CHEMISTRY

BOOKS - S DINESH & CO CHEMISTRY (HINGLISH)

RATES OF REACTIONS AND CHEMICAL KINETICS

Multiple Choice

1. Which of the following statements is correct?

A. For reaction $xX \rightarrow yY$

Rate $= \frac{1}{x}\frac{d[X]}{dt} = \frac{d[Y]}{dt}$

B. The parameter rate constant and specific reaction rate have different meaning

C. For any reaction the value of specific reaction rate is independent of the initial concentrations of reactants

D. $E_a = E_R + E_{\text{Threshold}}$

Answer: C

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2. For a hypothetical reaction, $A \rightarrow L$ the rate expression is rate $= -\frac{dC_A}{dt}$

A. negative sign represents that rate is negative

B. negative sign pertains to the decrease in the concentrations of reactants

C. negative sign indicates the attractive forces between reactants

D. none of the above is correct

Answer: B

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3. For a chemical reaction $2X + Y \rightarrow Z$, the rate of appearance of Z is 0.05 $molL^{-1}\min^{-1}$. The rate of disappearance of X will be

A. 0.05 mol L^{-1} per hour

B. 0.05 mol L^{-1} per min

C. 0.1 mol $L^{-1}\min^{-1}$

D. 0.25 mol L^{-1} per min

Answer: C

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4. For the reaction: $2HI \rightarrow H_2 + I_2$, the expression $-\frac{d[HI]}{2dt}$ represents

A. The rate of formation of HI

B. The rate of disappearance of HI

C. The instantaneous rate of the reaction

D. The average rate of reaction

Answer: C

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5. The term $-dx/dt$ in the rate expresison refers to the

A. concentration of the reactant

B. increase in concentration of the reactants

C. instantaneous rate of the reaction

D. average rate of the reaction

Answer: C

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6. Which of the following expression can be used to describe the instantaneous rate of the reaction ?

$2A + B \rightarrow A_2B$

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

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

C. $\frac{1}{2}\frac{d[A_2B]}{dt}$

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

Answer: A

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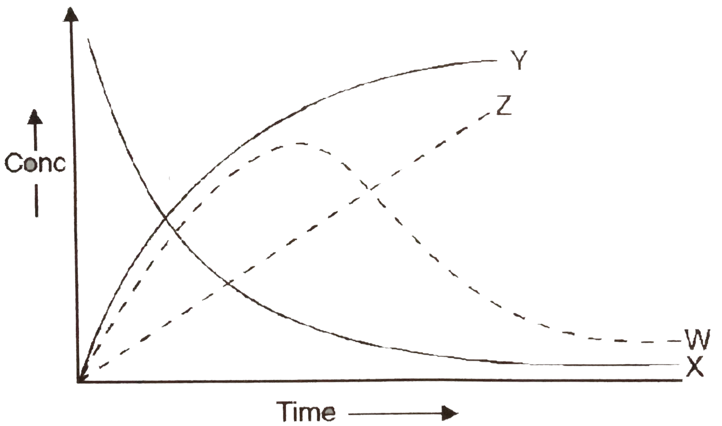
7. For the reaction $A + B \rightarrow C + D$ The variation of the concentration of the products is given by the curve



A. X

B. Y

C. W

D. Z

Answer: B

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8. A gaseous reaction $A_2(g) \to B(g) + \frac{1}{2}C(g)$ shows increase in pressure form $100mm$ to $120mm$ in 5 min . What is the rate of disappearance of A_2 ?

A. 4mm min^{-1}

B. 8mm min^{-1}

C. 16mm min^{-1}

D. 2mm min^{-1}

Answer: B

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

$2SO_2(g) + O_2(g) \Leftrightarrow 2SO_3(g)$

The rate of reaction is expressed as

$$-\frac{d(O_2)}{dt} = 2.5 \times 10^{-4} molL^{-1}s^{-1}$$

The rate of disappearance of (SO_2) will be-

A. $5.0 \times 10^{-4}\text{mol} \quad L^{-1}s^{-1}$

B. $-2.25 \times 10^{-4}\text{mol} \quad L^{-1}s^{-1}$

C. $3.75 \times 10^{-4}\text{mol} \quad L^{-1}s^{-1}$

D. $50.0 \times 10^{-4}\text{mol} \quad L^{-1}s^{-1}$

Answer: A

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10. In a catalytic reaction involving the formation of ammonia by Haber's process $N_2 + 3H_2 \rightarrow 2NH_3$ the rate of appearance of

NH_3 was measured as $2.5 \times 10^{-4} mol L^{-1} s^{-1}$ The rate of disappearance of H_2 will be

A. $2.50 \times 10^{-4} mol L^{-1} s^{-1}$

B. $1.25 \times 10^{-4} mol L^{-1} s^{-1}$

C. $3.75 \times 10^{-4} mol L^{-1} s^{-1}$

D. $5.00 \times 10^{-4} mol L^{-1} s^{-1}$

Answer: C

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11. For the reaction

$4A + B \rightarrow 2C + 2D$ which of the following statements is not correct:

A. Rate of dissapearance of B is $1/4$ th of rate of dissappearance of A

B. Rate of formation of C is $1/2$ the rate of consumption of A

C. Rate of apperance of D is $1/2$ the rate of dissappearance of B

D. Rate of formation of C and D are equal

Answer: C

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12. For the hypothetical reaction,

$A \rightarrow$ Products, rate $= -k[A]$

The negative sign used in the rate expression indicate that

A. the rate of decreasing with time

B. the concentration of reactants decrease with time

C. there are repulsive forces between the reactants

D. the reaction is reversible.

Answer: B

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

A. Amount of the reactants taken

B. Physical state of the reactants

C. ΔH of reaction

D. Size of the vessel

Answer: C

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14. The reactions $2NO + O_2 \rightarrow 2NO_2$

$2CO + O_2 \rightarrow 2CO_2$

look to be identical, yet the first is faster than the second. The reason is that

A. the first reaction has lower enthalpy change than the second

B. the first reaction has lower internal energy change than the second

C. the first reaction has lower activation energy than the second

D. nitric oxide is less stable than carbon monoxide

Answer: C

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15. If the reaction rate at a given temperature becomes slower

A. free energy of activation is higher

B. free energy of activation is lower

C. entropy changes

D. initial concentration of reactants remain constant

Answer: A

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16. Point out the incorrect statement

A. Rate law is an experimental fact whereas law of mass action is a theoretical proposal

B. Rate law is always different from the expression of law of mass action

C. Rate law is more informative than law of mass action for the development of mechanism

D. Order of a reaction is equal to the sum of powers of concentration terms in the rate law

Answer: B

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17. Consider the data given below for hypothetical reaction $A \rightarrow X$

Time (s)	Rate of the reaction $(mol L^{-1} s^{-1})$
0	1.60×10^{-2}
10	1.60×10^{-2}
20	1.60×10^{-2}
30	1.59×10^{-2}

From the above data, the order of reaction is:

A. 1

B. 0

C. 2

D. unpredictable

Answer: B

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18. A following mechanism has been proposed for a reaction

$2A + B \rightarrow D \rightarrow E$

$A + B \rightarrow C + D$(slow)

$A + C \rightarrow E$ (fast)

The rate law expression for the reaction by RDS method is:

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

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

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

D. $r = k[A][C]$

Answer: B

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19. 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. 4

B. 0

C. $1/2$

D. 1

Answer: C

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20. For a hypothetical reaction $A + B \rightarrow$ products, the law is $r = k[B][A]^0$ the order of reaction is:

A. 0

B. 1

C. 2

D. 3

Answer: B

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21. 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. 0

Answer: A

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22. For hypothetical chemical reaction $A \rightarrow I$, it is found that the reaction is third order in A. What happens to the rate of reaction when the concentration of A is doubled?

A. Rate increases by a factor of 2

B. Rate decreases by a factor of 3

C. Rate increases by a factor of 8

D. Rate remains unaffected

Answer: C

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23. What is the order of a reaction which has a rate expression, i.e. rate = $k[A]^{3/2}[B]^{-1}$?

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

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

C. zero

D. None of these

Answer: B

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24. For which of the following reactions, the units of rate constant and rate of reaction are same?

A. first order reaction

B. Second order reaction

C. Third order reaction

D. Zero order reaction

Answer: D

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25. If the first order reaction involves gaseous reactants and gaseous products the units of its rate are

A. atm

B. atm-sec

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

D. $atm^2 \sec^2$

Answer: C

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26. For a single step reaction $X + 2Y \rightarrow$ Products, the molecularity is

A. 0

B. 2

C. 3

D. 1

Answer: C

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27. A reaction $A_2 + B_2 \rightarrow 2AB$ occurs by the following mechanism:

$A_2 \rightarrow A + A$â€¦ (slow)

$A + B_2 \rightarrow AB + B$â€¦ (fast)

$A + B \rightarrow AB$ â€¦ (fast)

Its order would be

A. $3/2$

B. 1

C. zero

D. 2

Answer: B

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28. If order of reaction $A + B \xrightarrow{hv} AB$ is zero. It means that

A. rate of reaction is independent of temperature

B. rate of reaction is independent of the concentration of the reacting species

C. the rate of formation of activated complex is zero

D. rate of decomposition of activated complex is zero

Answer: B

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29. In acidic medium the rate of reaction between $(BrO_3)^-$ and Br^- ions is given by the expression $-\frac{d(BrO_3^-)}{dt} = k[BrO_3^-][Br^-][H^+]^2$ it means

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

B. rate of reaction is independent of the conc. Of acid

C. the change in pH of the solution will not affect the rate

D. doubling the conc. Of H^+ ions will increase the reaction rate by 4 times

Answer: D

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30. For a reaction $pA + qB \rightarrow$ products, the rate law expression is

$r = k[A]^l[B]^m$ then

A. $(p+q) = (l+m)$

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

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

D. $(p+q) \neq (l+m)$

Answer: C

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31. The chemical reaction $2O_3 \xrightarrow{k_1} 3O_2$ proceeds as follows:

$O_3 \overset{k_{eq}}{\Longleftrightarrow} O_2 + O$ (fast)

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

What should be the rate law expresison ?

A. $r = k[O_3]^2$

B. $r = k[O_3]^2[O_2]^{-1}$

C. $r = k[O_3][O_2]$

D. unperidictable

Answer: B

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32. For the reaction

$$CH_3COCH_3 + I_2 \xrightarrow{H^+} \text{Products}$$

The rate is governed by expression

$$\frac{dx}{dt} = k[\text{Acetone}]\left[H^+\right]$$

The order w.r.t. I_2 is

A. 0

B. 1

C. 2

D. 3

Answer: A

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33. Which of the following rate laws has the overall order of the reaction equal to 0.5 ?

A. $r=k[x]^{1/2}[y]^{1/2}[z]^{1/2}$

B. $r=k[x]^{3/2}[y]^{-1}[z]^{0}$

C. $r=k[x][y]^{0}[z]^{-1}$

D. $r=k[x][y][z]$

Answer: B

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34. The rate of certain hypothetical reaction

$A+B+C\rightarrow$ Products, is given by

$$r = -\frac{dA}{dt} = k[A]^{1/2}[B]^{1/3}[C]^{1/4}$$

The order of a reaction is given by

A. 1

B. $1/2$

C. 2

D. $13/12$

Answer: D

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35. A chemical reaction involves two reacting species. The rate of reaction is directly proportional to the conc. Of one of them and inversely proportional to the concentration of the other. The order of reaction is

A. 1

B. 2

C. zero

D. unpredictable

Answer: C

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36. Which one of the following is a reaction of zero order?

A. $N_2O_5 \rightarrow 2NO_2 + 1/2O_2$

B. $H_2 + Cl_2 \rightarrow 2HCl$

C. $PCl_5 \rightarrow PCl_3 + Cl_2$

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

Answer: B

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

A. 2

B. 1

C. 3

D. unpredictable

Answer: C

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38. In the presence of acid, the initial concentration of cane sugar was reduced from 0.2 M to 0.1 M in 5 h and to 0.05 M in 10 h. The reaction must be of

A. zero order

B. first order

C. second order

D. fractional order

Answer: B

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39. When the concentration of a reactant in reaction $A \rightarrow B$ is increased by 8 times but rate increases only 2 times, the order of the reaction would be

A. 2

B. $1/3$

C. 4

D. $1/2$

Answer: B

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40. A zero order reaction is one whose rate is independent of

A. temperature of the reaction

B. presence of light

C. concentration of the reactants

D. the material of the vessel in which the reaction is carried out

Answer: C

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41. The reactions of higher order are rare because

A. many body collisions involve very high activation energy

B. many body collisions have a very low probability

C. many body collisions are not energetically favoured

D. many body collisions can take place only in the gaseous phase

Answer: B

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42. The rate constant of a reaction is $2.5 \times 10^{-2} \text{minutes}^{-1}$ The order of the reaction is

A. one

B. zero

C. two

D. three

Answer: A

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43. The rate constant of a reaction has same dimensions as rate of reaction The reaction is of

A. zero order

B. 1st order

C. 2 nd order

D. None of these

Answer: A

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44. The rate constant of a reaction is $3.25 \times 10^{-3} \text{mol}^{-2} \text{litre}^2 \text{min}^{-1}$ The order of reaction is

A. zero

B. 1

C. 2

D. 3

Answer: D

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45. The rate constant of n^{th} order reaction has units :

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

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

C. $\text{mol}^{1-n^2}\text{litre}^{n^2}\text{sec}^{-1}$

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

Answer: D

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46. Which of the following represent the expression for $\frac{3}{4}$th life of first order reaction

A. $\frac{k}{2.303}\log 4/3$

B. $\frac{2.303}{k}\log 3/4$

C. $\frac{2.303}{k}\log 4$

D. $\frac{2.303}{k}\log 3$

Answer: C

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47. 99% at a first order reaction was completed in 32 min . When will 99.9% of the reaction complete.

A. 50 min

B. 46 min

C. 49 min

D. 48 min

Answer: D

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48. In a first order reaction, the concentration of the reactants is reduced to 25% in one hour. The half-life period of the reactions is

A. 2 hr

B. 4 hr

C. $1/2hr$

D. $1/4hr$

Answer: C

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49. For a hypothetical reaction $A \rightarrow B$, the rate constant is $0.25 s^{-1}$. If the concentration of A is reduced to half, then the value of rate constant is

A. $0.25 \sec^{-1}$

B. $0.30 \sec^{-1}$

C. $0.075 \sec^{-1}$

D. $2.25 \sec^{-1}$

Answer: A

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50. If a is the initial concentration of reaction, then the half life period of a reaction of nth order is proportional to

A. a^{n}

B. a^{n-1}

C. a^{1-n}

D. a^{n+1}

Answer: C

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51. If rate constant k for a hypothetical reaction $A \rightarrow B$ is $0.75 s^{-1}$ Which of the following statements (s) is (are) correct if $[A]_0$ is the initial concentration?

A. $t_{1/2} = \frac{[A]_0}{2 \times 0.75}$

B. $t_{1/2} = \frac{0.693}{0.75}$

C. $t_{1/2} = \frac{3}{2(0.75)[A]_0^2}$

D. None of these

Answer: B

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52. For producing effective collisions, the colliding molecules must have

A. a certain minimum amount of energy

B. energy equal to or greater than threshold energy

C. proper orientation

D. threshold energy and proper orientation both

Answer: D

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53. The rate of reaction increases by the increase of temperature because

A. collision frequency is increased

B. energy of products decreases

C. fraction of molecules possessing energy $\geq E_T$ (threshold energy) increases

D. mechanism of a reaction is changed

Answer: C

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

A. temperature

B. nature of reacting species

C. collision frequency

D. mechanism of a reaction is changed

Answer: B

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55. The rate constant of the reaction increases by

A. increasing the temperature

B. increasing the concentration of reactants

C. carrying out the reaction for a longer period

D. None is correct

Answer: A

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56. The rate of a certain reaction increases by 2.3 times when the temperature is raised form $300K$ to $310K$. If k is the rate constant at $300K$, then the rate constant at $310K$ will be equal to

A. 2k

B. k

C. $2.3k$

D. $3k^2$

Answer: C

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57. The activation energy for the forward reaction $X \rightarrow Y$ is $60 kJmol^{-1}$ and ΔH is $-20 kJmol^{-1}$. The activation energy for the reverse reaction is

A. $40 kJmol^{-1}$

B. $60 kJmol^{-1}$

C. $80 kJmol^{-1}$

D. $20 kJmol^{-1}$

Answer: C

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58. Which of the following expressions give the effect of temperature on the rate constant?

A. $\ln A = RT \ln E_a - \ln k$

B. $\ln k = \ln A - E_a / RT$

C. $k = AE_a / RT$

D. None of these

Answer: B

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59. The effect of temperature on reaction rate is given by

A. Clausius Clapeyron equation

B. Arrhenius equation

C. Gibb's Helmholtz equation

D. Kirchoff's equation

Answer: B

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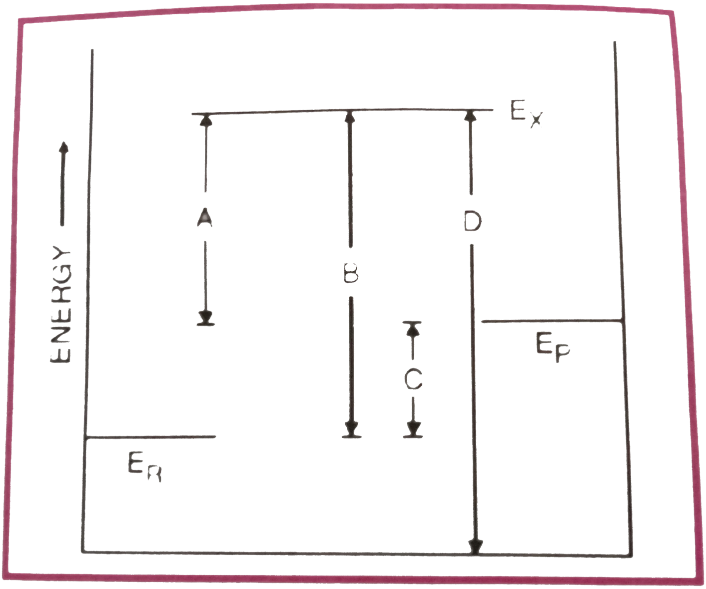
60. In the accompanied diagram E_R, E_P and E_X represents the energy of the reactants products and activated complex respectively Which of the following is the activation energy for the backward reaction?



A. A

B. B

C. C

D. D

Answer: A

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61. If E_f and E_r are the activation energies of forward and backward reactions and the reaction is known to be exothermic, then

A. $E_f < E_b$

B. $E_f > E_b$

C. $E_f = E_b$

D. Data insufficient to predict

Answer: A

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62. The large increase in the rate of the reaction due to rise in temperature is due to

A. increase in collision frequency

B. lowering of activation energy

C. increase in the number of effective collisions

D. None is correct

Answer: C

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63. The activation energy for a hypothetical reaction $A \rightarrow X$ is $12.49 kcal mol^{-1}$. If temperature is raised to 305 form $295K$, the reaction rate increased by $0.002 kcal L^{-1} mol^{-1}$ is almost equal to

A. $\approx 60\%$

B. $\approx 50\%$

C. $\approx 100\%$

D. unpredictable

Answer: C

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64. The plot of $\log k$ vs $1/T$ helps to calculate

A. Energy of activation

B. Rate constant of the reaction

C. Order of the reaction

D. Energy of activation as well as the frequency factor

Answer: D

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65. The correct expression for Arrhenius equation showing the effect of temperature on the rate constant is

A. $\frac{k_2}{k_1} = \frac{E_a}{2.303R}\left[\frac{T_2 - T_1}{T_1 T_2}\right]$

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

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

D. $\log\frac{k_2}{k_1} = \frac{E_a}{2.303}\left(\frac{T_1 T_2}{T_2 - T_1}\right)$

Answer: B

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66. The temperature coefficient of a reaction is:

A. ratio of the rate constants of the reaction at two different concentrations

B. ratio of the rate constants of the reaction at any two different temepratures

C. ratio of the rate constants at 308 K & 298 K

D. None of these

Answer: C

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67. The activation energy for most of the reaction is approximately 50 kJ mol^{-1} The value of temperature coefficient for such reaction will be

A. ≈ 2

B. ≈ 3

C. 1

D. > 4

Answer: A

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68. Which of the following explains the increase of the reaction rate by catalyst?

A. Catalyst decrease the rate of backward reaction so that the rate of forward reaction increases

B. Catalyst provides extra energy to reacting molecules so that they may produce effective collisions

C. Catalyst provides an alternative path of lower activation energy to the reactants

D. catalyst increases the number of collisions between the reacting molecules

Answer: C

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69. Point out the false statement

A. A catalyst does not differenctiate between the forward and backward reactions

B. Low activation energy is associated with fast

C. A catalyst changes the equilibrum point of the reaction

D. The activated state represents highly unstable state.

Answer: C

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70. What specific name can be given to the following sequence of steps:

$Hg + hv \rightarrow Hg^*$

$Hg^* + H_2 \rightarrow H_2^* + Hg$

A. Fluorescence

B. Phoshorescence

C. Photosensitisation

D. Chemiluminescence

Answer: D

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71. Which of the following is posing danger to the ozone atmosphere ?

A. IR radiations

B. X-radiations

C. Chloroflurometahne

D. CO_2

Answer: C

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72. The photochemical reactions are those which

A. take place at high temperatures

B. are involved in photography

C. are intiated by visible light only

D. requires photons to interact with chemical species.

Answer: D

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73. In fire flies the flashes are profuced due to the slow combustion of a protein luciferin in air and moisture. The phenomenon is known as

A. photochemical change

B. photocombustion

C. chemiluminescence

D. None of the above

Answer: C

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74. Which of the following does not apply to catalytic reactions ?

A. Capability to initiate the non-feasible reaction

B. Specificity

C. Lowering the activation energies of forward as well as backward reaction

D. Constancy in value of ΔH

Answer: A

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75. Phosphrous undergoes slow combustion and glows in dark. The precess is called

A. photochemical change

B. Chemiluminiscence

C. Fluorescence

D. Phosphorescence

Answer: B

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76. Among the following reactions, the fastest one is

A. burning of coal

B. rusting of iron in moist air

C. conversion of monoclinic sulphur to rhombic sulphur

D. precipitation of silver chloride by mixing silver naturee and sodium chloride solutions.

Answer: D

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77. Burning of coal is represented as $C(s) + O_2(g) \rightarrow CO_2(g)$.

The rate of this reaction is increased by

A. decrease in the concentration of oxygen

B. powdering the lumps of coal

C. decreasing the temperature of coal

D. providing inert atmosphere

Answer: B

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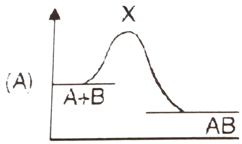
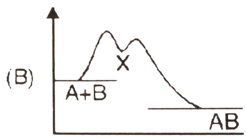
78. For an exothermic chemical process occurring in two as

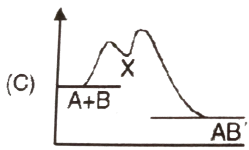
(i) $A + B \to X$ (slow)

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

The process of the reaction can be best described by

A. 

B. 

C. 

D. All are correct

Answer: B

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79. In a hypothetical reaction $2X + Y \rightarrow M + N$. If the concentration of Y is kept constant but that of X is tripled, the rate of reaction then will be

A. increased by 3 times

B. increased by 6 times

C. increased by 9 times

D. unpredictable

Answer: D

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80. Which of the following do not affect the rate of reaction ?

A. Temperature

B. Concentration of reactants

C. ΔH of reaction

D. Catalyst

Answer: C

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81. 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. 1/16 times

B. 16 times

C. 1/8 times

D. 8 times

Answer: B

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82. When ethyl acetate was hydrolyzed in the presence of $0.1MHCl$, the constant was found to be $5.40 \times 10^{-5}s^{-1}$. But when $0.1MH_2SO_4$ was used for hydrolyiss, the rate constant found to be $6.20 \times 10^{-5}s^{-1}$. form these we can say that

A. H_2SO_4 is stronger than HCl

B. H_2SO_4 and HCl are both of the same strength

C. H_2SO_4 is weaker than HCl

D. The data is insufficient to compare that strength of HCl and H_2SO_4.

Answer: D

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83. How will the rate of reaction $2SO_2(g) + O_2(g) \rightarrow 2SO_3(g)$ change if the volume of the reaction vessel is halved?

A. It will be 1/6th of its initial value

B. It will be 1/4th of its initial value

C. It will be 8 times of its initial value

D. It will be 4 times of its initial value

Answer: C

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84. The half-life periof for catalystic decompoistion of AB_3 at $50 mm$ is found to be 4 hr and at $100 mm$ it is $2.0 hr$. The order of reaction is

A. 3

B. 1

C. 2

D. 0

Answer: C

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85. $A \rightarrow$ Product, $[A]_0 = 2M$. After 10 min reaction is 10% completed. If $\frac{d[A]}{dt} = k[A]$, then $t_{1/2}$ is approximately

A. 0.693 min

B. 69.3 min

C. 66.0 min

D. 0.0693 min

Answer: C

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86. For a zero order reaction, the plot of concentration, vs time is linear with

A. $+ve$ slope and zero intercept

B. $-ve$ slope and zero intercept

C. $+ve$ slope and non-zero inertcept

D. $-ve$ slope and non-zero intercept

Answer: D

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87. In a certain gaseous reaction between A and B, $A + 3B \rightarrow AB_3$. The initial rate are reported as follows:

$[A]$	$[B]$	$Rate$
$0.1M$	$0.1M$	$0.002Ms^{-1}$
$0.2M$	$0.1M$	$0.002Ms^{-1}$
$0.3M$	$0.2M$	$0.008Ms^{-1}$
$0.4M$	$0.3M$	$0.018Ms^{-1}$

The rate law is

A. $r = k[X][Y]^3$

B. $r = k[X]^0[Y]^2$

C. $r = k[X][Y]$

D. $r = k[X]^0[Y]^3$

Answer: B

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88. For an elementary reaction , $X(g) \rightarrow Y(g) + Z(g)$ the half life period is 10 min. In what period of time would the concentration of X be reduced to 10% of original concentration?

A. 20 min

B. 33 min

C. 15 min

D. 25 min

Answer: B

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89. For a reaction $2A + B \rightarrow C + D$, the active mass of B is kept constant but tht of A is tripled. The rate of reaction will

A. decrease by 3 times

B. increase by 9 times

C. increase by 3 times

D. unpredictable

Answer: D

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

A. $k vs T$

B. $1/k vs T$

C. $lnkvs\frac{1}{T}$

D. $CvsT$

Answer: C

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91. The rate constant of forward and backward reactions for certain hypothetical reaction are 1.1×10^{-2} and 1.5×10^{-3}, respectively. The equilibrium constant of the reaction is

A. 7.33

B. 0.7333

C. 73.3

D. 733

Answer: A

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92. Rate constant $k = 1.2 \times 10^3 mol^{-1} Ls^{-1}$ and $E_a = 2.0 \times 10^2 kJ mol^{-1}$. When $T \rightarrow \infty$:

A. 2.0×10^2 kJ mol^{-1}

B. $1.2 \times 10^3 \mathrm{mol}^{-1} Ls^{-1}$

C. 1.2×10^3 mol $L^{-1} s^{-1}$

D. 2.4×10^3 kJ $\mathrm{mol}^{-1} s^{-1}$

Answer: B

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93. If initial concentration is doubled, the time for half-reaction is also doubled, the order of reaction is

A. zero

B. first

C. second

D. third

Answer: A

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94. If the concentration of a reactant 'A' is doubled and the rate of its reaction increase by a factor of 2, the order of reaction with respect to 'A' is

A. 1 st

B. zero

C. 2 nd

D. 3 rd

Answer: A

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95. 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. First order

B. Second order

C. Zero order

D. Third order

Answer: C

Watch Video Solution

96. The decomposition of N_2O_5 is a first order reaction represented by

$$N_2O_5 \rightarrow N_2O_4 + \frac{1}{2}O_2$$

After 15 minutes the volume of O_2 produced is 9 cc and at the end of the reaction 35 cc The rate constant is equal to

A. $\frac{1}{15}\frac{\ln 35}{44}$

B. $\frac{1}{15}\frac{\ln 44}{55}$

C. $\frac{1}{15}\frac{\ln 44}{26}$

D. $\frac{1}{15}\frac{\ln 35}{26}$

Answer: D

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97. 75% of a first-order reaction was completed in 32 minutes, when was 50% of the reaction completed ?

A. 16 minutes

B. 24 minutes

C. 8 minutes

D. 4 minutes

Answer: A

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98. The half life of a certain first order reaction is 60 minutes How long will it take for 80% reaction to occur?

A. 139.39 min

B. 19.9 min

C. 199.39 hrs

D. 40 min

Answer: A

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99. 75% of a first-order reaction was completed in 32 minutes, when was 50% of the reaction completed ?

A. 16 min

B. 32 min

C. 8 min

D. 4 min

Answer: A

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100. A first order reaction is 50% complete in 10 minutes The rate constant of the reaction is

A. 0.347min^{-1}

B. 0.0693min^{-1}

C. 0.013min^{-1}

D. 0.5min^{-1}

Answer: B

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101. The rate constant of a first order reaction is $2.0 \times 10^{-5} s^{-1}$ and the initial concentration is 0.10 mol L^{-1}. The initial rate is

A. $2.0 \times 10^{-6} \text{mol} L^{-1} s^{-1}$

B. $1.0 \times 10^{-6} \text{mol} L^{-1} s^{-1}$

C. $1.5 \times 10^{-6} \text{mol} L^{-1} s^{-1}$

D. $0.5 \times 10^{-6} \text{mol} L^{-1} s^{-1}$

Answer: A

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102. The initial rate of a second order reaction is $4 \times 10^{-4} \text{mol} L^{-1} s^{-1}$ and the initial concentration of the reaction substance is $0.20 \text{mol} L^{-1}$ the value of rate constant is

A. $0.02 L \text{mol}^{-1} s^{-1}$

B. $0.03 L \text{mol}^{-1} s^{-1}$

C. $0.01 L \text{mol}^{-1} s^{-1}$

D. $0.4 L \text{mol}^{-1} s^{-1}$

Answer: C

Watch Video Solution

103. For the ozonolysis of pentene in CCl_4 at 300 K $C_5H_{10} + O_3 \rightarrow C_5H_{10}O_3$ the following data is given

$[C_5H_{10}]$	$[O_3]$	rate
1.0×10^{-2}	2.8×10^{-3}	2.2
0.5×10^{-2}	2.8×10^{-3}	1.1
1.0×10^{-2}	5.6×10^{-3}	4.4

The over all order of reaction is

A. 2

B. 3

C. 1

D. zero

Answer: A

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104. For a reaction $aA + bB \rightarrow$ products the following data were found

$[A]$	$[B]$	rate
0.10	0.10	1×10^{-2}
0.20	0.20	8×10^{-2}
0.10	0.20	2×10^{-2}

The overall order of reaction is

A. 3

B. 1

C. zero

D. 2

Answer: A

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105. In a first order reaction the concentration of the reactant is reduced from $0.6 \text{mol} L^{-1}$ to $0.2 \text{mol} L^{-1}$ in 5 minutes the rate constant of the reaction is

A. $0.11 \min^{-1}$

B. $0.22 \min^{-1}$

C. $0.33 \min^{-1}$

D. $0.44 \min^{-1}$

Answer: B

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106. The first order reaction has a specific rate $10^{-3} s^{-1}$ How much time will it take for 10 g of the reactant to reduce to 5 g ?

A. 360 s

B. 180 s

C. 90 s

D. 270 s

Answer: A

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107. The rate constant for a reaction is $2 \times 10^{-2} s^{-1}$ at 300 K and $8 \times 10^{-2} s^{-1}$ at 340 K The energy of activation of the reaction is

A. 14.695 kJ mol^{-1}

B. 29.39 kJ mol^{-1}

C. $44 kJ \text{mol}^{-1}$

D. $22 kJ \text{mol}^{-1}$

Answer: B

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108. For the reaction, $2A + B + C \rightarrow A_2B + C$

The rate $= k[A][B]^2$ with $K = 2.0 \times 10^{-6} M^{-2} s^{-1}$. Calculate the initial rate of the reaction when $[A] = 0.1M$, $[B] = 0.2M$ and $[C] = 0.8M$. IF the rate of reverse reaction is negligible then calculate the rate of reaction after $[A]$ is reduced to $0.06M$.

A. $2.59 \times 10^{-9} Ms^{-1}$

B. $3.89 \times 10^{-9} Ms^{-1}$

C. $1.3 \times 10^{-9} Ms^{-1}$

D. none of these

Answer: B

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109. The decomposition of NH_3 on platinum surface is zero order reaction the rate of production of H_2 is $\left(k = 2.5 \times 10^{-4} Ms^{-1}\right)$

A. $2.5 \times 10^{-4} Ms^{-1}$

B. $1.25 \times 10^{-4} Ms^{-1}$

C. $3.75 \times 10^{-4} Ms^{-1}$

D. $5.0 \times 10^{-4} Ms^{-1}$

Answer: C

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110. The decomposition of NH_3 on finely divided platinum follows the rate expression

Rate $= \dfrac{k_1[NH_3]}{1 + k_2[NH_3]}$

it is a first order reaction when concentration of NH_3 is

A. very low

B. very high

C. moderate

D. never

Answer: A

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111. Consider the following hypothetical reactions

$$A \underset{k_2}{\overset{k_1}{\Longleftrightarrow}} B \quad , \quad B \xrightarrow[\text{slow}]{k_3} C$$

The overall rate constant k_θ of the reaction is

A. $\dfrac{k_3 k_1}{k_2}$

B. $\dfrac{k_1 k_2}{k_3}$

C. $\dfrac{k_1}{k_2 k_3}$

D. $\frac{k_1 - k_2}{k_3}$

Answer: A

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112. If during the fermentation of sugar solution that is 0.12 M the concentration of sugar is reduced to 0.06 M in 10 h and to 0.03 M in 20 h the order of reaction is

A. 1

B. $3/2$

C. 2

D. None of these

Answer: A

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113. The decomposition of N_2O into N_2 and O in the presence of gaseous argon follows second order kinetics with

$$k = \left(5.0 \times 10^{11} L \ \ \mathrm{mol}^{-1} s^{-1}\right) e^{-29000K/T}$$

The activation energy for the reaction E_a is

A. 5.0×10^{11} k cal

B. 29000 k cal

C. 58 k cal

D. -29000 cal

Answer: C

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114. The formation of H_2O_2 in the upper atmosphere follows the mechanism

$H_2O + O \rightarrow 2OH \rightarrow H_2O_2$

$\Delta H = 72 \text{ kJ mol}^{-1}, E_a = 77 \text{ kJ mol}^{-1}$

E_a for the backward process is

A. 149 kJ mol^{-1}

B. -149 kJ mol^{-1}

C. 5 kJ mol^{-1}

D. -5 kJ mol^{-1}

Answer: C

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115. Correct order for a first order reaction is

A. $T_{50} < T_{av} < T_{75}$

B. $T_{50} < T_{75} < T_{av}$

C. $T_{av} < T_{50} < T_{75}$

D. $T_{av} = T_{50} < T_{75}$

Answer: A

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116. Half life period of a first order reaction is 10 minutes. Starting with 10 M, rate after 20 minutes is

A. 0.0693M min^{-1}

B. $0.0693 \times 2.5 \text{M min}^{-1}$

C. $0.0693 \times 5 \text{M min}^{-1}$

D. $0.0693 \times 10 M \text{min}^{-1}$

Answer: B

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117. The rate of formation of SO_3 in the reaction

$2SO_2 + O_2 \rightarrow 2SO_3$

is 100 $\mathrm{g\ min}^{-1}$ Hence rate of disappearance of O_2 is

A. 50 $\mathrm{g\ min}^{-1}$

B. 100 $\mathrm{g\ min}^{-1}$

C. 20 $\mathrm{g\ min}^{-1}$

D. 40 $\mathrm{g\ min}^{-1}$

Answer: C

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118. The rate constant of a reaction is $0.0693 \min^{-1}$. Starting with $10 mol$, the rate of the reaction after $10 \min$ is

A. $0.693 M \min^{-1}$

B. $0.0693 \times 2 M \min^{-1}$

C. $0.0693 \times 5 M \min^{-1}$

D. $0.693 \times (5)^2 M \min^{-1}$

Answer: C

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119. For a given reaction, presence of catalyst reduces the energy of activation by 2 kcal at 27^(@)C`. Thus rate of reaction will be increased by:

A. 20 times

B. 14 times

C. 28 times

D. 2 times

Answer: C

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

A. 2.3

B. 6.9

C. 9.2

D. 0.105

Answer: B

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121. In the following simultaneous reaction

Bicyclohexane

$k=3\cdot8 \times 10^{-4}\ s^{-1}$ $\quad$ $k=1\cdot2 \times 10^{-4}\ s^{-1}$

Methylcyclopropane $\quad$ Cyclohexane

Cyclohexane formed is

A. $12\ \%$

B. $38\ \%$

C. $50\ \%$

D. $24\ \%$

Answer: D

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122. When temperature of a reaction mixture is changed from T_1 to T_2 half life is found to decrease thus,

A. $T_2 > T_1$ and the reaction is endothermic

B. $T_2 > T_1$ and the reaction is exothermic

C. $T_1 > T_2$ and the reaction is endothermic

D. $T_2 > T_1$ and the reaction can be endothermic or exothermic

Answer: D

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123. Half life period of a first order reaction is 100 min. After 144.3 min concentration of the reactant is reduced to of the original concentration

A. $1/e$

B. $1/e^2$

C. 10%

D. 20%

Answer: A

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

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

Temperature at which $k_A = k_c$ is

A. 1000 K

B. 2000 K

C. $(2000/2.303)K$

D. $(1000/2.303)K$

Answer: D

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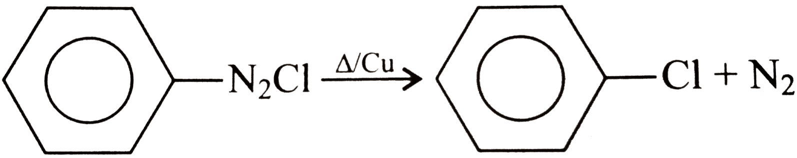

125. (A)

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

A. $\frac{2.303}{10}\log 1.25\text{min}^{-1}$

B. $\frac{2.303}{10}\log\ 5\ \text{min}^{-1}$

C. $\frac{2.303}{10}\log\ 5\ \text{min}^{-1}$

D. $\frac{2.303}{10}\log\ 4\ \text{min}^{-1}$

Answer: B

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126. For a reation: $A \rightarrow$ Product,

rate law is $-\frac{d[A]}{dt} = K[A]_0$.

The concentration of A left after time t when $t = \frac{1}{K}$ is:

A. $\frac{[A]_0}{e}$

B. $[A]_0 e$

C. $\frac{[A]_0}{e^2}$

D. $\frac{1}{[A]_0}$

Answer: A

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127. If $\frac{dx}{dt} = k\left[H_3O^+\right]n$

and rate becomes 100 times when pH changes from 2 to 1 Hence order of reactions is

A. 1

B. 2

C. 3

D. 0

Answer: B

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Revision Question

1. The rate of reaction $A + B \rightarrow$ Product is given by the equation $r = k[A][B]$. If B is taken in large excess, the order of the reaction would be

A. 2

B. 1

C. 0

D. unpredictable

Answer: B

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2. If the initial concentration of reactant in certain reaction is double, the half-life periof of the reaction doubles, the order of a reaction is

A. Zero

B. First

C. Second

D. Third

Answer: A

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3. Which of the following statement about the catalyst is/are true?

A. A catalyst accelerates the rate of reaction by bringing down the energy of activation

B. A catalyst does not participate in reaction mechanism

C. A catalyst makes the reaction more feasible by making ΔG more negative

D. A catalyst makes equilibrium constant more favourable for forward reaction

Answer: A

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4. 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. $2.7 \times 10^{-4}s^{-1}$

C. $72 \times 10^{-3}s^{-1}$

D. $1.8 \times 10^{-3}s^{-1}$

Answer: B

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5. A substance $''A''$ decomposes in solution following the first order kinetics. Flask I contains $1L$ of $1M$ solution of A and falsk II contains $100mL$ of $0.6M$ solution. After $8hr$, the concentration, of A in flask I becomes $0.25M$. What will be the time for concentration of A in flask II to become $0.3M$?

A. 0.4 hr

B. 2.4 hr

C. 4.0 hr

D. unpredictable as rate constant is not given

Answer: C

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6. Half life period of 2 nd order reaction is

A. proportional to initial concentration of reactants

B. independent of initial concentration of reactants

C. inversely proportional to initial concentration of reactants

D. inversely proportional to square of initial concentration of reactants

Answer: C

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7. The oxidation of oxalic acid by acidified $KMnO_4$ is an example of autocatalyiss. It is due to which of the following ?

A. SO_4^{2-}

B. MnO_4^{2-}

C. Mn^{2+}

D. K^{+}

Answer: C

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8. 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 initial concentration of reactant

D. a zero order reaction

Answer: A

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9. The hydrolysis of ester in alkaline medium is a

A. 1 st order reaction with molecularity 1

B. 2nd order reaction with molecularity 2

C. 1 st order reaction with molecularity 2

D. 2 nd order reaction with molecularity 1

Answer: B

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10. 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. 2

B. $1/2$

C. 4

D. $1/4$

Answer: C

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11. The rate constant for a first order reaction whose half life is 480 sec, is :

A. $1.44 \times 10^{-3} \sec^{-1}$

B. $1.44 \times \sec^{-1}$

C. $0.72 \times 10^{-3} \sec^{-1}$

D. $2.88 \times 10^{-3} \sec^{-1}$

Answer: A

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12. Select the law that corresponds to data shown for the following reaction $A + B \rightarrow$ Products

Exp	$[A]$	$[B]$	Initial rate
1	0.012	0.035	0.1
2	0.024	0.070	0.8
3	0.024	0.035	0.1
4	0.012	0.070	0.8

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

B. rate $= k[B]^4$

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

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

Answer: A

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13. The reaction $2H_2O_2 \rightarrow 2H_2O + O_2$ is

$r = k[H_2O_2]$

A. Zero order reaction

B. First order reaction

C. Second order reaction

D. Third order reaction

Answer: B

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14. A chemical reaction has catalyst X. Hence X

A. does not affect equilibrium constant of the reaction

B. decreases rate constant of the reaction

C. reduces enthalpy of reaction

D. increases activation energy of the reaction

Answer: A

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15. 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

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16. The phenomenon of emission of visible light as a result of chemical change is known as

A. Chemiluminescence

B. Fluorescence

C. Phosphorescence

D. Photosensitisation

Answer: A

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17. Rate constant in case of first order reaction is

A. inversely proportional to the concentration units

B. Independent of concentration units

C. directly proportional to the concentration units

D. inversely proportional to the square of the concentration units

Answer: B

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18. For a zero order reaction $A \rightarrow B, t_{1/2}$ is (k is rate constant)

A. $\frac{[A]_0}{2k}$

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

C. $\frac{1}{k[A]_0}$

D. $\frac{\ln 2}{[A]_0 k}$

Answer: A

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19. 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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20. For the first order reaction with rate contant k, which expression gives the half life period ? (Initail conc. = a)

A. $\frac{ln2}{ka}$

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

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

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

Answer: C

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21. The rate constant is given by the equation $k = P. Ze^{-E/RT}$. Which factor should register a decrease for the reaction to proceed more rapidly ?

A. T

B. Z

C. E

D. P

Answer: C

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22. For a reaction of type $A+B \rightarrow$ products it is observed that doubling concentration of A causes the reaction rate to be four times as great, but doubling amount of B does not affect the rate,The rate equation is

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

B. Rate $=\frac{k}{4}[A]^2$

C. Rate $=k[A]^2[B]^0$

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

Answer: C

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23. For the reaction $A \rightarrow B$, the rate law expression is rate $=k[A]$. Which of the following statements is incorrect ?

A. The reaction follows first order kinetics

B. The $t_{1/2}$ of reaction depends on initial concentration of reactants

C. k is constant for the reaction at a constant temperature

D. The rate law provides a simple way of predicting the conc. Of reactants and products at any time after the start of the reaction.

Answer: B

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24. 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. $7.75 \times 10^{-4} \text{mol L}^{-1} s^{-1}$

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. $3.85 \times 10^{-4} \text{mol L}^{-1} s^{-1}$

Answer: A

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25. 75% of a first-order reaction was completed in 32 minutes, when was 50% of the reaction completed ?

A. 16 minutes

B. 8 minutes

C. 4 minutes

D. 32 minutes

Answer: A

Watch Video Solution

26. Th Arrhenius equation expressing the effect of temperature on the rate constant of the reaction is

A. $k = e^{-E_a / RT}$

B. $k = \frac{E_a}{RT}$

C. $k = \log_e \frac{E_a}{RT}$

D. $k = A . e^{-E_a / RT}$

Answer: D

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27. The first order rate constant for the decomposition of N_2O_5 is $6.2 \times 10^{-4} \sec^{-1}$. The $t_{1/2}$ of decomposition is

A. 1117.2

B. 111.7

C. 223.4

D. 160.9

Answer: A

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28. A reaction is 50 % complete in 2 hours and 75 % complete in 4 hours the order of reaction is

A. 0

B. 1

C. 2

D. 3

Answer: C

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29. Velocity constant of a reactin at 290 K was found to be 3.2×10^{-3}. At 300 K it will be

A. 1.28×10^{-2}

B. 9.6×10^{-3}

C. 6.4×10^{-3}

D. 3.2×10^{-4}

Answer: C

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30. If reaction between A and B to give C shows first order kinetics in A and second order in B, the rate equation can be written as

A. Rate $= k[A][B]^{1/2}$

B. Rate $= k[A]^{1/2}[B]$

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

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

Answer: C

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31. For a first order reaction, the half-life period is independent of

A. initial concentration

B. cube root of initial concentration

C. first power of final concentration

D. square root of final concentration

Answer: A

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32. A catalyst increases rate of reaction by

A. decreasing enthalpy

B. decreasing interval energy

C. decreasing activation energy

D. increasing activation energy

Answer: C

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33. For a first order reaction, obatin a positive slope, we need to plot [A] in the concentration of reactant AB

A. $\log_{10}[A]vst$

B. $-\log_e[A]vst$

C. $\log_{10}[A]vs\log t$

D. $[A]vst$

Answer: B

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34. Given $t_{1/2} = 3$ hr. Then how many gram of a substance will remain after 18th hr from 300 gram of a substance

A. 4.6 g

B. 5.6 g

C. 9.2 g

D. 6.4 g

Answer: A

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

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

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

D. $r = k[A]^{1/2}[B]^{1/2}$

Answer: B

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36. The effect of temperature on reaction rate is given by

A. Clasisen-Clapeyron equation

B. Arrhenius equation

C. Gibbs-Helmholtz equation

D. Kirchoff's equation

Answer: B

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37. The decomposition of a substance follows first order kinetics. If its conc. Is reduced to 1/8th of its initial value, in 24 minutes, the rate constant of decomposition process is

A. $1/24\min^{-1}$

B. $0.692/24\min^{-1}$

C. $2.303/24\log(1/8)\min^{-1}$

D. $\frac{2.303}{24}\log(8/1)\min^{-1}$

Answer: D

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38. For a first order reaction, the plot of log k against 1/T is a straight line. The slope of the line is equal to

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

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

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

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

Answer: D

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39. $1\ \mathrm{dm}^3$ of $2MCH_3COOH$ is mixed with $1\ \mathrm{dm}^3$ of 3 M ethanol to form ester. The decrease in the initial rate if each solution is diluted with an equal volume of water would be

A. 2 times

B. 4 times

C. 0.25 times

D. 0.5 times

Answer: C

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40. $ROOR' + H_2O \xrightarrow{\text{HCl}} RCOOH + R'OH$ ltbtgt What type of reaction is this ?

A. 2nd order

B. unimolecular

C. psedo unimolecular

D. 3rd order

Answer: C

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41. 75 % of first order reaction is complete in 30 minutes. What is the time required for 93.75 % of the reaction (in minutes) ?

A. 45

B. 120

C. 90

D. 60

Answer: D

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42. For a given reaction, $t_{1/2} = 1/ka$. The order of this reaction is

A. 1

B. 0

C. 3

D. 2

Answer: D

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43. 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. 4

B. 2

C. $1/4$

D. $1/2$

Answer: A

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44. The activation energy of a reaction can be determined by

A. changing the concentration of reactants

B. evaluating rate constant at standard temperature

C. evaluating rate constant at two different temperatures

D. by doubling conc. Of reactants,

Answer: C

Watch Video Solution

45. 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. 1.732mol L^{-1}

B. 3mol L^{-1}

C. $1.02 \times 10^{-4} \text{mol L}^{-1}$

D. $3.2 \times 10^{5} \text{mol L}^{-1}$

Answer: B

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46. The time taken for 90% of a first order reaction to be completed is approximately

A. 1.1 times that of half life

B. 2.2 times that of half life

C. 3.3 times that of half life

D. 4.4 times that of half life

Answer: C

Watch Video Solution

47. The half-life period for the first order reaction is 693 seconds. The rate constant of this reaction would be

A. $0.1 \sec^{-1}$

B. $0.01\,\text{sec}^{-1}$

C. $0.001\,\text{sec}^{-1}$

D. $0.0001\,\text{sec}^{-1}$

Answer: C

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48. The reaction $2N_2O_5 \Leftrightarrow 2N_2O_4 + O_2$ is

A. Biomolecular and second order

B. Unimolecular and first order

C. Bimolecular and first order

D. Biomolecular and zero order

Answer: C

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49. Collision theory is application to

A. First order reactions

B. Zero order reactions

C. Bimolecular reactions

D. Intramolecular reactions

Answer: C

Watch Video Solution

50. A chemical reaction was carried out at 300 K and 280 K. The rate constants were found to be $k_1 \text{ and } k_2$ respectively. Then

A. $k_2 = 4k_1$

B. $k_2 = 2k_1$

C. $k_2 = 0.25k_1$

D. $k_2 = 0.5k_1$

Answer: C

Watch Video Solution

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

A. 4

B. 3

C. 5

D. 2

Answer: A

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52. The order of reaction is decided by

A. temperature

B. mechanism of reaction as well as relative concentration of reactants

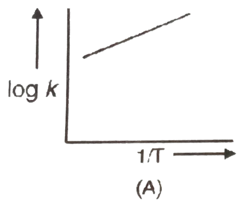
C. molecularity

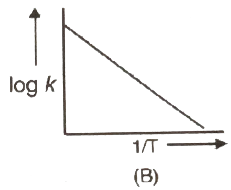
D. pressure

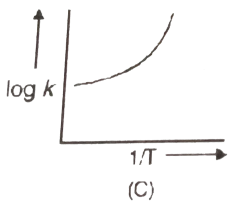
Answer: B

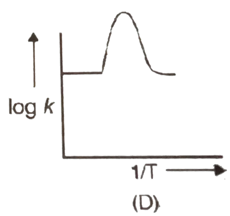
Watch Video Solution

53. A graph plotted between $\log k$ versus $1/T$ for calculating activation energy is shown by

A. 

B. 

C. 

D. 

Answer: B

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

A. $\sec^{-1}, M\sec^{-1}$

B. $\sec^{-1}, M$

C. $M\sec^{-1}, \sec^{-1}$

D. $M, \sec^{-1}$

Answer: A

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

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

B. $t_{1/2} \propto 1/a$

C. $t_{1/2} \propto a^0$

D. $t_{1/2} \propto \dfrac{1}{a^2}$.

Answer: C

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56. $2A \rightarrow B + C$. It would be a zero-order reaction when

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

B. the rate of reaction remains same at any concentration of A

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

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

Answer: B

Watch Video Solution

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

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

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

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

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

Answer: B

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58. When we increase the temperature, the rate of reaction increases because of

A. more number of collisions

B. decrease in mean free path

C. more number of energetic collisions

D. less number of energies collisions

Answer: C

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59. In Arrhenius plot, intercept is equal to

A. $-E_a / R$

B. lnA

C. lnK

D. $\log_{10} a$

Answer: B

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60. The rate of reaction is doubled for $10^\circ C$ rise in temperature. The increase in the reaction rate as a result of temperature rise from $10^\circ C$ to $100^\circ C$ is

A. 112

B. 512

C. 1400

D. 614

Answer: B

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61. For the reaction:

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

taking place on water. Find the order of reaction.

A. 0

B. 1

C. 2

D. 3

Answer: A

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62. The temperature dependence of rate constant (k) of a chemical reaction is written in terms of Arrhenius equation, $k = Ae^{-E_a / RT})$ Activation energy (E_a) of the reaction can be calculate by plotting

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

B. $k vs T$

C. $k vs \frac{1}{\log T}$

D. $\log k vs \frac{1}{T}$

Answer: D

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63. 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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64. The rate law for a reaction between the substances A and B is given by rate $= K[A]^n[B]^m$. On doubling the concentration of A and having the concentration of B, the ratio of the new rate to the earlier rate of the reactio will be:

A. $\dfrac{1}{2^{(m+n)}}$

B. $(m+n)$

C. $(n - m)$

D. $2^{(n-m)}$

Answer: D

Watch Video Solution

65. Temperature coefficient of a reaction is 2. When temperature is increased from $30^\circ C$ to $100^\circ C$, rate of the reaction increases by

A. 500 times

B. 250 times

C. 128 times

D. 100 times

Answer: C

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66. For the reaction $A + B \rightarrow C + D$, if concentratiton of A is doubled without altering the concentration of B, the rate gets doubling, If the concentration of B is increased by nine times without altering the concentration of A, the rate gas tripled. The order of reaction is

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

B. $1\frac{1}{3}$

C. 2

D. 1

Answer: A

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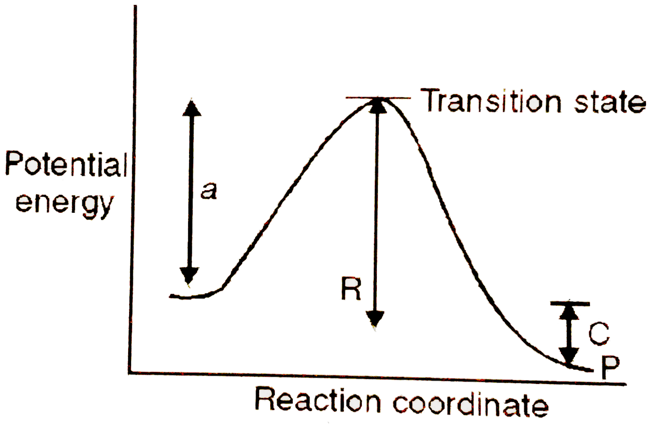
67. The potential energy diagram for a reaction $R \rightarrow P$ is given by



ΔH° of the reaction compounds to the energy

A. a

B. b

C. c

D. a + b

Answer: C

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68. Rate of 1st order depends upon

A. time

B. Concentration of reactants

C. temperature

D. All of these

Answer: D

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69. For a first order reaction, units of rate constant are

A. time^{-1}

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

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

D. $\mathrm{mol\ L}^{-1}$

Answer: A

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70. The unit of second order reaction rate constant is

A. $lit^{-1}.\ mol^{-1}.\ \sec^{-1}$

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

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

D. $\sec^{-1}$

Answer: C

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

A. 0.5

B. 1

C. 2

D. 0

Answer: C

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72. The rate constant of a reaction at temperature 200 K is 10 times less than the rate constant at 400 K. What is the activation energy (E_a) of the reaction ? (R = gas constant)

A. 1842.4 R

B. 921.2 R

C. 460.6 R

D. 230.3 R

Answer: B

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73. Which one of the following equation is correct forr the reaction : $N_2(g) + 3H_2(g) \to 2NH_3(g)$?

A. $\dfrac{3d[H_2]}{dt} = \dfrac{2d[N_2]}{dt}$

B. $\dfrac{2d[N_2]}{dt} = \dfrac{1}{3}\dfrac{d[H_2]}{dt}$

C. $\dfrac{2d[NH_3]}{dt} = \dfrac{-3[H_2]}{dt}$

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

Answer: D

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74. For a chemical reaction .... Can never be a fraction

A. order

B. half-life

C. molecularity

D. rate constant

Answer: C

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

A. 16 minutes

B. 24 minutes

C. 8 minutes

D. 4 minutes

Answer: A

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76. The time taken for the completion of 3/4 of a first order reaction is

A. $(2.303/k)\log 3/4$

B. $(2.303/k)\log 4$

C. $(2.303/k)\log 1/4$

D. $(2.303/0.75)\log k$

Answer: B

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77. 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. $[N_2O_5]_1 = [N_2O_5]_0 + kt$

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. $\ln\frac{[N_2O_5]_0}{[N_2O_5]_t} = kt$

Answer: D

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

A. 7.53 min

B. 0.383 min

C. 23.1 min

D. 8.73 min

Answer: C

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79. The velocity constant of a reaction at 290 K was found to be $3.2 \times 10^{-3} s^{-1}$. When the temperature is raised to 310 K, it will be about

A. 6.4×10^{-3}

B. 3.2×10^{-4}

C. 9.6×10^{-3}

D. 1.28×10^{-2}

Answer: D

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80. The reaction, $2SO_{2(g)} + O_{2(g)} \Leftrightarrow 2SO_{3(g)}$ is carried out in a 1 dm^3 and 2 dm^3vessel separately. The ratio of the reaction velocity will be

A. $1:8$

B. $1:4$

C. $4:1$

D. $8:1$

Answer: D

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81. The activation energy for most of the reactions is approximately $50\ \text{kJ mol}^{-1}$. The value of temperature coefficient for such reactions is

A. approx.2

B. approx.3

C. < 1

D. > 4

Answer: A

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82. Which is correct about zero order reaction ?

A. Rate of reaction depends on decay constant

B. Rate of reaction is independent of concentration

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

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

Answer: B

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83. 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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84. 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. 30 minutes

B. 60 minutes

C. 7.5 minutes

D. 15 minutes

Answer: A

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

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

B. Value of k is dependent of the initial concentration of A and B

C. Rate of formation of c is twice the rate of disappearance of

A

D. $t_{1/2}$ is a constant

Answer: B

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86. For the reaction : $2A + B \rightarrow C + D$, measurement of the rate of the reaction at varying concentrations are given below

Trial No.	[A]	[B]	rate$\left(\text{m mole L}^{-1}\text{s}^{-1}\right)$
1	0.010	0.010	2.5
2	0.010	0.020	5.0
3	0.030	0.020	45.0

The rate law is therefore

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

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

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

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

Answer: A

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87. 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 constant of the reaction is

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

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

C. $2.606 \times 10^{-3} \sec^{-1}$

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

Answer: C

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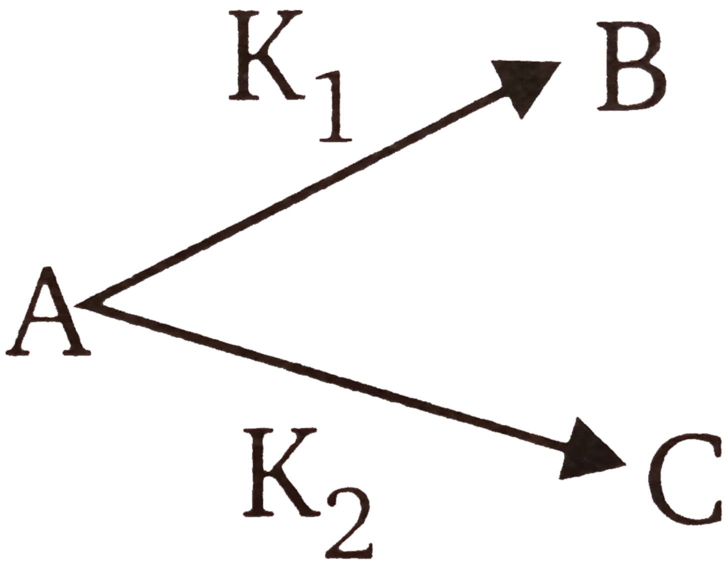
88. A substance undergoes first order decomposition. The decomposition follows two parallel first order reaction as:



and

$KP_1 = 1.26 \times 10^{-4} \sec^{-1}$

$K_2 = 3.80 \times 10^{-5} \sec^{-1}$

The percentage distribution of B and C are:

A. 75 % B and 25 % C

B. 80 % B and 20 % C

C. 60 % B and 40 % C

D. 76.83 % B and 23.17 % C

Answer: D

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89. 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

C. 2.5

D. 3

Answer: B

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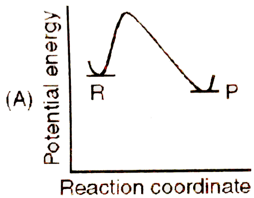
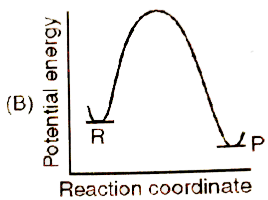
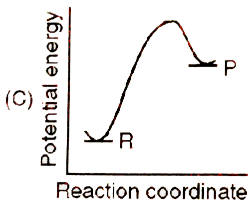
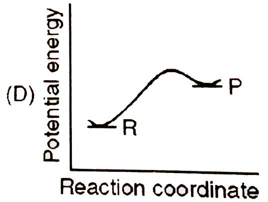
90. An endothermic reaction with high activation energy for the forward reaction is given by the diagram

A. 

B. 

C. 

D. 

Answer: C

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91. The energy of activations for forward and backward change for an endothermic reaction, $X \rightarrow Y$ 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. there is no definite relation between E_b and E_f

Answer: A

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

A. unimoleular reaction

B. First order reaction

C. Second order reaction

D. bimolecular reaction

Answer: A

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93. According to law of mass action rate of a chemical reaction is proportional to

A. concentration of reactants

B. molar concentration of reactants

C. concentration of products

D. molar concentration of products

Answer: B

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94. 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. 220 s

B. 30 s

C. 300 s

D. 347 s

Answer: D

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95. The experimental rate law for a reaction

$2A + 2B \rightarrow$ Product, is

$V \propto C_A C_B^{1/2}$. If the concentration of both A and B are doubled the rate of reaction increases by a factor of

A. $\sqrt{2}$

B. 2

C. $2. \sqrt{2}$

D. 4

Answer: C

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96. What is the time required for a first order reaction to be 99 % complete, compared to the time taken for the reaction to be 90 % complete ?

A. There is no change

B. Time taken is dounble

C. Time taken is triple

D. The time required is half the initial value

Answer: B

Watch Video Solution

97. During the decomposition of H_2O_2 to give oxygen, $48gO_2$ is formed per minute at a certain point of time. The rate of formation of water at this point is

A. 0.75mol min^{-1}

B. 1.5mol min^{-1}

C. 2.25mol min^{-1}

D. 3.0mol min^{-1}

Answer: D

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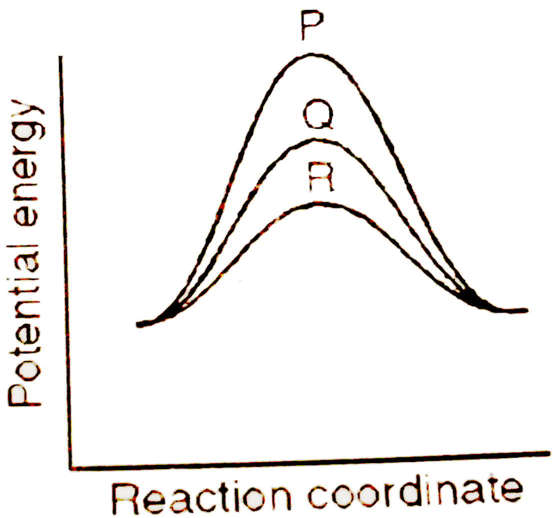
98. If a homogeneous catalytic reaction can take place through three alternative paths as depicted below, the catalytic efficiency of P,Q R representing the relative case would be



A. $P > Q > R$

B. $Q > P > R$

C. $P > R > Q$

D. $R > Q > P$

Answer: D

99. Observe the following reaction

$2A + B \rightarrow C$

The rate of formation of C is $2.2 \times 10^{-3} \text{mol L}^{-1} \text{min}^{-1}$. What is the value of $-\frac{d[A]}{dt}\left(\text{in mol L}^{-1}\text{min}^{-1}\right)$?

A. 2.2×10^{-3}

B. 1.1×10^{-3}

C. 4.4×10^{-3}

D. 5.5×10^{-3}

Answer: C

100. Half life of a radioactive substance is 6 minute. If its initial amount is 32g, then amount present after 18 minute is

A. 4 g

B. 8 g

C. 16 g

D. 2 g

Answer: A

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

B. $(m+n)$

C. $(n-m)$

D. $2^{(n-m)}$

Answer: B

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102. Unit of the constant of zero order reaction is

A. time^{-1}

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

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

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

Answer: B

Watch Video Solution

103. Arrhenius equation is

A. $\Delta H = \Delta E + \Delta nRT$

B. $\Delta G = \Delta H - T\Delta S$

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

D. None of the above

Answer: C

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104. $t_{1/4}$ 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

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105. 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. 2

B. -1

C. 1

D. -2

Answer: D

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106. 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. 300 s

B. 30 s

C. 220 s

D. 347 s

Answer: D

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107. The rate constant for a chemical reaction has unit litre $mol^{-1}\sec^{-1}$. Find the order of the reaction.

A. 0 order

B. 1st order

C. 2nd order

D. 3rd order

Answer: C

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108. Which of the following reaction ends in finite time ?

A. 0 order

B. 1st order

C. 2nd order

D. 2rd order

Answer: A

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109. For the reaction $A + B \rightarrow C + D$, if concentratiton of A is doubled without altering the concentration of B, the rate gets doubling, If the concentration of B is increased by nine times without altering the concentration of A, the rate gas tripled. The order of reaction is

A. 2

B. 1

C. $3/2$

D. $4/3$

Answer: C

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110. The following homogeneous gaseous reactions were experimentally found to be second order overall

(i) $2NO_2 \rightarrow N_2 + O_2$

(ii) $3O_2 \rightarrow 2O_3$

(iii) $N_2O_3 \rightarrow NO + NO_2$

(iv) $H_2 + I_2 \rightarrow 2HI$

Which of these are most likely to be elementary reaction that occur in one step ?

A. (iii) only

B. (i) and (iii)

C. (i) and (iv)

D. (iii) and (iv)

Answer: C

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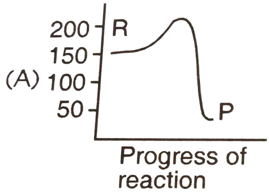
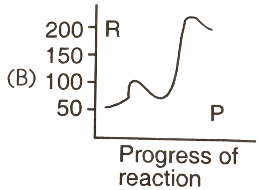
111. An exothermic chemical reaction proceeds by two stages reactants $\xrightarrow{\text{Stage I}}$ intermdediate $\xrightarrow{\text{Stage II}}$ products, The activation energy of stage I is $50 kJmol^{-1}$. The overall enthalpy change of the reaction is -100kJ mol^{-1}. Which diagram could represent the energy level diagram for the reaction ?



A.



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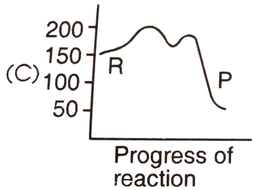

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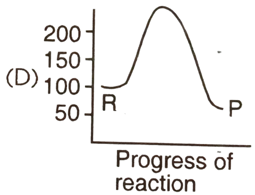

D.

Answer: C

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112. Reactant 'A' (initial concentration, a) reacts according to zero order kinetics, the time takews for the completion of the reaction is

A. k / a

B. $a / 2k$

C. ka

D. $2k / a$

Answer: C

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113. The rate of reaction $A + 2B \to 3C$ gets increased by 72 times when the concentration of A is tripled and that of B is doubled. The order of the reaction with present to A and B are..... And ..... Respectively.

A. 1,2

B. 2,3

C. 3,2

D. 2,2

Answer: B

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114. A reaction $P \rightarrow Q$ is completed 25 % in 25 min, 50 % completed in 25 min if [P] is halved, 25 % completed in 50 min if [P] is doubled. The order of reaction is

A. 1

B. 2

C. 0

D. 3

Answer: C

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115. Rate constant of a reaction (k) is $175 \text{litre}^2 \text{mol}^{-2} \sec^{-1}$. What is the order of reaction ?

A. First

B. Second

C. Third

D. Zero

Answer: C

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116. One mole of $N_2O_4(g)$ at 300 K is kept in a closed container under one atmosphere. It is heated to 600K when 20% by mass of N_2O_4(g) decomposes to NO_2(g). The resultant pressure is:

A. 1.2 atm

B. 2.4 atm

C. 2.0 atm

D. 1.0 atm

Answer: B

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117. The rate constant of a second order reactions

$2A \rightarrow$ Products, is $10^{-4} \text{lit mol}^{-1} \text{min}^{-1}$. The initial concentration of the reactant is $10^{-2} \text{mol lit}^{-1}$. What is the half life (in min) ?

A. 10

B. 1000

C. 100

D. 10^6

Answer: D

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118. For the reaction , $Cl_2 + 2I^- \rightarrow I_2 + 2Cl^-$, the initial concentration of I^- was 0.20mol lit^{-1} and the concentration after 20 minutes was 0.80mol lit^{-1}. Then the rate of formation of I_2 in $\text{mol lit}^{-1}\text{min}^{-1}$ would be

A. 1×10^{-3}

B. 5×10^{-4}

C. 1×10^{-4}

D. 2×10^{-3}

Answer: B

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119. Predict the rate law of the following reaction based on the data given below :

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

[A]M	[B]M	Magnitude of initial rate Ms^{-1}
1	1	x
2	1	$2x$
1	2	$4x$
2	2	$8x$

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

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

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

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

Answer: A

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120. In the acid hydrolysis of methyl acetate ester

A. acid is taken in excess

B. ester is taken in excess

C. water is taken in excess

D. both acid and water is taken in excess

Answer: C

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121. Activation energy is

A. Threshold energy + Average kinetic energy

B. Threshold energy - Average internal energy

C. Threshold energy + Potential energy

D. Threshold energy + Average kinetic energy

Answer: B

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122. At 500 K, the half-life period of a gaseous reaction at the initial pressure of 80 kPa is 350 sec. When the pressure is 40 kPa, the half life period is 175 sec. The order of reaction is

A. zero

B. one

C. two

D. three

Answer: A

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123. $1/[A]$ versus time is a straight line, the order of reaction is

A. -1

B. 2

C. 3

D. 0

Answer: B

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124. For a first order reaction half life is 14 sec. The time required for the initial concentration to reduce 1/8 of the value is

A. $(14)^3$ sec

B. 28 sec

C. 42 sec

D. $(14)^2$ sec

Answer: C

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125. For a zero order reaction, the plot of concentration of a reactant vs time is (intercept refers to concentration axis)

A. linear with positive slope and zero intercept

B. linear with negative slope and zero intercept

C. linear with negative and non-zero intercept

D. linear with positive and non-zero intercept

Answer: C

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126. The rate of reaction increases with temperature due to

A. Decrease in activation energy

B. Increase in activation energy

C. Increase in collision frequency

D. Increase in conentration

Answer: C

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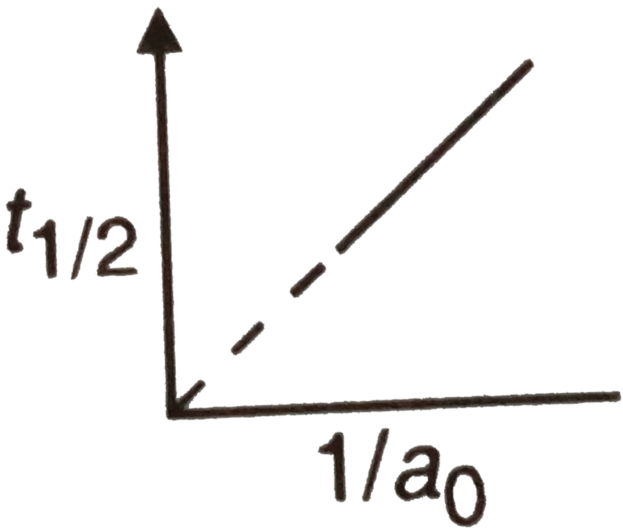
127. The following graph shows how $t_{1/2}$ (half-life) of a reactant R changes with the initial reactant concentration a_0.

The order of reaction will be



A. zero

B. 1

C. 2

D. 3

Answer: C

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128. For the reaction $SO_{2(g)} + \frac{1}{2}O_{2(g)} \Leftrightarrow SO_{3(g)}$, if $K_c = K_p(RT)^X$ then the value of X is

A. -1

B. $-1/2$

C. $1/2$

D. 1

Answer: B

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129. The time taken for 10 % completion of a first order reaction is 20 minutes. Then for 19 % completion, the reaction will take

A. 40 min

B. 60 min

C. 30 min

D. 50 min

Answer: A

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130. The half life period of a radioactive substance is 10 hours. How much will be left after 4 hours in 1g atom sample ?

A. 45.6×10^{23} atom

B. 4.56×10^{23} atom

C. 4.56×10^{21} atom

D. 4.56×10^{20} atom

Answer: B

Watch Video Solution

131. The rate law equation for a reaction $A \rightarrow B$ is ,

$r = k[A]^0$

If the initial concentration is 'a' mol dm^{-3}, the half of the reaction is

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

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

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

D. $\frac{a}{2k}$

Answer: D

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132. For a chemical reaction $A \rightarrow B$,the rate of the reaction is $2.0 \times 10^{-3} \sec^{-1}$, when the initial concentration is $0.05 moldm^{-3}$. The rate of the same reaction is $1.6 \times 10^{-2} moldm^{-3} \sec^{-1}$. When the initial concentration is 0.1 mol dm^3, find the order of reaction.

A. 2

B. 0

C. 3

D. 1

Answer: C

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133. For the decomposition of a compount AB at 600 K, the following data were obtained.

$[AB]$ mol dm^{-3}	Rate decomposition of AB in mol dm^{-3} sec^{-1}
0.20	2.75×10^{-8}
0.40	11.0×10^{-8}
0.60	24.75×10^{-8}

Find the order for the decomposition of AB.

A. 1.5

B. 0

C. 1

D. 2

Answer: D

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134. For a reaction between A and B, the initial rate of reaction is measured for various initial concentration of A and B. The data provided are

	[A]	[B]	Initial reaction rate
(a)	0.02 M	0.30 M	5×10^{-5}
(b)	0.20 M	0.10 M	5×10^{-5}
(c)	0.40 M	0.05 M	1×10^{-4}

The overall order of the reaction is

A. One (1)

B. Two (2)

C. Two and a half (2.5)

D. Three (3)

Answer: A

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135. For the first order reaction at $27^{\circ} C$, the ratio of time required for 75 % completion to 25 % completion of reaction is

A. 3.0

B. 2.303

C. 4.8

D. 0.47

Answer: C

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

A. 3/2 log 2

B. 2/3 log 3

C. 2/3 log 2

D. 3/2 log 3/4

Answer: C

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137. The unit $\text{mol L}^{-1} s^{-1}$ is meant for the rate constant of the reaction having the order

A. 0

B. 1

C. 2

D. 3

Answer: A

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138. The half life period of a reaction is inversely proportional to the square of the initial concentration of the reactant, then the order of reactions is

A. 0

B. 1

C. 2

D. 3

Answer: D

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139. For a first order reaction $A \rightarrow$ Products, the half life is 100 seconds. The rate constant of the reaction is

A. $6.9 \times 10^{-2} s^{-1}$

B. $6.93 \times 10^{-1} s^{-1}$

C. $6.93 \times 10^{3} s^{-1}$

D. $6.93 \times 10^{-1} s^{-1}$

Answer: C

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140. The rate of a gaseous reaction triples when temperature is increased by $10^{\circ} C$ from $25^{\circ} C$. The energy of activation of the reaction in $kJmol^{-1}$ will be

A. 410

B. 735

C. 514

D. 205

Answer: C

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141. 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. $5.15 \times 10^{-5} \mathrm{mol\ L}^{-1} s^{-1}$

B. $6.35 \times 10^{-3} \mathrm{mol\ L}^{-1} s^{-1}$

C. $7.75 \times 10^{-4} \mathrm{mol\ L}^{-1} s^{-1}$

D. $3.85 \times 10^{-4} \text{mol L}^{-1} s^{-1}$

Answer: C

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142. The first order reaction $2N_2O(g) \rightarrow 2N_2(g) + O_2(g)$ has a rate constant of $1.3 \times 10^{-11} s^{-1}$ at $270^\circ C$ and $4.5 \times 10^{-10} s^{-1}$ at $350^\circ C$. What is the activation energy for this reaction ?

A. 15 kJ

B. 30 kJ

C. 68 kJ

D. 120 kJ

Answer: D

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143. In Arrhenius equation for activation energy, $k = Ae^{-E_a/RT}$, A represents the following :

(1) pre-exponential factor

(2) Frequency factor

(3) Arrhenius factor

(4) Collision factor and frequency

The correct anwer is :

A. 1 and 3

B. 1 and 2

C. 2,3 and 4

D. 1,2 and 3

Answer: D

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144. In the reaction $A+2B \rightarrow C+2O$ the initial rate $\frac{-d[A]}{dt}$ at $t=0$was found to the $2.6 \times 10^{-2} \mathrm{M\,sec}^{-1}$. What is the value of $\frac{-d[B]}{dt}$ at $t=0$ in ms^{-1} ?

A. 2.6×10^{-2}

B. 5.2×10^{-2}

C. 1.0×10^{-1}

D. 6.5×10^{-3}

Answer: B

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145. Half life of a first order reaction and a zero order reaction are same. Then the ratio of the initial rate of the first order reaction to that of zero order reaction is

A. $\frac{1}{0.693}$

B. 2×0.693

C. 0.693

D. $2/0.693$

Answer: B

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146. If the activation enery for the forward reaction is 150kJ mol^{-1} and that of the reverse reaction is 260kJ mol^{-1}. What is the ethalpy change for the reaction ?

A. 410kJ mol^{-1}

B. -110kJ mol^{-1}

C. 110kJ mol^{-1}

D. -410kJ mol^{-1}

Answer: B

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147. The rate law for the reaction

$2X + Y \rightarrow Z$ is Rate $= k[X][Y]$

The correct statement with regard to this relation is

A. The unit of k is s^{-1}

B. The rate of reaction is independent of [X] and [Y]

C. For this reaction $t_{1/2}$ is independent of initial concentration of the reactions

D. The rate of formation of Z is half the rate of disappearance of X.

Answer: D

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148. Consider the following statements

(i) increase in the concentration of reactants increase the rate of zero order reactions

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

(iii) rate constant, k is equal to the collision frequency if $E_a = \infty$

(iv) $ln k vs T$ is straight line

(v) $ln k vs 1/T$ is a straight line

correct statements are

A. (i) and (v)

B. (ii) and (v)

C. (iii) and (iv)

D. (ii) and (iii)

Answer: B

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149. The activation energy for a reaction at temperature T K was found to be or $2.303\text{RT J mol}^{-1}$. The ratio of the rate constant to Arrhenius factor is

A. 10^{-1}

B. 10^{-2}

C. 2×10^{-3}

D. 2×10^{-2}

Answer: A

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150. The time required for 100% completion of a zero order reaction is

A. 2 k/a

B. a/2k

C. a/k

D. ak

Answer: C

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151. The following data is obtained during the first order thermal decomposition of

$2A(g) \rightarrow B(g) + C(s)$ at constant volume and temperature

S.No.	Time	Total pressure
1.	At the end of 10 minutes	300
2.	After completion	200

The rate constant in $\min^{-1}$ is

A. 0.0693

B. 6.93

C. 0.00693

D. 69.3

Answer: A

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152. Consider the decomposition of N_2O_5 as

$N_2O_5 \rightarrow 2NO_2 + 1/2O_2$

The rate of reaction is given by

$$-\frac{d[N_2O_5]}{dt} = \frac{1}{2}\frac{d[NO_2]}{dt} = 2\frac{d[O_2]}{dt}$$

$$= k_1[N_2O_5]$$

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

$$\frac{+d[NO_2]}{dt} = 2k_1[N_2O_5] = k_1[N_2O_5]$$

$$\frac{+d[O_2]}{dt} = \frac{1}{2}k_1[N_2O_5] = k_1[N_2O_5]$$

Choose the correct option

A. $k_1 = k_1 = k_1$

B. $k_1 = 2k_1 = k_1$

C. $2k_1 = k_1 = 4k_1$

D. $4k_1 = 2k_1 = k_1$

Answer: C

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153. For the reaction $R \rightarrow P$, graph of [R] against time is found to be a striaght line with negative slope. What is the order of reaction ?

A. Second order

B. Third order

C. First order

D. Zero order

Answer: D

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154. In a catalyst experiment involving the Haber process $N_2 + 3H_2 \rightarrow 2NH_3$, the rate of reaction was measured as

Rate $= \dfrac{\Delta[NH_3]}{\Delta t} = 2.0 \times 10^{-4} mol L^{-1} s^{-1}$

What is the rate of reaction expressed in terms of (a) N_2 (b) H_2 ?

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

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

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

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

Answer: A

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155. 10 g of a radioactive isotope is reduced to 1.25 g in 12 years. Therefore half-life period of the isotope is

A. 24 years

B. 4 years

C. 3 years

D. 8 years

Answer: B

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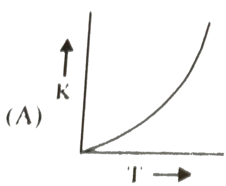
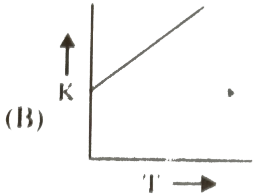
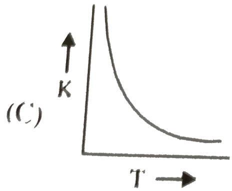
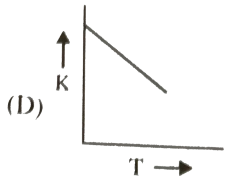
156. Plots showing the variation of the rate constant (k) with temperature (T) are given below. The plot that follows the Arrhenius equation is

A. 

B. 

C. 

D. 

Answer: A

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

A. $1/2$

B. $3/4$

C. $3/2$

D. $2/3$

Answer: D

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158. For first order reaction, the time taken to reduce tha initial concentration by a factor of $\frac{1}{4}$ is 20 minutes. The time required to reduce initial concentration by a factor of $1/10$ is.

A. 20 min

B. 10 min

C. 80 min

D. 40 min

Answer: D

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159. The initial rates of reaction $3A + 2B + C \rightarrow$ products at different initial concentration are given below

Initial rate, MS^{-1}	$\lvert A_0 \rvert M$	$\lvert B_0 \rvert M$	$\lvert C_0 \rvert M$
5.0×10^{-3}	0.010	0.005	0.010
5.0×10^{-3}	0.010	0.005	0.015
10×10^{-2}	0.010	0.010	0.010
1.25×10^{-2}	0.005	0.005	0.010

The order of reaction with respect to the reacts A, B and C are respectively.

A. 3,2,0

B. 3,2,1

C. 2,2,0

D. 2,1.0

Answer: D

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160. The activation energy for a reaction at temperature T K was found to be or $2.303\text{RT J mol}^{-1}$. The ratio of the rate constant to Arrhenius factor is

A. 10^{-1}

B. 10^{-2}

C. 2×10^{-3}

D. 2×10^{-2}

Answer: A

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161. Units of rate constant depend upon

A. rate of reaction

B. order of reaction

C. molecularity of reaction

D. all of the above

Answer: B

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

A. Order can be determined only experimentally

B. Order of reaction is the sum of powers of the concentration terms of reactants to express the rate of reaction

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

D. Order of reaction is always a whole number

Answer: D

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163. The rate of law for the reaction $xA + yB = mP + nQ$ is Rate $k[A]^c[B]^d$. What is the total order of reaction ?

A. $(x + y)$

B. $(m + n)$

C. $(c + d)$

D. (x/y)

Answer: B

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164. The rate of the reaction :

$2N_2O_5 \rightarrow 4NO_2 + O_2$ can be written in three ways.

$$\frac{1}{4}\frac{-d[N_2O_5]}{dt} = k[N_2O_5], \frac{d[NO_2]}{d} = k'[N_2O]\frac{d[NO_2]}{d} = k'[N_2O_5]$$

The relationship between K and K' and between K' and K' becomes

A. $K' = 2K, K'' = K'$

B. $K' = 2K, K'' = K/2$

C. $K' = 2K, K'' = 2K'$

D. $K' = K, K'' = K$

Answer: D

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165. Which one of the following is wrong about the molecularity of a reactions ?

A. It may be whole number of fractional

B. It is calculated from reaction mechanism

C. It is the number of molecules of the reactions taking parts is a single step chemical reaction

D. It is always equal to the order of elementary reaction

Answer: A

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166. 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. $1.73 \times 10^{-4} \mathrm{M/min}$

B. $3.47 \times 10^{-5} \mathrm{M/min}$

C. $3.47 \times 10^{-4} \mathrm{M/min}$

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

Answer: C

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167. When a catalyst increases the rate of a chemical reaction, the rate constant

A. remains constant

B. increase

C. decrease

D. may increase or decrease depending on the order of fraction

Answer: B

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168. The initial rate of hydrolysis of methyl acetate (1M) by a weak acid $(HA, 1M)$ is $1/100th$ of that of a strong acid $(HX, 1M)$, at $25^\circ C$. The $K_a(HA)$ is

A. 1×10^{-4}

B. 1×10^{-5}

C. 1×10^{-6}

D. 1×10^{-6}

Answer: A

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Selected Straight

1. The reaction rate of the reaction $H_2(g) + Br_2(g) \rightarrow 2HBr(g)$ is given by $r = k[H_2][Br_2]^{1/2}$

Which of the following statement/is/are true ?

A. Order of reaction is 2

B. Molecularity of reaction is 2

C. Order of reaction is 1.5

D. Molecularity of reaction is 1.5

Answer: B::C

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2. In acidic medium, the rate of reaction between $\left[BrO_3^-\right]$ and Br^- ions is given by the expression $-\frac{d\left[BrO_3^-\right]}{dt}=k\left[BrO_3^-\right]\left[Br^-\right]\left[H^+\right]^2$ It means

A. Rate constant for the reaction depends upon the concentration of H^+ ions

B. Rate of reaction is independent of the conc. Of acid added

C. The change in pH of the solution will affect the rate of reaction

D. doubling the conc. Of H^+ ions will increase the reaction rate by 4 times

Answer: C::D

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3. Which of the following is/are correct for reactions of first order ?

A. $A = \frac{1}{t}\ln(C_0 / C_t)$

B. $t = \frac{2.303}{k}\log[a / (a - x)]$

C. $[A]_0 = [A]e^{-kt}$

D. $t_{1/2} = (ln2) / k$

Answer: A::B::D

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4. Which of the following theory is/are not related to the chemical kinetics ?

A. Maxwell's theory

B. Transition theory

C. Absolute reaction rate theory

D. Ostwald's theory

Answer: A::D

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5. For a first order reaction with rate constant 'k' and initial concentration 'a', the half-life period is given by

A. $\frac{ln2}{k}$

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

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

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

Answer: A::C

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6. For a zero order reaction

A. The time taken for half the reaction to complete is inversely proportional to its rate constant

B. The time taken for half-change is directly proportional to its initial concentration

C. The time taken independent of initial concentration

D. There is no effect on the rate of reaction if concentration of reactants is doubled.

Answer: A::B::D

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7. Which of the following is/are wrong ?

A. A catalyst initiates a reaction

B. A catalyst lowers the activation energy of a reaction

C. A catalyst affects the enthalpy change of the reaction

D. A catalyst does not affect the speed of backward reaction

Answer: A::C::D

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8. The rate constant of a reaction is given by $k = 2.1 \times 10^{10} \exp(-2700/RT)$. It means that

A. $\log k vs 1/T$ will be a straight line with slope $= -\frac{2700}{2.303R}$

B. log vs 1/T will be a straight line with intercept on log k axis $= \log 2.1 \times 10^{10}$

C. The number of effective collisions are $2.1 \times 10^{10} \text{cm}^{-2} \text{sec}^{-1}$

D. Half-life of the reaction increases with increase of temperature

Answer: A::B

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9. Arrhenius equation may be represented as

A. $ln\frac{A}{k} = \frac{E_a}{RT}$

B. $\frac{dlnk}{dT} = \frac{E_a}{RT^2}$

C. $\log A = \log k + \frac{E_a}{2.303RT}$

D. $\log\left(-\frac{E_a}{RT}\right) = \frac{k}{A}$.

Answer: A::B::C

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10. In a pypothetical reaction $X \to Y$, the activation are 15 and 9kJ mol^{-1} respectively. The potential energy of X is 10kJ mol^{-1}

A. The threshold energy of the reaction is 25 kJ

B. The potential energy of Y is 16 kJ

C. Heat of reaction is 6 kJ

D. The reaction is endothermic

Answer: A::B::C::D

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11. Taking the reaction, $A + 2B \rightarrow$ Products to be of second order, which of the following is/are the correct rate law expresisons (s)?

A. $\frac{dx}{dt} = k[A][B]$

B. $\frac{dx}{dt} = k[A][B]^2$

C. $\frac{dx}{dt} = k[A]^2$

D. $\frac{dx}{dt} = k[A] + k[B]^2$

Answer: A::C

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12. Which of the following correctly represent/s the units of rate of reaction

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

B. L mol s^{-1}

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

D. atm s^{-1}

Answer: A::D

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13. Point out the correct statement/s

A. Rate law is an experimental fact whereas law of mass action is a theoretical proposal

B. Rate law is always different from the expression of law of mass action

C. Rate law is more informative than law of mass action for the development of mechanism

D. Order of a reaction is equal to the sum of powers of concentration terms in the rate law

Answer: A::C::D

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14. A catalyst

A. increases the average kinetic energy of the reacting molecules

B. decreases the activation energy

C. alters the reaction mechanism

D. increases the frequency of collision of reacting species.

Answer: B::C

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15. For a first order reaction,

A. the degree of dissociation is equal to $(1 - e^{-kt})$

B. a plot of reciproal concentration of the reactant vs time gives a straight line

C. the time taken for completion of 75 % of reaction is thrice the $t_{1/2}$ of the reaction

D. the pre-exoponential factor in the Arrhenius equation has the dimension of time T^{-1}

Answer: A::D

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16. The following statement (s) is/are correct

A. A plot of log k_p versus 1/T is linear

B. A plot of log [X] versus time in linear for a first order reaction, $X \rightarrow P$

C. A plot of log P versus 1/T is linear at constant volume

D. A plot of P versus 1/V is linear at constant pressure

Answer: A::B::D

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17. The specific rate constant of a first order reaction depends on the

A. concentration of the reactant

B. Concentration of the products

C. time

D. temperature

Answer: D

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18. A catalyst is a substance which

A. increases the equilibrium concentration of the product

B. changes the equilibrium constant of the reaction

C. shortens the time to reach equilibrium

D. supplies energy to the reaction

Answer: C

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19. A catalyst

A. increases the average kinetic energy of the reacting molecules

B. increases the activation energy

C. alters the reaction mechanism

D. increases the frequency of collision of reacting species.

Answer: C

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20. 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. doubled on doubling the concentration of sodium hydroxide

B. halved on reducing the concentration of ankyl halide to one half

C. decreased on increaseing the temperature of reaction

D. unaffected by increasing the temperature of the reaction

Answer: B

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21. The temperature coefficient of most of the reactions lies between

A. 1 and 3

B. 2 and 3

C. 1 and 4

D. 2 and 4

Answer: B

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22. 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 than ΔH

B. zero

C. more than ΔH

D. equal to ΔH

Answer: C

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23. The rate constant, the activation energy, and the Arrhenius parameter of a chemical reaction at $25^{\circ} C$ are

$3.0 \times 10^{-4} S^{-1}, 104.4 KJmol^{-1},$ and $6.0 \times 10^{14} S^{-1},$ respectively. The value of the rate constant as $T \rightarrow \infty$ 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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24. The rate constant for the reaction:

$2N_2O_5 \rightarrow 4NO_2 + O_2$ is $3.0 \times 10^{-5} \sec^{-1}$. If the rate is $2.40 \times 10^{-5} M \sec^{-1}$, then the concentration of N_2O_5 (in M) is:`

A. 1.4

B. 1.2

C. 0.04

D. 0.8

Answer: D

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25. When two reactants, A and B are mixed to give products C and D, the reaction quotient Q, at the initial stages of the reaction.

A. is zero

B. decreases with time

C. is independent of time

D. increases with time

Answer: D

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26. If I is the intenisty of an absorbed light and c is the concentration of AB for the photochemical process. $AB + hv \rightarrow AB^*$, the rate of formation of AB^* is directly proportional to

A. C

B. I

C. I°

D. CI

Answer: D

Watch Video Solution

27. Conisder the chemical reaction

$N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$

The rate of this reaction can be expressed in terms of time derivatives of the concentration of $N_2(g), H_2(g)$, or $NH_3(g)$. Identify the correct relationship among the rate expresisons.

A. Rate $= \; - d/[N_2]/dt = \; - 1/3d[H_2]/dt$

$= 1/2d[NH_3]/dt$

B. Rate $= \; - d[N_2]/dt = \; - 3d[H_2]/dt$

$= 2d[NH_3]/dt$

C. Rate $= d[N_2]/dt = 1/4d[H_2]/t$

$= 1/2d[NH_3]/dt$

D. Rate $= \; - d[N_2]/dt = \; - d[H_2]/dt$

$= d[NH_3/dt$

Answer: A

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28. In a first order reaction, the concentration of the reactant decreases form 800mol dm^{-3} to 50mol dm^{-3} in $2 \times 10^4 s$. The rate constant of the reaction (in s^{-1}) is

A. 2×10^4

B. 3.45×10^{-5}

C. 1.386×10^{-4}

D. 2×10^{-4}

Answer: C

Watch Video Solution

29. 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. 1.73×10^{-4}M min

B. 3.47×10^{-5}M min

C. 3.47×10^{-4}M min

D. 1.73×10^{-5}M min

Answer: C

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30. Which of the following is incorrect about the order of reaction ?

A. It is calculated experimentally

B. It is sum of powers of concentrations in rate law expression

C. The order of reaction cannot be fractional

D. There is not necessarily a connection between order and stoichiometry of a reaction

Answer: C

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

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

In this equation, E_a represents:

A. the total energy of the reacting molecular at a temperature, T

B. the fraction of molecules with energy greatere than the activation energy of the reaction

C. the energy above which all the colliding molecules will react

D. the energy below which colliding molecules will not react.

Answer: C

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32. The following mechanism has been proposed for the reaction of NO with Br_2 to from NOBr.

$NO(g)+Br_2 \Leftrightarrow NOBr_2(g)$

$NOBr_2(g)+NO(g) \rightarrow 2NOBr(g)$

If the second step is the rate determining step, the order of the reaction with respect to NO(g) is

A. 3

B. 2

C. 1

D. 0

Answer: B

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

A. $\frac{ln2}{k}$

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

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

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

Answer: A

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34. 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. I only

B. II only

C. I and II both

D. neither I nor II

Answer: B

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35. If 60 % of a first order reaction was completed in 60 minutes, 50 % of the same reaction would be completed in approximately [log = 4 = 0.60, log 5 = 0.69].

A. 40 minutes

B. 50 minutes

C. 45 minutes

D. 60 minutes

Answer: C

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

A. 20

B. 300

C. 120

D. 280

Answer: A

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37. 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 increased by two times. The unit of rate constant for this reaction is :

A. s^{-1}

B. $\mathrm{L\,mol}^{-1} s^{-1}$

C. no unit

D. $\mathrm{mol\,L}^{-1} s^{-1}$

Answer: B

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38. Conisder a reaction $aG + bH \rightarrow$ Products. When concentration of both the reactants G and H is doubled, the rate increases eight times. However, when the concentration of G is doubled, keeping the concentration of H fixed, the rate is doubled. The overall order of reaction is

A. 0

B. 1

C. 2

D. 3

Answer: D

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39. Under the same reaction conditions, the intial concentration of $1.386 mol dm^{-3}$ of a substance becomes half in $40s$ and $20s$ theough first order and zero order kinetics, respectively.

The ratio (k_1 / k_0) of the rate constants for first order (k_1) and zero order (k_0) of the reaction is

A. $0.5 \text{ mol}^{-1}\text{dm}^3$

B. 0.1 mol dm^{-3}

C. 1.5mol dm^{-3}

D. $2.0 \text{ mol}^{-1}\text{dm}^{-3}$

Answer: A

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40. 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: B

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

A. 230.3 min

B. 22.03 min

C. 46.06 min

D. 460.6 min

Answer: C

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43. 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. 11 h

B. 4 h

C. 0.5 h

D. 0.25 h

Answer: D

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44. 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. I only

B. II only

C. Both I and II

D. Neither I and II

Answer: A

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45. 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. $1.25 \times 10^{-2} \text{mol L}^{-1} s^{-1}$ and $6.25 \times 10^{-3} \text{mol L}^{-1} s^{-1}$

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

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

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

Answer: C

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

Run	$[A]$	$[B]$ in M	Initial rate of formation 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. rate $= k[A][B]^2$

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

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

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

Answer: A

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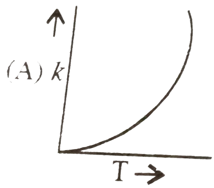
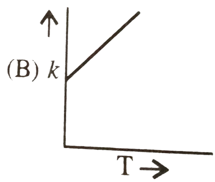
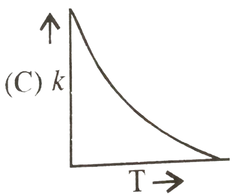
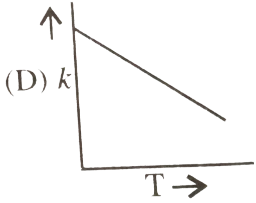
47. Plots showing the variation of the rate constant (k) with temperature (T) are given below. The plot that follows the Arrhenius equation is

A. 

B. 

C. 

D. 

Answer: A

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48. The rate of reaction:

$2NO + Cl_2 \rightarrow 2NOCl$ is given by the rate, equation rate $= k[NO]_2[Cl_2]$. The value of the rate constant can be increased by

A. increasing the temperature

B. increasing the concentration of NO

C. increasing the concentration Cl_2

D. doing all three

Answer: A

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49. 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. 24 times

B. 32 times

C. 64 times

D. 10 times

Answer: B

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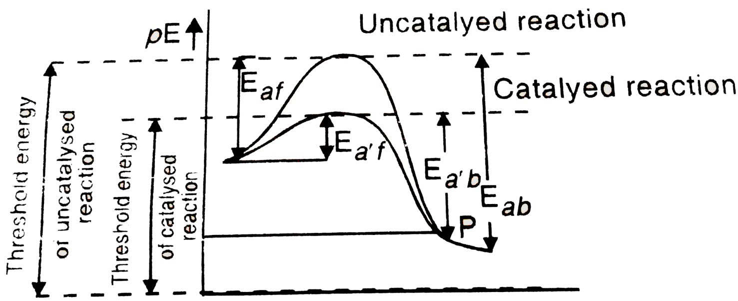
Comprehension

1. The energy profile diagrams are very important tool through which, we predict lot of things, like the amount of activation energy of the catalysed and uncatalysed reaction as well as for the backward reaction and forward reaction. Thershold energy of the catalysed and uncatalysed reaction. The graphs representing the energy profile diagram for catalysed and uncatalysed reactions are given below :



The graph of the lower energy barrier is the energy profile diagram for the catalysed reaction adn of the higher barrier is the energy profile diagram of uncatalysed reaction.

From the graph, it is clear that E_{af} and E_{ab} are the activation energy of the respectively. E_{af} and E_{ab} are the activation energy of the catalysed forward and backward reaction respectvely

The reaction which occurs by absorption of heat is known as endothermic reaction and by release of heat is known as exothermic reaction

For exothermic reaction, ΔH is negative and for endothermic reaction, ΔH is positive

From Arrhenius equation, we know that $k = Ae^{-E_a/RT}$ where k is rate constant which signifies effective number of collisions. A is known as Arrehnius constant, or maximum rate constant of frequency factor which signifies maximum number of collisions with proper orientation of reacting species per mole per second.

The catalysed reaction occurs at 500 K and the uncatalysed reaction occurs at 800 K in such way so that the rate of catalysed reaction and uncatalysed reaction becomes equal as well as the catalyst lower down the energy barrier by 60 J.

Answer the following questions on the basis of above paragraph

What will be the value of activation energy with respect to the uncatalysed reaction ?

A. 120 J

B. 100 J

C. 130 J

D. 160 J

Answer: D

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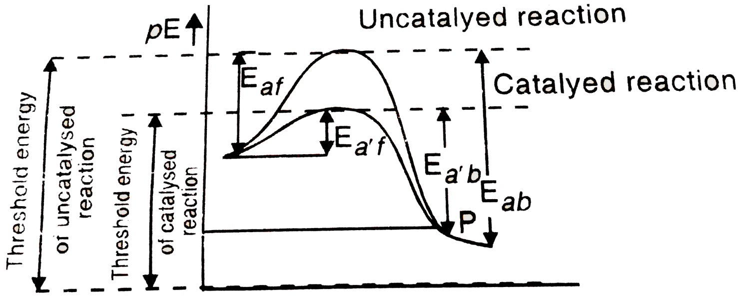
2. The energy profile diagrams are very important tool through which, we predict lot of things, like the amount of activation energy of the catalysed and uncatalysed reaction as well as for the backward reaction and forward reaction. Thershold energy of the catalysed and uncatalysed reaction. The graphs representing the energy profile diagram for catalysed and uncatalysed reactions are given below :



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Answer the following questions on the basis of above paragraph

From the given above information what will be the threshold energy for the uncatalysed reaction, if the normal energy of the reactant is 40 J.

A. 90 J

B. 120 J

C. 170 J

D. 200 J

Answer: D

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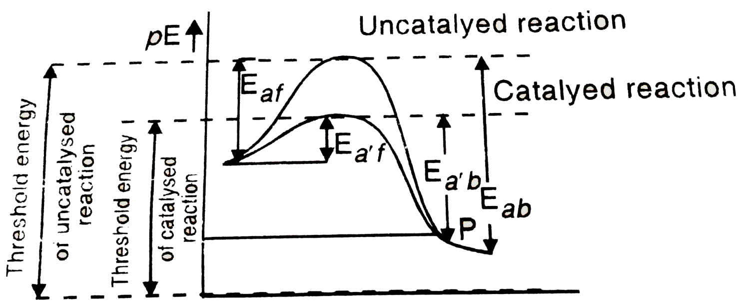

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Answer the following questions on the basis of above paragraph

From the given above information, what will be threshold energy for the catalysed reaction. If the normal energy of the reactant is 40 J

A. 170 J

B. 200 J

C. 140 J

D. 180 J

Answer: C

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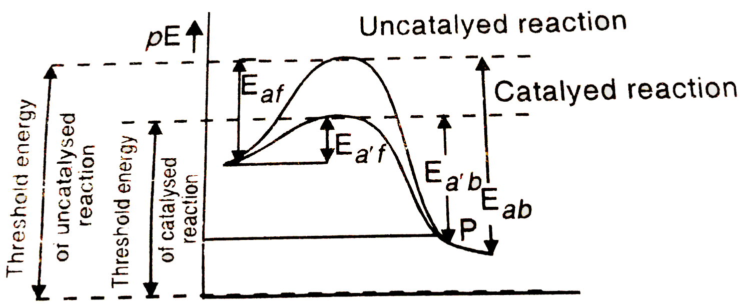
4. The energy profile diagrams are very important tool through which, we predict lot of things, like the amount of activation energy of the catalysed and uncatalysed reaction as well as for the backward reaction and forward reaction. Thershold energy of the catalysed and uncatalysed reaction. The graphs representing the energy profile diagram for catalysed and uncatalysed reactions are given below :



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Answer the following questions on the basis of above paragraph

From the above information given inthe compreshension, if the normal energy of the reactant is 50 J and that of the product is 20 J. then what will be the activation energy of the uncatalysed backward reaction ?

A. 170 J

B. 180 J

C. 160 J

D. 190 J

Answer: D

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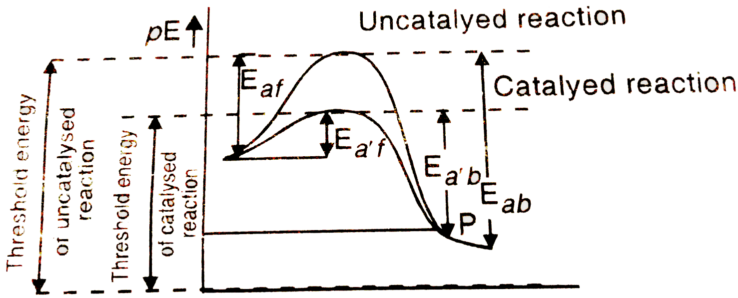
5. The energy profile diagrams are very important tool through which, we predict lot of things, like the amount of activation energy of the catalysed and uncatalysed reaction as well as for the backward reaction and forward reaction. Thershold energy of the catalysed and uncatalysed reaction. The graphs representing the energy profile diagram for catalysed and uncatalysed reactions are given below :



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Answer the following questions on the basis of above paragraph

From the above information givenin comprehension as well as from question no. 4, what will be the value of activation energy of the calalysed backward reaction ?

A. 150 J

B. 130 J

C. 160 J

D. 190 J

Answer: B

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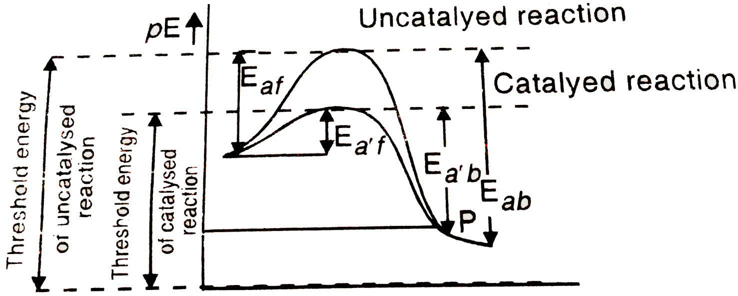
6. The energy profile diagrams are very important tool through which, we predict lot of things, like the amount of activation energy of the catalysed and uncatalysed reaction as well as for the backward reaction and forward reaction. Thershold energy of the catalysed and uncatalysed reaction. The graphs representing the energy profile diagram for catalysed and uncatalysed reactions are given below :



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For exothermic reaction, ΔH is negative and for endothermic reaction, ΔH is positive

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The catalysed reaction occurs at 500 K and the uncatalysed reaction occurs at 800 K in such way so that the rate of catalysed reaction and uncatalysed reaction becomes equal as well as the catalyst lower down the energy barrier by 60 J.

Answer the following questions on the basis of above paragraph

On the basis of question no. 4, what will be the value of threshold energy of the uncatalysed reaction ?

A. 180 J

B. 210 J

C. 170 J

D. 190 J

Answer: B

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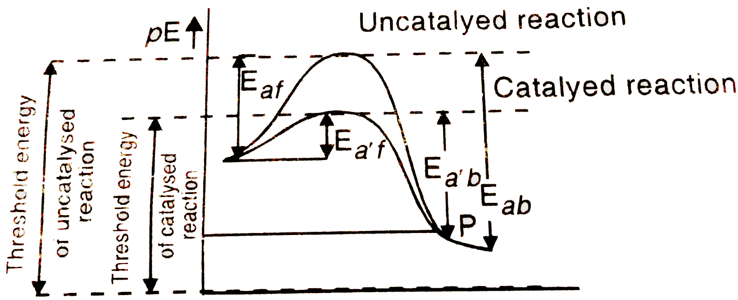
7. The energy profile diagrams are very important tool through which, we predict lot of things, like the amount of activation energy of the catalysed and uncatalysed reaction as well as for the backward reaction and forward reaction. Thershold energy of the catalysed and uncatalysed reaction. The graphs representing the energy profile diagram for catalysed and uncatalysed reactions are given below :



The graph of the lower energy barrier is the energy profile diagram for the catalysed reaction adn of the higher barrier is the energy profile diagram of uncatalysed reaction.

From the graph, it is clear that E_{af} and E_{ab} are the activation energy of the respectively. E_{af} and E_{ab} are the activation energy of the catalysed forward and backward reaction respectvely

The reaction which occurs by absorption of heat is known as endothermic reaction and by release of heat is known as exothermic reaction

For exothermic reaction, ΔH is negative and for endothermic reaction, ΔH is positive

From Arrhenius equation, we know that $k = Ae^{-E_a/RT}$ where k is rate constant which signifies effective number of collisions. A is known as Arrehnius constant, or maximum rate constant of frequency factor which signifies maximum number of collisions with proper orientation of reacting species per mole per second.

The catalysed reaction occurs at 500 K and the uncatalysed reaction occurs at 800 K in such way so that the rate of catalysed reaction and uncatalysed reaction becomes equal as well as the catalyst lower down the energy barrier by 60 J.

Answer the following questions on the basis of above paragraph

On the basis of question no. 4 what will be the value of threshold energy of the catalysed reactions ?

A. 150 J

B. 190 J

C. 170 J

D. 200 J

Answer: A

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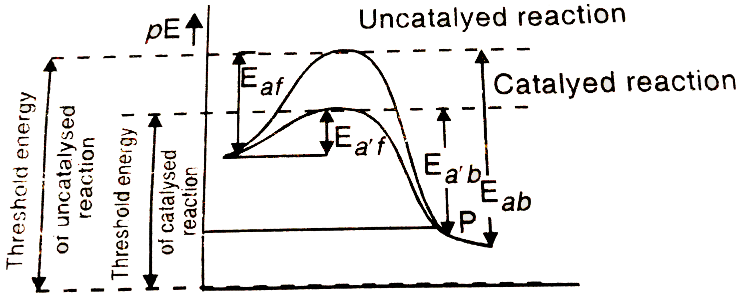
8. The energy profile diagrams are very important tool through which, we predict lot of things, like the amount of activation energy of the catalysed and uncatalysed reaction as well as for the backward reaction and forward reaction. Thershold energy of the catalysed and uncatalysed reaction. The graphs representing the energy profile diagram for catalysed and uncatalysed reactions are given below :



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Answer the following questions on the basis of above paragraph

Which of the following statement(s) is/are correct about the catalysed and uncatalysed reaction ?

A. For catalysed and uncatalysed reaction, ΔH of the reaction becomes same

B. At constant temperature, equilibrium for catalysed reaction and uncatalysed remains same

C. Even at constant temperatures the equilibrium constant of the catalysed and uncatalysed reactions are not same

D. Both (A) and (B)

Answer: D

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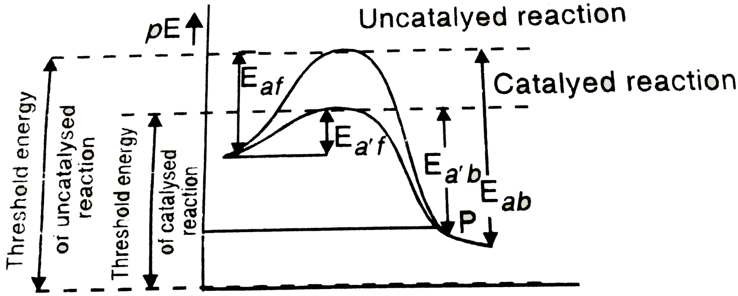

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Answer the following questions on the basis of above paragraph

Which of the following statement(s) is/are correct for the catalysed and uncatalysed reactions ?

A. At constant temperature, the ΔG° of the catalysed and uncatalysed reactions are same

B. Even at constant temperature the ΔG^{2} of the catalysed and uncatalysed and uncatalysed reaction are different

C. At constant temperature ΔG° of the catalysed and uncatalysed reaction ΔS (entropy change) are same

D. Both (A) and (B)

Answer: D

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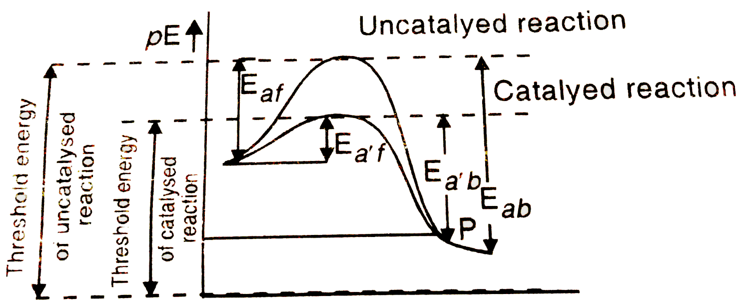
10. The energy profile diagrams are very important tool through which, we predict lot of things, like the amount of activation energy of the catalysed and uncatalysed reaction as well as for the backward reaction and forward reaction. Thershold energy of the catalysed and uncatalysed reaction. The graphs representing the energy profile diagram for catalysed and uncatalysed reactions are given below :



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The catalysed reaction occurs at 500 K and the uncatalysed reaction occurs at 800 K in such way so that the rate of catalysed reaction and uncatalysed reaction becomes equal as well as the catalyst lower down the energy barrier by 60 J.

Answer the following questions on the basis of above paragraph

What percentage fraction of the molecule will cross over the energy barrier at 2000 K temperature for 36.848 kJ activation energy ? (Given $\mathrm{R} = 8\ \mathrm{J\ mol^{-1} K^{-1}}$)

A. $10\ \%$

B. $20\ \%$

C. $90\ \%$

D. $80\ \%$

Answer: A

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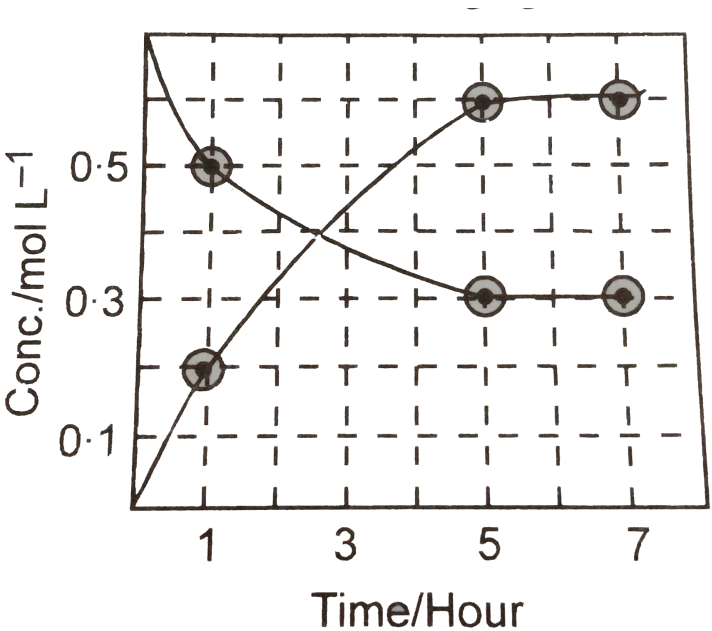
11. The process of the reaction $A \Leftrightarrow nB$ with time is represented in the fig, given below



The value of n is

A. 1

B. 2

C. 3

D. 1.5

Answer: B

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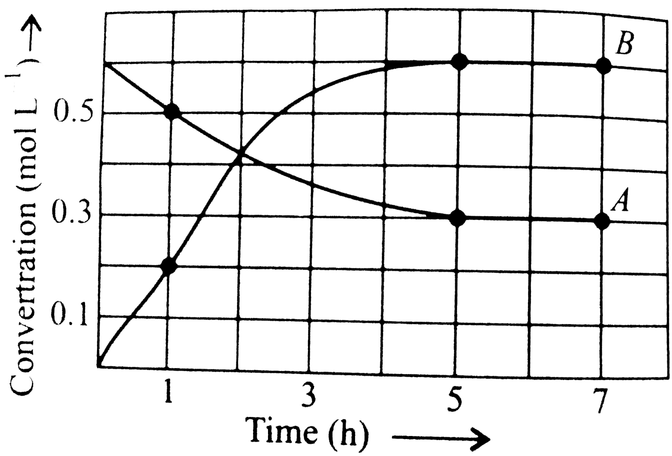
12. The progress of the reaction $A \Leftrightarrow nB$ with time is presented in the figure given below:



Determine

a. The value of n.

b. The equilibrium constant K.

c. The initial rate of concentration of A.

A. 2

B. 1.2

C. 0.5

D. 6.67

Answer: B

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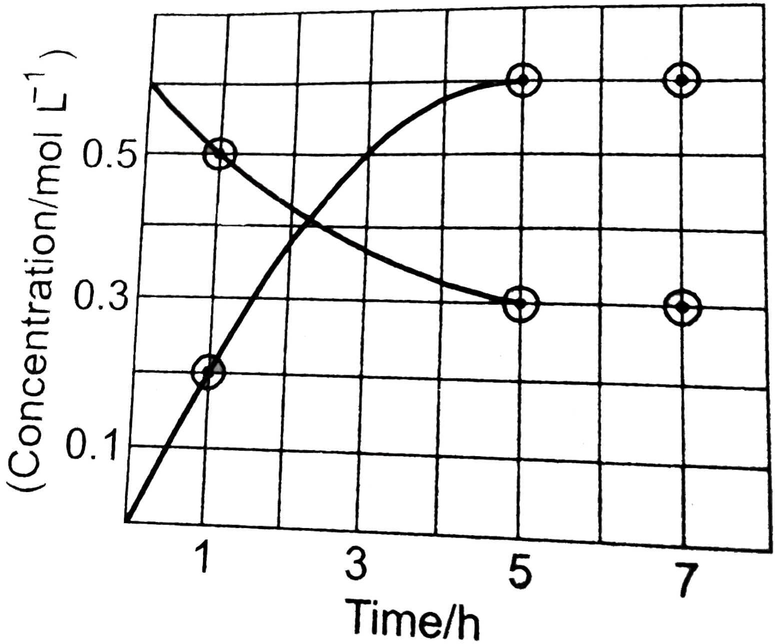
13. The progress of reaction

$A \Leftrightarrow nB$

with time, is represented in fig use given below.



Determine:

(i) the value of n

(ii) the equilibrium constant, K and

(iii) the initial rate of conversion of A

A. $0.1 \mathrm{mol\ L^{-1} hr^{-1}}$

B. $0.2 \mathrm{mol\ L^{-1} hr^{-1}}$

C. $0.4 \mathrm{mol\ L^{-1} hr^{-1}}$

D. $0.8 \mathrm{mol\ L^{-1} hr^{-1}}$

Answer: A

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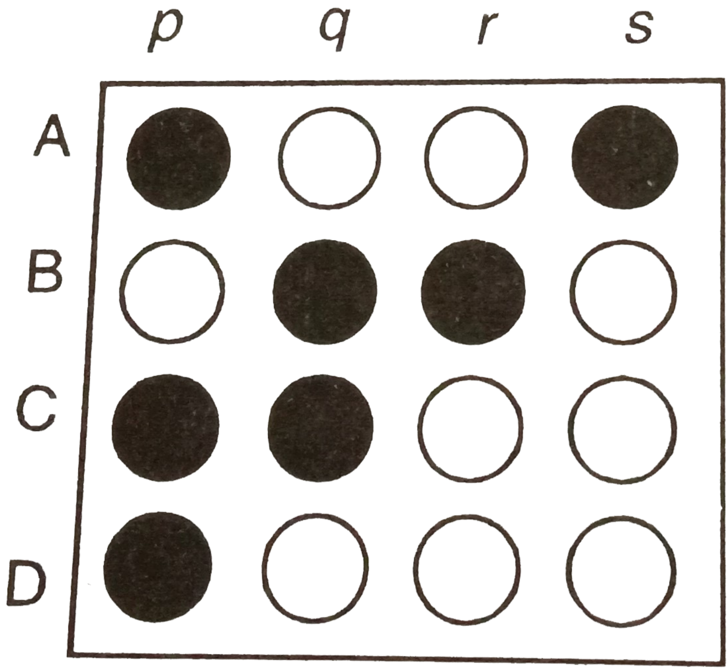
Matrix Match

1. Here each question contains statements are given in two columns which have to be matched. Statements in Column I are labelled as A,B,C and D whereas statements in Column II are labelled as p,q,r and s. The answer to these questions are to ne appropriately bubbled as illustrated below in the following example.

If the correct matches are $A-p, A-s, B-q, B-r, c-p, c-q,$ and $D-p$ then correctly labelled 4×4 matrix should look like



	Column-I		Column-II
(A)	Rate of reaction	p	mol $L^{-1}s^{-1}$
(B)	First order reaction	q	s^{-1}
(C)	Zero order reaction	r	$mol^{-1}L\,s^{-1}$
(D)	second order reaction	s	Decomposition of H_2O_2

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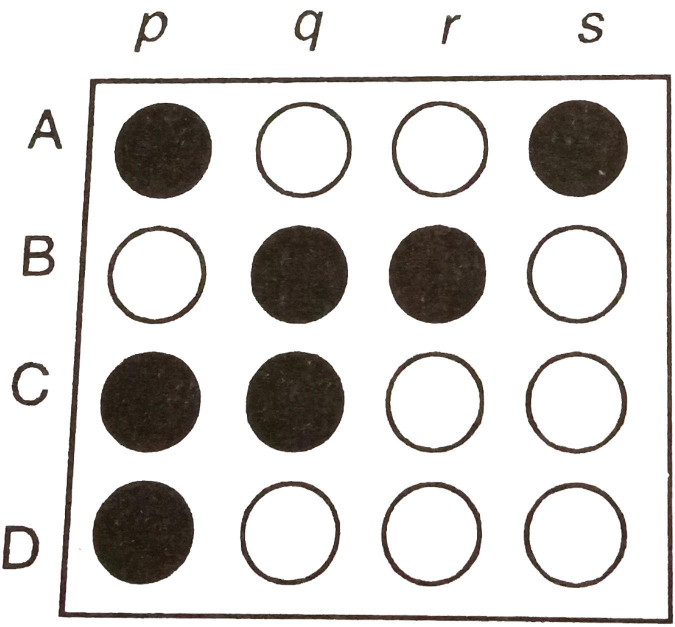
2. Here each question contains statements are given in two columns which have to be matched. Statements in Column I are labelled as A,B,C and D whereas statements in Column II are labelled as p,q,r and s. The answer to these questions are to ne appropriately bubbled as illustrated below in the following example.

If the correct matches are $A - p, A - s, B - q, B - r, c - p, c - q,$ and $D - p$ then correctly labelled 4×4 matrix should look like



	Column-I		Column-II
(A)	Activation energy	p	$H_P = H_R$
(B)	Threshold energy	q	Height of the barrier
(C)	Heat of reaction	r	Negative for exothermic reaction
(D)	Role of catalyst	s	Activated complex

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Integer

1. The concentration of R in the reaction $R \rightarrow P$ was measured as a function of time and the following data were obtained. What is the order of the reaction?

$[R](mol)$	1.0	0.75	0.40	0.10
$T(\min)$	0.0	0.05	0.12	0.18

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2. An organic compound undergoes first decompoistion. The time taken for its decompoistion to $1/8$ and $1/10$ of its initial concentration are $t_{1/8}$ and $t_{1/10}$, respectively. What is the value of $\frac{[t_{1/8}]}{[t_{1/10}]} \times 10?$ $(\log_{10} 2 = 0.3)$

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3. The answer to each of the following questions is a single digit integer, ranging from 0 to 9. If the correct answer to the question numbers A,B,C and D (say) are 4,0,9, and 2 respectively. Then the correct darkening of bubbles should be as shown on the slide.

If the temperature of a reaction is increased from $20^\circ C$ to $50^\circ C$ the rate of reaction will become.....times.

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4. The answer to each of the following questions is a single digit integer, ranging from 0 to 9. If the correct answer to the question numbers A,B,C and D (say) are 4,0,9, and 2 respectively. Then the correct darkening of bubbles should be as shown on the slide.

For a first order reaction, the number of half lives required for the initial concentration of the reactant to fall to 3.125% if its initial concentration.....

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Assertion or Reason

1. Assertion (A) : The molecularity of the reaction

$H_2 + Br_2 \rightarrow 2HBr$ is 2.

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

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is not a correct explanation of A

C. A is true but R is false

D. A is false but R is true

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2. Assertion (A) : In a reaction $A \rightarrow$ Products, the concentratiton of the reactant is reduced to zero after a finite time

Reason (R) : The order of reaction is zero.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is not a correct explanation of A

C. A is true but R is false

D. A is false but R is true

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3. Assertion (A) : The order a reaction can have a fractional value

Reason (R) : The molecularity of a reaction can have a fractional value.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is not a correct explanation of A

C. A is true but R is false

D. A is false but R is true

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4. Assertion (A) : Acid catalysed hydrolysis of ethyl acetate is a first order reaction

Reason (R) : Water does not take part in the reaction.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is not a correct explanation of A

C. A is true but R is false

D. A is false but R is true

Answer: C

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5. Assertion (A) : Rate of reaction increases with temperature.

Reason (R) : Number of collisions increases with temperature.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is not a correct explanation of A

C. A is true but R is false

D. A is false but R is true

Answer: B

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6. Assertion (A) : Catalyst increases the rate of a reaction

Reason (R) : It lowers the threshold energy of the reaction.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is not a correct explanation of A

C. A is true but R is false

D. A is false but R is true

Answer: A

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7. Assertion (A) : Molecularity of inversion of sugar is one

The order of this reaction is one.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is not a correct explanation of A

C. A is true but R is false

D. A is false but R is true

Answer: D

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8. Assertion (A) : Reaction of CO with O_2 is slower than that between NO and O_2

Reason (R) : E_{act} for the first reaction is higher than that of the second reaction.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is not a correct explanation of A

C. A is true but R is false

D. A is false but R is true

Answer: A

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9. Assertion (A) : In a reversible endothermic reaction, E_{act} of the forward reaction is higher than that of the backward reaction

Reason (R) : The threshold energy of the forward reaction is more than that of the backward reaction.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is not a correct explanation of A

C. A is true but R is false

D. A is false but R is true

Answer: C

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10. Assertion (A) : The order of a reaction can have fractional value

Reason (R) : The order of a reaction cannot be written from balanced equation of a reaction.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is not a correct explanation of A

C. A is true but R is false

D. A is false but R is true

Answer: B

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11. Assertion (A) : In zero order reaction, the concenration of reactants is reduced to zero after its half life.

Reason (R) : The concentration-time graph for zero order reactions is a straight line.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is not a correct explanation of A

C. A is true but R is false

D. A is false but R is true

Answer: D

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12. Assertion (A) : Many of photochemical changes have positive sign of ΔG, yet they are spontaneous

Reason (R) : The activation energy in photochemical reaction is provided by light energy.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is not a correct explanation of A

C. A is true but R is false

D. A is false but R is true

Answer: B

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13. Assertion(A): A catalyst speed up a reaction but does not participate in its mechanism.

Reason(R): A catalyst provides an alternative path of lower activation energy to the reactants.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is not a correct explanation of A

C. A is true but R is false

D. A is false but R is true

Answer: D

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14. Assertion (A) : The molecularity of a reaction may be a fraction

Reason (R) : The molecularity of a reaction is the number of molecules whether of the same or different species that must contact simultaneously in a single step for the reaction to occur.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is not a correct explanation of A

C. A is true but R is false

D. A is false but R is true

Answer: D

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15. Assertion (A) : The multi molecular reactions are quite rare in comparision with biomolecular reactions

Reason (R) : At normal pressure, triple collisions are much less frequent than double ones.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is not a correct explanation of A

C. A is true but R is false

D. A is false but R is true

Answer: A

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16. Assertion (A) : The order of a reaction may be defined as the sum of the powers to which the concentration terms are raised in order to determine the rate of reaction gives the total order of reactions.

Reason (R) : The number of molecules whose concentrations determine the ratio of reaction at a given temperature is called order to the reaction.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is not a correct explanation of A

C. A is true but R is false

D. A is false but R is true

Answer: A

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17. Assertion (A) : The order of the reaction $2NO(g) + 2H_2(g) \rightarrow 2H_2O(g) + N_2(g)$ is 3.

Reason (R) : Order of reaction with respect to a given reactant the power of the reactant's concentration in the rate equation.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is not a correct explanation of A

C. A is true but R is false

D. A is false but R is true

Answer: A

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18. Assertion (A) : A catalyst provides an alternative path to the reaction in which conversion of reactants into products takes place quickly

Reason (R) : The catalyst forms an activated complex of lower potential energy with the reactants.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is not a correct explanation of A

C. A is true but R is false

D. A is false but R is true

Answer: A

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19. Assertion (A) : Catalyst alters the individual energies of the reactants and products

Reason (R) : As such more number of molecules are able to cross the barrier per unit time.

ΔH or ΔU of the reaction remains unaltered.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is not a correct explanation of A

C. A is true but R is false

D. A is false but R is true

Answer: D

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20. Assertion (A) : Photochemical reactions always occur in the presence of light.

Reason (R) : Photochemical reactions do not require activation energy.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is not a correct explanation of A

C. A is true but R is false

D. A is false but R is true

Answer: C

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1. The general expression for half life period of an nth order reaction

$$t_{1/2} = \frac{2^{n-1} - 1}{k(n-1)a^{n-1}}$$ is

A. valid for all reactions

B. not valid for fractional or negative order reactions

C. not valid for first order reactions

D. not valid for zero order reaction

Answer: C

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2. The general expression for rate constant k for an nth order reaction

$$k = \frac{1}{(n-1)t}\left[\frac{1}{[A]^{n-1}} - \frac{1}{[A]_0^{n-1}}\right]$$ is

A. valid for zero order reaction

B. not valid for first order reaction

C. not valid for zero order reaction

D. not valid for negative/fractional order reaction

Answer: B

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3. Which of the following will react faster (i.e., produce more product more product in a given time) and will react at the highest rate ?

(i) 1 mol of A and 1 mol of B in a 1 L flask

(ii) 2 mol of A and 2 mol of B in a 2 L flask

(iii) 0.2 mol of A and 0.2 mol of B in a 0.1 L flask

A. Fastest and highest rate (iii)

B. Fastest (iii) and highest rate (ii)

C. Fastest (ii) and highest rate (iii)

D. Fastest and highest rate (ii)

Answer: C

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4. The hydrolysis of methyl acetate in alkaline solution $CH_3COOH_3 + OH^- \rightarrow CH_3COO^- + CH_3OH$ followed rate $= k[CH_3COOCH_3][OH^-]$ where $k = 0.137$ L $\text{mol}^{-1}s^{-1}$ at 298 K A reaction mixture was prepared to have initial concentrations of methyl acetate and OH^- of 0.050 M each The time taken for $5.0\,\%$ of the methyl acetate to be hydrolysed at 298 K is (assume that there is no change in the rate during this interval)

A. $7.4s$

B. $4.7s$

C. 4.7 min

D. 0.47 min

Answer: A

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5. A viral preparation was inactivated in a chemical bath. The inactivated in a chemical bath. The inactivation process was found to the first order in virus concentration and at the beginning of the experiment 2.0% of the virus was found to be inactivated per minute The k for the inactivated per minute The k for the inactivated process is (assume that there is no change in rate in the interval)

A. $2.00 \times 10^{-2} s^{-1}$

B. $3.3 \times 10^{-4} s^{-1}$

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

D. $3.0 \times 10^{-1} s^{-1}$

Answer: B

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6. If initial concentration of ethyl acetate is 0.50 M it is hydrolysed with dilute mineral acid in such a way that the reaction is almost (90%) complete at equilibriu The final concentration of water in the reaction mixture is

A. 0.45 M

B. 45 M

C. 55.05 M

D. Cannot be determined

Answer: C

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7. The hypothetical reaction $A + B \rightarrow C$ is first order with respect to each reactant with $k = 1.0 \times 10^{-2}$ L $\text{mol}^{-1} s^{-1}$ if initial concentration of each reactant is 0.100 M the concentration of A after 100s is

A. 0.091 M

B. 1.0×10^{-3} M

C. 1.9×10^{-3} M

D. 9.1×10^{-3} M

Answer: A

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8. A certain reaction $A + B \rightarrow C$ is first order with respect to each reactant with $k = 1.0 \times 10^{-3}$ L s^{-1} If initial concentrations of A and B are 0.100 M and 0.200 M the concentration of A after 100 s is

A. 0.098 M

B. 0.199 M

C. 0.019 M

D. None of these

Answer: A

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9. The decomposition of N_2O into N_2 and O in the presence of gaseous argon follows second kinetics with

$$k = \left(5.0 \times 10^{11} \text{ L mol}^{-1} s^{-1}\right) e^{-29000K/T}$$

The energy of activation is

A. $2.9 \times 10^4 kJ\text{mol}^{-1}$

B. $2.41 \times 10^2 kJ\text{mol}^{-1}$

C. $1.45 \times 10^4 kJ\text{mol}^{-1}$

D. None of these

Answer: B

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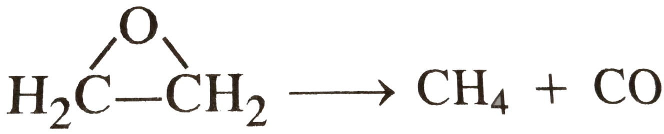
10. The rate constant for the first order decomposition of ethylene oxide into CH_4 and CO,



may be describe by

$$\log k(\text{in}s^{-1}) = 14.34 - \frac{1.25 \times 10^4 K}{T}$$

The activation energy of the reaction is

A. $4.8 \times 10^{-5} kJ\text{mol}^{-1}$

B. $4.8 \times 10^5 kJ\text{mol}^{-1}$

C. $2.39 \times 10^2 kJ\text{mol}^{-1}$

D. $2.39 \times 10^5 kJ\text{mol}^{-1}$

Answer: C

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11. A substance X decomposes in solution following the first order kinetics Flask (I) contains 500 mL of 1 M solution of X and flask (II) contains 1.5 L of 0.8 M solution of X After 5 hours concentration of X in flask (I) becomes 0.25 M what will be the time for concentration of X in flask (II) to become 0.4 M

A. 2.5 hours

B. 1.5 hours

C. 1.75 hours

D. unpredictable as rate constant is not given

Answer: A

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12. In a second order reaction, first order in each reactant A and B, which one of the following reactant mixtures will provide the highest initial rate?

A. 0.1 mol of X and 0.1 mol of Y in 0.2 L of solvent

B. 0.2 mol of X and 0.2 mol of Y in 0.1 L of solvent

C. 1.0 mol of X and 1.0 mol of Y in 1.0 L of solvent

D. 0.1 mol of X and 0.1 mol of Y in 0.1 L of solvent

Answer: B

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13. For a first order reaction, the ratio of time for the completion of 99.9% and half of the reaction is

A. 2

B. 4

C. 10

D. 8

Answer: C

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14. For the reaction $R \to P$ when concentration of R is made double the rate of reaction becomes 2.828 times the order of reaction is

A. 2.5

B. 1.5

C. 1.0

D. 2.0

Answer: B

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15. The chemical reaction $2O_3 \xrightarrow{k_1} 3O_2$ proceeds as follows:

$O_3 \overset{k_{eq}}{\Longleftrightarrow} O_2 + O$ (fast)

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

What should be the rate law expresison ?

A. $r = k[O_3]^2[O_2]^{-1}$

B. $r = k[O_3]^2$

C. $r = k[O_3][O_2]$

D. None of these

Answer: A

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16. The concentration of a reactant in solution falls from (i) 0.5 M to 0.25 M in 5 hourse and from (ii) 1.0 M to 0.25 M in 10 hours The order of reaction is

A. two

B. one

C. zero

D. $3/2$

Answer: B

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17. In a particular reaction $t_{1/2}$ was found to increase 16 times when initial concentration of the reactant was reduced to one fourth What is the order of the reaction ?

A. Zero

B. One

C. Two

D. Three

Answer: D

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18. For a zero order reaction a graph of conc. (along Y axis) and time (along X-axis) is linear with

A. a $+ve$ slope and a non - zero Y- intercept

B. a $-ve$ slope with a non - zero Y-intercept

C. a $+ve$ slope with a zero Y - interpt

D. a $-ve$ slopw with a zero Y-intercept

Answer: B

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19. The rate constant of a zero order reaction is 0.2 mol $dm^{-3}\text{min}^{-1}$ if the concentration of reactants after 30 minutes in 0.5 mol dm^{-3} then the initial concentration would be

A. 0.65 mol dm^{-3}

B. 65 mol dm^{-3}

C. 3.0 mol dm^{-3}

D. 6.5 mol dm^{-3}

Answer: D

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20. For a hypothetical reaction $R \rightarrow P$ the rate constant is $2944.06s^{-1}$ if the concentration of R is reduced to half then the value of rate constant is

A. $1472.03s^{-1}$

B. $2944.06s^{-1}$

C. $294.406s^{-1}$

D. $29.4406s^{-1}$

Answer: B

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21. For a zero order reaction a plot of rate (along Y-axis) and concentration (along X-axis) is

A. a rectangular parabola

B. a line with $-ve$ slope and zero Y - intercept

C. a line with $+ve$ slope and a non - zero Y- intercept

D. a line with zero slope and a positive Y-intercept

Answer: D

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22. At 373 k, the following reaction $A(g) \rightarrow 2B(g) + C(g)$ is found to be of first order. Starting with pure A, the total pressure at the end of 10 minutes was 176 mm Hg and after a long time when A was completely dissociated, it was 270 mm Hf. The pressure of A at the end of 10 minutes was

A. 94 mm Hg

B. 47 mm Hg

C. 43 mm Hg

D. 90 mm Hg

Answer: B

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23. A reaction has a rate constant of 0.25mol^{-1} L s^{-1} if the initial concentration of the reactant is 0.2 mol L^{-1} half life of the reaction is

A. 15 s

B. 10 s

C. 20 s

D. 50 s

Answer: C

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24. In a reversible reaction the rate of the backward reaction is

A. negative

B. positive

C. can be positive or negative

D. None of these

Answer: B

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25. Hydrolysis of amyl acetate was carried out separately in the presence of 0.02 M HCl and 0.02 M H_2SO_4 The rate constants were found to be k_1 and k_2 then

A. $k_1 = k_2$

B. $k_1 = 2k_2$

C. $k_2 = 2k_1$

D. $k_1 = 4k_2$

Answer: A

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26. When number of reactants are very large the method used to find the order of a reaction is

A. Half life method

B. Integrated rate equation method

C. Initial rate method

D. Ostwald isolation method

Answer: D

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27. Which of the following is not used to find the order of reaction ?

A. Graphical method

B. Ostwald dilution law method

C. Isolation method

D. Integrated method

Answer: B

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28. The branch of chemistry which deals with the study of very fast reaction is

A. kinetic chemistry

B. dynamic chemistry

C. high speed

D. femto chemistry

Answer: D

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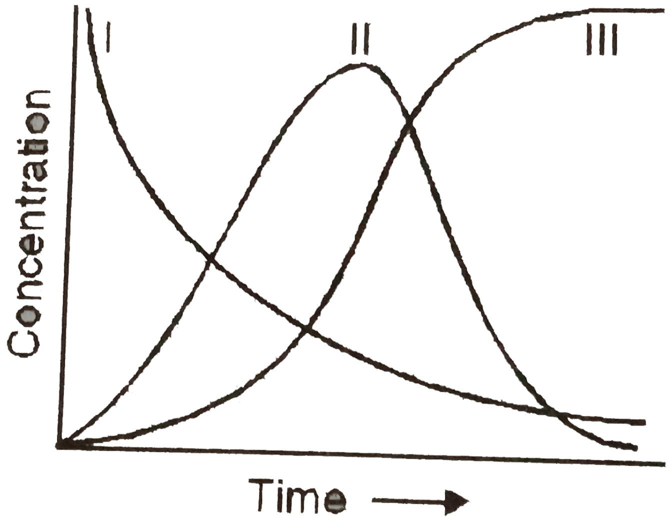
29. For the two step reaction in which both the steps are first order



$$R \xrightarrow{k_1} I$$

$$I \xrightarrow{k_2} P$$

the rate of change of concentration of I is given by the plot

A. I

B. II

C. III

D. None

Answer: B

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