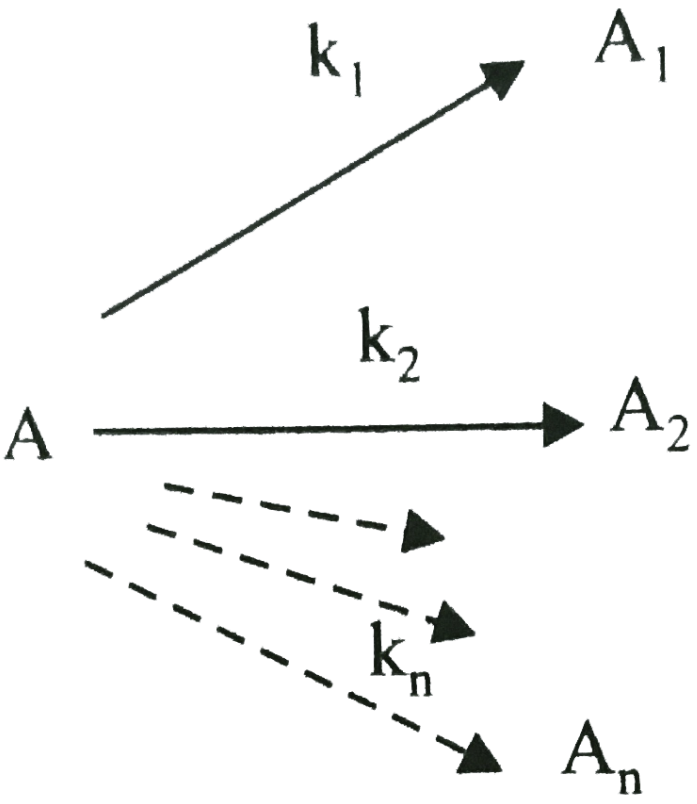
11. For a Ist order decomposition of A as given



Therefore rate constant (K) for the overall decomposition of A is

A. $K = k_1 + k_2 + \ldots\ldots + k_n$

B. $K = (k_1 + k_2 + \ldots\ldots + k_n)_n$

C. $K = k_1 \times k_2 \times \ldots\ldots \times k_n$

D. $K = k_1k_2 + k_2k_3 + \ldots\ldots + k_{n-1}k_n$

Answer: A

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12. For the consecutive unimolecular-type first-order reaction $A \xrightarrow{k_1} R \xrightarrow{k_2} S$, the concentration of component R, C_R at any time t is given by -

$$C_R = C_{OA} K_1 \left[\frac{e^{-k_1 t}}{(k_2 - k_1)} + \frac{e^{-k_2 t}}{(k_1 - k_2)} \right]$$

if $C_A = C_{AO}, C_R = C_{RO} = 0$ at $t = 0$

The time at which the maximum concentration of R occurs is -

A. $t_{\max} = \dfrac{k_2 - k_1}{\ln(k_2 / k_1)}$

B. $t_{\max} = \dfrac{\ln(k_2 / k_1)}{k_2 - k_1}$

C. $t_{\max} = \dfrac{e^{k_2 / k_1}}{k_2 - k_1}$

D. $t_{\max} = \dfrac{e^{k_2 - k_1}}{k_2 - k_1}$

Answer: B

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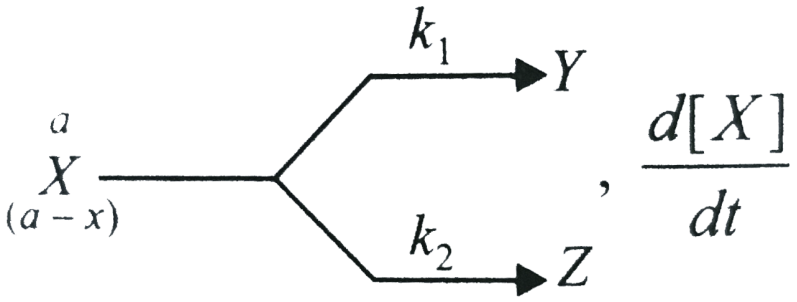
13. For a reaction



, $\frac{d[X]}{dt}$, $\frac{d[X]}{dt}$ is ewqual to

A. $k_1(a-x) - k_2(a-x)$

B. $k_2(a-x) - k_1(a-x)$

C. $k_1(a-x) + k_2(a-x)$

D. $-k_1(a-x) - k_2(a-x)$

Answer: C

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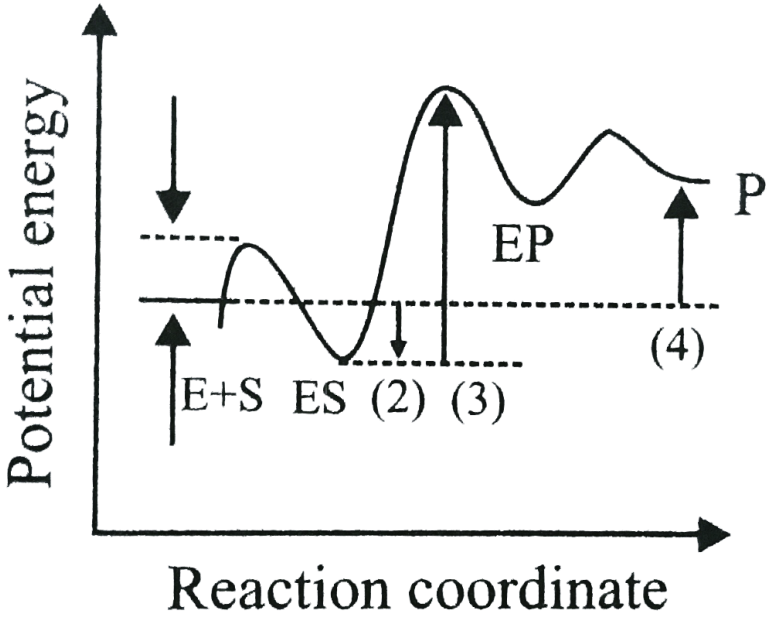
14. Choose the correct set of identification.



A. $\underset{E+S\rightarrow ES}{\Delta E}$ for $\underset{ES\rightarrow EP}{E_a}$ for $\underset{\text{for}\,S\rightarrow P}{\Delta E_{\text{overall}}}$ $\underset{EP\rightarrow E+P}{E_a}$ for

B. $\underset{E+S\rightarrow ES}{E_a}$ for $\underset{E+S\rightarrow ES}{\Delta E}$ for $\underset{ES\rightarrow EP}{E_a}$ for $\underset{\text{for}\;\;S\rightarrow P}{\Delta E}$ for

C. $\underset{ES\rightarrow EP}{E_a}$ for $\underset{EP\rightarrow E+P}{E_a}$ for $\underset{\text{for}\;\;S\rightarrow P}{\Delta E_{\text{overall}}}$ $\underset{EP\rightarrow E+P}{\Delta E}$ for

D. $\underset{E+S\rightarrow ES}{E_a}$ for $\underset{ES\rightarrow EP}{E_a}$ for $\underset{EP\rightarrow E+P}{E_a}$ for $\underset{\text{for}\;\;S\rightarrow P}{\Delta E_{\text{overall}}}$

Answer: B

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15. The mechanism of the reaction: $A + 2B + C \rightarrow D$ is

(step 1) (fast) equilibrium $A + B \Leftrightarrow X$

(step 2)(slow) $X + C \rightarrow Y$

(step 3) (fast) $Y + B \rightarrow D$

Which rate law is correct ?

A. $v = k[C]$

B. $\underline{v} = \underline{k}[A][B]^2[C]$

C. $v = k[A][B][C]$

D. $v = k[D]$

Answer: C

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16. Catalyst decomposition of hydrogen peroxide is a..... Order reaction

A. First

B. Second

C. Third

D. Zero

Answer: A

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17. In the reaction $NH_4NO_2(aq.) \rightarrow N_2(g) + 2H_2O(l)$ the volume of N_2 after 20 min and after a long time is $40ml$ and $70ml$ respectively, The value of rate constant is :

A. $(1/20)In(7/4)\text{min}^{-1}$

B. $(2.303/1200)\log(7/3)\text{sec}^{-1}$

C. $(1/20)\log(7/3)\text{min}^{-1}$

D. $(2.303/20)\log(11/7)\text{min}^{-1}$

Answer: B

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18. The half life of decompoistion of N_2O_5 is a first order reaction represented by $N_2O_5 \rightarrow N_2O_4 + 1/2O_2$

After 15min the volume of O_2 produced is $9ml$ and at the end of the reaction $35ml$. The rate constant is equal to

A. $\frac{1}{15}\log_e \frac{35}{26}$

B. $\frac{1}{15}\log_e \frac{44}{26}$

C. $\frac{1}{15}\log_e \frac{35}{36}$

D. None of the foregoing

Answer: A

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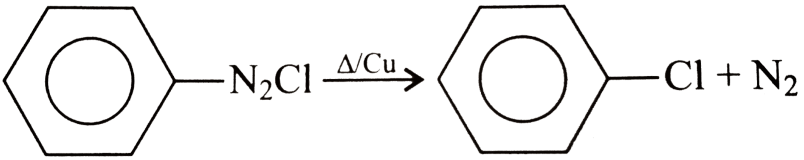

(A)

19.

Half life id independent of the concentration of A. After $10min$ volume of N_2 gas is $10L$ and after complete reaction is $50L$. Hence, the rate constant is

A. $(2.303/10)\log 5\text{min}^{-1}$

B. $(2.303/10)\log 1.25\text{min}^{-1}$

C. $(2.303/10)\log 2\text{min}^{-1}$

D. $(2.303/10)\log 4\text{min}^{-1}$

Answer: B

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20. For the consecutive unimolecular first order reaction $A \xrightarrow{k_1} R \xrightarrow{k_2} S$, the concentration of component A, C_A at any time t is given by

A. $C_{=} C_{A_0} e^{(k_1+k_2)t}$

B. $C_A = C_{A_0} e^{-(k_1+k_2)t}$

C. $C_A = C_{A_0} e^{-k_1 t}$

D. $C_A = C_{A_0} e^{k_1 t}$

Answer: C

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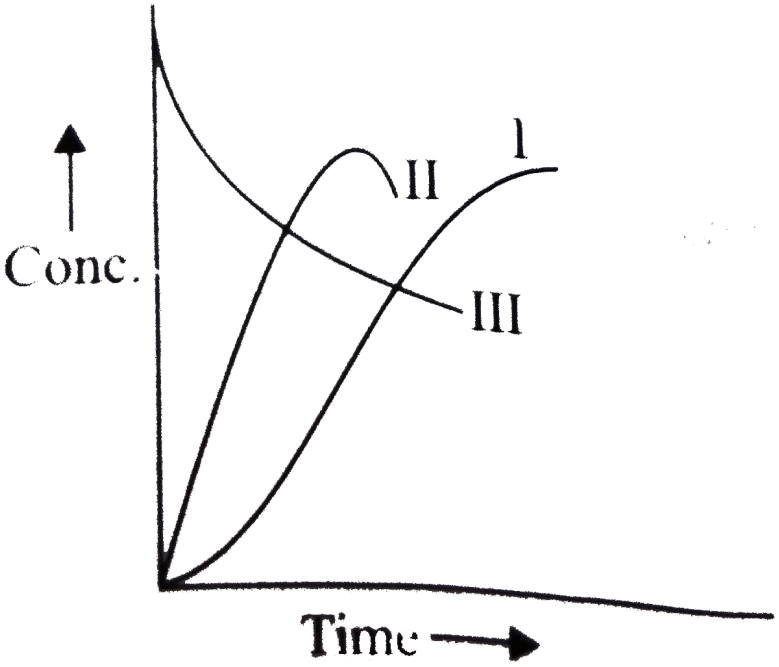
21. A first order homogeneous reaction of the type $X \to Y \to Z$ (consecutive reaction) is carried out in a $CSTR$. Which of the following curves reacpectively show the variation of the concentration

of X, Y nad Z with time



A. I,II,III

B. III, II, I

C. III, I, II

D. II, III, I

Answer: B

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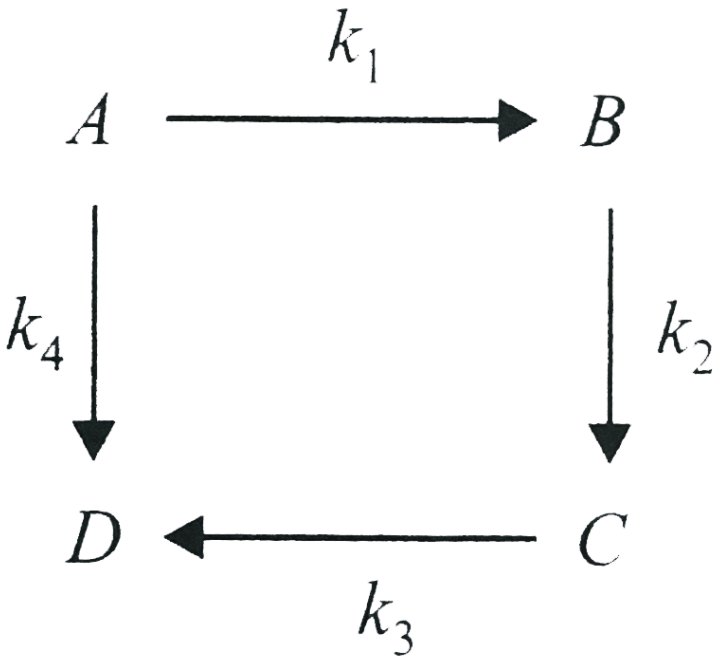
22. Consider the elementary reaction sequence shown in figure. Which of the following equations are correct ?



A. $\frac{d[A]}{dt} = -k_1[A] + k_4[D]$

B. $\frac{d[C]}{dt} = k_2[B] - k_3[C]$

C. $\frac{d[D]}{dt} = -k_4[D] + k_3[D]$

D. Nothing can be said about order of reactions in this problem.

Answer: B

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23. A hypothetical reaction $A_2 + B_2 \rightarrow 2AB$ follows the mechanism as given below:

$A_2 \Leftrightarrow A + A(\text{fast})$

$A + B_2 \rightarrow AB + B$ (slow)

$A + B \rightarrow AB$ (fast)

The order of the overall reaction is

A. 2

B. 1

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

D. zero

Answer: C

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24. For a gaseous reaction, following data is given:

$A \rightarrow B, k_1 = 10^{15} e^{-2000/T}$

$C \rightarrow D, k_2 = 10^{14} e^{-1000/T}$

The temperature at which $k_1 = k_2$ is

A. $1000K$

B. $2000K$

C. $868.82K$

D. $434.2K$

Answer: D

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25. H_2O and O atom react in upper atmosphere bimolecularly to form two OH radicals. ΔH for the reaction is $72kJ$ at $500K$ and energy of activation is $77kJmol^{-1}$. Estimate E_a for bimolecular recombination of two OH radicals to form H_2O and O atom.

A. $149kJ\text{mol}^{-1}$

B. $-149kJ\text{mol}^{-1}$

C. $5kJ\text{mol}^{-1}$

D. $-5kJ\text{mol}^{-1}$

Answer: C

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Section B - Assertion Reasoning

1. Assertion: Half-life of a certain radioactive element is 100 days. After 200 days, fraction left undecayed will be $25\ \%$.

Reason: $\frac{C_t}{C_0} = \left(\frac{1}{2}\right)^n$, where symbols have standard meaning.

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

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

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: A

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2. Assertion: Time taken for the completion of $75\,\%$ of a Ist order reaction is double than its $t_{.^1/_2}$.

Reason: Time taken for completion of any fraction of a Ist order reaction is a constant value.

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

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

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: A

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3. Assertion (A) : If the activation energy of a reaction is zero, temperature will have no effect on the rate constant. Reason (R): Lower the activation energy, faster is the reaction.

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

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

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: B

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4. Assertion: For a reaction $A(g) \rightarrow B(g)$

$-r_A = 2.5P_A$ at $400K$

$r_A = 2.5P_A$ at $600K$

activation energy is $4135J/\text{mol}$.

Reason: Since for any reaction, values of rate constant at two different temp is same therefore activation energy of the reaction is zero.

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

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

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: B

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5. Assertion: In $A \xrightarrow{k_1} B \xrightarrow{k_2} C$

If half-life of A is very less as compared to B, so the net reaction is $A \rightarrow C$ with rate constant $(k_1 \times k_2)$

Reason: Slowest step is the rate determining step so $B \rightarrow C$ is rate determining step.

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

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

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: D

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6. Assertion: Larger is the activation energy, lesser is the effect of a given temperature rise on rate constant $'K'$.

Reason: $K = Ae^{-E_a/RT}$.

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

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

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: D

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7. Assertion: For a free radical combination, $K = A$.

Reason: E_a is zero for free radical combination.

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

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

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: A

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8. Assertion: Every collision of reactant molecule is not successful.

Reason: Every collision of reactant molecule with proper orientation is successful one.

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

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

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: C

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9. Assertion: A plot of $\log - \frac{\log(dX)}{dt}$ vs. $\log(a - X)$ leads to value of K as antilog (inercept) and slope equal to order of reaction.

Reason: $\frac{dX}{dt} = K(a - X)^n$.

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

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

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: A

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10. Assertion: the plots of $\log t_{1/2}$ vs. $\log[A]_0$ gives a straight line with slope $(1-n)$.

Reason: $t_{1/2} \propto [A]_0^{1-n}$

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

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

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: A

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11. Assertion: Emission of light as result of exposure of P to air in night is called phosphorescence.

Reason: Phosphorus burns in O_2 to give P_2O_5 and conversion of chemical energy into light energy producing cold light and the phenomenon is called chemiluminiscence.

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

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

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: D

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12. Assertion: In the reaction $N_2 + 3H_2 \rightarrow 2NH_3$, the rate of reaction is different in terms of N_2, H_2 and NH_3.

Reason: Rate of disapperenace of N_2 and H_2 and rate of formation of NH_3 are not equal to each other.

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

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

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: D

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13. Assertion (A) : The rate constant of a zero order reaction has same units as the rate of reaction.

Reason (R): Rate constant of a zero order reaction does not depend upon the units of concentration.

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

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

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: C

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14. Assertion: In a zero order reaction, if concentration of the reactant is doubled, half-life period is also doubled.

Reason: The total time taken for a zero order reaction to complete is double of the half-life period.

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

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

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: B

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15. Assertion (A) : The rate constant of a pseudo unimolecular reaction has the units of a first order reaction. Reason (R): A pseudo unimolecular reaction is a reaction of first order in which one of the reactant is present in large excess.

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

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

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: A

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16. Assertion: $50\,\%$ of reaction is completed in $50\,\text{sec}$, therefore, $75\,\%$ of the reaction will be completed in $75\,\text{sec}$.

Reason: The rate constant of a zero order reaction depends uopn time as $k = \frac{1}{t}\{[A]_0 - [A]\}$.

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

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

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: C

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17. Assertion: For a first order reaction, the concentration of the reactant decreases exponentially with time.

Reason: Rate of reaction at any time depend upon the concentration of reactant at that time.

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

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

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: B

View Text Solution

18. Assertion: Temperature coefficients of most of the reactions lies between 2 and 3.

Reason: Increases in temperature increases the number of collisions.

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

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

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: B

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19. Assertion: The molecularity of the reaction $H_2 + Br_2 \rightarrow 2HBr$ is 2.

Reason: The order of the reaction is $3/2$.

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

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

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: B

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20. Assertion: For the reaction $RCl + NAOH(aq) \rightarrow ROH + NACl$, the rate of reaction is reduced to half on reducing the concentration of RCl to half.

Reason: The rate of the reaction is represented by $k[RCl]$ i.e., it is a first-order reaction.

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

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

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: C

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21. Assertion: According to transition state theory, for the formation of an activated complex, one of the vibrational degree of freedom is converted into a translation degree of freedom.

Reason: Energy of the activated complex is higher than the energy of the reactant molecules.

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

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

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: A

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AIPMT/NEET Questions

1. The given reaction $2NO \rightarrow O_2 \rightarrow 2NO_2$ is an example of

A. first-order reaction

B. second-order reaction

C. third-order reaction

D. none of these

Answer: C

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

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

B. the rate of reaction reamains same at any conc. of A

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

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

Answer: B

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3. For the reaction $2N_2O_5 \rightarrow 4NO_2 + O_2$ rate of reaction and rate constant are 1.02×10^{-4} and $3.4 \times 10^{-5}\,\text{sec}^{-1}$ respectively. The concentration of N_2O_5 at that time will be

A. $1.732M$

B. $3M$

C. $1.02 \times 10^{-4}M$

D. $3.5 \times 10^{5}M$

Answer: B

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4. An elementary reaction is given as $2P + Q \rightarrow$ products. If concentration of Q is kept constant and concentration of P is

doubled then rate of reaction is

A. doubled

B. halved

C. quadrupled

D. remains same

Answer: C

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5. If the rate of the reaction is equal to the rate constant, the order of the reaction is

A. 3

B. 0

C. 1

D. 2

Answer: B

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6. The activation energy for a simple chemical reaction $A \rightarrow B$ is E_a in the forward reaction: The activation of the reverse reaction

A. is always double of E

B. is negative of E_a

C. is always less than E_a

D. can be less than or more than E_a

Answer: D

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7. The rate constant and rate of reaction are same for

A. first order

B. zero order

C. second order

D. all are wrong

Answer: B

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8. Which plots will give the value of activation energy?

A. $Kvs.T$

B. $1/Kvs.T$

C. In $Kvs.T$

D. In $Kvs.\frac{1}{T}$

Answer: D

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9. The reaction $A \rightarrow B$ follows first order kinetics. The time taken for $0.8mol$ of A to produce $0.6mol$ of B is $1hr$. What is the time taken for the conversion of $9.0mol$ of A to Product $0.675mol$ of B ?

A. $1hr$

B. $0.5hr$

C. $0.25hr$

D. $2hr$

Answer: A

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

A. 0.383 min

B. 23.1 min

C. 8.73 min

D. 7.53 min

Answer: B

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11. For a first-order reaction $A \rightarrow B$ the reaction rate at reactant concentration of $0.10M$ is found to be $2.0 \times 10^{-5} \text{mol} L^{-1} s^{-1}$. The half-life period of the reaction is

A. $220s$

B. $30s$

C. $300s$

D. $347s$

Answer: D

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12. The rate of reaction between two A and B decreases by factor 4 if the concentration of reactant B is doubled. The order of this reaction with respect to B is

A. -1

B. -2

C. 1

D. 2

Answer: B

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13. for the reaction, $2A + B \rightarrow 3C + D$, which of the following does not express the reaction rate

A. $\frac{d[D]}{dt}$

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

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

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

Answer: C

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14. The equality relationship between $\frac{d[NH_3]}{dt}$ and $-\frac{d[H_2]}{dt}$ is

A. $+\frac{d[NH_3]}{dt} = -\frac{3}{2}\frac{d[H_2]}{dt}$

B. $\frac{d[NH_3]}{dt} = -\frac{d[H_2]}{dt}$

C. $\frac{d[NH_3]}{dt} = -\frac{1}{3}\frac{d[H_2]}{dt}$

D. $+\frac{d[NH_3]}{dt} = -\frac{2}{3}\frac{d[H_2]}{dt}$

Answer: D

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15. The reaction obey I order with respect to H_2 and ICl both.

$H_2(g) + 2ICl(g) \rightarrow 2HCl(g) + I_2(g)$

Which of the following mechanism is in consistent with the given fact ?

Mechanism A: $H_2(g) + 2Cl \rightarrow 2HCl(g) + I_2(g)$

Mechanism B: (i) $H_2(g) + ICl(g) \xrightarrow{\text{slow}} HCl(g) + HI(g)$

(ii) $HI(g) + ICl(g) \rightarrow HCl(g) + I_2$

A. A and B both

B. Neither A nor B

C. A only

D. B only

Answer: D

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

A. $\frac{\ln 2}{K}$

B. $\frac{\ln 2}{K\sqrt{0.5}}$

C. $\frac{\log_{10} 2}{K}$

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

Answer: A

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17. $60\ \%$ of a first order reaction was completed in $60\ \text{min}$. The time taken for reactants to decompose to half of their original amount will be

A. 45 min

B. 60 min

C. 40 min

D. 50 min

Answer: A

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18. The rate constant k_1 and k_2 for two different reactions are $10^{16}e^{-2000/T}$ and $10^{15}e^{-1000/T}$, respectively. The temperature at

which $k_1 = k_2$ is

A. $\frac{2000}{2.303}K$

B. $2000K$

C. $\frac{1000}{2.303}K$

D. $1000K$

Answer: C

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19. The bromination of acetone that occurs in acid solution is represented by this equation.

$CH_3COCH_3(aq) + Br_2(aq) \rightarrow$

$CH_3COCH_2Br(aq) + H^+(aq) + Br(aq)$

These kinetic data were obtained for given reaction concentrations.

Initial concentration, M

$[CH_2COCH_3]$	$[Br_2]$	$[H^+]$	(Initail rate) (disappearance of Br_2)
0.30	0.05	0.05	1.5×10^{-5}
0.30	0.10	0.05	5.7×10^{-5}
0.30	0.10	0.10	1.2×10^{-4}
0.40	0.5	0.20	3.1×10^{-4}

A. rate $= k[CH_3COCH_3][Br_2]$

B. rate $= k[CH_3COCH_3][Br_2]\left[H^+\right]^2$

C. rate $= k[CH_3COCH_3][Br_2]\left[H^+\right]$

D. rate $= k[CH_3COCH_3][H_+]$

Answer: D

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20. In the reaction

$BrO^{-3}(aq) + 5Br^-(aq) + 6H^+ \rightarrow 3Br_2(1) + 3H_2O(1)$

The rate of appearance of bromine (Br_2) is related to rate of disapperance of bromide ions as folllwoing :

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

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

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

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

Answer: B

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21. For the reaction $A + B$ products, it is observed that:

(1) on doubling the initial concentration of A only, the rate of reaction is also doubled and

(2) on doubling te initial concentration of both A and B, there is a charge by a factor of 8 in the rate of the reaction.

The rate of this reaction is given by

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

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

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

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

Answer: C

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22. For the reaction, $N_2 + 3H_2 \rightarrow 2NH_3$, if $\frac{d[NH_3]}{dt} = 2 \times 10^{-4} \text{mol L}^{-1} s^{-1}$, the value of $\frac{-d[H_2]}{dt}$ would be:

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

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

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

D. $6 \times 10^{-4} \text{mol} L^{-1} s^{-1}$

Answer: B

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23. Half-life period of a first-order reaction is 1386 seconds. The specific rate constant of the reaction is

A. $5.0 \times 10^{-2} s^{-1}$

B. $5.0 \times 10^{-3} s^{-1}$

C. $0.5 \times 10^{-2} s^{-1}$

D. $0.5 \times 10^{-3} s^{-1}$

Answer: D

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24. For an endothermic reaction energy of activation is E_a and enthalpy of reaction is ΔH (both in $kJ\mathrm{mol}^{-1}$). Minimum value of E_a will be

A. $< \Delta H$

B. $= \Delta H$

C. $> \Delta H$

D. $= 0$

Answer: C

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25. The rate of the reaction

$2NO + CI_2 \rightarrow 2NOCI$

is given by the rate equation

$Rate = k[NO]^2[CI_2]$

The value of the rate constant can be increased by

A. increasing the temperature

B. increasing the concentration of NO

C. increasing the concentration of the Cl_2

D. doing all of these

Answer: D

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26. For the reaction $N_2O_5 \rightarrow 2NO_2 + \frac{1}{2}O_2$, the rate of disappearance of N_2O_5 is $6.25 \times 10^{-3} \text{mol L}^{-1} s^{-1}$. The rate of formation of NO_2 and O_2 will be respectively.

A. $6.25 \times 10^{-3} \text{mol L}^{-1} s^{-1}$ and $6.25 \times 10^{-3} \text{mol L}^{-1} s^{-1}$

B. $1.25 \times 10^{-2} \text{mol L}^{-1} s^{-1}$ and $3.125 \times 10^{-3} \text{mol L}^{-1} s^{-1}$

C. $6.25 \times 10^{-3} \text{mol L}^{-1} s^{-1}$ and $3.125 \times 10^{-3} \text{mol L}^{-1} s^{-1}$

D. $1.25 \times 10^{-3} \text{mol L}^{-1}$ and $6.25 \times 10^{-3} \text{mol L}^{-1} s^{-1}$

Answer: B

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27. During the kinetic study of the reaction $2A + B \rightarrow C + D$ following results were obtained.

	$Run[A]$	$[B]inM$	Initial rate of fo rmation of D in ms^{-1}
I	0.1	0.1	6.0×10^{-3}
II	0.3	0.2	7.2×10^{-2}
III	0.3	0.4	2.88×10^{-1}
IV	0.4	0.1	2.40×10^{-2}

On the basis of above data which one is correct ?

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

B. $r = k[A][B]$

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

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

Answer: D

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28. Which one of the following statements for the order of a reaction is incorrect ?

A. Order of reaction is always whole number

B. Order can be determined only experimentally

C. Order is not influenced by stoichiometric coefficient of the reactants

D. Order of reaction is sum of power to the concentration terms of reactants to express the rate of reaction

Answer: A

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29. For the reaction $N_2(g) + O_2(g) \Leftrightarrow 2NO(g)$, the equilibrium constant is K_1. The equilibrium constant is K_2 for the reaction $2NO(g) + O_2 \Leftrightarrow 2NO_2(g)$

What is K for the reaction

$NO_2(g) \Leftrightarrow \frac{1}{2}N_2(g) + O_2(g)$?

A. $1/(2K_1K_2)$

B. $1/(4K_1K_2)$

C. $[1/K_1K_2]1/2$

D. $1/(K_1K_2)$

Answer: C

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30. $2N_2O_5 \rightarrow 4NO_2 + O_2$

If $\frac{-d[N_2O_5]}{dt} = k_1[N_2O_5]$

$\frac{d[NO_2]}{dt} = k_2[N_2O_5]$

$\frac{d[O_2]}{dt} = k_3[N_2O_5]$

What is the relation between k_1, k_2, and k_3?

A. $k' = 2k, k' = k$

B. $k' = 2k, k'' = k$

C. $k' = 2k, k'' = 2k$

D. $k' = k, k'' = k$

Answer: B

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31. In a zero-order reaction for every 10° rise of temperature, the rate is doubled. If the temperature is increased from $10^\circ C$ to $100^\circ C$, the rate of the reaction will become

A. 64 times

B. 512 times

C. 256 times

D. 128 times

Answer: B

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32. In a reaction , $A + B \rightarrow$ Product, rate is doubled when the concentration of B is doubled, and rate increases by a factor of 8 when the concentration of both the reactants (A and B) are doubled, rate law for the reaction can be written as

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

B. Rate $= k[A][B]$

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

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

Answer: A

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33. Activation energy (E_a) and rate constants (k_1 and k_2) of a chemical reaction at two different temperatures (T_1 and T_2) are related by

A. $\ln\frac{k_2}{k_1} = -\frac{E_\square}{R}\left(\frac{1}{T_1} - \frac{1}{T_2}\right)$

B. $\ln\frac{k_2}{k_1} = -\frac{E_a}{R}\left(\frac{1}{T_2} - \frac{1}{T_1}\right)$

C. $\ln\frac{k_2}{k_1} = \frac{E_a}{R}\left(\frac{1}{T_2} + \frac{1}{T_1}\right)$

D. $\ln\frac{k_2}{k_1} = \frac{E_a}{R}\left(\frac{1}{T_1} - \frac{1}{T_2}\right)$

Answer: B::D

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34. What is the activation energy for a reaction if its rate doubles when the temperature is raised from $20^\circ C$ to $35^\circ C$? $\left(R = 8.314 J\text{mol K}^-\right)$

A. $269 kJ\text{mol}^{-1}$

B. 34.7kJ mol^{-1}

C. 15.1kJ mol^{-1}

D. 342kJ mol^{-1}

Answer: B

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35. A reaction having equal energies of activation for toward and reverse reaction has

A. $\Delta G = 0$

B. $\Delta H = 0$

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

D. $\Delta S = 0$

Answer: B

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36. The activation energy of a reaction can be determined from the slope of which of the following graphs ?

A. ln k vs. $\frac{1}{T}$

B. $\frac{T}{\ln k}$ vs. $\frac{1}{T}$

C. ln k vs. T

D. $\frac{\ln k}{T}$ vs. T

Answer: A

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37. When initial concentration of a reactant is doubled in a reaction, its half-life period is not affected. The order of the reaction is

A. second

B. more than zero but less than first

C. zero

D. first

Answer: D

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38. The rate constant of the reaction $A \rightarrow B$ is 0.6×10^{-3} mole per second. If the concentration of A is $5M$, then concentration of B after 20 minutes is:

A. $0.36M$

B. $0.72M$

C. $1.08M$

D. $3.60M$

Answer: B

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39. The addition of a catallystic during a chemical reaction alters which of the following quantities ?

A. Activation energy

B. Entropy

C. Internal energy

D. Enthalpy

Answer: A

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40. The rate of a first-order reaction is $0.04 \text{mol L}^{-1} s^{-1}$ at 10 seconds and $0.03 \text{mol L}^{-1} s^{-1}$ at 20 seconds after initiation of the reaction. The hlaf-life period of the reaction is :

A. $54.1 s$

B. $24.1 s$

C. $34.1 s$

D. $44.1 s$

Answer: B

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41. Mechanism of a hypothetical reaction

$X_2 + Y_2 \rightarrow 2XY$ is given below:

(i) $X_2 \rightarrow X + X$ (fast)

(ii) $X + Y_2 \Leftrightarrow XY + Y$ (slow)

(iii) $X + Y \rightarrow XY$ (fast)

The overall order of the reaction will be :

A. 2

B. 0

C. 1.5

D. 1

Answer: C

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42. A first order reaction has a specific reaction rate of $10^{-2}\,\text{sec}^{-1}$. How much time will it take for $20g$ of the reactant to reduce to $5g$?

A. $138.6\,\text{sec}$

B. $346.5\,\text{sec}$

C. $693.0\,\text{sec}$

D. $238.6\,\text{sec}$

Answer: A

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43. When initial concentration of the reactant is doubled, the half-life period of a zero order reaction

A. is halved

B. is doubled

C. is tripled

D. remains unchanged

Answer: B

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AIIMS Questions

1. If doubling the concentration of a reactant $'A'$ increases the rate 4 times and tripling the concentration of $'A'$ increases the rate 9 times, the rate is proportional to

A. concentration of $'A'$

B. square of concentration of $'A'$

C. under root of the concentration of $'A'$

D. cube of concentration of $'A'$

Answer: B

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2. A gaseous hypothetical chemical equation $2A \Leftrightarrow 4B + C$ is carries out in a closed vessel. The concentration of B is found to increase by

$5 \times 10^{-3} molL^{-1}$ in 10 second. The rate of appearance of B is

A. $5 \times 10^{-4} \text{mol l}^{-1} \text{sec}^{-1}$

B. $5 \times 10^{-5} \text{mol l}^{-1} \text{sec}^{-1}$

C. $6 \times 10^{-5} \text{mol l}^{-1} \text{sec}^{-1}$

D. $4 \times 10^{-4} \text{mol l}^{-1} \text{sec}^{-1}$

Answer: A

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3. The reaction

N_2O_5 (in CCl_4 solution) $\rightarrow 2NO_2$ (solution) $+\frac{1}{2}O_2(g)$ is of first order in N_2O_5 with rate constant $6.2 \times 10^{-1} s^{-1}$. What is the value of rate of reaction when $[N_2O_5] = 1.25$ mole ?

A. $7.75 \times 10^{-1} \text{mol l}^{-1} s^{-1}$

B. $6.35 \times 10^{-3} \text{mol l}^{-1} s^{-1}$

C. $5.15 \times 10^{-5} \text{mol l}^{-1} s^{-1}$

D. $3.85 \times 10^{-1} \text{mol l}^{-1} s^{-1}$

Answer: A

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4. If the concentration is expressed in moles per liter, the unit of the rate constant for a first-order reaction is

A. $\text{mole litre}^{-1} \text{sec}^{-1}$

B. mole litre^{-1}

C. sec^{-1}

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

Answer: C

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5. Which of the following rate laws has an overall order of 0.5 for reaction involving substances x, y and z ?

A. Rate $= K(C_x)(C_y)(C_z)$

B. Rate $= K(C_x)^{0.5}(C_y)^{0.5}(C_z)^{0.5}$

C. Rate $= K(C_x)^{1.5}(Cy)^{-1}(Cz)^{0}$

D. Rate $= K(C_x)(C_z)^n/(C_y)^2$

Answer: C

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6. For a chemical reaction $A \rightarrow B$, it is found that the rate of reaction doubles when the concentration of A is increased 4 times. What is the order of reaction ? Suggest the rate law also.

A. two

B. one

C. half

D. zero

Answer: C

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7. The inversion of cane sugar is represented by

$C_{12}H_{22}O_{11} + H_2O \rightarrow C_6H_{12}O_6 + C_6H_{12}O_6$

It is a reaction of

A. second order

B. unimolecular

C. pseudo unimolecular

D. none of the three

Answer: C

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8. A first-order reaction which is 30% complete in 30 minutes has a half-life period of

A. 24.2 min

B. 58.2 min

C. 102.2 min

D. 120.2 min

Answer: B

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9. For the reaction $H_2 + Cl_2 \xrightarrow{\text{Sunlight}} 2HCl$ taking place on water, the order of reaction is

A. 1

B. 2

C. 3

D. 0

Answer: D

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10. The rate constant of a reaction is 0.69×10^{-1} and the initial concentration is 0.2mol l^{-1}. The half-life period is

A. 400 sec

B. 600 sec

C. $800\,\text{sec}$

D. $1200\,\text{sec}$

Answer: B

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11. The rate constant of a first-order reaction is 3×10^{-6} per second. If the initial concentration is $0.10m$, the initial rate of reaction is

A. $3 \times 10^{-5} ms^{-1}$

B. $3 \times 10^{-6} ms^{-1}$

C. 3×10

D. $3 \times 10^{-7} ms^{-1}$

Answer: D

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12. A first-order reaction is half completed in 45 minutes. How long does it need $99.9\ \%$ of the reaction to be completed

A. 5 hours

B. 7.5 hours

C. 10 hours

D. 20 hours

Answer: B

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13. A subtance $'A'$ decomposes by a first-order reaction starting initially with $[A] = 2.00m$ and after $200\ \min\ \ [A] = 0.15m$. For this reaction what is the value of k

A. $1.29 \times 10^{-2}\min^{-1}$

B. $2.29 \times 10^{-2} \text{min}^{-1}$

C. $3.29 \times 10^{-2} \text{min}^{-1}$

D. $4.40 \times 10^{-2} \text{min}^{-1}$

Answer: A

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14. For reaction $aA \rightarrow xP$, when $[A] = 2.2mM$, the rate was found to be $2.4mMs^{-1}$. On reducing concentration of A to half, the rate changes to $0.6mMs^{-1}$. The order of reaction with respect to A is

A. 1.5

B. 2.0

C. 2.5

D. 3.0

Answer: B

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15. If a substance with hlaf life 3 days is taken at other place in 12 days. What amount of substance is laft now ?

A. $1/4$

B. $1/8$

C. $1/16$

D. $1/32$

Answer: C

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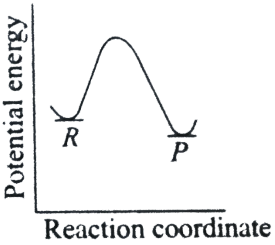
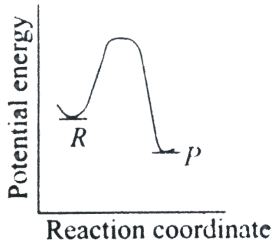
16. An endothermic reaction with high activation energy for the forward reaction is given by the diagram

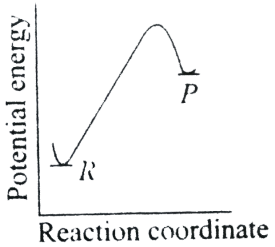
A.



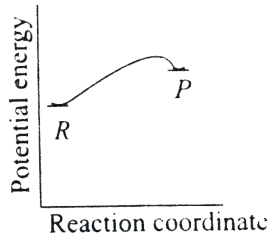
B.



C.



D.



Answer: C

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17. The rate cnstant k, for the reaction $N_2O_5(g) \rightarrow 2NO_2(g) + \frac{1}{2}O_2(g)$ is $23 \times 10^{-2} s^{-1}$. Which equation given below decribes the change of $[N_2O_5]$ with time? $[N_2O_5]_0$ and $[N_2O_5]_t$ correspond to concentration of N_2O_5 initially and at time, t

A. $[N_2O_5] = [N_2O_5]_0 + kt$

B. $[N_2O_5] = [N_2O_5]_t e^{kt}$

C. $\log_{10}[N_2O_5]_t = \log_{10}[N_2O_5]_0 - kt$

D. $\ln \frac{[N_2O_5]_0}{[N_2O_5]t} = kt$

Answer: D

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18. In the Arrhenius for a certain reaction, the value of A and E_a (activation energy) are $4 \times 10^{13}\ \sec^{-1}$ and 98.6kJ mol^{-1}, respectively. If the reaction is of first order, the temperature at which its half-life period is 10 minutes is

A. $280K$

B. $290K$

C. $311.35K$

D. $418.26K$

Answer: C

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19. A first order reaction is $50\,\%$ complete in 30 minutes at $27^\circ C$ and in 10 minutes at $47^\circ C$. The rate constant at $47^\circ C$ and energy of activation of the reaction in kJ/mole will be

A. $0.0693, 43.848 kJmol^{-1}$

B. $0.0560, 45.621 kJmol^{-1}$

C. $0.0625, 42.926 kJmol^{-1}$

D. $0.0660, 46.189 kJmol^{-1}$

Answer: A

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20. The half-life period of a radioactive element is 140 days. After 560 days, one gram of the element will reduce to

A. $(1/2)g$

B. $(1/4)g$

C. $(1/8)g$

D. $(1/6)g$

Answer: D

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21. The chemical reaction, $2O_3 \rightarrow 3O_2$ proceeds as follows

Step1 : $O_3 \Leftrightarrow O_2 + O$ ...(fast)

Step 2: $O + O_3 \rightarrow 2O_2$ ...(slow)

The rate law expression should be

A. $r = K'[O_3][O_2]$

B. $r = K'[O_3]^2[O_2]^{-1}$

C. $r = K'[O_3]^2$

D. unpredictable

Answer: B

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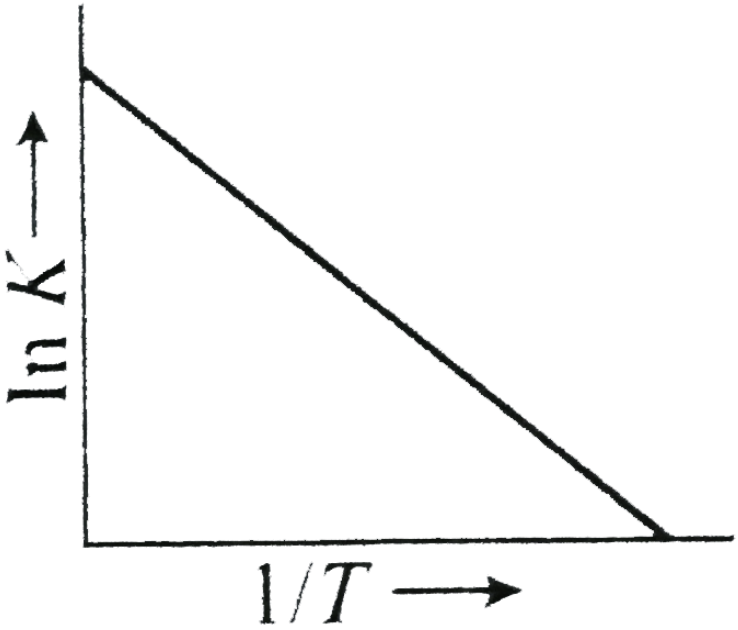
22. The temperature dependence of a reaction is represented by the Arrhenius euqation

In $k = \frac{E_a}{RT} + InA$

Which among the following is wrong conclusion about the given plot?



A. Intercept of the line $= InA$

B. Slope $= -\frac{E_a}{RT}$

C. Reaction with high activation energy is more temperature sesitive than thatof low activation energy (E_a)

D. Slope $= -\frac{E_a}{R}$

Answer: B

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23. Which of the following option is valid for zero reaction?

A. $t_{1/2} = \frac{3}{2} t_{1/4}$

B. $t_{1/2} = \frac{4}{3} t_{1/4}$

C. $t_{1/2} = 2t_{1/4}$

D. $t_{1/4} = \left(t_{1/2}\right)^2$

Answer: C

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24. If reaction A and B are given with same temperature and same concentration but rate of A is double than B. Pre exponential factor is same for both the reaction then difference in activation energy $E_A - E_B$ is ?

A. $-RT\ln 2$

B. $RT\ln 2$

C. $2RT$

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

Answer: A

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Assertion-Reasoning Questions

1. Assertion: The instantaneous rate of reaction can be studied in chemical kinetics.

Reason: Inoic reactions occur instantaneously.

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

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

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: A

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2. Assertion: The acid hydrolysis of ester takes place more rapidly in D_2O than H_2O.

Reason: D_3O^+ is stronger acid tham H_3O^+ or H_2D^+O.

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

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

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: A

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3. Assertion: Photosynthesis in plants involves reaction of CO_2 and H_2O in presence of light and cholrophyll.

Reason: It is chlorophyll which absorbs light and passes this energy to reactant molecules.

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

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

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: A

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4. Assertion: Order of reaction can never be fractional for an elementary reaction.

Reason: An elementary reaction takes place by one step mechanism.

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

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

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: A

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5. Assertion: The emission of light during burning of P in O_2 is called chemiluminescence.

Reason: The chemical energy is converted into light energy.

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

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

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: A

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6. Assertion: According to the transition state theory, for the formation of an activated complex, one of the vibrational degree of freeedom is converted into the transition degree of freedom.

Reason: The energy of the activated complex is higher than the energy of the reactant molecules.

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

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

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: B

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Section D - Chapter End Test

1. The Arrhenius equation for trans ispmerisation of 2-butene and 2-butene nitrile are given as follows:

(a) For 2-butene $CH_3CH = CHCH_3 K\left(S^{-1}\right) = 10^{13.8}$

(b) For 2-butene nitrile $CH_3CH = CH.CNK'\left(S^{-1}\right)$

$= 10^{11} \exp^{-214.5 kJ \text{mol} - 1 / Rt}$

The temperature at which $K = K'$

A. $913.87K$

B. $533.43K$

C. $1000.02K$

D. $407.05k$

Answer: A

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2. Thermal decomposition of a compound is of first order. If 50% of a sample of the compound is decomposed in 120 minutes how long will it take for 90% of the compound to decompose?

A. 399 min

B. 410 min

C. 250 min

D. 120 min

Answer: A

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3. The decompoistion of Cl_2O_7 at $400K$ in gas phase to Cl_2 and O_2 is a first order reaction.

a. After $55s$ at $400K$, the pressure of Cl_2O_7 falls form 0.062 to $0.044atm$. Calculate k.

b. Calculate the pressure of Cl_2O_7 after $100s$ of decompoistion.

A. $5.2 \times 10^{-4}\,\text{sec}^{-1}, 0.05atm$

B. $6.2 \times 10^{-3}\,\text{sec}^{-1}, 0.033atm$

C. $5.8 \times 10^{-3}\,\text{sec}^{-1}, 0.44atm$

D. $4.6 \times 10^{-3}\,\text{sec}^{-1}, 0.005atm$

Answer: B

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4. A substance having a half-life period of 30 minutes decomposes according to the first order rate law. The fraction decomposed, the balance remaining after 1.5 hours and time for $60\,\%$ decomposition on its doubling the initial concentration will be.

A. $87.4, 0.126, 39.7$ min

B. $80.6, 0.135, 40.8$ min

C. $90.5, 0.144, 2829$ min

D. `80.2, 0.135, 26.6 min

Answer: A

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5. In a Arrhenius equation for a certain reaction, the values of A and E_a (energy of activation)are $4 \times 10^{13} s^{-1}$ and $98.6 KJmol^{-1}$,

respectively. If the reaction of first order at, what temperature will its life period be $10\ \min$.

A. $280K$

B. $290K$

C. $311.35k$

D. $418.26K$

Answer: C

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6. A first order reaction is $50\ \%$ complete in 30 minutes at $27^\circ C$ and in 10 minutes at $47^\circ C$. The rate constant at $47^\circ C$ and energy of activation of the reaction in kJ / mole will be

A. $0.0693,\ 43.848kJ\text{mol}^{-1}$

B. $0.0560,\ 45.621\text{kJ mol}^{-1}$

C. $0.0625, 42.926 \text{kJ mol}^{-1}$

D. $0.0660, 46.189 \text{kJ mol}^{-1}$

Answer: A

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7. $75\ \%$ of a first-order reaction was completed in 32 minutes. When was $50\ \%$ of the reaction completed

A. 24 min

B. 4 min

C. 16 min

D. 8 min

Answer: C

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8. What will be the fraction of ${}_{m}^{n}X\left(t_{1/2}=25\text{min}\right)$ laft after 100 minutes?

A. $1/2$

B. $1/4$

C. $1/3$

D. $1/16$

Answer: D

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9. What is the activation energy for the decomposition of N_2O_5 as

$$N_2O_5 \Leftrightarrow 2NO_2 + \frac{1}{2}O_2$$

If the values of the rate constants are 3.45×10^{-5} and 6.9×10^{-3} at $27^\circ C$ and $67^\circ C$ respectively

A. $102 \times 10^2 kJ$

B. $488.5kJ$

C. $112kJ$

D. $14.7kJ$

Answer: D

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10. $50\,\%$ of the amount of a radioactive substance decomposes in 5 years. The time required for the decomposition of $99.9\,\%$ of the substance will be

A. 10 years

B. between 10 and 50 years

C. less than 10 years

D. between 49 and 50 years

Answer: D

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11. In a first order reaction, 75% of the reactants disappeared in $1.386hr$. What is the rate constant ?

A. $3.6 \times 10^{-3} s^{-1}$

B. $7.2 \times 10^{-3} s^{-1}$

C. $2.7 \times 10^{-4} s^{-1}$

D. $1.8 \times 10^{-3} s^{-1}$

Answer: C

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12. For a first order reaction, the ratio of time for the completion of $99.9\,\%$ and half of the reaction is

A. 8

B. 10

C. 9

D. 12

Answer: B

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13. For the first order reaction $A(g) \rightarrow 2B(g) + C(g)$, the initial pressure is $P_A = 90$ mm Hg, the pressure after 10 minutes is found to be 180 mm Hg. The rate constant of the reaction is

A. $1.15 \times 10^{-3}\,\text{sec}^{-1}$

B. $2.3 \times 10^{-3} \sec^{-1}$

C. $3.45 \times 10^{-3} \sec^{-1}$

D. $6 \times 10^{-3} \sec^{-1}$

Answer: A

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14. The rate law for the reaction

$RCL + NaOH(aq) \rightarrow ROH + NaCl$ is given by Rate $= k[RCl]$.

The rate of the reaction will be

A. unaffected by increasing temperature of the reaction

B. doubled on doubling the concentration of $NaOH$

C. halved on reducing the concentration of $NaOH$ to one half

D. halved on reducing the concentration of RCL to one half

Answer: D

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15. For a given reaction of first order, it takes 20 minutes for the concentration to drop from 1.0mol liter^{-1} to 0.6mol litre^{-1}. The time required for the concentration to drop from 0.6mol litre^{-1} to $0.36\text{mol litre}^{-1}$ will be

A. more than 20 minutes

B. less than 20 minutes

C. equal to 20 minutes

D. infinitly

Answer: C

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16. The unit of rate constant of a reaction having order 1.5 would be

A. $\left(\text{mol L}^{-1}\right)^{1/2} s^{-1}$

B. $\left(\text{mol L}^{-1}\right)^{-3/2} s^{-1}$

C. $(\text{conc.})^{-0.5} time^{-1}$

D. $(\text{conc.})^{-0.75} time^{-1}$

Answer: C

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17. The half-life period of a radioactive element is 140 days. After 560 days, one gram of the element will reduce to

A. $(1/2)g$

B. $(1/4)g$

C. $(1/8)g$

D. $(1/16)g$

Answer: D

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18. In a reaction, the concentration of reactant is increased two times and three times than the increases in rate of reaction were four times and nine times respectively, order of reaction is

A. Zero

B. 1

C. 2

D. 3

Answer: C

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19. In a first order reaction, the concentration of the reactant decreases form $0.8M$ to $0.4M$ in $15\ \min$. The time taken for the concentration to change form $0.1M$ to $0.025M$ is

A. 7.5 minutes

B. 15 minutes

C. 30 minutes

D. 60 minutes

Answer: C

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20. The half-life of 2 sample are 0.1 and 0.4 seconds. Their respctive concentration are 200 and 50 respectively. What is the order of the reaction

A. 0

B. 2

C. 1

D. 4

Answer: B

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21. The rate constant is doubled when temperature increases from $27^\circ C$ to $37^\circ C$. Activation energy in kJ is

A. 34

B. 54

C. 100

D. 50

Answer: B

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22. For a reaction, $X(g) \rightarrow Y(g) + Z(g)$. The half-life periof is $10\ \min$. In what periof of time would the concentration of X be reduced to $10\ \%$ of the original concentration ?

A. 20 min

B. 33 min

C. 15 min

D. 25 min

Answer: B

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23. For an endothermic reaction, where ΔH represents the enthalpy of reaction in $kJmol^{-1}$, the minimum value for the energy of activation will be

A. less ΔH

B. Zero

C. more than ΔH

D. Equal to ΔH

Answer: B

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24. The rate constant, the activation energy and the Arrhenius parameter of a chemical reaction at $25^{\circ}C$ are $3.0 \times 10^{-4}s^{-1}$, 104kJ mol^{-1} and $6.0 \times 10^{14}s^{-1}$ respectively. The value of the rate constant as $T \to \infty$ is

A. $2.0 \times 10^{18} s^{-1}$

B. $6.0 \times 10^{14} s^{-1}$

C. Infinity

D. $3.6 \times 10^{30} s^{-1}$

Answer: B

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25. Rate law for a gaseous reaction

$A + B \rightarrow C + D$ is given by

Rate $= K[A]^2[B]^0$

The volume of reaction vessel containing these gases is suddenly reduced to one fourth the volume. The rate of reaction relative to original rate would be

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

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

C. $\frac{1}{8}$

D. $\frac{8}{1}$

Answer: B

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26. On introfucing a catalyst at $500K$, the rate of a first order reaction increases by 1.718 times. The activation energy in the presence of a catalyst is $4.15KJmol^{-1}$. The slope of the polt of $k\left(s^{-1}\right)$ against $1/T$ in the absence of catalyst is

A. $+1$

B. -1

C. $+1000$

D. -1000

Answer: D

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27. If a second order reaction involving a single reactant in 25% complete in 20 minutes then what is its half life if initial concentration of the reactant is being made double at the same temperature.

A. 50 min

B. 30 min

C. 60 min

D. 15 min

Answer: B

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28. Assertion: The photochemical reaction $H_2 + Cl_2 \rightarrow 2HCl$ and $H_2 + Br_2 \rightarrow 2HBr$ have equal quantum efficiencies.

Reason: Both the reaction proceed by different mechanism.

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

B. If both assertion and reason are true and reason Iis not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: D

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29. Assertion: Half-life period of a reaction of first order is independent of initial concentration.

Reason: Half-life period for a first order reaction $t_{1/2} = \frac{2.303}{K} \log 2$.

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

B. If both assertion and reason are true and reason Iis not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: A

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30. Assertion: Glow worm shows chemiluminescence.

Reason: Glow worm emits light due to oxidation protein, luciferin present in it.

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

B. If both assertion and reason are true and reason Iis not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: A

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