CHEMISTRY

JEE (MAIN AND ADVANCED) CHEMISTRY

CHEMICAL KINETICS

LEVEL-1 (EXERCISE -I INTRODUCTION, RATE OF REACTION, FACTORS INFLUENCING RATE, SPECIFIC RATE:)

1. Which of the following reactions occurs at measurable rate?

A. reaction between H^+ and OH^- ions in aqueous solution

B. reaction between $AgNO_3$ and NaCl aqueous solutions

C. hydrolysis of methyl acetate

D. reaction between hydrogen and oxygen gases at room temperature

Answer: C

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2. Which of the following reaction is spontaneous at room temperature

A. $I_2 + H_2O \rightarrow HI + HIO$

B. $2H_2 + O_2 \xrightarrow{Pt} 2H_2O$

C. $N_2 + O_2 \rightarrow 2NO$

D. $2HC < oH_2 + Cl_2$

Answer: B

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3. Among the following slowest reaction under idetical conditions is

A. $H^+ + OH^- \rightarrow H_2O$

B. $2KnO_4 + 5H_2C_2O_4 + 3H_2SO_4 \rightarrow K_2SO_4 + 10CO_2 + 2MnSO_4 + 8H_2O$

C. $$2KMnO_4 + 10FeSO_4 + 8H_2SO_4 \rightarrow K_2SO_4 + 2MnSO_4 + 5Fe_2\left(SO_4\right)_3 + 8H$$

D. $AgNO_{3(aq)} + NaCl_{(aq)} \rightarrow AgCl_{(S)} + NaNO_{3(aq)}$

Answer: B

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4. The rate of a chemical reaction

A. increases as the reaction proceeds

B. decreases as the reaction proceeds

C. may increase or decrease during the reaction

D. remains constant as the reaction proceeds

Answer: B

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5. The rate of reaction for $N_2 + 3H_2 \rightarrow 2NH_3$ may be represented as

A. $r = -\frac{d[N_2]}{dt} = -\frac{1}{3}\frac{d[H_2]}{dt} = +\frac{1}{2}\frac{d[NH_3]}{dt}$

B. $r = -\frac{d[N_2]}{dt} = \frac{1}{3}\frac{d[H_2]}{dt} = +\frac{1}{2}\frac{d[NH_3]}{dt}$

C. $r = -\frac{d[N_2]}{dt} = -3\frac{d[H_2]}{dt} = +\frac{1}{2}\frac{d[NH_3]}{dt}$

D. $r = -\frac{d[N_2]}{dt} = -\frac{1}{3}\frac{d[H_2]}{dt} = +2\frac{d[NH_3]}{dt}$

Answer: A

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6. The chemical reaction occurring between covalent moleculse a involves

A. breaking of existing bonds

B. formation of new bonds

C. evolution heat energy

D. 1 & 2

Answer: D

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7. In a reaction $2A + b \rightarrow A_2B$ the reaction A will disappear at

A. half the rate at which B disppears

B. the same rate at which B disappears

C. the same rate at which A_2B is formed

D. twice the rate at which B disappears

Answer: D

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8. If the first order reaction involves gaseous reactant & 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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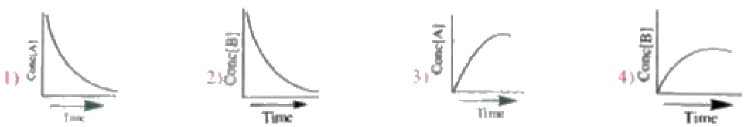
9. For the reaction $A \rightarrow B$ following curves represent conc. Vs time

The correct curves are



A. 1,2, only

B. 2,3, only

C. 1,4, only

D. 3,4, only

Answer: C

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10. The reaction $2NO + O_2 \rightarrow 2NO_2, 2CO + O_2 \rightarrow 2CO_2$ 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. The first reaction has higher activation energy than the second

Answer: C

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11. For $3A \rightarrow xB$, $\frac{d[B]}{dt}$ is found to be 2/3rd of $\frac{d[A]}{dt}$,. Then the value of x is

A. 1.5

B. 3

C. 44198

D. 2

Answer: D

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12. Burning of coal is reprsented 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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13. 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 partains to the decrease in the concentrations of reactant

C. negativesig indicates the attractive forces between reactants

D. all of the above are correct

Answer: B

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14. For the reaction $2HI \rightarrow H_2 + I_2$ the expression - $\frac{1}{2}\frac{d[HI]}{dt}$ 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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15. For a reaction $A \rightarrow 2B$, as time proceeds

A. $[A] \downarrow$ but $[B] \uparrow$

B. Rate of disappearance of $A \downarrow$ but that of rate of appearance of $B \uparrow$

C. Rate of disappearance of $A \uparrow$ but that of rate of appearance of $B \downarrow$

D. Rate with respect to A and B remain same

Answer: A

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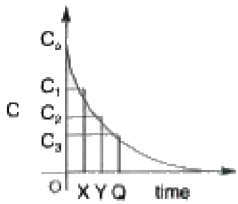
16. From the graph



X = 10 min;

Y = 20 min;

Q = 30 min

Now correct relationship is

A. $\dfrac{C_o - C_1}{X} = \dfrac{C_1 - C_2}{Y} = \dfrac{C_2 - C_3}{Q}$

B. $\dfrac{C_2 - C_3}{Q} > \dfrac{C_1 - C_2}{Y} > \dfrac{C_0 - C_1}{X}$

C. $\dfrac{C_0 - C_1}{X} > \dfrac{C_1 - C_2}{Y - X} > \dfrac{C_2 - C_3}{Q - Y}$

D. $\dfrac{C_1 - C_3}{Q - X} = \dfrac{C_0 - C_2}{Y}$

Answer: C

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17. At 298 K, atm among

A. $H_2 + O_2 \rightarrow 2H_2O$ B. $H_2 + Cl_2 \rightarrow 2HCl$

c. $N_2 + O_2 \rightarrow 2NO$ D. $H_2SO_4 + KOH \rightarrow K_2SO_4$ products, correct order of reaction rates is

A. $D > A > C > B$

B. $D < A < B < C$

C. $D > B > A > C$

D. $D > B = C > A$

Answer: C

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18. In which of the following cases, rate of disappearance of any reactant at a given instant equals to rate of appearance of any product

A. $H_2 + F_2 \rightarrow 2HF$

B. $N_2 + 3H_2 \rightarrow 2NH_3$

C. $PCl_5 \rightarrow PCl_3$

D. $H_2 + \frac{1}{2}O_2 \rightarrow H_2O$

Answer: C

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19. For $\frac{1}{2}X_2 + Y_2 \rightarrow XY_2$ relartive rates of species is given as

A. Rate $= \frac{-d[X_2]}{dt} = \frac{-d[Y_2]}{dt} = | \frac{d[XY_2]}{dt}$

B. Rate $= -2\frac{d[X_2]}{dt} = \frac{-d[Y_2]}{dt} = | \frac{d[XY_2]}{dt}$

C. Rate $= \frac{-1}{2}\frac{d[X_2]}{dt} = \frac{-d[Y_2]}{dt} = | \frac{d[XY_2]}{dt}$

D. Rate $= -\frac{1}{2}\frac{d[X_2]}{dt} = \frac{-d[Y_2]}{dt} = | \frac{d[XY_2]}{dt}$

Answer: B

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20. For $N_2 + 3H_2 \rightarrow 2NH_3$ rates of disappearance of N_2 and H_2 and rate of appearance of NH_3 respectively, are a,b and c then

A. $a > b > c$

B. $a < c < b$

C. $a = b > c$

D. $a = b = c$

Answer: B

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21. The reaction $CH_3COOC_2H_5 + H_2O \xrightarrow{H^+}$ products is a/an_____process

a. Instantantaneous B. Spontaneous C. Moderately slow

Then correct statement(s) is/are

A. A&C

B. B&C

C. A only

D. C only

Answer: B

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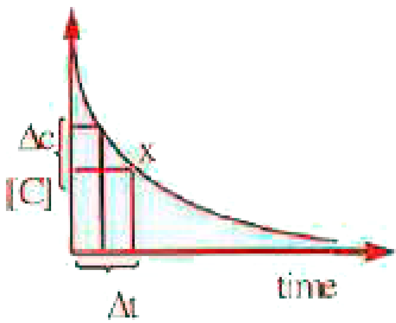
22. From the graph the value $\frac{\Delta c}{\Delta t}$ and the value of rate reaction at X respectively are called



A. Average rate and instantaneous rate

B. Instantaneous rate and average rate

C. Average rate only

D. Instantaneous rate only

Answer: A

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23. The rate of reaction which does not involve gases, does not depend upon

A. temperature

B. concentration

C. pressure

D. catalyst

Answer: C

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24. The specific rate constant of a reaction depends on the

A. concentration of the reactant

B. time

C. temperature

D. concentration of the product

Answer: C

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25. A catalyst accelerates the reaction, because

A. it brings the reactants closer

B. it lowers the activation energy

C. it changes the heat of reaction

D. it increases the activation energy

Answer: B

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26. The unit of rate constant depends on

A. number of reactants

B. concentration terms

C. order of reaction

D. moleclarity of reaction

Answer: C

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27. The temperature coefficient of a reaction is

A. the rate constant at a fixed temperature

B. the rato of rate constants at two temperatures

C. the ratio of rate constants at two different temperatures differing by $10\,^{\circ}C$

D. the ratio fo rate constants at two pressures

Answer: C

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28. If concentration of reactants is made x times the rate constant k becomes

A. $e^{k/x}$

B. k/x

C. unchanged

D. x/k

Answer: C

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

A. 1& 3

B. 2&3

C. 1&4

D. 2&4

Answer: B

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30. For a reaction $\frac{K_{(1+10)}}{K_{(1)}} = x$. When temperature is increased from $10^{\circ}C$ to $100^{\circ}C$ rate constnat (K) increased by a factor of 512. Then value of x is

A. 0.015

B. 0.025

C. 0.03

D. 0.02

Answer: D

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31. Increase of temperature will increase the reaction rate due to

A. increase of number of effective collisions

B. increase of mean free path

C. increase of number of molecules

D. increase of number of collisions

Answer: A

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32. The rate constants of a reaction at 300K and 280 K respectively are K_1 and K_2. Then

A. $k_1 = 20K_2$

B. $K_2 = 4K_1$

C. $K_1 = 4K_2$

D. $K_1 = 0.5K_2$

Answer: C

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33. The rate constant K_1 of a reaction is found to be double that of rate constant K_2 of another reaction. The relationship between corresponding activation energies of the two reactions E_1 and E_2 can be represented as

A. $E_1 > E_2$

B. $E_1 < E_2$

C. $E_1 = E_2$

D. $E_1 = 2E_2$

Answer: B

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34. The Arrhenius equation expressing the effect of temperature on the rate constant of reaction is

A. $K = Ea/RT$

B. $K = ae^{-Ea/RT}$

C. $K = \text{In}\frac{Ea}{RT}$

D. $K = e^{-Ea/RT}$

Answer: B

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35. Activation energy depends on

A. pressure

B. concentration of reactants

C. concentration of products

D. nature of reactants

Answer: D

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36. A catalyst in a chemical reaction does not change

A. Average energy of reactants or products

B. Enthalpy of the reaction

C. Activation energy of the reaction

D. Both 1 and 2

Answer: D

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37. In general the rate of a given reaction can be increased by all the factors except

A. Increasing the temperature

B. Increasing the concentration of reactants

C. Increasing the activation energy

D. Using a positive catalyst

Answer: C

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38. The effect of temperature on a reaction rate for whilch Ea is zero is give by

A. with increase of temperature rate increases

B. with increases of temperature rate decreases

C. rate is independent of temperature

D. reaction never occurs

Answer: C

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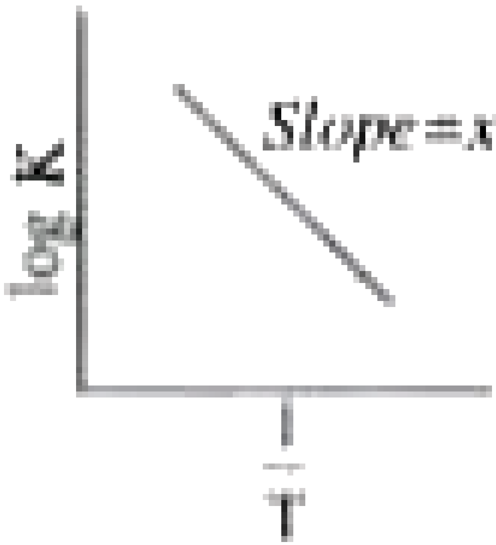
39. The graph of log K versus 1/T is given below. Here x is equal to

[Where K=rate constant and T=absolute temperature]



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

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

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

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

Answer: B

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40. In the graph drawn between log K and 1/T, intercept equalst o

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

B. $\log A$

C. InA

D. $(\log A)/2.303$

Answer: B

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41. In the Arrhenius equation equation,the Boltzmann factor $e^{Ea/RT}$ represents the..............of the molecules possessing energ in excess of activation energy

A. number

B. fraction

C. weight

D. percentage

Answer: B

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42. Rate constant of a reaction can be expressed by Arrhenius equation as $K = Ae(-E/R)$. In this equation, E represents

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

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

C. the energy below which colliding molecules will not react

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

Answer: C

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43. Activationenergies for different reactions are give below

a. $A \rightarrow$ products Ea=14K.Cal b. $B \rightarrow$ products, Ea=15K.cal

c. $C \rightarrow$ products, Ea=1K.Cal d. $D \rightarrow$ products, Ea=10K.cal

IF the temperature increases by $10^{\circ} C$ for which reactions the temperature coefficients $\left(\frac{k_1 + 10}{k_1}\right)$ are maximum and minimum respectively.

A. a&b

B. b&c

C. b&d

D. d&b

Answer: C

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44. Which of the following parameters of a chemical readtion are increased when a catalyst is used?

A. Rate and activation energy

B. Rate constnat and enthalpy

C. Enthalpy and time duration

D. Rate and Rate constant

Answer: D

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45. Which of the following influence the rate of reaction

a. Nature of reactants b. Concentration of rectants

c. Temperature D. Molecularity

A. A,B

B. B,c,D

C. C,D

D. A,B,C

Answer: D

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46. 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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47. The rate expression gives the relation between rate of reaction and

A. conc. Of reactants

B. conc.of products

C. rate constant

D. rate law

Answer: A

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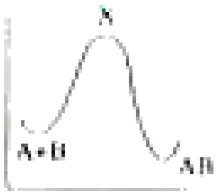
LEVEL-1 (EXERCISE -I COLLISION THEORY:)

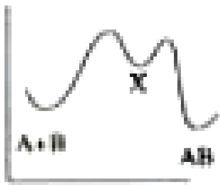
1. For an exothermic chemical process occurring in two steps as

(i) $A + B \rightarrow X$ (slow) (ii) $X \rightarrow AB$ (fast)

The progress of the reaction can be best described by



A.



B.

C.

D. All are correct

Answer: B

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2. The minimum energy required for molecules to enter into chemical reactionn is called

A. Kinetic energy

B. Potential energy

C. Threshold energy

D. Activation energy

Answer: D

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3. In a reaction, threshold energy is equal to

A. activation energy

B. normal energy of the reactants

C. activation energy + energy of reactants

D. activation energy - energy of reactants

Answer: C

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4. The value of activation energy for a chemical reaction primarily depends on

A. temperature

B. nature of the reacting species

C. the collision frequency

D. concentration of the reacting species

Answer: B

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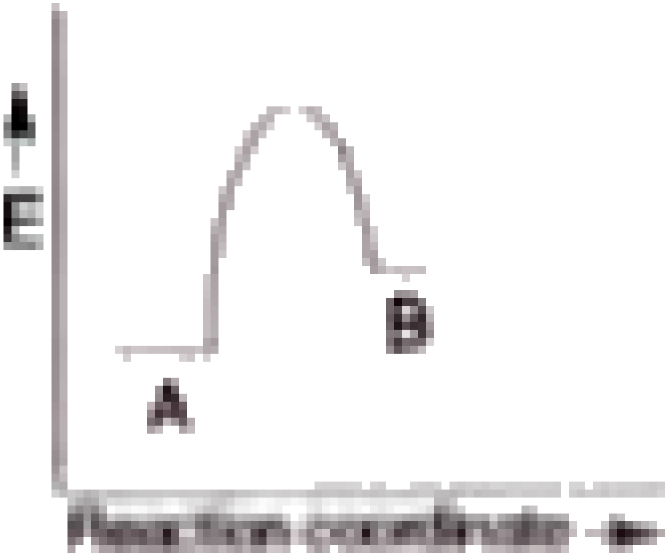
5. For a reversible reaction $A \Leftrightarrow B$ which one of the following statements is wrong from the given energy profile diamgram?



A. Activation energy of forward reaction is greater than that of backward reaction

B. The threshold energy is less than that of activation energy

C. The forward reaction is endothermic

D. Activation energy of forward reaction is equal to the sum of heat of reaction and the activation energy of backward reaction

Answer: B

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6. Wrong statement among the following is

A. effective collisions are more if activation energy is less

B. zero order reaction proceeds at a constant rate independent of concentrationor time

C. reactions with highest rate constant values have lowest activation energies

D. if initial concentration increases half life decreases in zero order

Answer: D

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7. For the reaction $A + B \Leftrightarrow C + D$, the forward reaction is exothermic. The activation energy of formation of A+B is ....that for the formation of $C + D$

A. equal to

B. less than

C. greater than

D. double

Answer: C

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8. Collision theory satisfactorily explains

A. First order reaction

B. Zero order reaction

C. Bimolecular reaction

D. Any order reactio

Answer: C

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9. According to collision theory of reaction rates, the activation energy is

A. the energy gained by the molecule on colliding with other molecules

B. the energy that molecule should possess in order to undergo reaction

C. the energy it should possess so that it can enter into an effective collision

D. the energy ithas to acquire so that it can enter into an effective collision

Answer: D

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10. Increase in the concentration of the reactants leads to the change in

A. heat of reaction

B. Activation energy

C. Collision frquency

D. Threshold energy

Answer: C

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11. The population of activated molecules can be increased by

A. increased in temperature

B. using a catalyst

C. increase of concentration of reactants

D. All

Answer: D

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12. Consider an endothermic reaction $X \rightarrow Y$ with the activation energies E_b and E_f for the backward and forward reactions, respectively. In general

A. $E_b < E_f$

B. $E_b > E_f$

C. $E_b = E_f$

D. no definite relation

Answer: A

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13. Which of the following expkains the increase of reaction rate by a catalyst?

A. Catalyst provides the necessary energy to the colliding molecules to cross the barrier

B. Catalyst decreases the rate of backward reacion so that the rate of forward reaction increases

C. Catalyst decreases the enthalpy change of the reaction

D. Catalyst provides an alternative path of lower activation energy

Answer: D

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14. An endothermic reactio $A \rightarrow B$ ha s an activation energy as $kKJ\text{mol}^{-1}$ of A. If energy change of the reaction is yKJ, the activation energy of the reverse reaction is

A. $-x$

B. $x - y$

C. $x + y$

D. $y - x$

Answer: B

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15. The plot of log k vs $\frac{1}{T}$ helps to calculate

A. Energy oif 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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16. The activation energy of a reaction can be determined by

A. chaning the concentration of reactants

B. evaluating rate constnat at standard temperature

C. evaluateing rate constants at two different temperatures

D. by doubling conc. Of reactants

Answer: C

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17. In the equilibrium reaction $A + B \Leftrightarrow C + D$, the activation energy for the forward reaction is 25 kcals mole^{-1} and that of backward reaction is 15 kcals mole^{-1}. Which one of the following statements is correct?

A. it is an exothermic process

B. it is an endothermic process

C. it is a reaction for which $\Delta H = 0$

D. it is a sublimation process

Answer: B

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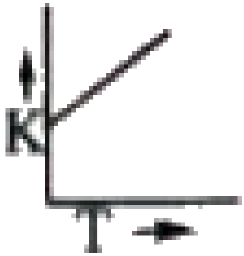
18. Plots showing the variation of the rate constant (k) with temperature (T) ar given below. The plot that follows arrhenius equation is

A.



B.

C.

D.

Answer: A

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LEVEL-1 (EXERCISE -I ORDER MOLECULARIT AND HALF LIFE:)

1. Which of the foloiwng is correct?

A. Molecularity of a reaction is always same as the order of reaction

B. IN some cases molecularity of the reaction is same as the order of reaction

C. Molecurlarity of the reaction is always more than order of reaction

D. Molecularity never be equal to order

Answer: B

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

A. units of k must be $\sec^{-1}$

B. value of k is independent of the initial concentrations 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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3. If the rate for the chemical reaction is expresssed at Rate =K[A][B]" then

A. order of reaction is one

B. order of reaction is n

C. order of reaction is 1+n

D. order of reaction is 1-n

Answer: C

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4. Which of the following statements is correct regarding order of reaction

A. first order reaction should be bimolecular

B. order of reaction must be positive

C. order depends upon stoichiometry

D. order is determined by experimental results

Answer: D

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5. If the rate of gaseous reaction is independent of pressure, the order of raction is

A. 0

B. 1

C. 2

D. 3

Answer: A

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6. For the reaction $H_2 + Br_2 \rightarrow 2HBr$, the rate expression is rate $= K[H_2][Br_2]^{1/2}$ which statement is true about this reaction

A. The reaction is of second order

B. Order of the reaction is $3/2$

C. The unit of is $\sec^{-1}$

D. Molecularity fo the fraction is 2

Answer: B

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7. For the following elementary step $(CH_3)_3CHr_{(aq)} \rightarrow (CH_3)C^{+}_{(aq)} + Br^{-}_{(aq)}$ the molecularity is

A. Zero

B. 1

C. 2

D. fractional

Answer: B

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8. The units of rate constant for the reaction obeying rate expression $r = k[A][B]^{2/3}$ is

A. $\text{mole}^{-2/3}\text{lig}^{2/3}\text{time}^{-1}$

B. $\text{mole}^{2/3}\text{lit}^{-2/3}\text{time}^{-1}$

C. $\text{mole}^{-5/3}\text{lit}^{5/3}\text{time}^{-1}$

D. $\text{mole}^{2/3}\text{lit}^{2/3}\text{time}^{-1}$

Answer: A

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9. Two gases A and B are in a container. The experimental rate law for the reaction between them has been found to be rate $= k[A]^2[B\}$. Predict the effect on the rate of the reaction when the partial pressure of each reactant is doubled.

A. the rate is doubled

B. rate becomes four times

C. the rate becomes six times

D. the rate becomes eight times

Answer: D

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10. In the following sequence of reactions $M \overset{K_1}{\rightarrow} N \overset{K_2}{\rightarrow} O \overset{K_3}{\rightarrow} P : K_1 < K_2 < K_3$ then the rate determining step is

A. $M \rightarrow N$

B. $N \rightarrow O$

C. $O \rightarrow P$

D. $M \rightarrow P$

Answer: A

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11. Taking the reaction $x + 2y \rightarrow$ producsts to be second order, which fo

the following is/are the rate law expression/for the reaction

I. $\frac{dx}{dt} = K[x][y]$ II. $\frac{dx}{dt} = K[x][y]^2$ III. $\frac{dx}{dt} = K[x]^2$ IV. $\frac{dx}{dt} = K[x] + K[y]^2$

Then the correct answers can b

A. I only

B. I and III only

C. I and I only

D. I and IV only

Answer: B

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12. ....of a reaction cannot be determined experimentally.

A. order

B. rate

C. rate constant

D. molecularity

Answer: D

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13. The rate expression for the reaction $A_{(g)} + B_{(g)} \rightarrow C_{(g)}$ is rate $= kC_A^2 C_B^{1/2}$ what changes in the initial concentrations of A and B will cause the rate of reaction to increase by a factor of eight?

A. $C_A \times 2, C_B \times 2$

B. $C_A \times 2, C_B \times 4$

C. $C_a \times 1, C_B \times 4$

D. $C_A \times 4, C_B \times 1$

Answer: B

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14. For a reaction $pA + qB \rightarrow$ products the rate law expression is $r = k[A]^1[B]^m$ then

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

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

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

D. $(p + q) \neq (1 + m)$

Answer: C

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15. For $H_2 + Cl_2 \xrightarrow{x} 2HCl$ rate law is given R=K. Then X is

A. Pt

B. Ni

C. hv

D. water

Answer: C

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16. If both $\frac{dc}{dt}$ & specific rate have same units then rate law is

A. $R = K[A]^2$

B. $R = K[A]^{1/2}$d

C. $R = K[A]^{-2}$

D. $R = K$

Answer: D

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17. For $A + B \rightarrow C + D$ when [A] alone is doubled rate gets doubled but when [B] alone is increased by 9 times rate gets tripled. Then orders of reaction is

A. 0.75

B. 1.5

C. 0.44444444444444

D. 2

Answer: B

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18. Rate law for $2A + B \rightarrow C + D$ from following data:

S.No.	$[A](M)$	$[B](M)$	Rate(M/s)
1	0.01	0.01	2.5
2	0.01	0.02	5
3.	0.03	0.02	45

A. $r = K[A]^{1/3[B]}$

B. $4 = K[A]^2[B]$

C. $r = K[A][B]^{1/3}$

D. $r = K[A]^{2/3}[B]^{1/3}$

Answer: B

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

(k=rate constant, r=rate of reaction , c=conc. Of reactat

A. $k = r \times c^2$

B. $k = r \times c$

C. $k = \frac{c}{r}$

D. $k = \frac{r}{c}$

Answer: D

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20. $\frac{dc}{dt}$ of a first order reaction depends on

A. time

B. concentration

C. temeprature

D. all

Answer: D

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21. Which of the following is correct for a first order reaction? (K=rate constant $t_{\frac{1}{2}} =$ half life)

A. $t_{1/2} = 0.693 \times K$

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

C. $k.\,t_{1/2} = 0.693$

D. $6.93 \times k \times t_{1/2} = 1$

Answer: C

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22. The half life for a given reaction was doubled as the initial concentration of the reaction was doubled. The order of the reactio is

A. Zero

B. 1st

C. 2nd

D. 3rd

Answer: A

Watch Video Solution

23. The inversion of cane sugar into glucose and fructose is

A. 1st order

B. 2nd order

C. 3rd order

D. zero order

Answer: A

Watch Video Solution

24. The half life of a first order reaction is

A. independent of the initial concentrationof the reactant

B. directly proportional to the initial concentra tion of the reactant

C. inversely proportional to the initial concentra tion of the reaction

D. directly proportional to the square of the initial concenration of the reactant.

Answer: A

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25. The hydrolysis of ester in the presence of alklai solution is a ....order reaction

A. 1

B. 2

C. 0

D. 3

Answer: B

Watch Video Solution

26. $CH_4 + Cl_2 \xrightarrow{hv} CH_3Cl + HCl$ the order of this reaction is

A. 0

B. 1

C. 2

D. 3

Answer: A

Watch Video Solution

27. $RCOOR + H_2O \xrightarrow{HCl} RCOOH + ROH$ follows..........reaction kinetics

A. 2nd order

B. unimolecular

C. pseudo unimolecular

D. zero order

Answer: C

Watch Video Solution

28. Order of a reaction is decided by

A. molecularity

B. law of mass action

C. performing experiment

D. Lechatlier principle

Answer: C

Watch Video Solution

29. $2A \rightarrow B + C$ would be a zero order reaction when rate of reaction

A. is directly proportiona [A]

B. is directly proportional $[A]^2$

C. is independent of change of [A]

D. is independent of [B] & [C]

Answer: C

Watch Video Solution

30. Which of the following is a first order reaction

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

B. $2H_2O_2 \rightarrow 2H_2O + O_2$

C. $CH_3COOC_2H_5 + H_2O \xrightarrow{H^+}$ products

D. All the above

Answer: D

Watch Video Solution

31. If a reaction obeys the following equation $k - \frac{2.303}{t}\log\frac{a}{a - x}$ the order of the reaction will be

A. zero

B. one

C. two

D. three

Answer: B

Watch Video Solution

32. The rate constant for a reaction is 2.05×10^{-5} mole $\text{lit}^{-1}.\ \text{sec}^{-1}$. The rection obeys ......order

A. First

B. Second

C. Zero

D. half

Answer: C

Watch Video Solution

33. A reaction involves two reactants. The rate of reaction is directly proportional to the concentration of one of them and inversely proportional to the concentration of the other. The overall order of reaction will be

A. One

B. Two

C. Zero

D. Fractional

Answer: C

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34. In the reaction of $aA + bB + cC \rightarrow$ Products,

(i) If concentration of A is doubled, keeping conc. Of B and C constant the rate of reaction becomes double.

(ii) If concentration of B is halved keeping conc. Of A and C constant, the rate of reaction remains unaffected

(iii) If concentration of C is made 1.5 times, the rate of reaction becomes 2.25 times.

The order of reaction is

A. 1

B. 2.5

C. 3

D. 3.5

Answer: C

Watch Video Solution

35. In the reaction $2A + B \rightarrow$ Products the order w.r.t A is found toi be 1 and w.r.t equal to 2. Concentration of A is doubled and that of B is halved, the rate of reaction will be

A. Doubled

B. Halved

C. Remain unaffected

D. Four times

Answer: B

Watch Video Solution

36. While studyging the decomposition of gaseous N_2O_5 it is observed that a plot of logarithmof its partial pressure versus time is linear.The kenetic parameter obtained from this observation is

A. Specific rate

B. Reaction rate

C. Enerlgy of activation

D. Molecularity

Answer: A

Watch Video Solution

37. The correct expression for the rate constant for reactions of zero order is

A. $k = [A_0]/2t$

B. $k = \frac{1}{4}\{[A_0] - [A]\}$

C. $k = \frac{1}{t}\{[A] - [A_0]\}$

D. $k = \frac{2.303}{t}\log\{[A_0] - [A]\}$

Answer: B

Watch Video Solution

38. If a is the initial concentration of the reactant, the time taken for completion of the reaction if it is of zero order will be

A. a/k

B. $a/2k$

C. $2a/k$

D. k/a

Answer: A

Watch Video Solution

39. The slowest step of a particular reaction is found to be $\frac{1}{2}X_2 + Y_2 \rightarrow XY_2$ the order of the reaction is

A. 2

B. 3

C. 5

D. 1.5

Answer: D

Watch Video Solution

40. For the reaction $A \rightarrow B$ the rate law expressions is rate $= K[A]$. Which of the following statements is incorrect?

A. The reactionn follows first order kinetics

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

C. K is constnat for the reaction at a constant temperature

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

Answer: B

Watch Video Solution

41. What are the units of the rate constant of a reaction in which the half life is doubled by halving the initial concentration of reactants.

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

B. $M^{-1}S^{-1}$

C. $\sec^{-1}$

D. $M^{-2}s^{-1}$

Answer: B

Watch Video Solution

42. Which of the following represents the expression for 3/4 th life of 1st order reaction

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

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

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

D. $K2.303\log 4$

Answer: C

Watch Video Solution

43. The formation of gas at the surface of tungsten due to adsorption is ------------------order reaction

A. 0

B. 1

C. 2

D. Insufficient data

Answer: A

Watch Video Solution

44. The rare law for a reaction between th substances A and B is given by Rate $= k[A]^m[B]^n$ 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 will be as

A. $(m+n)$

B. $(n-m)$

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

D. $\frac{1}{2^{(m+n)}}$

Answer: C

Watch Video Solution

Watch Video Solution

45. For the reaction $2NO(g) + O_2(g) \rightarrow 2NO_{2(g)}$ volume is suddenly reduced to half its value by increasing the pressure on it. If the reaction is of first order with respect to O_2 and second order with respect to NO, the rate of reaction will

A. diminish to one eighth of its initial value

B. increase to eight times of its initial value

C. increase to four tmes of its initial value

D. diminish to one fourth oif its initial value

Answer: B

Watch Video Solution

LEVEL-1 (EXERCISE -I ASSERTION REASON TYPE:)

1. A: Spontaeous reaction may be slow or fast.

R: Spontanteous nature deals with feasibility of the reaction but not rate.

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

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

C. A is true but R is false

D. A is false but R is true

Answer: A

Watch Video Solution

2. A: Rate of reaction increases with increasse in concentration of reactants.

R: Number of effective collisions increases with increase in concentration of reactants.

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

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

C. A is true but R is false

D. A is false but R is true

Answer: A

Watch Video Solution

3. A: Rate constant of a reaction at a particular temperature is constant

R: The value of rate constant K is indepdnent of initial concentration.

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

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

C. A is true but R is false

D. A is false but R is true

Answer: B

Watch Video Solution

4. A: Hydrolysis of an ester is a slow reaction

R: Reactions between covalent species involve breaking and making of bonds.

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

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

C. A is true but R is false

D. A is false but R is true

Answer: A

Watch Video Solution

5. A: As time passes the rate of non zero order reaction w.r.t reactant (or) products decreases.

R: Rat eof a reaction is directly proportional to $(\text{Concentration})^{\text{order}}$

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

B. Both A and R are true and R is not the 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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6. A: All collision lead to chemical reaction

R: Activated molecules bring about effective collisions

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

B. Both A and R are true and R is not the 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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7. A: Lesser the activation energy, greater is the rate of reaction

R: Activation energy of a reaction is independent of temperature

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

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

C. A is true but R is false

D. A is false but R is true

Answer: B

Watch Video Solution

8. A: Order of reaction is evaluated from the mechanism of a reaction

R: Order of reaction can be zero

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

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

C. A is true but R is false

D. A is false but R is true

Answer: D

Watch Video Solution

9. A: A catalyst increases the rate of a reaction.

R: In presence of a catalyst, the activation energy of the reaction increases.

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

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

C. A is true but R is false

D. A is false but R is true

Answer: C

Watch Video Solution

LEVEL-1 (EXERCISE -I MATCH THE FOLLOWING QUESTIONS:)

1.

Set-I	Set-II $\left(t_{\frac{1}{2}}\right)$
A) $H_2 + I_2 \rightarrow 2HI$	1) Independent of C_o
B) $2H_2O_2 \rightarrow 2H_2O + O_2$	2) Proportional to $[C_o]^{-1}$
C) $2NO + Cl_2 \rightarrow 2NOCl$	3) Proportional to $[C_o]^{1}$
D) $CH_4 + Cl_2 \xrightarrow{h\nu} CH_3Cl + HCl$	4) Proportional to $[C_o]^{-2}$
	5) Inversely proportional to $[C_o]^{-2}$

Correct match is

A. $\begin{matrix} A & B & C & D \\ 2 & 1 & 5 & 3 \end{matrix}$

B. $\begin{matrix} A & B & C & D \\ 2 & 1 & 4 & 5 \end{matrix}$

C. $\begin{matrix} A & B & C & D \\ 2 & 1 & 4 & 3 \end{matrix}$

D. $\begin{matrix} A & B & C & D \\ 1 & 2 & 3 & 5 \end{matrix}$

Answer: C

Watch Video Solution

Set-I (process)	Set-II (unit of K)
A) $2HI \xrightarrow{Au}$ products	1) Sec^{-1}
B) $SO_2Cl_2 \rightarrow$ products	2) $mol - ltr^{-1} - sec^{-1}$
C) $R_1COOR_2 + H_2O \xrightarrow{OH^-}$ products	3) $lit^2 - mol^{-2} - sec^{-1}$
D) $2NO + Cl_2 \rightarrow$ products	4) $lit - mol^{-1} - sec^{-1}$

2.

Correct match is

A. $\begin{array}{cccc} A & B & C & D \\ 1 & 2 & 3 & 4 \end{array}$

B. $\begin{array}{cccc} A & B & C & D \\ 4 & 2 & 3 & 1 \end{array}$

C. $\begin{array}{cccc} A & B & C & D \\ 2 & 1 & 4 & 3 \end{array}$

D. $\begin{array}{cccc} A & B & C & D \\ 2 & 4 & 3 & 1 \end{array}$

Answer: C

Watch Video Solution

LEVEL-1 (EXERCISE -II REACTION RATE, FACTORS INFLUENCING RATE, SPECIFIC RATE:)

1. Consider the following reaction $N_{2(g)} + 3H_{2(g)} \rightarrow 2NH_{3(g)}$. The rate of the reaction in terms in terms of N_2 at $T(k)$ is $-\frac{d[N_2]}{dt} = 0.02$ mole $\text{lit}^{-1}\text{sec}^{-1}$. What is the value of $-\frac{d[H_2]}{dt}$ (in mole $\text{lit}^{-1}\text{sec}^{-1}$) at the same temperature?

A. 0.02

B. 50

C. 0.06

D. 0.04

Answer: C

Watch Video Solution

2. What is the rate of the reaction for $2A \rightarrow B$

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

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

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

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

Answer: B

Watch Video Solution

3. For the reaction $4NH_3 + 5O_2 \rightarrow 4NO + 6H_2O$ the rate of reaction with respection with respect to NH_3 is $2 \times 10^{-3} Ms^{-1}$. Then the rate of the reaction with respect to oxygen is ______Ms^{-1}

A. 2×10^{-3}

B. 1.5×10^{-3}

C. 2.5×10^{-3}

D. 3×10^{-3}

Answer: A

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4. Concetration of a reactant A is changed from 0.044 M to 0.032 M in 25 minutes, the average rate of the reactio during this interval is

A. 0.0048 mole /lti/min

B. 0.00048 mole/lit/sec

C. 4.8×10^{-4} mole/lit/min

D. 0.0048 mole/lit/sec

Answer: C

Watch Video Solution

5. In the reaction $A \rightarrow 2B$ the concentration of a falls from 1.0M to 0.98 2M in one minute what is the rate of in moles $\text{litre}^{-1}\text{sec}^{-1}$

A. 1.8×10^{-3}

B. 3.0×10^{-5}

C. 3.6×10^{-3}

D. 6.0×10^{-5}

Answer: B

Watch Video Solution

6. The rate of formation of SO_3 in the reaction $2SO_2 + O_2 \rightarrow 2SO_3$ is 100 g min^{-1} Hence rate of disappearance of O_2 is

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

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

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

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

Answer: C

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7. $1dm^3$ of $2MCH_3COOH$ is mixed with $1dm^3$ of 3M 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

Watch Video Solution

8. An endothermic reaction $A \rightarrow B$ has an activatio energy 15 kaca/mole and the heat of reaction is 5kcal/mole. The activation energy of the reaction $B \rightarrow A$ is

A. 20 kcal/mole

B. 15 kcal/mole

C. 10 kcal/mole

D. zero

Answer: C

Watch Video Solution

9. The rate law of the reaction $RCl + NaOH \rightarrow ROH + NaCl$ is given by Rate =k[RCI]. The rate of this reaction

A. is doubled by doubling the concentration of NaOH

B. is halved by reducing the concentration of RCI to half

C. is increased by increasing the temprature of the reaction

D. is unaffected by changing in temperature

which is correct?

Answer: B

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10. The activation energy of a reaction is 58.3 kJ/mole. The ratio of the rate constnat at 205 K and 300 K is about (R=8.31$Jk^{-1}\text{mole}^{-1}$)(Antilog 0.1667=1.468)

A. 1.25

B. 1.75

C. 1.5

D. 2

Answer: C

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11. Decompositon of NH_3 on gold surface follows zero order kinetics. If rate constant is $5 \times 10^{-4} Ms^{-1}$, rate of formation of N_2 will be

A. $10^{-3} M - s^{-1}$

B. $2.5 \times 10^{-4} M - s^{-1}$

C. $5 \times 10^{-4} M - s^{-1}$

D. Zero

Answer: C

Watch Video Solution

12. For $X \rightarrow Y \frac{k_{t+10}}{k_t} = 3$. If the rate constant at 300 k is Q $\min^{-1}$, at what temperature rate constant becomes $9Q\min^{-1}$?

A. $47^{\circ} C$

B. $320^{\circ} C$

C. $280K$

D. $\sqrt{9 \times 300}K$

Answer: A

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13. For $N_2O_5(\text{in CCl}_4) \rightarrow 2NO_2 + \frac{1}{2}O_2,$ $K = 6 \times 10^{-4}s^{-1}$ at 350 K and $K = 1.2 \times 10^{-3}s^{-1}$ at 360 K. Then, when temperature is changed to 380 K, value of K $\left(\text{in s}^{-1}\right)$

A. 1.2×10^{-3}

B. 2.4×10^{-3}

C. 4.8×10^{-4} mole/lit/min

D. $4.8x10^{-3}$

Answer: D

Watch Video Solution

14. At 300 K rate constant for $A \rightarrow$ products at t=50 min is $0.02 s^{-1}$, then rate constant at t=75 min and 310 K will be (in s^{-1})

A. $\frac{0.04}{25}$

B. 0.04×25

C. 0.04

D. $\left(\frac{0.02}{25}\right)$

Answer: C

Watch Video Solution

15. The rate constant of a first order reaction at $27^{\circ} C$ is $10^{-3} min^{-1}$. The temperature coefficient of this reaction is 2. What is the rate constant (in min^{-1}) at $17^{\circ} C$ for this reaction?

A. 10^{-3}

B. 5×10^{-4}

C. 2×10^{-3}

D. 10^{-2}

Answer: B

Watch Video Solution

LEVEL-1 (EXERCISE -II ORDER, MOLECULARITY, HALF LIFE:)

1. Sucrose decompose in acid solution into glucose and fructose according to the first order rate law, with $t_{\frac{1}{2}} = 3.00$ hours. What fraction of sample of sucrose remains after 8 hours ?

A. 1.158

B. 0.518

C. 0.158

D. 3.182

Answer: C

Watch Video Solution

2. For an elementary reaction $2A + B \rightarrow C + D$ the active mass of B is kept constant but that 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. decrease by 6 times

Answer: B

Watch Video Solution

3. For a chemical reaction $Y_2 + 2Z \rightarrow$ Product rate controlling step is $Y + 1/2Z \rightarrow Q$. If the concenntration of Z is doubled the rate of reactin will

A. Remain the same

B. Become four times

C. Become 1.414 times

D. Become double

Answer: C

Watch Video Solution

4. In a reaction $A \rightarrow B$ when the concentration of reaction is made 8 times, the rate got doubled. The order of reaction is

A. $1/3$

B. 1

C. $1/2$

D. 2

Answer: A

Watch Video Solution

5. The rate of reaction $A + 2B \rightarrow$ Products is given by $-\frac{d[A]}{dt} = k[A][B]^2$.If B is present in large excess, the order of reaction is

A. 3

B. 2

C. 1

D. zero

Answer: C

Watch Video Solution

6. For the reaction $2A + B \rightarrow$ Products, it is found that doubling the concentration of both reactants increases the rate by a factor of 8. But doubling the concentration of B alone, only doubles the rate. What is the order of the reaction w.r.t to A?

A. 2

B. 3

C. 0

D. 1

Answer: A

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7. The increase in rate constant of a reaction is more when the temperature increases from

A. 290K-300K

B. 300K-310K

C. 310K-320K

D. 320K-330K

Answer: A

Watch Video Solution

8. The initial rates for gaseous reaction $A + 3B \rightarrow AB_3$ are given below

$[A](M)$	$[B](M)$	$\text{Rate}(\text{Msec}^{-1})$
0.1	0.1	0.002
0.2	0.1	0.002
0.3	0.2	0.008
0.4	0.3	0.018

order of reaction is

A. zero

B. three

C. one

D. two

Answer: D

Watch Video Solution

9. Based on the following data for a reaction what is its order ($A \rightarrow$ products)

$\text{Conc.A} \quad 2M \quad 0.2M \quad 0.02M \quad 0.00$

$\text{Time in min} \quad 0 \quad 10 \quad 20 \quad \propto$

A. 1st

B. 2nd

C. 3rd order

D. zero

Answer: A

Watch Video Solution

10. $[A](M)$ $[B](M)$ Initial rate $\left(Ms^{-1}\right)$

0.4 0.3 2×10^{-3}

0.8 0.3 0.8×10^{-2}

1.2 0.9 0.54×10^{-1}

From the above dat athe rate law for the equation $A + B \rightarrow$ products is equal to

A. K[A][B]

B. $K[A]^2[B]^2$

C. $K[A]^2[B]$

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

Answer: C

Watch Video Solution

11. In the initial cocnentration is reduced to 1/4th of the initial value of a zero order reaction the half life of the reaction

A. remains constant

B. Becomes 1/4 tj

C. becomes double

D. Becomes fourfold

Answer: B

Watch Video Solution

12. If $\frac{dx}{dt} = k\left[H_3O^+\right]^n$ and rate becomes 100 times when pH changes form 2 to 1. Hence order of reaction is

A. 1

B. 2

C. 3

D. 0

Answer: B

Watch Video Solution

13. The initial concentration of cane sugar is presence of an acid was reduced from 0.20 to 0.10 M in 5 hours and to 0.05 M in 10 hours, value of K ? (in hr^{-1})

A. 0.693

B. 1.386

C. 0.1386

D. 3.465

Answer: C

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14. 505 completion of a first order reaction takes place in 16 minute. Then fraction that would react in 32 minutes from the beginning

A. 44198

B. 44198

C. 44204

D. 44259

Answer: D

Watch Video Solution

15. The time needed for the completion of 2/3 of a 1st order reaction, when rate constant is $4.771 \times 10^{-2} \text{min}^{-1}$ is

A. 23.03 min

B. 2.303 min

C. 6.93 min

D. 69.3min

Answer: A

Watch Video Solution

16. The rate constant of a first order reaction of $0.0693 \min^{-1}$. What is the time (in min) required for reducing an initial concentration of 20 mole lit^{-1} to 2.5 mole lit^{-1}?

A. 40

B. 41

C. 20

D. 30

Answer: D

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17. The half life of a first order reaction is 100 seconds. What is the time required for 90% completion of the reaction?

A. 100 sec

B. 200 sec

C. 333 sec

D. 500 sec

Answer: C

Watch Video Solution

18. The half life periods of four reactions labelled by A,B, C & D are 30 sec, 4.8 in, 180 sec and 16 min respectively. The fastest reaction is

A. A

B. B

C. C

D. D

Answer: A

Watch Video Solution

19. 3/4 th of first order reaction was completed in 32 min 15/16 the part will be completed in

A. 24 min

B. 64 min

C. 16 min

D. 32 min

Answer: B

Watch Video Solution

20. Initial concentration of the reactant is 1.0 M. The concentration becomes 0.9 M, 0.8 M and 0.7 M in 2 hours, 4 hours and 6 hours respectively. Then the oerder of reaction is

A. 2

B. 1

C. zero

D. 3

Answer: C

Watch Video Solution

21. Half life periods for a reaction at initial concentration of 0.1 M and 0.01 M are 5 and 50 minutes respectively. Then the order of reaction is

A. zero

B. 1

C. 2

D. 3

Answer: C

Watch Video Solution

22. For first order reaction $t_{0.75}$ is 138.6 sec. Its specific rate constant is (in s^{-1})

A. 10^{-2}

B. 10^{-4}

C. 10^{-5}

D. 10^{-6}

Answer: A

Watch Video Solution

23. 20% first order reaction is completed in 50 minute. Time required for the completion of 60% of the reaction is

A. 100 min

B. 150 min

C. 262 min

D. 205 min

Answer: D

Watch Video Solution

24. In a first order reaction, 20% reaction is completed in 24 minutes.The percentage of reactat remaining after 48 minutes is

A. 60

B. 64

C. 81

D. 80

Answer: B

Watch Video Solution

25. The concentration of the reactant A in the reaction $A \rightarrow B$ at different times are given below:

Concentration (M)	Time(seconds)
0.069	0
0.052	17
0.035	34
0.018	51

The rate constant of the reaction according to the correct order of reaction is

A. $0.001 M^{-2} s^{-1}$

B. $0.001 M^{-2} s^{-1}$

C. $0.001 s^{-1}$

D. $0.001 M s^{-1}$

Answer: D

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26. A first order reaction is half completed is 45 minutes. How long does it need for 99.9% of the reaction tobe completed?

A. 20 hours

B. 10 hours

C. 7 1/2 hours

D. 5 hours

Answer: C

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27. 99% of a first order reaction was completed in 32 in. When wil 99.9% of the reaction complete?

A. 50 min

B. 46 min

C. 49 min

D. 48 min

Answer: D

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28. For a first order reaction with half life of 150 seconds, the time taken for the concentration of the reactant to fall from M/10 to M/100 will be approximately

A. 1500 s

B. 500 s

C. 900 s

D. 600 s

Answer: B

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29. A reaction which is of first order w.r.t reactant A has a rate constnat is 6min^{-1}. If we start with $[A] = 0.5\text{mol}L^{-1}$ when would [A] reach the value of $0.05\text{mol}L^{-1}$

A. 0.384 min

B. 15 min

C. 20 min

D. 3.84 min

Answer: A

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30. For a first order reaction $A \rightarrow B$ the reaction rate at reactant concetration of 0.01 M is found to be 2.0×10^{-5}mol $L^{-1}s^{-1}$. The half life period of the reactionis

A. 220 s

B. 30 s

C. 374 s

D. 347 s

Answer: D

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31. 99% of a 1st order reaction completed in 2.303 minutes. What is the rate constant and half life of the reaction

A. 2.303 and 0.3010

B. 2 and 0.3465

C. 2 and 0.693

D. 0.310 and 0.693

Answer: B

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32. In the case of a first order reaction, the ratio of the time required for 99.9% completion of the reaction to its half life is nearly

A. 1

B. 10

C. 20

D. 8

Answer: B

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33. Out og 300 g substance [decomposes as per 1st order], hou much will remains after 18 hr? ($t_{0.5} = 3\text{hr}$)

A. 4.6 gm

B. 5.6 gm

C. 9.2 gm

D. 6.4 gm

Answer: A

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34. For a first order reaction at $27^{\circ}C$ the rato of time required for 75% completion of 25% completion of reaction is

A. 3

B. 2.303

C. 4.8

D. 0.477

Answer: C

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LEVEL-II(LECTURE SHEET EXERCISE-I SINGLE & ONE OR MORE THAN ONE CORRECT ANSWER)

1. The rate constant of a a reaction depends on

A. Extent of reaction

B. Time of reaction

C. Temperature

D. Initial cocentration of the reactants

Answer: C

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2. In the following reaction, how is the rate of appearance of the underline product related to the rate of disappearance of the underlined reactant?

$$BrO_3^-(aq) + 5\underline{Br^-}(aq) + 6H^+(aq) \rightarrow 3\underline{Br_2}_{(1)} + 3H_2O_{(1)}$$

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

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

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

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

Answer: D

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3. $A(g) + \frac{1}{2}B(g) \rightarrow 2C(g) + \frac{1}{2}D(g)$

the rate of disappearance of B is x. What is the rate of appeance of C?

A. 3x

B. x/2

C. 2x

D. 4x

Answer: D

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4. For the reaction $2N_2O_5 \rightarrow 4NO_2 + O_2$, rate and rate constant are $1.02 \times 10^{-4} M \sec^{-1}$ and $3.4 \times 10^{-5} \sec^{-1}$ respectively then concentration of N_2O_5 at that time will be (in moles /lit)

A. 3

B. 1.732

C. 1

D. 1.5

Answer: A

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5. In the reaction $2A + B \rightarrow 2C + D$, 5 mol/lt of A are allowed to react with 2 mol/lt of B. After 5 seconds the concentration of A was found to be 4 molar. What is the rate of reaction in tems of A?

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

B. $0.2M\sec^{-1}$

C. $0.3M\sec^{-1}$

D. $0.15M\sec^{-1}$

Answer: A

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6. Thallium (I) is oxidized Ce(IV) as follows: $Tl^{+} + 2Ce^{+4} \rightarrow Tl^{+3} + 2Ce^{+3}$

Following are the elementary steps involved in the above reactionn

If rate $= k\left[Ce^{+4}\right]\left[Mn^{+2}\right]$ then catalyst intermediate and rate determining step are respectively

A. $Mn^{+2}, Mn^{+3}, 1$

B. $Mn^{+2}, Mn^{+3}, 2$

C. $Mn^{+2}, Mn^{+4}, 1$

D. $TI^{+1}, Mn^{+2}, 1$

Answer: A::C

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7. $CO(g) + 2H_2(g) \rightarrow CH_3OH(g)$

In the above reaction Hydrogen disappears at the rate of 0.2 gm/sec. What is the rate fo appearance of Methano,at that moment?

A. 0.1 gm/sec

B. 1.6 gm/sec

C. 3.2 gm/sec

D. 0.05 gm/sec

Answer: B

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8. Hydrogen of vegetable ghee at $250^{\circ}C$ reduces pressure of H_2 from 2 atm to 1.2 atm in 30 minutes. The rate of reaction in terms of molarity per second is

A. 1.03×10^{-6}

B. 1.03×10^{-5}

C. 1.03×10^{-7}

D. 1.03×10^{-9}

Answer: B

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9. Which of the followign is (are) true for first order reaction?

A. Rate of reaction is fastest at the beginning of the reaction.

B. Rate of reaction is fastest when [reactants]=[products]

C. Rate of reaction increases with temperature usually.

D. rate of exothermic reaction decreases with increase in temperature.

Answer: A::C

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10. Select the correct statements(s)

A. The rare law of the elementary reaction $2A \rightarrow B + C$, must bne Rate $= K[A]^2$

B. The rate law for the complex reaction $A + B \rightarrow C$, might not be Rate $= K[A][B]$

C. If the partial orders differ from the coefficients in the balanced reaction, the reaction must be complex.

D. If the partial orders equal to corresponding coefficients in the balanced reaction, the reaction must be elementary.

Answer: A::B::C

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11. Select the correct statement(s)

A. The rate of reaction decreases with decrease in temperature

B. The rate of reaction depends on nature of reactants

C. As time proceeds concentration of reactants decreases

D. As time proceeds concentration of products increases.

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

Watch Video Solution

12. For the reaction $2A + B + C \rightarrow 2D$. The observed rate law is Rate $= K[A][B]^2$. Correct statements are :

A. increase of conc. Of C does not effect rate

B. Doubling the conc. Of A, doubles the rate

C. Triplign the con of B, increases rate by 9 times

D. Doubling the conc of C, doubles the rate

Answer: A::B::C

Watch Video Solution

13. SO_2 reacts with O_2 as follows $2SO_2 + O_2 \rightarrow 2SO_3$, the rate of disappearance of SO_2 is 2.4×10^{-4} mole lit^{-1}min^{-1}. Then

A. Rate of reaction is $.2 \times 10^{-4}$ mole lit^{-1}min^{-1}

B. Rate of apprance of SO_3 is 2.4×10^{-4} mole lit^{-1}min^{-1}

C. Rate of disppearance of O_2 is 1.2×10^{-4} mole lit^{-1}min^{-1}

D. Rate of reaction is twice the rate of disappearance of SO_3.

Answer: A::B::C

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14. For a certain reactiona plot of $\frac{[C_0 - C]}{C}$ against time t, yields a straight line.C_0 and C are concentrations of reactat at t=0 and t=t respectively. The order of reaction is

A. 3

B. zero

C. 1

D. 0.02

Answer: D

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15. At the point of intersection of the two curves shown the conc. Of B is given by ....for $A \rightarrow nB$

A. $\dfrac{nA_0}{2}$

B. $\dfrac{A_0}{n-1}$

C. $\dfrac{nA_0}{n+1}$

D. $\left(\dfrac{n-1}{n+1}\right)A_0$

Answer: C

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16. The rate constant for a zero order reaction is 2×10^2 mol $L^{-1}\sec^{-1}$ .If the concentration of the reactant after 25 sec is 0.5 M., the initial concentration must have been

A. 0.5 M

B. 1.25 M

C. 12.5 M

D. 1.0 M

Answer: D

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17. Given that for a reaction of nth order the integrated rate equation is

$K = \frac{1}{t(n-1)}\left[\frac{1}{C^{n-1}} - \frac{1}{C_0^{n-1}}\right]$ where C and C_0 are the concentration of reactant at time to initiallyh respectivley. The $t_{3/4}$ and $t_{1/2}$ are related as ($t_{3/4}$ is time required to C to become C/4)

A. $t_{3/4} = t_{1/2}\left[2^{n-1} + 1\right]$

B. $t_{3/4} = t_{1/2}\left[2^{n-1} - 1\right]$

C. $t_{3/4} = t_{1/2}\left[2^{n+1} + 1\right]$

D. $t_{3/4} = t_{1/2}\left[2^{n+1} - 1\right]$

Answer: A

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18. Two first order reactions have half lives in the ratio 3:2. If t_1 and t_2 are the time periods for 25% and 75% completion for the first and second reactions respectiely find $t_1 : t_2$

A. $0.311 : 1$

B. $0.420 : 1$

C. $0.273 : 1$

D. $0.119 : 1$

Answer: A

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19. If a is the initial concentration then time required to decompose half of the substance for nth order is inversely proportiional to :

A. a^n

B. a^{n-1}

C. a^{1-n}

D. a^{n-2}

Answer: B

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

$A_2 \Leftrightarrow A + A$............(fast)

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

$A + B \rightarrow AB$..............(fast) Its order would be:

A. 44257

B. 1

C. zero

D. 2

Answer: A

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21. Graph between which of the following coordinate produce striaght line with reference to zero order reaction

A. Rate vs time

B. $t_{1/2}$ Vs initial concentration

C. Concentration of reactants Vs time

D. Rate Vs concentration of reactant

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

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22. In case of zero order reactions

A. $t_{1/2} = 2t_{1/4}$

B. $t_{3/4} = 3t_{1/2}$

C. $t_{\infty} = 1t_{1/2}$

D. All

Answer: A::C

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23. Identify incorrect statements

A. Molecularilty is not always an integral quantity

B. Moelcularity can be defined for elementary reactions only

C. Order of reaction does not exceed three

D. All

Answer: A::C

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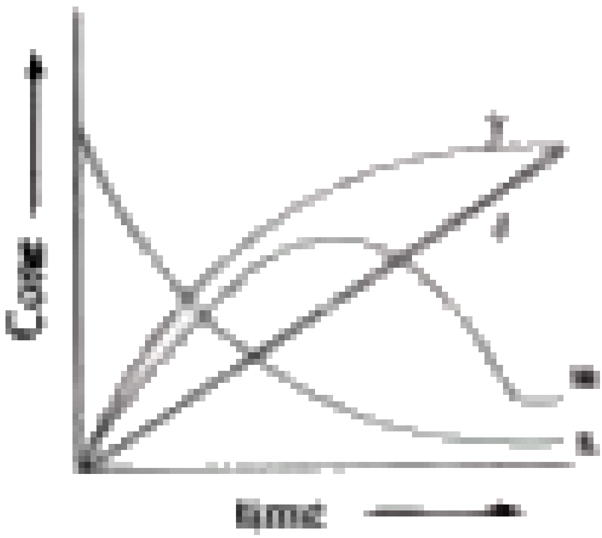
24. For the reaction $A + B \rightarrow C + D$. The variation of the concentration of the products withtime is given by the curve:



A. X

B. Y

C. Z

D. W

Answer: B

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25. Which of the following statements is correct?

A. The catalytic efficiency of a solid catalyst depends upon its surface area.

B. Catalyst operates by providing alternate path for the reactio that involves a lower activation energy.

C. Catalyst lowers the energy of activation of the forward direction with out affecting the energy of activation of the backward direction.

D. Catalyst does not affect the overall enthalpy change of the reaction.

Answer: A::B::D

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26. For the reaction: $\left[Cu\left(NH_3\right)_4\right]^{2+} + H_2O \Leftrightarrow \left[Cu\left(NH_3\right)_3 H_2O\right]^{2+} + NH_3$

The net rate of reaction at any time is given by: rate

$= 2.0 \times 10^{-4}\left[\left[Cu\left(NH_3\right)_4\right]^{2+}\right]\left[H_2O\right] - 3.0 \times 10^5\left[\left[Cu\left(NH_3\right)_3 H_2O\right]^{2+}\right]\left[NH_3\right]$

The correct statement is (are)

A. Rate constannt for forward reaction $= 2 \times 10^{-4}$

B. Rate constant for backward reaction $= 3 \times 10^5$

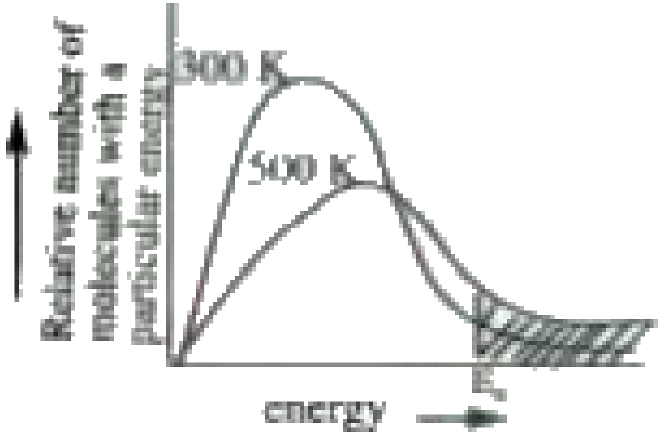
C. Equilibrium constant for the reaction $= 6.6 \times 10^{-10}$

D. At equilibrium, net rate =0

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

Watch Video Solution

27. The distribution of molecular K.E. at two temperatures is shown in the following graph. Which of the following conclusions are correct?



A. The number of molecules with enerty E_a (or) greater is proportional to the shaded area for each temperature

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

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

D. The graph follows the Maxwell-Boltzman energy distribution law.

Answer: A::D

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28. Which statement (s) are correct?

A. Activated complec has no physical, individual existance

B. Activated complex can be isolated

C. Activated complex maintains equilibrium with reactants

D. Average energy of activated complex can be less than that of products.

Answer: A::C

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29. For the reaction, following data is given

$$A \rightarrow B : K_1 = 10^{15} \text{ exp}\left(\frac{-2000}{T}\right) \quad C \rightarrow D, K_2 = 10^{14} \text{ exp}\left(\frac{-1000}{T}\right)$$

The temperature at whilch $K_1 = K_2$ is

A. 1000 K

B. 2000 K

C. 868.4 K

D. 434.22 K

Answer: D

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30. Fraction of reactant consumed in a first order reaction after time t in terms of rate constant k is _______

A. $\left(1 - e^{-kt}\right)$

B. e^{-kt}

C. e^{kt}

D. $\left(1 - e^{kt}\right)$

Answer: A

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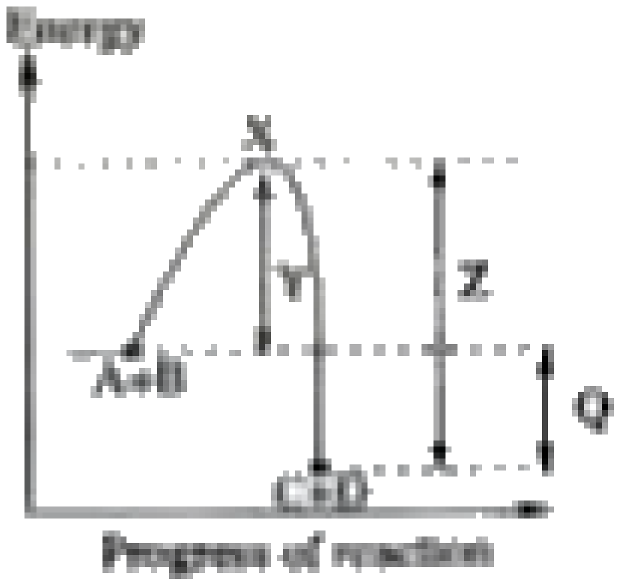
31. Mark correct statement about given graph:



A. X is threshold energy

B. Y and Z are energy of activation for forward and backward reaction respectively

C. reaction is exothermic

D. Backward reactionis endothermic

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

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32. Effective collision are those in which molecules must:

A. Have energy equal to or greater than the threshold energy

B. Have proper orientation

C. Acquire the energy of activation

D. All of these

Answer: D

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33. The activation energy of a reaction is zero. The rate constant of the reaction:

A. Increases with increase of temperature

B. Decreases with decrease of temperature

C. Decreases with increase of temperature

D. Independent of temperature

Answer: D

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34. The rate constant is given by the equation $K = Ae^{-Ea/RT}$. Which factor should register a decrease for the reaction to proceed more rapidly:

A. T

B. Activated complex can be isolated

C. A and T

D. E_a

Answer: D

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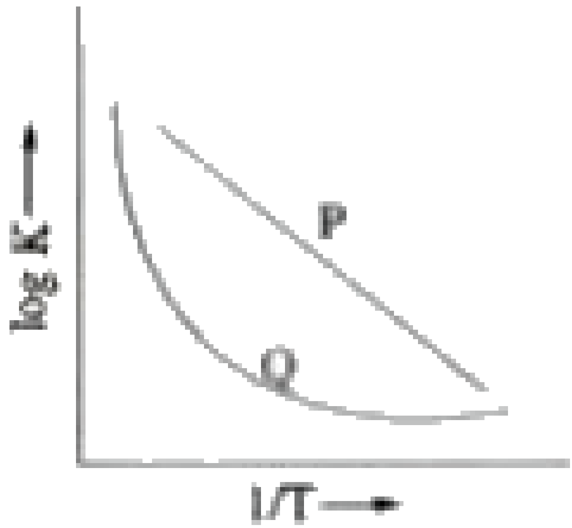
35. Which of the following statement(s) are true regarding the log K vs 1/T plots shown in the given diagram.



Plot P shows that the energy of activation is independent of temperature

A. Plot P shows that the energy of activation is independent of temperature

B. Plot Q describes the behaviour of temperature dependence of energy of activation

C. Arrhenius behaviour is described by P.

D. None of these

Answer: A::B::C

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36. When the temperature is raise from 300 K to 400 K the rate of a reaction is increased by 10^8 times. What is the energy of activation?

A. 44.1 Kcal

B. 22.5 Kcal

C. 28.2 Kcal

D. 18.6 Kcal

Answer: A

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37. For the decomposition of $N_2O_5(g)$ it is given that $2NOI_2O_{5(g)} \rightarrow 4NO_{2(g)} + O_{2(g)}$.Activation energy

$E_a, N_2O_{5(g)} \rightarrow 2NO_{2(g)} + \frac{1}{2}O_{2(g)}$ Activating energy E_a

A. $E_a = E_a^{'}$

B. $E_a > E_a^{'}$

C. $E_a < E_a^{'}$

D. $E_a = 2E_a^{'}$

Answer: A

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38. Unit of frequency factor A in : $KL + AE^{-Ea/RT}$ is

A. time^{-1}

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

C. $\text{litremol}^{-1}t^{-1}$

D. dependent of order of reaction

Answer: D

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39. Rate constant K varies with temperature by equation log $K\left(\min^{-1}\right) = 5 - \frac{(2000)}{T}$.We can conclude that $\left(R = 8.314J\text{mol}^{-1}K^{-1}\right.$ (or) cal $\text{mol}^{-1}K^{-1}$)

A. Pre exponential factor A is 5

B. Ea is 4 k cal/mol

C. Pre exponential factor, A is 10^5

D. Ea is 9.212 Kcal/mol

Answer: C::D

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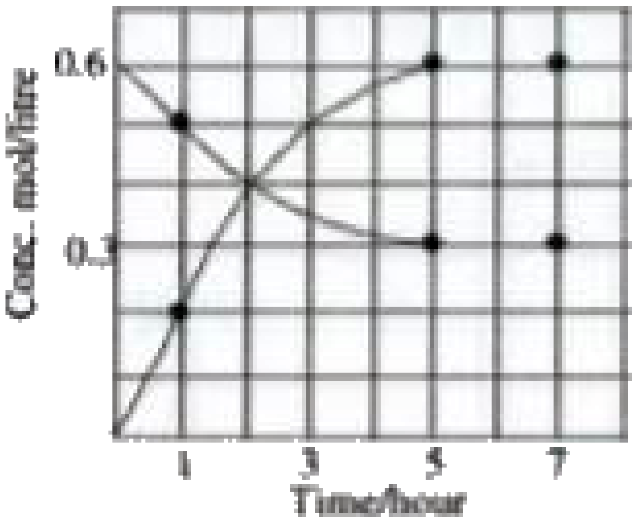
40. The progress of the reaction $A \Leftrightarrow nB$ with time is presented in the figure. Determine the value n



A. 1

B. 2

C. 3

D. 4

Answer: B

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41. Select the correct statements(s)

A. when $T \rightarrow \propto$ or $E_a \rightarrow 0$, then K=A

B. A positive catalyst can change ΔH of the reaction

C. A mixture of reactants may be thermodynamically unstable but kinetically stable.

D. A negative catalyst increases the activation energy of the reaction.

Answer: A::D

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42. Which of the following are correct?

A. Lower the activation energy, more is the rate of reaction at normal temperatures

B. Lower the activation energy,lesser is the increase of rate with increase of temperature.

C. Rate of endothermic reactions increases more with increase of temperature

D. All the above

Answer: A::B

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43. For a first order reaction $A \rightarrow$ products 93.75% of A initilly taken (2M), reacts in 80 min, then

A. Rate constant is $3.465 \times 10^{-2} \text{min}^{-1}$

B. units of rate constant are min^{-1}

C. Initial rate is 6.93×10^{-2} mole $\text{lit}^{-1} \text{min}^{-1}$

D. $t_{1/2}$ is independent of initial concentration

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

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44. The rate of constant is numerically the same for 1 order, II order and III order. Select the correct statements, if

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

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

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

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

Answer: A::B::D

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45. For a reaction $A \rightarrow B + C$. It was found that at the end of 10 minutes from the start.The total optical rotation of the system was 50° and when the reaction is complete it qws 100°. Assume that only B and C are optically active and dextro rotatory, the rate constant of this first order reaction wouldbe

A. 6.9min^{-1}

B. 0.069min^{-1}

C. 0.69min^{-1}

D. $6.9 \times 10^{-2}\text{min}^{-2}$

Answer: B

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46. Incorrect statements in the following

A. Unimolecular reactions are always 1st order

B. Order does not change with pressure and temperature

C. In case of free radical combination, order is qual to molecularity

D. In 1st order reactions rate decreases with increase of time

Answer: A::B::C

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47. Which of the following statement(s) is are/correct

A. A plot of log K vs $\frac{1}{T}$ is linear (T is temperature)

B. A plot of r vs c is a straight line passing through the origin for the first order reaction

C. A plot of log p vs 1/T is linear at constant V (P is pressure , T is temperature)

D. c vs t is a straight line for zero order reactions.

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

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48. For a chemical reaction $A \rightarrow$ Products, the rate of disappearance of A is given by:

$\frac{dC_A}{dt} = \frac{K_1 C_A}{1 + K_2 C_A}$ at low C_A, the reaction is of the ________order with rate constant________(Assume K_1, K_2 are lesser than 1)

A. $I, K_1/K_2$

B. I, K_1

C. $II, K_1/K_2$

D. $II, K_1/K_1 + K_2$

Answer: B

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49. For the first order reaction $2N_2O_{5(g)} \rightarrow 4NO_{2(g)} + O_{2(g)}$

A. the concentration of the reaction decreases exponentially with time

B. the half life of the reaction decreases with increasing temperature

C. the half life of the reaction depends on the initial concentration of the reactant

D. the reaction proceeds to 99.6% completion in eight half life duration

Answer: A::B::D

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50. An organic compound A decomposes following two parallel first order reactions $K_2/K_1 = 9/1$ and $K_1 = 1.3 \times 10^{-5}\ sec^{-1}$

If an experiment is started with A for one hour, the ratio of B to A is

A. 0.1

B. 0.15

C. 0.5

D. 0.25

Answer: C

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LEVEL-II(LECTURE SHEET EXERCISE-II LINKED COMPREHENSION TYPE QUESTIONS)

1. A certain endothermic reaction: $A \rightarrow$ Product, $\Delta H = +ve$ proceeds ina sequence of three elementary steps with the rate constant K_1, K_2 and K_3 and each one having energy of activation E_1, E_2 and E_3 respectively at $25\,^\circ C$. The observed rate constannt for the reaction is equal to $K_3\sqrt{\frac{K_1}{K_2}}$.

A_1, A_2 and A_3 are Arrhenius parameters respectively.

The observed energy of activation for the reaction is

A. $\frac{2E_1 - E_2 + 2E_3}{2}$

B. $\frac{E_2 - E_1 - 2E_3}{2}$

C. $\sqrt{\frac{E_1 E_3}{E_2}}$

D. $\frac{E_1 - E_2}{2} + E_3$

Answer: D

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2. A certain endothermic reaction: $A \rightarrow$ Product, $\Delta H = +ve$ proceeds ina sequence of three elementary steps with the rate constant K_1, K_2 and K_3 and each one having energy of activation E_1, E_2 and E_3 respectively at $25^\circ C$. The observed rate constannt for the reaction is equal to $K_3\sqrt{\frac{K_1}{K_2}}$.

A_1, A_2 and A_3 are Arrhenius parameters respectively.

The observed Arrhebius parameter for the reaction is

A. $\frac{2A_1 - A_2 + 2A_3}{2}$

B. $\sqrt{\frac{A_1}{A_2}}.A_3$

C. $A_1A_2A_3$

D. $\frac{A_1.A_3}{A_2}$

Answer: B

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3. A certain endothermic reaction: $A \rightarrow$ Product, $\Delta H = +ve$ proceeds ina sequence of three elementary steps with the rate constant K_1, K_2 and K_3 and each one having energy of activation E_1, E_2 and E_3 respectively at $25^{\circ} C$. The observed rate constannt for the reaction is equal to $K_3\sqrt{\frac{K_1}{K_2}}$.

A_1, A_2 and A_3 are Arrhenius parameters respectively.

Presence of a catalyst decreasesthe energy of activation of each path by half the value of E_1. Assuming the other factors same, the observed energy of activation would be

A. $E_3 - \frac{E_2}{2}$

B. $2E_3 - E_2$

C. $E_2 - \frac{E_3}{2}$

D. $\frac{E_1}{2} + \frac{E_2}{2} + E_3$

Answer: A

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4. A certain endothermic reaction: $A \rightarrow$ Product, $\Delta H = +ve$ proceeds ina sequence of three elementary steps with the rate constant K_1, K_2 and K_3 and each one having energy of activation E_1, E_2 and E_3 respectively at $25^\circ C$. The observed rate constannt for the reaction is equal to $K_3\sqrt{\frac{K_1}{K_2}}$.

A_1, A_2 and A_3 are Arrhenius parameters respectively.

Which represents the correct value if catalyst is not present:

A. ΔH is definitely lower thanE_1

B. ΔH is definitely lower than E_3

C. ΔH is definitely lower than $E_1 - E_2$

D. ΔH is definitely lower than $\dfrac{E_1 - E_2 + 2E_3}{2}$

Answer: D

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5. A certain endothermic reaction: $A \rightarrow$ Product, $\Delta H = +ve$ proceeds ina sequence of three elementary steps with the rate constant K_1, K_2 and K_3 and each one having energy of activation E_1, E_2 and E_3 respectively at $25\,^{\circ}C$. The observed rate constannt for the reaction is equal to $K_3\sqrt{\frac{K_1}{K_2}}$.

A_1, A_2 and A_3 are Arrhenius parameters respectively.

If temperature coefficient of the observed reactionis 2,the numerical value of E_1 - $E_2 + 2E_3$ is

A. 12.73 kcal

B. 25.4 kcal

C. 38.19 kcal

D. cannot be calculated

Answer: B

6. A certain endothermic reaction: $A \rightarrow$ Product, $\Delta H = +ve$ proceeds ina sequence of three elementary steps with the rate constant K_1, K_2 and K_3 and each one having energy of activation E_1, E_2 and E_3 respectively at $25^\circ C$. The observed rate constannt for the reaction is equal to $K_3\sqrt{\frac{K_1}{K_2}}$.

A_1, A_2 and A_3 are Arrhenius parameters respectively.

For a reversible $A \overset{K_1}{\Leftrightarrow}_{K_2} B, \Delta H = q$ if pre exponential factors are same. The correct relation is

A. $K_{eq} = e(-q/RT)$

B. Rate of reaction $= \frac{-d[A]}{dt} = K_1[A] - K_2[B]$

C. At equilibrium $K_1[A] = K_2[B]$

D. Either of these

Answer: D

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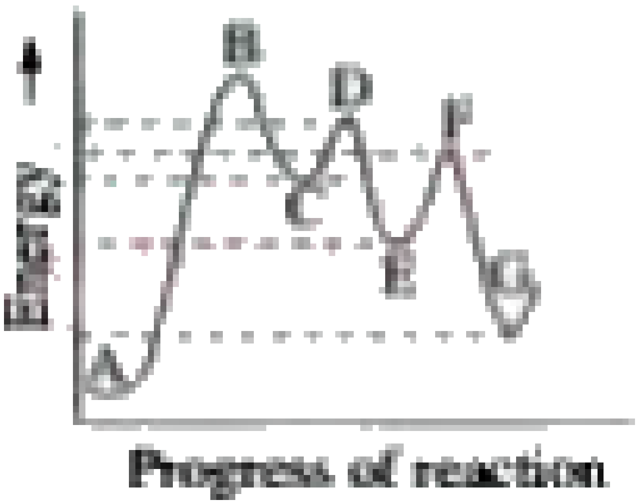
7. The free energy profile for the transformation of A into G is shown below:

The over all reaction is:



A. Endothermic

B. Exocyclic

C. Exothermic

D. Epoxygenic

Answer: A

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8. The free energy profile for the transformation of A into G is shown below:

The slowest step in the forward direction:

A. A to C

B. C to E

C. E to G

D. C to F

Answer: A

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9. The free energy profile for the transformation of A into G is shown below:

What is the least stable transition state:

A. E

B. C

C. Decreases with increase of temperature

D. B

Answer: D

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LEVEL-II(LECTURE SHEET EXERCISE-III MATCH THE FOLLOWING QUESTIONS)

1. Match the following columns

List - I (order)	List - II (feature)
A) 0	p) units of 'rate' = units of 'K'
B) 1	q) $t_{1/2} \propto C_0$
C) 2	r) $t_{1/2} = \frac{1}{KC_0}$
D) 0.5	s) $\frac{(t_{1/2})_1}{(t_{1/2})_2} = \sqrt{\frac{a_1}{a_2}}$
	t) $t_{1/2}$ constant

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2.

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3. Match the order of Reaction (in column -I) with its property (in column - II):

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LEVEL-II(LECTURE SHEET EXERCISE-IV INTEGER ANSWER TYPE QUESTIONS)

1. For the reaction $A \rightarrow$ products the following dats is given for a particular run

time (in): $0 \quad 5 \quad 15 \quad 35$

$\frac{1}{[A]}\left(M^{-1}\right): 1 \quad 2 \quad 4 \quad 8$

Determine the order of the reaction.

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2. 50% of a reaction is completed in 20 minute and 75% is completed in 30 minutes from the beginning, What is the order of reaction?

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3. $H_2O_2 \xrightarrow{1st order} H_2O + \frac{1}{2}O_2$. Pressure of O_2 is recorded as:

time (min) 10 min $\propto$

P_{O_2} (mm) $120 \quad 160$

What is half life?

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4. $H_2O_2 \rightarrow H_2O + \frac{1}{2}O_2$(1storder)

Time to time the H_2O_2 solutioni is titrated with standard acidified $KMnO_4$. Thedata is

Time (min) $0 \quad 15$

$KMnO_4$(consumed) $16ml$ $2ml$

What is half life in minutes?

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5.

After one mole of A is consumed. What is the difference in moles of B and C formed?

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6. In hypothetical reversible reaction

$$A(1M) \underset{t_{1/2}=2\text{min}}{\overset{t_{1/2}=6.93\text{min}}{\Leftrightarrow}} B(0.4M)$$

Forward reaction =1st order

Backward reaction =0 order

What is the rate of disappearance of A at the given moment?

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7. For a chemical reaction $aA \rightarrow B$, $\log\left[-\frac{d[A]}{dt}\right] = \log\left[\frac{d[B]}{dt}\right] + 0.3$ then find the approximate ratio and of a and b

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8. The concentrationfo R in the reaction $R \rightarrow P$ was measured as a function of time and the following data is obtained:

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

The order of the reactionis

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9. An organic compound undergoes first order decomposition. The time taken for its decomposition to 1/8 and 1/10 of its initial concentration are

$t_{\frac{1}{8}}$ and $t_{1/10}$ respectively. What is the value of

$$\frac{\left[t_{1/8}\right]}{\left[t_{1/10}\right]} \times 10? \left(\log_{10}2 = 0.3\right)$$

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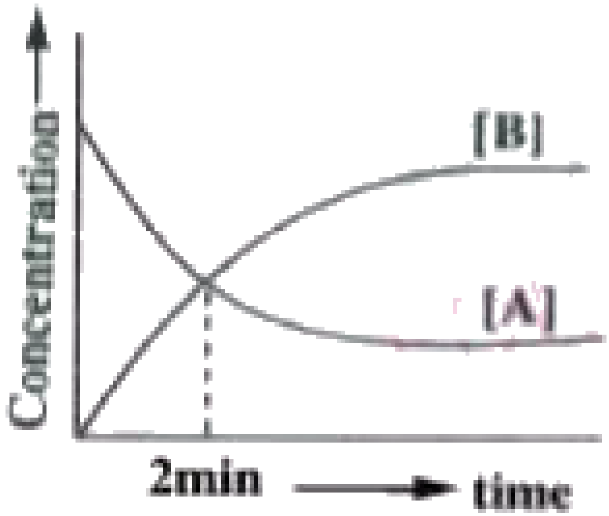
10. For a first order reaction $A_{(g)} \Leftrightarrow 3B_{(g)}$ the concentration verses time graph is given below:



What is the half life in minutes (answer to nearest intetger)?

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PRACTICE SHEET-1 (SINGLE OR MORE THAN ONE OPTION QUESTIONS)

1. For the reaction $N_2 + 3H_2 \rightarrow 2NH_3$, the rate $\frac{d[NH_3]}{dt} = 2 \times 10^{-4} Ms^{-1}$.

Therfore the rate $-\frac{d[N_2]}{dt}$ is given

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

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

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

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

Answer: A

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2. The rate of a heterogeneous reaction such as iron (solid) and any gas (oxygen) does not depend on

A. concentration of reactants

B. surface area of reactants

C. pressure of reactant gases

D. potential energy of reactant

Answer: D

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3. For a first order homogeneous gaseous reaction $A \rightarrow 2B + C$, if the total pressure after time t was P_t and after a long time ($\rightarrow$ $\rightarrow \infty$) was P_∞ then k in terms of P_t, P_∞ and t is

A. $k = \frac{2.303}{t}\log\left(\frac{P_\infty}{P_\infty - P_t}\right)$

B. $k = \frac{2.303}{t}\log\left(\frac{2P_\infty}{P_\infty - P_t}\right)$

C. $\frac{2.303}{t}\log\left(\frac{2P_\infty}{3\left(P_\infty - P_{yt}\right)}\right)$

D. None of these

Answer: C

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4. The inversion of cane sugar proceeds with half life of 500 minute at pH=5 for any concentration of sugar. However if pH=6 the half life changes to 50 minutes. The rate law expression for sugar inversioncan be written as

A. $r = K[\text{sugar}]^2\left[H^+\right]^0$

B. $r = k[\text{sugar}]^1\left[H^+\right]^0$

C. $r = k[\text{sugar}]^1\left[H^+\right]^1$

D. $r = K[\text{sugar}]^0\left[H^+\right]^1$

Answer: B

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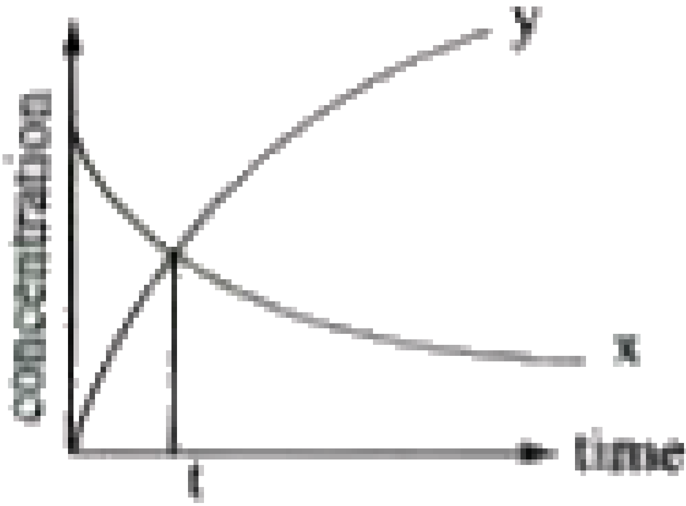
5. The accompanying figure depicts the change in concentration of species X and Y for the reaction



$X \rightarrow Y$, as a function of time. The point of intersection of the two curves represents:

A. $t_{1/2}$

B. $t_{3/4}$

C. $t_{2/3}$

D. $t_{1/4}$

Answer: A

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6. Benzene diazonium chloride (A) decoposes into chlorobenzene (B) and N_2 (g) in first order reaction. Volumes of N_2 collected after 5 min and at the complete decomposition of A are 10 mL. and 50mL respectively. The are constant for the reaction is

A. 0.446min^{-1}

B. 0.0446min^{-1}

C. 0.223min^{-1}

D. $0.112\text{min}(-1)$

Answer: B

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7. For the reaction $N_2O_5 \rightarrow 2NO_2 + \frac{1}{2}O_2$, Given $\frac{-d\left[N_2O_5\right]}{dt} = K_1\left[N_2O_5\right]$, $\frac{d\left[NO_2\right]}{dt} = K_2\left[N_2O_5\right]$ and $\frac{d\left[O_2\right]}{dt} = K_3\left[N_2O_4\right]$.

The relation in between K_1, K_2 and K_3 is

A. $2K_1 = K_2 = 4K_3$

B. $K_1 = K_2 = K_3$

C. $2K_1 = 4K_2 = K_3$

D. None of these

Answer: A

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

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

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

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

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

Answer: C

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9. Hydrogenaton of vegetable thee at$25^{\circ}C$ reduces pressure of H_2 from 2 atm to 1.2 atm in 50 minute. The rate of reaction in terms of molarity per second is

A. 1.06×10^{-6}

B. 1.06×10^{-5}

C. 1.06×10^{-7}

D. 1.06×10^{-9}

Answer: B

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10. In the reversible reaction $2NO_2 \overset{k_1}{\Leftrightarrow} k_2 N_2O_4$ the rate of disappearance of NO_2 is equal to

A. $\frac{2k_1}{k_2}[NO_2]^2$

B. $2k_1[NO_2]^2 - 2k_2[N_2O_4]$

C. $2k_1[NO_2]^2 - k_2[N_2O_4]$

D. $(2k_1 - k_2)[NO_2]$

Answer: B

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11. Hydrolysis of an ester is catalysed by H^+ ion. Using equimolar concentrations of two acids HX and HY both being strong acids. The rate constants of the reaction are found to eb $3 \times 10^{-3} \text{min}^{-1}$ and

$5 \times 10^{-3} \min^{-1}$ respectively at a fixed temperature. It can be concluded that.

A. Rate const may be taken as the measure of degree of ionization of one acid used as catalyst.

B. HX is a stonger acid than HY, relative strength being 1.7

C. HX is a weaker acid than HY, their relative strength being 0.7

D. HX is a stronger base than HY.

Answer: A::C

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12. Which of the following statements is (ar) true for the given reaction $4A + B \Leftrightarrow 2C + 2D$?

A. The rate of disappearance of B is one fourth the rate of disappearance of A

B. The rate of appearance of C is half the rate of disappearance of B

C. The rates of formation of C and D are equal

D. The rare of formation of D is half the rate of disappearance of A

Answer: A::C::D

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13. The rate equation for the decomposition of N_2O_5 in CCl_4 is rate $= K[N_2O_4]$ where $K = 6.3x10^{-4}s^{-1}$ at 320 K. what would be the initial rate of decompositioni of N_2O_5 in a 1.10 M solution of N_2O_4?

A. 6.3×10^{-5} mol litre$^{-1}s^{-1}$

B. 0.63×10^{-6} mol litre$^{-1}s^{-1}$

C. 6.3×10^{-5} mol litre$^{-1}s^{-1}$

D. 0.63×10^{-4} mol litre$^{-1}s^{-1}$

Answer: C::D

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14. A 2 litre container contains 4 moles of N_2O_5. On heating to $100\,^\circ C$, N_2O_5 undergoes complete dissociation to NO_2 and O_2. If rate constant for decomposition of N_2O_5 is $6.2 \times 10^{-4}\text{sec}^{-1}$ select the correct statemertns:

A. The mole ratio before and after dissociation is 4:2

B. The time required to complete 40% of reaction is 824 sec

C. $t_{1/2}$ of N_2O_5 is 1117.7 sec and it is independent of temperature.

D. If volume of container is doubled, the rate of decomposition becomes half of the initial rate

Answer: B::D

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15. The rate of first order reaction increases:

A. If the temperature is increased

B. If the concentration of the reactants is decreased

C. If the concentration of the reactants is increased

D. With time

Answer: A::C

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16. For the reaction $A + B + C \rightarrow D$. The following observation were made

(i) When the concentrations of A was doubled, the rate of formation of D was doubled

(ii) When the concentration of B was halved, the rate of formation of d becomes one fourth

(iii) Doubling the concentration of C and no effect on rate

Select the correct statement (s).

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

B. Reactant C must involve after rate determining step

C. Only A and B participate in the rate determining step

D. Order of C is 1.

Answer: B::C

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PRACTICE SHEET-1 (LINKED COMPREHENSION TYPE QUESTIONS)

1. The instantaneous rate of an elementary chamical reactkon $aA + bB \Leftrightarrow cC + dD$ can be given by rate $= K_f[A]^a[B]^b - K_b[C]^c[D]^d$ where K_f and K_b are rate constants for forward and backward reactions respectively for the reversible reaction. If the reaction is an irreversible one, the rate is expressed as, rate $= K[A]^a[B]^b$ where K is rate contant for the given irreversible rate of disappearance of A is a/b times the rate of disappearance of B. The variation of rate constant K with temperature is expressed in terms of Arrhenius equation: $K = Ae^{-E_a/RT}$ whereas the ratio $\frac{K_f}{K_b}$ is expressed in terms of van't Hoff isochore: $\frac{K_f}{K_b} = Ae^{-\Delta H/RT}$,

where E_a and ΔH are energy of activation and heat of reaction respectively.

The variation of rate constant K and $\frac{K_f}{K_b}$ with temperature shows the following effects:

For endothrmic reaction when T increases then K increases and $\frac{K_f}{K_b}$ also increases.

(ii) For endothemic reaction when T decreases then K decreases and $\frac{K_f}{K_b}$ also decreases.

(iii) For exothermic when T increases then K and $\frac{K_f}{K_b}$ both increases.

(iv) For exothermic reaction when T decreases then K increases and $\frac{K_f}{K_b}$ decrease.

(v) For exothermic reaction when T increases thenK and $\frac{K_f}{K_b}$ both decrease.

A. I,ii

B. iii,v

C. ii,iii

D. ii,iii,v

Answer: A

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2. The instantaneous rate of an elementary chamical reactkon $aA + bB \Leftrightarrow cC + dD$ can be given by rate $= K_f[A]^a[B]^b - K_b[C]^c[D]^d$ where K_f and K_b are rate constants for forward and backward reactions respectively for the reversible reaction. If the reaction is an irreversible one, the rate is expressed as, rate $= K[A]^a[B]^b$ where K is rate contant for the given irreversible rate of disappearance of A is a/b times the rate of disappearance of B. The variation of rate constant K with temperature is expressed in terms of Arrhenius equation: $K = Ae^{-E_a/RT}$ whereas the ratio $\frac{K_f}{K_b}$ is expressed in terms of van't Hoff isochore: $\frac{K_f}{K_b} = Ae^{-\Delta H/RT}$, where E_a and ΔH are energy of activation and heat of reaction respectively.

For a gaseous phase -I order reaction $A(g) \rightarrow B(g) + 2C(g)$ (rate constant $K = 10^{-2}\text{time}^{-1}$) in a closed vesel of 2 litre containing 5 mole of A(g) at $27^{\circ}C$ which of the following is correct?

A. Rate of appearance of C (g) is 5×10^{-2}, $\text{mol}L^{-1}t^{-1}$

B. Rate of disappearance of A(g) is $6.15 \times 10^{-3'} atmt^{-1}$

C. Rate of disappearance of A (g) is $5.0 \times 10^{-2}\text{mol}t^{-1}$

D. Rate of appearance of B (g) is $5 \times 10^{-2}\text{moL}^{-1}t^{-1}$

Answer: A

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3. The instantaneous rate of an elementary chamical reactkon $aA + bB \Leftrightarrow cC + dD$ can be given by rate $= K_f[A]^a[B]^b - K_b[C]^c[D]^d$ where K_f and K_b are rate constants for forward and backward reactions respectively for the reversible reaction. If the reaction is an irreversible one, the rate is expressed as, rate $= K[A]^a[B]^b$ where K is rate contant for the given irreversible rate of disappearance of A is a/b times the rate of disappearance of B. The variation of rate constant K with temperature is expressed in terms of Arrhenius equation: $K = Ae^{-E_a/RT}$ whereas the ratio $\frac{K_f}{K_b}$ is expressed in terms of van't Hoff isochore: $\frac{K_f}{K_b} = Ae^{-\Delta H/RT}$, where E_a and ΔH are energy of activation and heat of reaction respectively.

For an elementary reaction $aA \rightarrow$ product, the graph plotted $\frac{\log([-d[A]])}{dt}$ vs $\log[A]_t$ gives a straight line with intercept equal to 0.6 and showing an angle of 45° then

A. rate constant =4time^{-1} and a=1

B. rate constant $= 4\text{mol}L^{-1}t^{-1}$ and a=1

C. rate constant =1.99time^{-1} and a=1

D. rate constant $= 1.99\text{mol}^{-1}L^{-1}$ and a=2

Answer: A

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4. For the overall reaction between A and B to yield C and D, two mechanisms are proposed:

I. $A + B \rightarrow AB \cdot \rightarrow C + D, k_1 = 1 \times 10^{-5} M^{-1} s^{-1}$

II. $A \rightarrow A^* \rightarrow E, k_1 = 1 \times 10^{-4} s^{-1},$

$E + B \rightarrow C + d, k_2 = 1 \times 10^{10} M^{-1} s^{-1}$

(species with * are short lived)

Rate of reaction for mechanism I when concentration of each is 0.1 M, is

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

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

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

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

Answer: A

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5. For the overall reaction between A and B to yield C and D, two mechanisms are proposed:

I. $A + B \rightarrow AB \cdot \rightarrow C + D, k_1 = 1 \times 10^{-5} M^{-1} s^{-1}$

II. $A \rightarrow A^* \rightarrow E, k_1 = 1 \times 10^{-4} s^{-1}$,

$E + B \rightarrow C + d, k_2 = 1 \times 10^{10} M^{-1} s^{-1}$

(species with * are short lived)

Rate of reaction for mechanism II when concentrationof eacn 1 M is

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

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

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

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

Answer: A

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6. For the overall reaction between A and B to yield C and D, two mechanisms are proposed:

I. $A + B \rightarrow AB \cdot \rightarrow C + D, k_1 = 1 \times 10^{-5} M^{-1} s^{-1}$

II. $A \rightarrow A* \rightarrow E, k_1 = 1 \times 10^{-4} s^{-1}$,

$E + B \rightarrow C + d, k_2 = 1 \times 10^{10} M^{-1} s^{-1}$

(species with * are short lived)

AT what concetration of B, rates of two mechanism are equal?

A. 1M

B. 5M

C. 7M

D. 10M

Answer: D

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PRACTICE SHEET-1 (MATCH THE FOLLOWING QUESTIONS)

1. Match the following columns

COLUMN - I	COLUMN - II
A) A zero order reaction	p) $2HI \rightarrow H_2 + I_2$
B) A pseudo unimolecular reaction	q) $H_2 + Cl_2 \xrightarrow[H_2O]{h\nu}$
C) A bimolecular reaction	r) $2NO + 2H_2 \rightarrow N_2 + 2H_2O$
D) A complex reaction	s) $C_{12}H_{22}O_{11} + H_2O \xrightarrow{H^+} C_6H_{12}O_6 + C_6H_{12}O_6$

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2. Match the following columns

COLUMN - I	COLUMN - II
A) Elementary reactions	p) No energy of activation
B) Complex reactions	q) Single step
C) Free radical combinations	r) High energy of activation
D) Slow reactions	s) Several elementary steps

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PRACTICE SHEET-1 (INTEGER ANSWER TYPE QUESTIONS)

1. In a gaseous phase reaction $A_2(g) \rightarrow B(t) + 1(1/2)C(g)$, the increase in pressure from 100 mm to 120 mm is noticed in 5 minute.The rate of disappearance of A_2 in mm min^{-1} is

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2. For the reaction $Cl_2 + 2I^- \rightarrow I_2 + 2CI^-$, the initial concentration of I^- was 0.20 mol lit^{-1} and the concentration after 20 min was 0.18 mol lit^{-1}. If the rate of formation of I_2 in mol $\text{lit}^{-1}\text{min}^{-1}$ is $x \times 10^{-4}$ then the value of x is

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3. For are reaction $A \rightarrow$ product, initially 10 mole of A is taken. In 80 minutes 9.375 mole of A is found to be reacted. The rate constant of the reaction is represented as $3.5 \times 10^{-x}\text{min}^{-1}$. What is the value of X

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4. A first order reaction is completed by 20% 2 minutes. How much further time is required for 64% of the initial concentration of the reactants to remain.

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5. A drop of a solution (v=0.05ml) contains 6×10^{-7} moles of H^+. If the rate constant of disappearance of H^+ is 6×10^5 mole $L^{-1}S^{-1}$ it takes $X \times 10^{-8}s$ for H^+ in the drop to disappear X is

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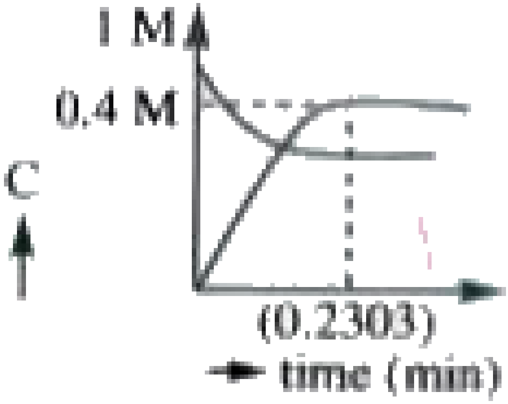
6. 

$A \rightarrow 2B$ (1st order reaction) . If the rate constant is 9.7×10^{-x} in $\min^{-1}$ then x=

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PRACTICE SHEET-2 (SINGLE OR MORE THAN ONE OPTION QUESTIONS)

1. The rate constant (K) for the reactio. $2A + B \rightarrow$ Products was found to be

2.5×10^{-5}litremol^{-1}sec^{-1} after 15 sec, 2.60×10^{-5} litre mol^{-1}sec^{-1} after 30 sec and 2.55×10^{-5} litre "mol"^(-1)"sec"^(-1)` after 50 sec. The order of reaction is

A. 2

B. 3

C. zero

D. 1

Answer: A

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2. A first order reaction is carried out with an initial concentration of 10 mol per litre an 80% of the reactant changes into the product in 10 sec. Now if the same reaction is carried out with an initial concentration of 5 mol per litre. The percentage of the reactant changing to the product in 10 sec is:

A. 40

B. 80

C. 60

D. 50

Answer: B

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3. For a first order reactantion

which of the following relation is not correct:

A. $K = K_1 + K_2$

B. $\frac{1}{\tau} = \frac{1}{\tau_1} + \frac{1}{\tau_2}$

C. $\frac{1}{t_{1/2}} = \left(\frac{1}{t_{1/2}}\right)_1 + \left(\frac{1}{t_{1/2}}\right)_2$

D. $\frac{1}{K} = \frac{1}{K_1 + \frac{1}{K_2}}$

Answer: D

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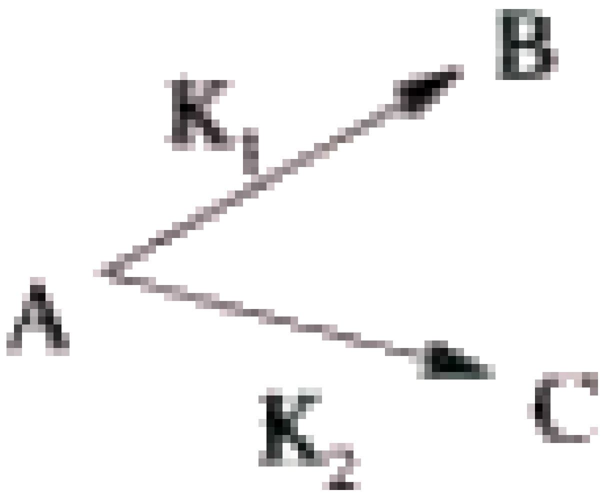
4. A substance undergoes first order decomposition. The decomposition follows two parallel first order reactios as:

and $K_1 = 1.26 \times 10^{-4} \text{sec}^{-1}, K_2 = 3.80 \times 10^{-5} \text{sec}^{-1}$



The percentage distribution of B and C are

A. 80% B and 20%C

B. 76.83% B and 23.17%C

C. 90%B and 10%C

D. 60%B and 40%C

Answer: B

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5. Two first order reaction hasve halflives in 1:2 ratio. After two halflives of first reaction. What is the ratio of their rates of reactions?(Initial concentrations same)

A. $1:2$

B. $1:3$

C. $1:4$

D. $1:1$

Answer: D

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6. For a first order reaction, the half life is 50 sec. Identify the correct statement form the following.

A. the reaction is almost complet in 500 sec

B. the same quantity of reactant is consumed for every 50 sec of the reaction

C. quantity of reactant remaining after 100 sec is half of what remains after 50 sec

D. All the above three

Answer: C

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7. For a first order reaction, if the time taken for completion of 50% of the reaction is t second, the time required for completion of 99.9% of the reaction is:

A. 10t

B. 5t

C. 100t

D. 2t

Answer: A

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8. In a first order reaction, the concentration of the reactant, decreases from 0.8 M to 0.4 M in 15 minutes. The time taken for the concentration to hange from 0.1 M to 0.025 M is

A. 30 minutes

B. 60 minutes

C. 7.5 minutes

D. 15 minutes

Answer: A

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9. The following data re obtained from the decomposition of a gaseous compound

Initial pressure, atm	1.6	0.8	0.4
Time for 50% reac., min	80	113	160

The order of the reaction is

A. 0.5

B. 1

C. 1.5

D. 2

Answer: C

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10. In a zero order reactionn 47.5% of the reactant remains at the end of 2.5 hours. The amount of reactant consumed in one hour is

A. 0.105

B. 0.32

C. 0.526

D. 0.21

Answer: D

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11. In case of first order reactions

A. $t_{3/4} = 2t_{1/2}$

B. $t_{7/8} = 3t_{1/2}$

C. $t_{0.99} = 10t_{1/2}$

D. All

Answer: A::B

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12. Which of the following statements are correct?

A. Time required for 75% completion is 1.5 times of half life for zero order reaction.

B. Time needed for a definite fraction of 1st order reaction not vary with the initial concentration.

C. Time for 25% reaction is one third of half life in second order process

D. Rate of 1st order reaction gets doubled if the conc of the reactant in increased to a two fold value.

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

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13. For the reaction $H_2(g) + Br_2(g) \rightarrow 2HBr(g)$, the reaction rate $= K[H_2][Br_2]^{1/2}$, which statement is true about this reaction?

A. The reaction is of second order

B. Molecularity of the reaction is 3/2

C. Order of the reaction is 3/2

D. Molecularity of the reaction is 2

Answer: C::D

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14. For a reaction $A \rightarrow$ products, the rate of reaction is increased by 8 times when the concentration of A is doubled then

A. order of the reaction is 4

B. order of the reaction is 3

C. units of rate constant are $\text{mole}^{-2}\text{lit}^{2}\text{time}^{-1}$

D. rate $= K[A]^3$

Answer: B::C::D

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15. For a reaction $A + B \rightarrow$ productss the rate of reactions is increased by 8 times when the concentration af A and B are doubled. The rate of reaction in doubled when the concentration of A alone is doubled. Then

A. Order of reaction with respect to A is 1

B. Order of reaction with respect to B is 2

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

D. Units of rate constant are $\text{mole}^{-2}\text{lit}^{-2}\text{time}^{-1}$

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

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16. For a reaction $A \rightarrow$ products, half life is 40 min, when the initial concentration of A is 4 molar. Half life of same reaction is 80 mm when the initial concentration orf A is 2 molar. Then

A. order is 1

B. order of the reaction is 2

C. units of rate constant is time^{-1}

D. unit of rate of reaction mole $\text{lit}^{-1}\text{time}^{-1}$

Answer: B

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PRACTICE SHEET-2 (LINKED COMPRHENSION TYPE QUESTIONS)

1. Elemantary unimolecular reactions have first order rate laws, elementary bimolecular reactions have second order rate laws. A rate law is often derived from a proposed mechanism by imposing the state approximation or by assuming that there is a pre -equilibrium. A proposed mechanism must be consistent with the experiment rate law.

The decomposition of O_3 obeys the mechanism give below

Step 1: $O_3 \Leftrightarrow O_2 + (O)$ (both forward and backward reactions are fast)

Step 2: $O_3 + (O) \xrightarrow{\text{slow}} O_2 + O_2$ (ignore) backward reaction), the rate of reaction is given by

A. $k\left[O_3\right]^2\left[O_2\right]$

B. $k\left[O_3\right]^2\left[O_2\right]^{-1}$

C. $k\left[O_3\right]^2$

D. $k\left[O_2\right]^2$

Answer: B

Watch Video Solution

2. Elemantary unimolecular reactions have first order rate laws, elementary bimolecular reactions have second order rate laws. A rate law is often derived from a proposed mechanism by imposing the state approximation or by assuming that there is a pre -equilibrium. A proposed mechanism must be consistent with the experiment rate law.

The molecularity of the elementary reaction $C_2N_2 \rightarrow 2CN$ is

A. zero

B. one

C. two

D. three

Answer: B

Watch Video Solution

3. Elemantary unimolecular reactions have first order rate laws, elementary bimolecular reactions have second order rate laws. A rate law is often derived from a proposed mechanism by imposing the state approximation or by assuming that there is a pre -equilibrium. A proposed mechanism must be consistent with the experiment rate law.

In a gas phase reaction, a reaction takes place only if the reactant molecules get____________during the molecular collisions

A. threshold energy

B. activation emergy

C. both

D. None of these

Answer: B

Watch Video Solution

4. Suppose 50 bacteria are placed in a flask containing nutrients for the bacteria so that they can multiply. A study at 35° C gave the following results

Time (minutes)	0	15	30	45	60
Number of bacteria	100	200	400	800	1600

Then

This multiplication of bacteria follows a

A. Zero order reaction

B. 1st order reaction

C. 2nd order reaction

D. 3rd order reaction

Answer: B

Watch Video Solution

5. Suppose 50 bacteria are placed in a flask containing nutrients for the bacteria so that they can multiply. A study at 35° C gave the following results

Time (minutes)	0	15	30	45	60
Number of bacteria	100	200	400	800	1600

Then

The rate of the reaction initially is

A. 4.62 bacterial per minute

B. 23.1 bacterial per minute

C. 23.1 bacteria per sec

D. 0.231 bacteria per sec

Answer: A

Watch Video Solution

6. Suppose 50 bacteria are placed in a flask containing nutrients for the bacteria so that they can multiply. A study at 35° C gave the following results

Time (minutes)	0	15	30	45	60
Number of bacteria	100	200	400	800	1600

Then

The expressionn used for calculating the rate constant value in this experiment is

A. $k = \frac{2.303}{t}\log\frac{a}{a - x}$

B. $k = -\frac{2.303}{t}\log\frac{a}{a - x}$

C. $k = -\frac{0.693}{t}$

D. $k = -\frac{2.303}{t}\log\frac{a}{a + x}$

Answer: D

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PRACTICE SHEET-2 (MATCH THE FOLLOWING QUESTIONS)

1. Match the following columns

COLUMN - I	COLUMN - II
A) Molecularity of a reaction	p) 0,1 possible
B) Order of a reaction	q) 1,2 possible
C) The dissociation of $H_2O_{2\,(aq)}$	r) First order
D) $H_{2(g)} + Cl_{2(g)} \xrightarrow{h\nu} 2HCl$	s) zero order

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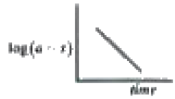
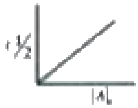
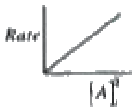
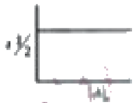
2. Match the following columns

COLUMN - I	COLUMN - II
A) Zero order reaction	p) 
B) First order reaction	q) 
C) Second order reaction	r) 
D) Third order reaction	s) 
	t) 

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PRACTICE SHEET-2 (INTEGER ANSWER TYPE QUESTIONS)

1. For a reaction the graph drawn between half life period and reciprocal of initial concentration(1/a) gives a straight line with positive slope. The

magnitude of the slope is 500 and iniital concentration of the reactant is 2M. If the initial rate of the reaction is represented as $x \times 10^{-3}$ units, then the value of x is ___________

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2. For a reaction $A \to$ products, the graph drawn between rate of reaction Vs (a-x) gives a straight line with the slope 0.0693 $\min^{-1}$.Initial concentration of the reactant is 0.4M . After 20 minutes the rate of reaction is calculated as 6.93×10^{-x}. Report the value of x?

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3. For reaction $A \to$ products, initially 8M of A is take. In 20 minutes the concentration of Ais reduced to 4M. In next 10 minutes the concentration of A is reduced to 2M. Report the order of the reaction.

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4. For a reaction the graph drawn between $t_{1/2}$ and a gives a straight line passing through the origin with the slope $2 \times 10^2 \text{mole}^{-1}$ lit min. If the initial concentation of the reactant is 1M, then the half life period is ____________$X10^2$ min.

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5. The conversion of molecules of A to B follows second order kineitcs. Doubling the concentration of A will increase the rate of formation of B by a factor of?

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6. How much time in minutes passes between 99% to 99.9% completion of a first order reaction with half life 0.3010min^{-1}?

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PRACTICE SHEET-3 (SINGLE OR MORE THAN ONE OPTION QUESTIONS)

1. It was found that for a reaction, on changin the temperature the $t_{1/2}$ value get decreased. Hence it can be said that

A. $T_2 > T_1$ Reaction is exothermic

B. $T_2 > T_1$ Reaction is endothermic

C. $T_2 > T_1$ Reaction may be endothermic or exothermic

D. None of these

Answer: C

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2. I. $E_a = 20kJ\text{mol}^{-1} \quad \Delta H = -60kj\text{mol}^{-1}$

II. $E_a = 30kj\text{mol}^{-1} \quad \Delta H = -20kj\text{mol}^{-1}$

III. $E_a = 60kj\text{mol}^{-1} \quad \Delta H = +25kj\text{mol}^{-1}$

If all the three reaction have same frequency factor then fastest and slowest reaction are

A. III is fastest, I is slowest

B. II is fastest, III is slowest

C. I is fastest, III is slowest

D. III is fastest, II is slowest

Answer: C

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3. The energies of activation for forward and reverse reactions for $A_2 + B_2 \rightarrow 2AB$ are $280 kJ\text{mol}^{-1}$ and $400 kJ\text{mol}^{-1}$ respectively. The presence of catalyst lowers the activation energy of both forward as well as reverse reactions by $100 KJ\text{mol}^{-1}$. The enthalpy change of the reaction $A_2 + B_{20 \rightarrow 2AB}$ in the presence of catalyst will be (in KJ mol^{-1})

A. -120

B. -280

C. $+120$

D. -300

Answer: A

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4. A hydrogenation reaction is carried out at 500 K. If the same reaction is carried out in the presence of a catalyst at the same rate with same frequency factor, the temperature required is 400 K. What is the activation energy of the eaction. If the catalyst lowers the activation energy barrier by 16 KJ/mol?

A. 100kJ/mol

B. 80kJ/mol

C. 60kJ/mol

D. None of these

Answer: B

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5. The decompostion of N_2O into N_2 and O_2 in presence of Argon follows first order kinetics $k = 5.0 \times 10^{11} e^{-2000/T(K)}$. The activation energy is

A. $16.628 kJ\text{mol}^{-1}$

B. $166.28 kJ\text{mol}^{-1}$

C. $166.28 J\text{mol}^{-1}$

D. $16.628 J\text{mol}^{-1}$

Answer: A

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6. For the reaction : $H^{\cdot} + {}^{\cdot}CH_2CH_3 \xrightarrow{K} CH_3.CH_3$, a chain termination step of the reaction:

$2C_2H_6 \to CH_2 = CH_2 + H_2$, the activation energy and Arrhenius parameter can be given as

A. 0,K

B. 0,Ea

C. A,1

D. 1,K

Answer: A

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7. By what fraction the Ea should be decreased in order to increase the rate by 10 times at 300 K (initial Ea=8.314kJ/mol) by use of a catalyst?

A. 0.79

B. 0.84

C. 0.76

D. 0.69

Answer: D

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8. Two reactions proceed at same rate at $25^{\circ} C$. The temperature coefficient for the first reaction is 2 and that ofsecond is 3. The ratio of the rates of these reactions at 55° C is

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

B. $\frac{4}{9}$

C. $\frac{8}{27}$

D. $\frac{1}{9}$

Answer: C

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9. For a reaction $A \rightarrow B$ with activation energy E_a and rate constant $k = Ae^{-Ea/RT}$. The rate of the reaction (Rate $= k[A]$) increases by increasing the temperature because

A. activation energy decreases with increase in temperature

B. The factor -Ea/RT increases

C. less number of collision take place

D. the value of [A] increases

Answer: B

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10. For reaction $A \rightarrow B$ the rate constant $k_1 = A_1 e^{-Ea_1/RT}$ and for the reaction $P \rightarrow Q$ the rate constant $k_2 = A_2 e^{-Ea_2/RT}$. If $A_1 = 10^8, A_2 = 10^{10}$ and $E_{a_1} = 600, E_{a_2} = 1200$, then the temperature at which $k_1 = k_2$ is

A. $\dfrac{600}{R} K$

B. $\dfrac{300 \times 4.606}{R} K$

C. $\frac{600}{4.606R}K$

D. $\frac{4.606}{600R}K$

Answer: C

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11. Arrhenius equation may be represented as

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

B. $\frac{d\text{In}K}{dT} = \frac{E_a}{RT}$

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

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

Answer: A::C

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12. Which of the following is correct for Arrhenilus equation $k = Ae^{-E_a/RT}$

A. k is the rate of reaction at zero concentration of reactants

B. A may be termed as the rate constannt at very high temperature

C. A may be termed as the rate constant at zero activation energy

D. E_a is the activation energy of reactants

Answer: B::C::D

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13. Which of the following statements are correct about the Arrhenius equation?

A. The Arrhenius constant becomes equal to rate constant at a very high temperature

B. When EA is zero, rate is independent of temperature

C. $e^{-E_a/RT}$ represents the fraction of molecules having energy more than threshold energy

D. Positive catalyst increases E_a of the reaction

Answer: A::B::C

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14. Pick out the correct Statements

A. Activated complex is an unstable intermediate with maximum energy and normal bonds

B. Activated compled is an unstable intermediate with maximum energy and fractional bond orders

C. Transition state cannot exist independently, it has greater vibrational character than unstable intermediate

D. Transition state is a state in which bonds are half broken and half formed

Answer: B::D

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15. In Arrhenius equation

A. The Arrhenius constant has units of rate of reaction

B. The Arrhenius constant has the units of rate constant of reaction

C. If E_a is high, rate of reaction is slow

D. If E_a is high, rate of reaction is high

Answer: B::C

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16. Whilch of the following statements are correct?

A. The plot log k against 1/T is straight line

B. The slope of the line in the plot of log k vs 1/T is equal to $-E_a/2.303R$

C. The slope of the linein the plot of log k vs 1/T is equal to $-E_a$

D. The slope of the line in the plot of log (a-x) vs time is a straight line with negative slope equal to $-k/2.303$

Answer: A::B::D

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PRACTICE SHEET-3 (LINKED COMPREHENSION TYPE QUESTIONS)

1. For a chemical reaction $A \rightarrow$ products, the following equation is found to be followed, $\log K = 16.398 - \frac{2800}{T}$

Arrhenius factor for the reaction is _____

A. 2.5×10^{16}

B. 5×10^{16}

C. 7.5×10^{-16}

D. 4×10^{-16}

Answer: A

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2. For a chemical reaction $A \rightarrow$ products, the following equation is found to be followed, $\log K = 16.398 - \frac{2800}{T}$

Activation energy of the reaction is ___________K.Cal

A. 128.13

B. 12.767

C. 12813

D. 1.2813

Answer: B

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3. For a chemical reaction $A \rightarrow$ products, the following equation is found to be followed, $\log K = 16.398 - \frac{2800}{T}$

At $27^\circ C$ the rate contant of the reaction is _____

A. 1.16×10^5

B. 1.16×10^6

C. 1.321×10^7

D. 1.16×10^7

Answer: D

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4. Arrhenius studied the effect of temperature on the rate of a reaction and postulated that rate constant varies with temperature exponentially as$k = Ae^{-E_a/RT}$. For most of the reactions it was found that the temperature coefficient of the reaction lies between 2 to 3. The method is generally used for finding the activation energy of a reaction. Keeping temperature constant, the effect of catalyst on the activation energy has also been studied by studying how much the rate of reaction changes in the presence of catalyst. In most of the cases, it is observed that catalyst lowers the activationenergy barrier and increases the rate of reaction.

The pre-exponential factor in the Arrhenius equation of a second order reaction has the units

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

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

C. s^{-1}

D. dimensionless

Answer: B

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5. Arrhenius studied the effect of temperature on the rate of a reaction and postulated that rate constant varies with temperature exponentially as$k = Ae^{-E_a/RT}$. For most of the reactions it was found that the temperature coefficient of the reaction lies between 2 to 3. The method is generally used for finding the activation energy of a reaction. Keeping temperature constant, the effect of catalyst on the activation energy has also been studied by studying how much the rate of reaction changes in the presence of catalyst. In most of the cases, it is observed that catalyst lowers the activationenergy barrier and increases the rate of reaction.

Which of the following plot will be linear?

A. In k versus T with -ve slope

B. k versus 1/T with -ve slope

C. In k versus 1/T wit -ve slope

D. In k versus 1/T with +ve slope

Answer: C

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6. Arrhenius studied the effect of temperature on the rate of a reaction and postulated that rate constant varies with temperature exponentially as $k = Ae^{-E_a/RT}$. For most of the reactions it was found that the temperature coefficient of the reaction lies between 2 to 3. The method is generally used for finding the activation energy of a reaction. Keeping temperature constant, the effect of catalyst on the activation energy has also been studied by studying how much the rate of reaction changes in the presence of catalyst. In most of the cases, it is observed that catalyst lowers the activationenergy barrier and increases the rate of reaction.

If the rate oc reaction grwos 15.6 times on increasing the temperature by 30 K the temperature coefficient of the reaction will be nearly

A. 2

B. 2.5

C. 3

D. 3.5

Answer: B

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PRACTICE SHEET-3 (MATCH THE FOLLOWING QUESTIONS)

1. Match the following columns

COLUMN - I	COLUMN - II
A) Decomposition of H_2O_2	p) Ten halflives
B) $\frac{k_{308K}}{k_{298K}}$	q) 1^{st} order
C) Arrhenius equation coefficient	r) Temperature
D) $t_{99.9\%}$	s) $\log\frac{k_2}{k_1} = \frac{E_a}{2.303R}\left(\frac{T_2 - T_1}{T_1T_2}\right)$
	t) 2 to 3

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2. Match the following columns

COLUMN - I	COLUMN - II
A) $e^{-E_a/RT}$	p) $\tan\theta, \theta > \frac{\pi}{2}$
B) A	q) Boltzmanns factor
C) $\frac{-k}{2.303}$	r) Zero order reation
D) $t_{1/2} = \frac{a}{2k}$	s) Arrhenius factor

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PRACTICE SHEET-3 (INTEGER ANSWER TYPE QUESTIONS)

1. The energy of activation for a reaction is 100 kJ/mol at $57\,^{\circ}C$. Presence of catalyst lower activation energy by 25%. The rate of reaction is increased by 10^{x} the value of x is

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2. In a reaction the following equation holds good as per chemical kinetics is viewed. $\log k = 4 - \frac{4000}{2.303RT}$. The frequency factor is 10^x. What is x.

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3. Figure shows a graph in log K vs $\frac{1}{T}$ where K is rate constant and T is temperature. The straight line BC has slope $\tan\theta = \frac{1}{2.303}$ and an intercept of 5 on y-axis. Thus E_a the energy of activation is ....Cal.

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4. The rate of reaction becomes two times for every $10\,^\circ C$ rise in temperature. If the rate of reaction increases by 32 times when the temperature is increased from $30\,^\circ C$ to $(10x)^2 C$. Then X=

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5. If the activation energy is decreased by $(5x)$ % by using a catalyst (300K) to achieve the same effect as of increasing the temperature from 300K-400K in a reaction, then find x.

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6. If the rate of reaction increases by 27 times, when temperature is increased by 30 K, then temperature coefficient of the reaction is________________

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PRACTICE SHEET-4 (SINGLE OR MORE THAN ONE OPTION QUESTIONS)

1. In general the rate of a given reaction can be increased by all the factors except

A. Increasing the temperature

B. Increasing the concentration of reactants

C. Increasing the activation energy

D. Using a positive catalyst

Answer: C

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2. The rate at which a substance reacts depends upon its

A. Atomic masss

B. Equivalet mass

C. Molecular mass

D. Active mass

Answer: D

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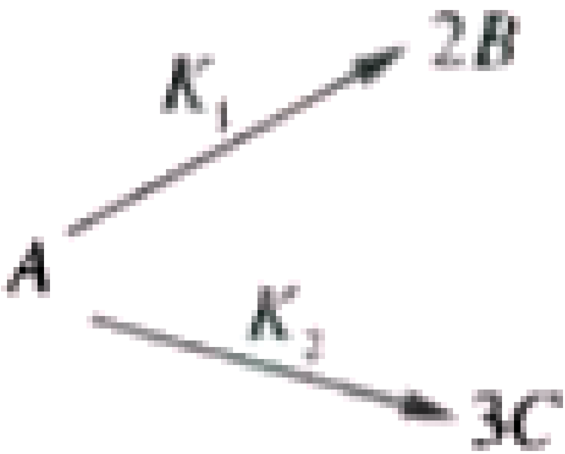
3. Consider the following parallel reaction being given $A\left(t_{1/2} = 1.386 \times 10^2 hrs\right)$, each path being first order.



If the distribution of B in the product mixture is 50%, the partial half life of A for conversion into C is

A. 346.5 hr

B. 131 hr

C. 115.5 hr

D. 31 hr

Answer: A

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4. For reaction $A_{(g)} \rightarrow B_{(g)} + C_{(g)} + D_{(g)}$ at 750 K the rate constant is $2.3 \times 10^{-3} \text{min}^{-1}$. Starting with a pressure of 400 mm of Hg at this temperature in a closed container how, many minutes would it take for the pressure in the container to become 760 mm Hg (log 11=1.041)

A. 360

B. 460

C. 260

D. 460

Answer: C

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5. For the reaction, following data is given

$A \rightarrow B : K_1 = 10^{15} \exp\left(\frac{-2000}{T}\right) \quad C \rightarrow D, K_2 = 10^{14} \exp\left(\frac{-1000}{T}\right)$

The temperature at whilch $K_1 = K_2$ is

A. 1000 K

B. 2000K

C. 864.8K

D. 434.22K

Answer: D

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6. $A_{(g)} + \frac{1}{2}B_{(g)} \rightarrow 2C + \frac{1}{2}D_{(g)}$

The rate of disappearance of B is x. What is the rate of appearance of C?

A. 3x

B. x/2

C. 2x

D. 4x

Answer: D

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7. Which of the following reaction is spontaneous at room temperature

A. $1_2 + H_2O \rightarrow$

B. $2H_2 + O_2 \rightarrow 2H_2O$

C. $N_2 + O_2 \rightarrow 2NO$

D. $2HCl \rightarrow H_2 + Cl_2$

Answer: B

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8. If a reaction $A + B \rightarrow C$ is exothermic to the extent of 30 KJ/mol and the forward reaction has an activation energy of 70 KJ/mol, the activation energy for the reverse reaction is

A. 30 KJ/mol

B. 40KJ/mol

C. 70KJ/mol

D. 100KJ/mol

Answer: D

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9. The rate of a chemical reaction doubles for every $10\,^{\circ}C$ rise in temperature. If the temperature is increased by $60\,^{\circ}C$ the rate of reaction increases by about

A. 20 times

B. 32 times

C. 64 times

D. 128 times

Answer: C

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10. An example for second order reaction is

A. $NO + \frac{1}{2}O_2 \rightarrow NO_2$

B. $Cl_2O \rightarrow Cl_2 + \frac{1}{2}O_2$

C. $2NO_2O_5 \rightarrow 2N_2O_4 + O_2$

D. $2H_2O_2 \rightarrow 2H_2O + O_2$

Answer: B

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11. The correct statement among the following is

A. order is known from rate equation

B. rate equation must be written basing on experiment

C. Molecularity is know from mechanism of reaction

D. Specific rate do not change with catalyst

Answer: A::B::C

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12. The catalyst used in a reaction can change

A. Activation energy of a reactio

B. Threshold energy of a reaction

C. Enthalpy of a reaction

D. Mechanism of a reaction

Answer: A::B::D

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13. The rate constant of a first order reaction is given by $K = 2.1 \times 10^{10} \exp(-2700/T)$. It meas that

A. Greater the activation energy, greater will be the temperature coefficient $\left(\frac{K_{T+10}}{K_T}\right)$

B. Freququency factor of the reaction is 2.1×10^{10}

C. Half life increases with increase of temperature

D. Activation energy of reaction is 5.4 is K.Cal

Answer: A::B::D

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14. It is observed that only 0.39% of the original radioactive sample remains undecayed after eight hours.Hence:

A. the half of that substance is 1hr

B. the mean life of the substance is $\frac{1}{\log_e 2}$ hr

C. decay constant of the substance is $\left(\log_e 2\right)\text{hour}^{-1}$

D. if the number of radioactive nuclei of this substance at a given instant is 10^8 then the number left after 30 min would be $\sqrt{2} \times 10^9$

Answer: A::B::C

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15. Which of the following are true for the first order reaction

A. $t_{3/4} = 2t_{1/2}$

B. $t_{15/16} = 4t_{1/2}$

C. $t_{15/16} = 3t_{3/4}$

D. $t_{7/8} = 2t_{3/4}$

Answer: A::B

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16. Select the correct statement(s) among following

A. Increase in concentration of reactant increases the rate of a zero order reaction

B. Rate constant k is equal to collision frequency A if $E_a = 0$

C. Rate constant k is equal to collision frequency A if $E_a = \infty$

D. $\log_{10}$ k vs 1/T is a straight line

Answer: B::D

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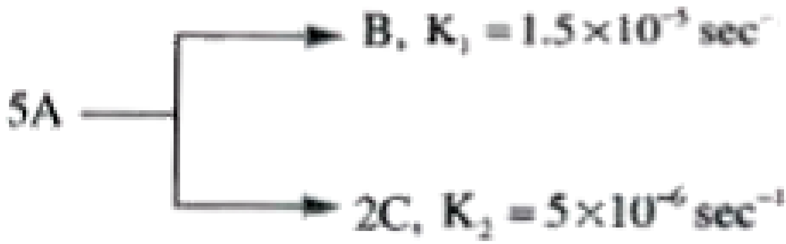
PRACTICE SHEET-4 (LINKED COMPREHENSION TYPE QUESTIONS)

1. A follows parallel path first order reaction to give B and C as given below (Take antilog (0.156)=1.428)



Initial conc of A is 0.2 M

The overall rate constant of the reaction is

A. $2 \times 10^{-5} sec^{-1}$

B. $1.5 \times 10^{-4} sec^{-1}$

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

D. b or c

Answer: A

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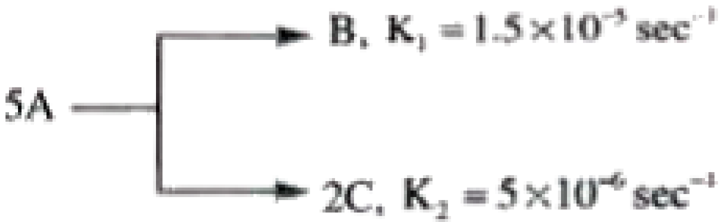
2. A follows parallel path first order reaction to give B and C as given below (Take antilog (0.156)=1.428)



The concentratio of A after 5 hours is

A. $3.6 \times x10^{-2}M$

B. $6 \times 10^{-2}M$

C. $1.5 \times 10^{-2}M$

D. $1.39 \times 10^{-1}M$

Answer: D

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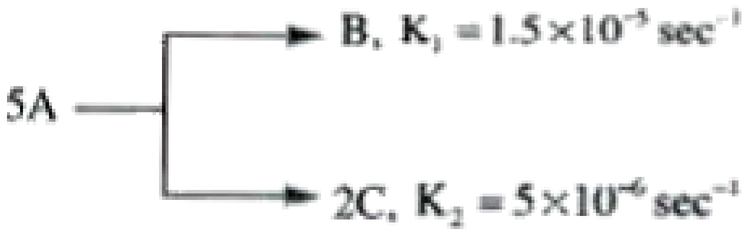
3. A follows parallel path first order reaction to give B and C as given below (Take antilog (0.156)=1.428)



At any stage of reaction molar yield of B in the products is

A. 0.4

B. 0.5

C. 0.6

D. 0.666

Answer: C

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4. Elementary unimolecular reaction have first order rate laws, elementary bimolecular reaction have second order rate laws. A rate law is often derived from a proposed mechanism by imposiing the steady state approximation by assuming that there in pre equilibrium A proposal mechanism must be constat with the experimental rate law.

The decomposition of O_3 obeys the mechanism given below,

Step 1: $O_3 \Leftrightarrow O_2 + (O)$ - fast

Step 2: $O_3 + (O) \rightarrow O_2 + O_2$ - slow

Then find the incorrect one

A. Order of reaction =1

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

C. Order with respect to $O_3 = 2$

D. Order with respect to $O_2 = 1$

Answer: D

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5. Elementary unimolecular reaction have first order rate laws, elementary bimolecular reaction have second order rate laws. A rate law is often derived from a proposed mechanism by imposiing the steady state approximation by assuming that there in pre equilibrium A proposal mechanism must be constant with the experimental rate law.

The decomposition of O_3 obeys the mechanism given below,

Step 1: $O_3 \Leftrightarrow O_2 + (O)$ - fast

Step 2: $O_3 + (O) \rightarrow O_2 + O_2$ - slow

The milk beacteria growth follows which order of reaction

A. 0

B. 1

C. 2

D. 3

Answer: B

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6. Elementary unimolecular reaction have first order rate laws, elementary bimolecular reaction have second order rate laws. A rate law is often derived from a proposed mechanism by imposiing the steady state approximation by assuming that there in pre equilibrium A proposal mechanism must be constant with the experimental rate law.

The decomposition of O_3 obeys the mechanism given below,

Step 1: $O_3 \Leftrightarrow O_2 + (O)$ - fast

Step 2: $O_3 + (O) \rightarrow O_2 + O_2$ - slow

$H_2 + Br_2 \rightarrow 2HBr$

Mechaism : $Br_2 \Leftrightarrow 2Br$ (fast)

$H_2 + br \rightarrow HBr + H$(slow)

$H + Br \rightarrow HBR$ (Fast)

Order of the reaction is

A. 0

B. 0.1

C. 1.5

D. 0.2

Answer: C

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PRACTICE SHEET-4 (MATCH THE FOLLOWING QUESTIONS)

1.

COLUMN - I (Reaction)	COLUMN - II (Units of K)
A) $SO_2Cl_2 \rightarrow SO_2 + Cl_2$	p) S^{-1}
B) $CH_3COOC_2H_5 + NaOH \rightarrow CH_3COONa + C_2H_5OH$	q) min^{-1}
C) $2H_2O_2 \rightarrow 2H_2O + O_2$	r) $L.mole^{-1}.min^{-1}$
D) $H_2O_2 + 2I^- + 2H^+ \rightarrow 2H_2O + I_2$	s) $L.mole^{-1}\ S^{-1}$

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2.

COLUMN - I	COLUMN - II
A) $U \longrightarrow Th + \alpha$	p) Same units for rate and specific rate constant
B) Ester $\xrightarrow{OH^-}$ Acid + Alcohol	q) rate constant : $mol^{-1}\ lit.sec^{-1}$
C) $NH_3 \xrightarrow[Surface]{Au} N_2 + \frac{3}{2} H_2$	r) $t_{0.5}$ in constant
D) $2NO + O_2 \longrightarrow 2NO$ (single step)	s) $t_{1/2} \propto \frac{1}{a^2}$

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PRACTICE SHEET-4 (INTEGER ANSWER TYPE QUESTIONS)

1. The concentrationfo R in the reaction $R \rightarrow P$ was measured as a function of time and the following data is obtained:

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

The order of the reactionis

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2. The rate of reaction becomes two times for every $10^{\circ}C$ rise in temperature. If the rate of reaction increases by 32 times when the temperature is increased from $30^{\circ}C$ to $(10x)^2C$. Then X=

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3. The periodic table consists of 18 groups. An isotope of copper, on bombardment with proton, undergoes a nuclear reaction yielding element as shown below. To which group element X belongs in the periodic table? ${}_{29}^{63}Cu + {}_{1}^{1}H \rightarrow 6{}_{0}^{1}n + \alpha + 2{}_{1}^{1}H + X$

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4. A,B and C are isodiapher, while C,D and E are isobars. Calculate the difference of protons between A and E${}_{82}^{206}A \rightarrow B \rightarrow C \rightarrow D \rightarrow E$

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5. $H_2O_2 + H_2O + \frac{1}{2}O(2)$ (1st order).

Time to time the H_2O_2 solution is titrated with standard acidified $KMnO_4$.

The data is

Time (min) $\quad 0 \quad 15$

$KMnO_4\text{consumed}) \quad 16ml \quad 2ml$

What is half life in minutes?

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6. At 300 K, half life of gaseous reactant initially at 58 K pa is 320 min. When the pressure is 29kpa, the half life is 160 min. The order of the reaction is

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PRACTICE SHEET-5 (SINGLE OR MORE THAN ONE OPTION QUESTIONS)

1. Identify the reaction order from the following rate constant $K = 2.3 \times 10^{-5}$ lt/mole /sec

A. 1st order

B. 2nd order

C. 3rd order

D. None of these

Answer: B

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2. The initial concentration of N_2O_5 in the first order reaction $N_2O_5 \rightarrow 2NO_2 + \frac{1}{2}O_2$ was 1.24×10^{-2} mole /lit at 318 k. The concentration of N_2O_5 after 60 min is 0.20×10^{-2} mole/lt. Calculate the rate constant of reaction at 318 K

A. 0.0304min^{-1}

B. 0.0602sec^{-1}

C. 0.0802sec^{-1}

D. 1.265min^{-1}

Answer: A

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3. The rate constants of a reaction at 500 k and 700 k are 0.02sec^{-1} and 0.07sec^{-1} respectively.

Calculate the value of E_a

A. 18230.8J

B. 190.83J

C. 185.02J

D. 172.02J

Answer: A

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4. The rate constant of zero order reaction is 2×10^{-2} mole L /sec. If the concentration of the reactant after 25 sec is 0.5 M, the initial concentration is

A. $2 \times 10^{-2} M$

B. 1M

C. 2M

D. $2 \times 10^{2} M$

Answer: B

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5. Two first order reactions half lives in the ratio $3:2$. If t_1 and t_2 are the time periods for 25% and 75% completion for the first and second reactions respectively, find $t_1 : t_2$

A. $0.0311 : 1$

B. $0.420 : 1$

C. $0.273 : 1$

D. $0.119 : 1$

Answer: A

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6. At the point of intersection of the two curves shown the conc. Of B is given by ....for $A \rightarrow nB$

A. $\dfrac{nA_0}{2}$

B. $\dfrac{A_0}{n - 1}$

C. $\dfrac{nA_0}{n + 1}$

D. $\left[\dfrac{n - 1}{n + 1}\right]A_0$

Answer: C

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7. For a first order reaction $(A) \rightarrow$ products the concentration of A changes from 0.1 M to 0.025 M in 40 minutes. The rate of reaction when the concentration of A is 0.01 M is

A. 3.47×10^{-4}M/in

B. 3.47×10^{-5}M/min

C. 1.73×10^{-4}M/min

D. 1.73×10^{-5}M/min

Answer: A

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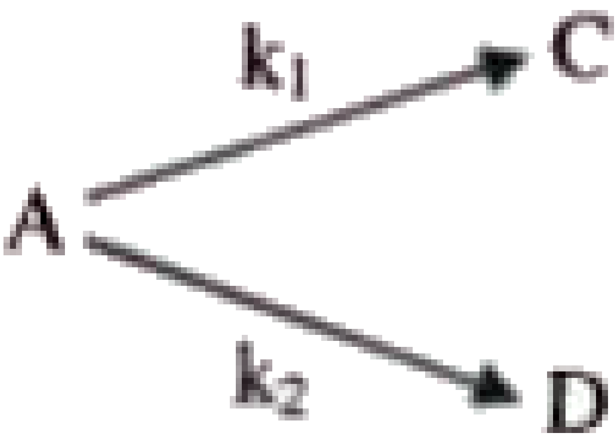
8. Which of the following is correct when at a time $t[A] = [C] = [D]$



A. $t = \frac{1}{2k_1} In3$

B. $t = \frac{1}{2k_2} In2$

C. $t = \frac{1}{3k_1} In2$

D. $t = \frac{1}{3k_2} In2$

Answer: A

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9. For the reaction, following data is given:

$$A \rightarrow B, K_1 = 10^{15}\exp\left(\frac{-2000}{T}\right), C \rightarrow D, K_2 = 10^{14}\exp\left(\frac{-1000}{T}\right)$$

The temperature at which $K_1 = K_2$ is

A. $1000K$

B. $2000K$

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

D. 1000/2.303K

Answer: D

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10. A substance A decomposes in solution by following the first order kinetics. Flask I contains 1 L of 1 M of solution of A and flask II contains 100 ml of 0.6 M solution of A. After 8 hrs the concentrationof A is flask I become 0.25 M. What will be time for concentration of A in flask II to become 0.3 M?

A. 2.0hrs

B. 8.0 hrs

C. 4.0hrs

D. 6.0 hrs

Answer: C

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11. Consider the order of a reaction. Choose the incorrect statement(s).

A. Order of a reaction may be zero, integer or fractional

B. Overall order of the reactio never be negative.

C. The order of an elementary step is always equal to tis molecularity.

D. For the chemical equation $N_2 + 3H_2 \rightarrow 2NH_3$ the order of reaction is 4.

Answer: D

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12. For a reaction $A \rightarrow$ Product, half life is 50 min, when the initial concentration of A is 4 molar Half life of same reaction is 80 min, when the initial concentration of A is 2 molar. Then

A. Order is 1

B. Order of reaction is 2

C. units of rate constant is time^{-1}

D. Unit of rate of reaction is mole $\text{litre}^{-1}\text{time}^{-1}$

Answer: B

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13. SO_2 reacts with O_2 as follows $2SO_2 + O_2 \rightarrow 2SO_3$, the rate of disappearance of SO_2 is 2.4×10^{-4} mole $\text{lit}^{-1}\text{min}^{-1}$. Then

A. Rate of reaction is $1.2 \times 10^{-4}\text{mol lit}^{-1}\text{min}^{-1}$

B. Rate of appearance of SO_3 is$2.4 \times 10^{-4}\text{mole lit}^{-1}\text{min}^{-1}$

C. Rate of disappearance of O_2 is 1.2×10^{-4} mole $'\,lit^{-1}\ \text{min}^{-1}$

D. Rate of reaction is twice the rate of disappeanrance of SO_3

Answer: A::B::C

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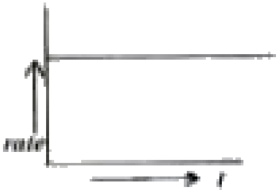
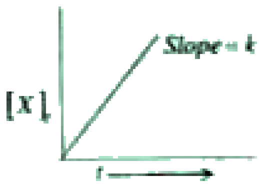
14. Which of the following graphs represents zero order if $A \rightarrow P$ At $t = 0 \Rightarrow [A]_0$ at $t = t \Rightarrow [A]_t$

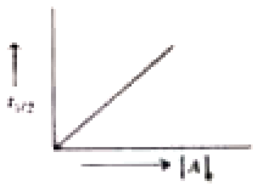


A.

B.



C.



D.

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

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15. Which of the following is/are examples of pseudo unimolecular reactions?

A. $CH_3CO_2C_2H_5 + H_2O \xrightarrow{H^+} CH_3CO_2H + C_2H_5OH$

B. $C_{12}H_{22}O_{11} + H_2O \xrightarrow{H^+} C_6H_{12}O_6 + C_6H_{12}O_6$glucose fructose

C. $SO_2Cl_2 \rightarrow SO_2 + Cl_2$

D. $CH_3CO_2C_2H_5 + H_3O \xrightarrow{OH^-} CH_3CO_2H_{C\_}(2)H_5OH$

Answer: A::B

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16. Select the correct statements

A. Every substance that appears in the rate law of reaction must be a reactant or product in that reaction

B. If we know the rate law of a reaction,we can deduce its mechanism

C. If the reaction has rate $r = K[A][B]^{3/2}$ then reaction may be elementary

D. A zero order reaction must be a complex reaction.

Answer: B::D

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PRACTICE SHEET-5 (LINKED COMPREHENSION TYPE UESTIONS)

1. The data given below are for the reaction of NO and Cl_2 to form NOCl at 295 K

$\left[Cl_2\right]$ $[NO]$ initial rate(mol litre^{-1}sec^{-1})

0.05 0.05 1×10^{-3}

0.15 $0.053x10^{-3}$

0.05 0.15 9×10^{-3}

The rate constant of the reaction is

A. 6

B. 8

C. 3

D. 2

Answer: B

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2. The data given below are for the reactionof NO and Cl_2 to form NOCl at 295 K

$\left[Cl_2\right]$ $[NO]$ initial rate(mol litre^{-1}sec^{-1})

0.05 0.05 1×10^{-3}

0.15 0.053×10^{-3}

0.05 0.15 9×10^{-3}

The reaction rate when conc. of Cl_2 an NO are 0.2 M and 0.4 M respectively is

A. 0.256 mole litre^{-1}

B. 0.256 mole $\text{litre}^{-1}\text{sec}^{-1}$

C. 0.512 mole litre sec^{-1}

D. 0.512 mole litre^{-1}sec

Answer: B

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3. The data given below are for the reactionof NO and Cl_2 to form NOCl at 295 K

$[Cl_2]$ $[NO]$ initial rate(mol $\text{litre}^{-1}\text{sec}^{-1}$)

0.05 0.05 1×10^{-3}

0.15 0.053×10^{-3}

0.05 0.15 9×10^{-3}

If $[Cl_2]$ is halved and (NO) is double the rate of the reaction is ______

A. halved

B. doubled

C. unchanged

D. becomes 1/4th

Answer: B

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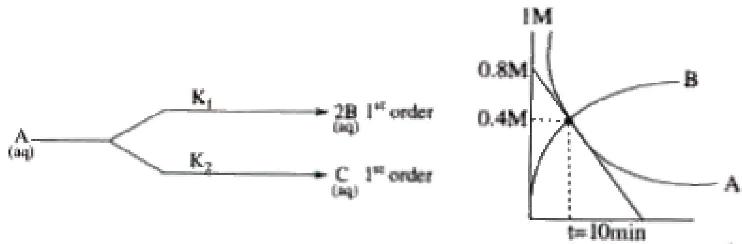
4.



What is the half life of the given reaction?

A. 8min

B. 7.5 min

C. 3.5 min

D. 10 min

Answer: B

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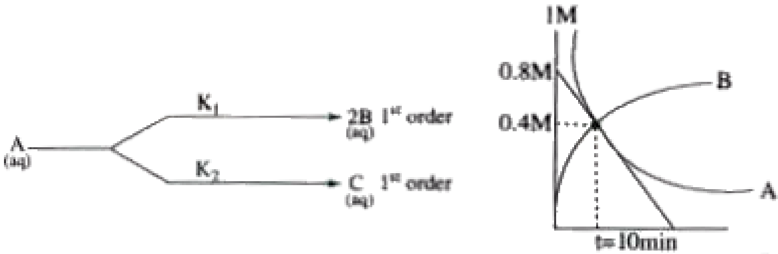
5. 

What is the ratio of the rate constants K_1 and K_2 ?

A. $2:3$

B. $1:3$

C. $2:5$

D. $1:2$

Answer: D

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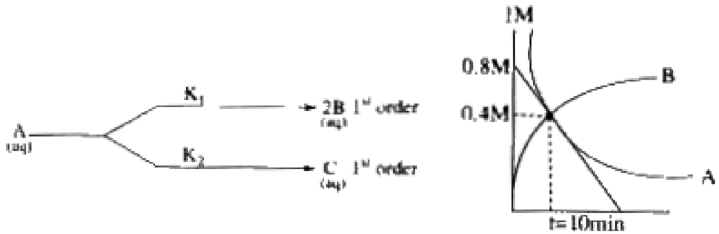
6. 

What is the ratio of concentration of B C at ay stage of the reaction?

A. 1

B. 2

C. 3

D. 4

Answer: A

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PRACTICE SHEET-5 (MATCH THE FOLLOWING QUESTIONS)

1\.

List - A (1st order)	List-B (Feature)
A) Fraction reacted	p) $(1-e^{-kt})$
B) Fraction of reactants left	q) $\alpha\left(2^{-t/t_{1/2}}\right)$
C) $t_{99.99\%}$	r) $13.4\ t_{1/2}$
D) $2t_{87.5}\%$	s) $3t_{75\%}$

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2\.

List - A	List-B
A) $A \longrightarrow B;\ \Delta H = -10kJ$	p) $(E_a)_f > (E_a)_B$
B) $X \longrightarrow Y;\ \Delta H = +20kJ$	q) increase in temperature increaes rate
C) $X \longrightarrow Y;\ \Delta H = +40kJ$	r) $(E_a)_f < (E_a)_B$
D) $M \longrightarrow N;\ \Delta H = -80kJ$	s) $(P.E)_R > (P.E)_P$

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PRACTICE SHEET-5 (INTEGER ANSWER TYPE QUESTIONS)

1. For an acid catalysed reaction $A \xrightarrow{H^+} B$ half life period is independent of concentration of A at given pH. At same concentrationn of A half tiem is

10 min at $p^H = 2$ and half life time is 100 min at $P^H = 3$. If the rate law expression of reaction is $r = K[A]^x\left[H^+\right]^y$ then calculate (x+y)

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2. For first order parallel reactionK_1 and K_2 are 4 and 2min^{-1} respectively at 300K. If the activation energies for the formation of B and C are respectively 30,000 and 38,314 Joul/mol respectively. The temperature at which B and C will be obtained in equimolar ratio is 47x. Hence x is ____________

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3. The rate of a reaction increased from 2 units to 54 units due to change in temperature from $27^\circ C$ to $57^\circ C$. What is the approximate temperature coefficient of the reaction.

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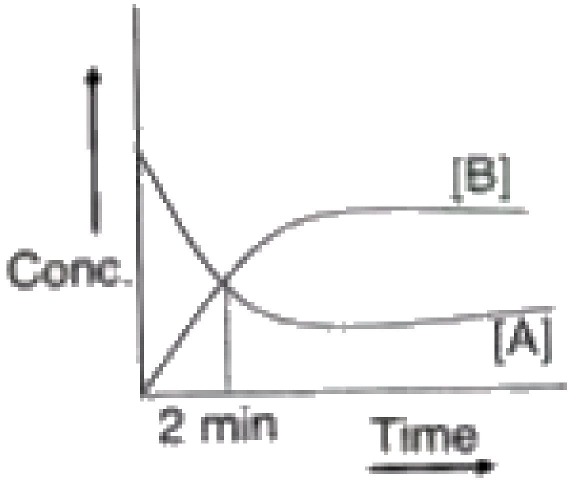
4. For a first order reaction $A_{(g)} \Leftrightarrow 3B(g)$ the concentration verses time graph is given below



What is the half life in minutes (answer to the nearest integer)?

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5. A chemical reaction occurs in three paths having rate constants k_1, k_2 and k_3 respectively. If Ea_1, Ea_2 and E_{a_3} are 4,5 and 8kJ respectivel and overall rate constant $k = \frac{k_1 k_3}{k_2}$. Assuming $A_{av} = \frac{A_1 A_3}{A_2}$ the overall energy of activation in kJ is ________

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6. In a closed container NO_2 gas is getting dimerised intoN_2O_4 gas with first order kinetics. Pressure after 10 hours of reaction is 5 atm and pressure after completion of reaction is 4atm. What is half life in hours?

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Examples

1. Formation of water from its elements is spontaneous, but is slow. Comment .

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2. Express the rate of the reaction between bromide and bromate ions in acid medium.

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3. $N_2 + 3H_2 \rightarrow 2NH_3$. The rate of disappearance of nitrogen is $0.02 mol L^{-1} s^{-1}$. What is the rate of apperance of ammonia ?

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4. $2CO(g) + O_2(g) \rightarrow 2CO_2(g), 2NO(g) + O_2(g) \rightarrow 2NO_2(g)$. Which is relatively faster ? Why ?

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5. Decolourisation of acidified permaganate in fast by Mohr's salt , but is solw by oxalate . Expalin .

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6. At $27^\circ C$ and $37^\circ C$, the rates of a reaction are given as $1.6 \times 10^{-2} mol L^{-1} s^{-1}$ and 3.2×10^{-2} mol $L^{-1} s^{-1}$. Calculate the energy of

activation for the given reaction .

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7. the rate of the reaction at $25^{\circ} C$ $3 \text{ mol L}^{-1} \text{ min}^{-1}$. The temperature coefficient of a reaction is 2 andCalculate the rate at the temperature $75^{\circ} C$.

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8. Pre -exponential factor for a reaction is $8.4 \times 10^{21} molL^{-1}s^{-1}$. What will be the specific rate at temperature of one million degree ?

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9. A_2B is an ideal gas , which decompase according f to the equation : $A_2B \rightarrow A_2 + \frac{1}{2}B_2$. At start , the initial pressure is 100 mm Hg and after 5 minutes , the pressure is 120 mm Hg. What is the average rate of decomposition of A_2B ? Assume T and V are constant .

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10. Rate of a chemical reaction depends on concentration of reactant is independent on concentration. Why?

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11. For a reaction a,$A \rightarrow$ Products , the units of rate constant are given as $Lmol^{-1}s^{-1}$. Write the rate expression .

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12. Units of rate constnat is the same for the elementary reactions :

Reaction (1) $A + B + C \rightarrow$ products, Reaction (2) , $A + 2B \rightarrow$ products,

Reaction (3), $3A \rightarrow$ products. Substantiate.

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13. The decomposition of nitrogen pentoxide is given as $2N_2O_5 \rightarrow 4NO_2 + O_2$. The rates of reaction are $\frac{[N_2O_5]}{\Delta t} = k_1[N_2O_5], \frac{\Delta[NO_2]}{\Delta t} = k_2[N_2O_5]$ and $\frac{\Delta[O_2]}{\Delta t} = k_3[N_2O_5]$

Relate the rate constants k_1, k_2 and k_3 .

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14. Rate expression for two reaction are : (a) $\text{rate}_a = k_a[A]$ and (b) $\text{rate}_b = k_b[B]^2$. When [A] = [B] $= 1moll^{-1}, k_a = k_b molL^{-1}$. If [A] = [B] = 2 mol L^{-1} , write the relation between rate_a and rate_b .

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15. What is the difference between activated complex and unstable intermediate ?

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16. An increase in temperature by 10° , can increase the number of collisions only by 2% , but the rate of reaction increases by 100%. Why?

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17. Energy of activation and orientation of molecule together determine the criteria for effective collision . Explain.

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18. At $25^{\circ}C$ the activation energy for a catalysed reaction is $126 KJmol^{-1}$ and for uncatalysed reaction is $350 KJmol^{-1}$. How many times the rates is increased in the presence of catalyst ?

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19. The experimental data for the reaction $2A + B_2 \rightarrow 2AB$ is given below.

Based on the data write the rate equation.

$[A], mol\ L^{-1}$	$[B_2], mol\ L^{-1}$	$Rate, mol\ L^{-1}s^{-1}$
0.5	0.5	1.6×10^{-4}
0.5	1.0	3.2×10^{-4}
1.0	1.0	3.2×10^{-4}

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20. $4HBr + O_2 \rightarrow 2H_2O + 2Br_2$. The molecularity of the reaction appears as 5, but experimentally, it is 2.

Explain.

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21. 75%. of a first order reaction is complete is 30 min. Calculate (a) half life, (b) rate constant and (c) time required for 99.9% completion of the reaction.

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22. A first order reaction is 20% complete in 10 min. How long it takes to complete 80% ?

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23. At $193^{\circ}C$, the rate law for the reaction $2Cl_2O \rightarrow 2Cl_2 + O_2$ is rate $= k[Cl_2O]^2$.

(a) How the rate changes if $[Cl_2O]$ is raised to therefold of the original ?

(b) How should $[Cl_2O]$ be changed in order to order to double the rate ?

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24. At $193^{\circ}C$, the rate law for the reaction $2Cl_2O \rightarrow 2Cl_2 + O_2$ is rate $= k\left[Cl_2O\right]^2$.

(a) How the rate changes if $\left[Cl_2O\right]$ is raised to therefold of the original ?

(b) How should $\left[Cl_2O\right]$ be changed in order to order to double the rate ?

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25. The initial concentration of ethyl acetane is $0.85 molL^{-1}$. Following the acid catalysed hydrolysis the , concentrations of ester after 30 min and 60 min of the reaction are respectively 0.8 and $0.754 molL^{-1}$. Calculate the rate constant and pseudo rate constant.

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26. The rate constant of a reaction is $2.5 \times 10^{-2}\ \text{L mol}^{-1}s^{-1}$. Calculate the initial rate with concentration $0.2\ \text{mol L}^{-1}$.

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27. $2NO + H_2 \rightarrow N_2O + H_2O$, The reaction , follows third order kinetics.

Write (a) rate law and (b) units of rate constant.

What happens to the rate if the volume of vessel is reduce to one - half at constnat temperature ?

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28. The rate of a reaction is given as , rate $= k[X]^{3/2}[Y]^{-1/2}$

What is the order of the reaction ? If Y is taken large in excess , write the rate equation.

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29. A and B are two radioctive substance with half lives 20 min and d30 min respectively. Starting from equal number of moles A and B , after 1hr , what is the (a) ratio of moles of A and B and (b) ratio of activity of A and B ?

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30. For the reaction $X \rightarrow Y + Z$ if the initial concentration of X was reduced form 2M to 1M in 20 min and from 1M to 0.25M in 40min , find the order .

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31. Radium disintegrates to give radon. Write chemical equation as well as rate equation.

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32. Half-life of ^{210}Pb is 22 years. 2gram of lead is allowed decay for 11 years. (a) How much lead is left ?and (b) What is the percentage decay ?

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Subjective Exercise -1 (Long answer questions)

1. The rate of a chemical reaction

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Subjective Exercise -1 (Short answer questions)

1. Mention different types of reation based on their speeds . Give examples .

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2. What are everage rate and instant rate ? How is rate determined graphically ?

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3. How nature and concentration of reactants influence the rate of a reaction .

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4. Discuss the effect of temperature on the rate of a reaction. Derive necessary equations in this contaxt.

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Subjective Exercise -1 (Very short answer questions)

1. What is catalyst ? How does it influences the rate ?

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2. Define rates with respect to substance and rate of the reaction for Haber's process. $N_2 + 3H_2 \rightarrow 2NH_3$.

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3. Express the relation between the rates measured with respect to the disppearance of N_2, H_2 and formation of NH_3 for $N_2 + 3H_2 \rightarrow 2NH_3$

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4. How does the rate of reaction change with time.

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Subjective Exercise -2 (Short answer questions)

1. Define rate law . How is it related to the stoichiometric equation and experimental result ?

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2. What are (a) rate constant and (b) specific rate ? Write the units of rate constant.

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3. Write four main difference between reaction rate and reaction rate constant.

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4. Write the rate law and units of rate constant for the following elementary reactions.

$A \rightarrow$ Products

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5. Write the rate law and units of rate constant for the following elementary reactions.

$A + B \rightarrow$ Products

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6. Write the rate law and units of rate constant for the following elementary reactions.

$2A \rightarrow$ Products

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7. Write the rate law and units of rate constant for the following elementary reactions.

$A + 2B \rightarrow$ Products

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8. Write the rate law and units of rate constant for the following elementary reactions.

$2A + B \rightarrow$ Products

Watch Video Solution

9. Write the rate law and units of rate constant for the following elementary reactions.

$3A \rightarrow$ Products

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10. Write the rate law and units of rate constant for the following elementary reactions.

$A + B + C \rightarrow$ Products

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Subjective Exercise -2 (Very short answer questions)

1. Give the units for rate constant if the rate law rate $= k[\text{reactant}]^3$

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Subjective Exercise -3 (Long answer questions)

1. What is activated complex ? Discuss its formation and transformation .

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2. What is activated complex ? Discuss its formation and transformation .

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3. Write the main points of collision theory of reaction rates .

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4. Distinguish between a proper and an imporper collision .

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Subjective Exercise -3 (Short answer questions)

1. How is the reaction rate influenced by energy of activation ?

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2. What are threshold energy and energy of activation ?

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Subjective Exercise -4 (Long Answer Questions)

1. Derive an expression for the integral rate constant of a first order reaction.

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Subjective Exercise -4 (Short Answer Questions)

1. Write the difference between elementary and complex reactions. What is rate limiting step ?

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2. What are the main differences between order and molecularity ?

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3. Define half-life. How is it related to the rate constant of zero and first order rate constants ?

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4. How is half life method useful in the determination of the order of a reaction ?

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5. Derive the relation between rate constant and half life period for a first order reaction.

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Subjective Exercise -4 (Very Short Answer Questions)

1. The rate equation for the reaction is established experimentally as $V = K[A]^2[B]^{1/2}$. What is the total order ?

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2. Name two first order reactions.

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3. What is zero order reaction ? Give an example.

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4. Derive an integrated rate equatin for a first order reaction.

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5. Write the slope and intercept of the plot of ln(a-x) against time for a first order reaction.

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6. Write an first order gas phase reactions.

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7. The graphs for a zero order reaction are different from other order reactions. Substantiate.

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8. In an experiment the half time is found to be the same with any initial concentration of the reactant. What is the order ?

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9. $H_{2(g)}$ reacts with $I_{2(g)}$ to give $HI_{(g)}$. Write the rate equation and predict order.

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10. For any radioactive element the half time of half life is not dependent on the initial amount of the element taken. Why ?

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11. In a reaction, the rate did not change with concentration of reactants. What is your inference ?

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Subjective Exercise -4 (Numerical Problems)

1. The initial concentration of [A] = 0.3 mol/lit. The concentration after 2.3 min is 0.15 moles/lit. What is the value of rate constant.

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2. Rate constant for a reaction, $X \rightarrow Y$, is $4.5 \times 10^{-3}\ \text{min}^{-1}$. If the initial concentration of X is 1 M, what is the rate of reaction after one hour ?

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3. A first order reaction has rate constant $1.15 \times 10^{-1} s^{-1}$. How long will 10 grams of this reactant take to reduce 6 grams ?

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4. Half life of a first order reaction is $2.1 \times 10^{12} s^{-1}$. Calculate the rate constant of the reaction.

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5. Rate constant of first order reaction is $0.693 \mathrm{sec}^{-1}$. What is the half - life ?

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6. $N_2O_{5(g)}$ is at a pressure of 0.5 atm. After 100 s the pressure of the decomposition mixture is 0.512 atm. Calculate the rate constant.

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7. $C_4H_8 \rightarrow 2C_2H_4$. The rate constant is $2.84 \times 10^{-4} s^{-1}$. Calculate the time required to attain a molar ratio of the mixture, ethylene to cyclobutane is equal to $1:100$.

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OBJECTIVE EXERCISE - 1 (Rate and factors influencing rate)

1. Which of the following reactions occurs at measurable rate?

A. reaction between H^+ and OH^- ions in aqueous solution

B. reaction between $AgNO_3$ and $NaCl$ aqueous solutions

C. hydrolysis of methyl acetate

D. reaction between hydrogen and oxygen gases at room temperature

Answer: C

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2. Which of the following reaction is spontaneous at room temperature

A. $I_2 + H_2O \rightarrow$

B. $2H_2 + O_1 \xrightarrow{Pt} 2H_2O$

C. $N_2 + O_2 \rightarrow 2NO$

D. $2HCl \rightarrow H_2 + Cl_2$

Answer: B

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3. Among the following slowest reaction under idetical conditions is

A. $H^{+} + OH^{-} \rightarrow H_2O$

B.

$$2KMnO_4 + 5H_2C_2O_4 + 3H_2SO_4 \rightarrow K_2SO_4 + 10CO_2 + 2MnSO_4 + 8H_2O$$

C.

$$2KMnO_4 + 10FeSO_4 + 8H_2SO_4 \rightarrow K_2SO_4 + 2MnSO_4 + 5Fe_2(SO_4)_3 + 8H$$

D. $AgNO_{3(aq)} + NaCl_{(aq)} \rightarrow AgCl_{(s)} + NaNO_{3(aq)}$

Answer: B

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4. The rate of reaction for $N_2 + 3H_2 \rightarrow 2NH_3$ may be represented as

A. $r = -\frac{d[N_2]}{dt} = -\frac{1}{3}\frac{d[H_2]}{dt} = +\frac{1}{2}\frac{d[NH_3]}{dt}$

B. $r = -\frac{d[N_2]}{dt} = \frac{1}{3}\frac{d[H_2]}{dt} = +\frac{1}{2}\frac{d[NH_3]}{dt}$

C. $r = -\frac{d[N_2]}{dt} = 3\frac{d[H_2]}{dt} = +\frac{1}{2}\frac{d[NH_3]}{dt}$

D. $r = -\frac{d[N_2]}{dt} = -\frac{1}{3}\frac{d[H_2]}{dt} = +2\frac{d[NH_3]}{dt}$

Answer: A

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5. (A) : The rate of a chemical reaction decreases as the reaction proceeds.

(R) : The reactant concentration remains constant as the reaction proceeds.

The correct answer is

A. Both (A) and (R) are true, (R) explains proprly (A)

B. Both (A) and (R) are true, (R) does not explain (A)

C. (A) is true (R) is false.

D. (A) is false (R) is true.

Answer: B

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6. The chemical reaction occurring between covalent moleculse a involves

A. breaking of existing bonds

B. formation of new bonds

C. evolution of neat energy

D. 1 and 2

Answer: D

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7. In a reaction $2A + b \rightarrow A_2B$ the reaction A will disappear at

A. half the rate at which B disappears

B. the same rate at which B disappears

C. the same rate at which A_2B is formed

D. twice the rate at which B disappears

Answer: D

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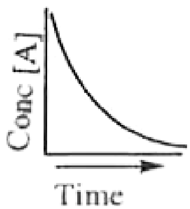
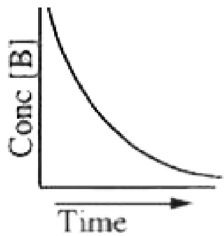
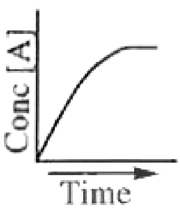
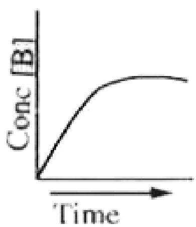
8. For the reaction $A \rightarrow B,$ following curves represent reaction

1) 

2) 

3) 

4) 

The correct curves are

A. 1,2 only

B. 2,3 only

C. 1,4 only

D. 3,4 only

Answer: C

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9. If the first order reaction involves gaseous reactant & 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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10. The reaction $2NO + O_2 \rightarrow 2NO_2, 2CO + O_2 \rightarrow 2CO_2$ 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 lowe internal energy change than the second

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

D. first reaction has higher activation energy than the second

Answer: C

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11. Burning of coal is reprsented 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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12. For a hypothetical reaction $A \rightarrow L$ the rate expression is rate $= - \dfrac{dC_A}{dt}$

A. Negative sign represents that rate is negative

B. Negative sign pertains to the decrease in the concentrations of reactant

C. Negative sign indicates the attractive forces between reactants.

D. All of the above are correct

Answer: B

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13. For the reaction $2HI \rightarrow H_2 + I_2$ the expression - $\frac{1}{2}\frac{d[HI]}{dt}$ 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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14. For $3A \rightarrow xB$, $\frac{d[B]}{dt}$ is found to be 2/3rd of $\frac{d[A]}{dt}$,. Then the value of x is

A. 1.5

B. 3

C. $1/2$

D. 2

Answer: D

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15. For a reaction $A \rightarrow 2B$, as time proceeds

A. $[A] \downarrow \quad \text{but} \quad [B] \uparrow$

B. Rate of disappearance of $A \downarrow$ but that of rate of appearance of $B \uparrow$

C. Rate of disappearance of $A \uparrow$, but that of rate of apparance of $B \downarrow$

D. Rate with respect to A and B remain same

Answer: A

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16. At 298 K, atm among

A. $H_2 + O_2 \rightarrow 2H_2O$ B. $H_2 + Cl_2 \rightarrow 2HCl$

c. $N_2 + O_2 \rightarrow 2NO$ D. $H_2SO_4 + KOH \rightarrow K_2SO_4$ products, correct order of reaction rates is

A. $D > A > C > B$

B. $D < A < B < C$

C. $D > B > A > C$

D. $D > B = C > A$

Answer: C

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17. In which of the following cases, rate of disappearance of any reactant at a given instant equals to rate of appearance of any product

A. $H_2 + F_2 \rightarrow 2HF$

B. $N_2 + 3H_2 \rightarrow 2NH_3$

C. $PCl_5 \rightarrow PCl_3 + Cl_2$

D. $H_2 + \frac{1}{2}O_2 \rightarrow H_2O$

Answer: C

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18. For $\frac{1}{2}X_2 + Y_2 \rightarrow XY_2$ relartive rates of species is given as

A. Rate $= \frac{-d[x_2]}{dt} = \frac{-d[y_2]}{dt} = +\frac{d[xy_2]}{dt}$

B. Rate $= -2\frac{d[x_2]}{dt} = \frac{-d[y_2]}{dt} = +\frac{d[xy_2]}{dt}$

C. Rate $= \frac{-1}{2}\frac{d[x_2]}{dt} = \frac{-d[y_2]}{dt} = +\frac{d[xy_2]}{dt}$

D. Rate $= -\frac{1}{2}\frac{d[x_2]}{dt} = \frac{+d[y_2]}{dt} = +\frac{d[xy_2]}{dt}$

Answer: B

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19. The reaction $CH_3COOC_2H_5 + H_2O \xrightarrow{H^+}$ products is a/an_____process

a. Instantantaneous B. Spontaneous C. Moderately slow

Then correct statement(s) is/are

A. A & C

B. B & C

C. A only

D. C only

Answer: B

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20. For $N_2 + 3H_2 \rightarrow 2NH_3$ rates of disappearance of N_2 and H_2 and rate of appearance of NH_3 respectively, are a,b and c then

A. $a > b > c$

B. $a < c < b$

C. $a = b > c$

D. $a = b = c$

Answer: B

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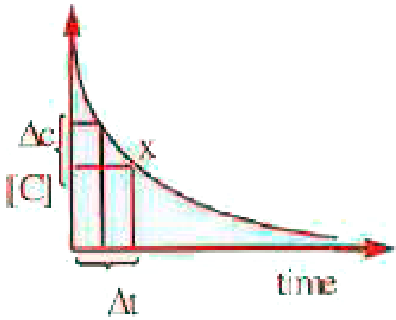
21. From the graph the value $\frac{\Delta c}{\Delta t}$ and the value of rate reaction at X respectively are called



A. Average rate and instantaneous rate

B. Instantaneous rate and average rate

C. Average rate only

D. Instantaneous rate only

Answer: A

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22. The rate of reaction which does not involve gases, does not depend upon

A. temperature

B. concentration

C. pressure

D. catalyst

Answer: C

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23. The specific rate constant of a reaction depends on the

A. concentration of the reactant

B. time

C. temperature

D. concentration of the product

Answer: C

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24. A catalyst accelerates the reaction, because

A. it brings the reactants closer

B. it lowers the activation energy

C. it changes the heat of reaction

D. it increases the heat of reaction

Answer: B

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25. The unit of rate constant depends on

A. number of reactants

B. concentration terms

C. order of reaction

D. molecularity or reaction

Answer: C

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26. The temperature coefficient of a reaction is

A. the rate constant at a fixed temperature

B. the ratio of rate constants at two temperatures

C. the ratio of rate constants at two different temperatures differing by $10^{\circ}C$

D. the ratio of rate constants at two pressures

Answer: C

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27. If concentration of reactants is made x times the rate constant k becomes

A. $e^{k/x}$

B. k/x

C. unchanged

D. x/k

Answer: C

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

A. 1 & 3

B. 2 & 3

C. 1 & 4

D. 2 & 4

Answer: B

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29. For a reaction $\frac{K_{(1+10)}}{K_{(1)}} = x$. When temperature is increased from $10\ ^\circ C$ to $100\ ^\circ C$ rate constnat (K) increased by a factor of 512. Then value of x is

A. 1.5

B. 2.5

C. 3

D. 2

Answer: D

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30. Increase of temperature will increase the reaction rate due to

A. increase of number of effective collisions

B. increase of mean free path

C. increase of number of molecules

D. increase of number of collisions

Answer: A

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31. The rate constants of a reaction at 300K and 280 K respectively are K_1 and K_2. Then

A. $K_1 = 20K_2$

B. $K_2 = 4K_1$

C. $K_1 = 4K_2$

D. $K_1 = 0.5K_2$

Answer: C

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32. The rate constant K_1 of a reaction is found to be double that of rate constant K_2 of another reaction. The relationship between corresponding activation energies of the two reactions E_1 and E_2 can be represented as

A. $E_1 > E_2$

B. $E_1 < E_2$

C. $E_1 = E_2$

D. $E_1 = 2E_2$

Answer: B

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33. The Arrhenius equation expressing the effect of temperature on the rate constant of reaction is

A. $K = Ea/RT$

B. $K = A \quad e^{-Ea/RT}$

C. $K = \text{loge}\dfrac{Ea}{RT}$

D. $K = e^{-Ea/RT}$

Answer: B

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34. Activation energy depends on

A. pressure

B. concentration of reactants

C. concentration of product

D. nature of reactants

Answer: D

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35. A catalyst in a chemical reaction does not change

A. Average energy of reactants or products

B. Enthalpy of the reaction

C. Activation energy of the reaction

D. Both 1 and 2

Answer: D

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36. In general the rate of a given reaction can be increased by all the factors except

A. Increasing the temperature

B. Increasing the concentration of reactants

C. Increasing the activation energy

D. Using a positive catalyst

Answer: C

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37. The effect of temperature on a reaction rate for whilch Ea is zero is give by

A. with increase of temperature rate increases

B. with increase of temperature rate decreases

C. rate is independent of temperature

D. reaction never occurs

Answer: C

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38. (A) The rate law of a reaction cannot be predicted from its balanced chemical equation, but must be determined experimentally only.

(R) The order of a reaction is always an integer like, $0, 1, 2$ and 3.

A. (A) and (R) are correct, (R) is not the correct explanation of (A)

B. (A) is correct but (R) is not correct

C. (A) is not correct but is correct

D. (A) and (R) are correct, (R) is the correct explanation of (A)

Answer: B

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39. In the graph drawn between log K and 1/T, intercept equalst o

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

B. log A

C. ln A

D. (log A)/2.303

Answer: B

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40. In the Arrhenius equation equation,the Boltzmann factor $e^{Ea/RT}$ represents the..............of the molecules possessing energ in excess of activation energy

A. number

B. fraction

C. weight

D. percentage

Answer: B

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41. Activation energies for different reactions are given below

(a) A $\rightarrow$ products, Ea=14 K.Cal

(b) B $\rightarrow$ products, Ea=16 K.cal

(c) C $\rightarrow$ products, Ea=12 K.Cal

(d) D $\rightarrow$ products, Ea=10 K.cal

If the temperature increases by 10^0C for which reactions the temperature coefficients are maximum and minimum respectively.

A. a & b

B. b & c

C. b & d

D. d & b

Answer: C

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42. Which of the following parameters of a chemical readtion are increased when a catalyst is used?

A. Rate & activation energy

B. Rate constant & enthalpy

C. Enthalpy & time duration

D. Rate & Rate constant

Answer: D

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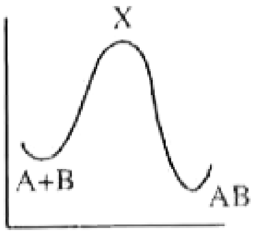
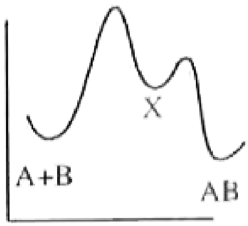
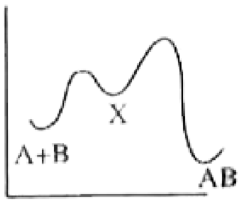
43. For an exothermic chemical process occurring in two steps as

i) $A + B \rightarrow X$ (slow) ii) $X \rightarrow AB$ (fast)

The progress of the reaction can be best described by

A. 

B. 

C. 

D. All are correct

Answer: B

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44. Which of the following influence the rate of reaction

a. Nature of reactants b. Concentration of rectants

c. Temperature D. Molecularity

A. A,B

B. B,C,D

C. C,D

D. A,B,C

Answer: D

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45. 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 or reaction

D. Size of the vessel

Answer: C

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46. The rate expression gives the relation between rate of reaction and

A. conc. of reactants

B. conc. of products

C. rate constant

D. rate law

Answer: A

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47. Rate constant of a reaction can be expressed by Arrhenius equation as $K = Ae(-E/R)$. In this equation, E represents

A. The energy above which not all the colliding molecules will react

B. The energy below which colliding molecules will not reacts

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

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

Answer: B

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48. For $N_2O_5\left(\text{in CCl}_4\right) \rightarrow 2NO_2 + \frac{1}{2}O_2$, $K = 6 \times 10^{-4}s^{-1}$ at 350 K and $K = 1.2 \times 10^{-3}s^{-1}$ at 360 K. Then, when temperature is changed to 380 K, value of K $\left(\text{in s}^{-1}\right)$

A. 1.2×10^{-3}

B. 2.4×10^{-3}

C. 4.8×10^{-4}

D. 4.8×10^{-3}

Answer: D

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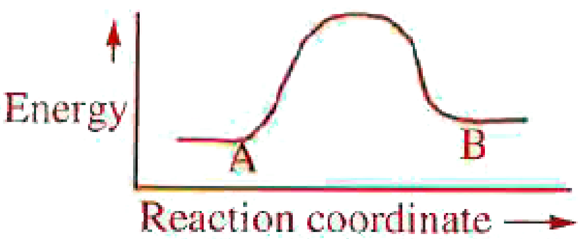
OBJECTIVE EXERCISE - 1 (Collision theory)

1. For a reversible reaction, $A \Leftrightarrow B$, which one of the following statements is wrong from given energy profile diagram ?



A. Activation energy of forward reaction is greater than that of backward reaction.

B. The threshold energy is less than that of activation energy

C. The forward reaction is endothermic

D. Activation energy of forward reaction is equal to the sum of heat of reaction an the activation energy of backward reaction.

Answer: B

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2. In a reaction, threshold energy is equal to

A. activation energy

B. normal energy of the reactants

C. activation energy + energy or reactants

D. activation energy - energy of reactants

Answer: C

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3. The value of activation energy for a chemical reaction primarily depends on

A. temperature

B. nature of the reacting species

C. the collision frequency

D. concentration of the reacting species

Answer: B

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4. Wrong statement among the following is

A. effective collisions are more if activation energy is less

B. zero order reaction proceeds at a constant rate independent of concentration or time

C. reactions with highest rate constant value have lowest activation energies

D. if initial concentration increases half life decreases in zero order

Answer: D

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5. For the reaction $A + B \Leftrightarrow C + D$, the forward reaction is exothermic. The activation energy of formation of A+B is ....that for the formation of $C + D$

A. equal to

B. less than

C. greater than

D. double

Answer: C

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6. Collision theory satisfactorily explains

A. First order reaction

B. Zero order reaction

C. Bimolecular reaction

D. Any order reaction

Answer: C

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7. According to collision theory of reaction rates, the activation energy is

A. the energy gained by the molecule on colliding with other molecules.

B. the energy that molecule should possess in order to undergo reaction

C. the energy it should possess so that it can enter into an effective collision

D. the energy it has to acquire so that it can enter into an effective collision.

Answer: D

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8. Increase in the concentration of the reactants leads to the change in

A. Heat or reaction

B. Activation energy

C. Collision frequency

D. Threshold energy

Answer: C

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9. The population of activated molecules can be increased by

A. increase in temperature

B. using a catalyst

C. increase of concentration of reactants

D. All

Answer: D

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10. Consider an endothermic reaction $X \rightarrow Y$ with the activation energies E_b and E_f for the backward and forward reactions, respectively. In general

A. $E_b < E_f$

B. $E_b > E_f$

C. $E_b = E_f$

D. no definite relation

Answer: A

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11. An endothermic reactio $A \rightarrow B$ ha s an activation energy as $kKJ\text{mol}^{-1}$ of A. If energy change of the reaction is yKJ, the activation energy of the reverse reaction is

A. $-x$

B. $x - y$

C. $x + y$

D. $y - x$

Answer: B

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12. Which of the following expkains the increase of reaction rate by a catalyst?

A. Catalyst provides the necessary energy to the colliding molecules to cross the barrier

B. Catalyst decreases the rate of backward reaction so that the rate of forward reaction increases

C. Catalyst decreases the enthalpy change of the reaction

D. Catalyst provides an alternative path of lower activation energy.

Answer: D

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13. The plot of log k vs $\frac{1}{T}$ 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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14. 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 constants at two different temperatures

D. by doubling conc. of reactants

Answer: C

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OBJECTIVE EXERCISE - 1 (Order, molecularity and half life)

1. Which of the following is correct ?

A. Molecularity of a reaction is always same as the order of reaction

B. In some cases molecularity of the reaction is same as the order of reaction

C. Molecularity of the reaction is always more than order or reaction

D. Molecularity never be equal to order

Answer: B

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2. If the rate for the chemical reaction is expresssed at Rate =K[A][B]" then

A. order of reaction is one

B. order of reaction is n

C. order of reaction is $1 + n$

D. order of reaction is $1 - n$

Answer: C

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

A. unit of k must be $\sec^{-1}$

B. value of k is independent of the initial concentrations of A and B

C. rate of formation fo C is twice the rate of disappearance of A

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

Answer: B

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4. Which of the following statements is correct regarding order of reaction

A. first order reaction should be bimolecular

B. order of reaction must be positive

C. order depends upon stoichiometry

D. order is determined by experimental results

Answer: D

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5. If the rate of gaseous reaction is independent of pressure, the order of raction is

A. 0

B. 1

C. 2

D. 3

Answer: A

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6. For the reaction $H_2 + Br_2 \rightarrow 2HBr$, the rate expression is rate $= K\left[H_2\right]\left[Br_2\right]^{1/2}$ which statement is true about this reaction

A. The reaction is of second order

B. Order of the reaction is 3/2

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

D. Molecularity of the reaction is 2

Answer: B

Watch Video Solution

7. For the following elementary step $\left(CH_3\right)_3CHr_{(aq)} \rightarrow \left(CH_3\right)C^{+}_{(aq)} + Br^{-}_{(aq)}$ the molecularity is

A. Zero

B. 1

C. 2

D. fractional

Answer: B

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8. The units of rate constant for the reaction obeying rate expression $r = k[A][B]^{2/3}$ is

A. $\text{mole}^{-2/3}\text{lit}^{2/3}\text{time}^{-1}$

B. $\text{mole}^{2/3}\text{lit}^{-2/3}\text{time}^{-1}$

C. $\text{mole}^{-5/3}\text{lit}^{5/3}\text{time}^{-1}$

D. $\text{mole}^{2/3}\text{lit}^{2/3}\text{time}^{-1}$

Answer: A

Watch Video Solution

9. Two gases A and B are in a container. The experimental rate law for the reaction between them has been found to be rate $= k[A]^2[B\}$. Predict the effect on the rate of the reaction when the partial pressure of each reactant is doubled.

A. the rate is doubled

B. rate becomes four times

C. the rate becomes six times

D. the rate becomes eight times

Answer: D

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10. In the following sequence of reactions $M \xrightarrow{K_1} N \xrightarrow{K_2} O \xrightarrow{K_3} P : K_1 < K_2 < K_3$ then the rate determining step is

A. $M \rightarrow N$

B. $N \rightarrow O$

C. $O \rightarrow P$

D. $M \rightarrow P$

Answer: A

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11. ____of a reaction cannot be determined experimentally.

A. order

B. rate

C. rate constant

D. molecularity

Answer: D

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12. The rate expression for the reaction $A_{(g)} + B_{(g)} \rightarrow C_{(g)}$ is rate $= kC_A^2 C_B^{1/2}$ what changes in the initial concentrations of A and B will cause the rate of reaction to increase by a factor of eight?

A. $C_A \times 2, C_B \times 2$

B. $C_A \times 2, C_B \times 4$

C. $C_A \times 1, C_B \times 4$

D. $C_A \times 4, C_B \times 1$

Answer: B

Watch Video Solution

13. For a reaction $pA + qB \rightarrow$ products the rate law expression is $r = k[A]^1[B]^m$ then

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

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

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

D. $(p + q) \neq (1 + m)$

Answer: C

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14. For $H_2 + Cl_2 \xrightarrow{x} 2HCl$ rate law is given R=K. Then X is

A. Pt

B. Ni

C. h v

D. Water

Answer: C

Watch Video Solution

15. If both $\frac{dc}{dt}$ & specific rate have same units then rate law is

A. $R = K[A]^2$

B. $R = K[A]^{1/2}$

C. $R = K[a]^{-2}$

D. $R = K$

Answer: D

Watch Video Solution

16. For $A + B \rightarrow C + D$ when [A] alone is doubled rate gets doubled but when [B] alone is increased by 9 times rate gets tripled. Then orders of reaction is

A. $3/4$

B. $3/2$

C. $4/9$

D. 2

Answer: B

Watch Video Solution

17. Rate law for $2A + B \rightarrow C + D$ from following data:

S.No.	$[A](M)$	$[B](M)$	Rate(M/s)
1	0.01	0.01	2.5
2	0.01	0.02	5
3.	0.03	0.02	45

A. $r = K[A]^{1/3}[B]$

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

C. $r = K[A][B]^{1/3}$

D. $r = K[A]^{2/3}[B]^{1/3}$

Answer: B

Watch Video Solution

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

(k=rate constant, r=rate of reaction , c=conc. Of reactat

A. $k = r \times c^2$

B. $k = r \times c$

C. $k = \frac{c}{r}$

D. $k = \frac{r}{c}$

Answer: D

Watch Video Solution

19. $\frac{dc}{dt}$ of a first order reaction depends on

A. time

B. concentration

C. Temperature

D. All

Answer: D

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20. Which of the following is correct for a first order reaction? (K=rate constant $t_{\frac{1}{2}}$ = half life)

A. $t_{1/2} = 0.693 \times K$

B. $k.\, t_{1/2} = \dfrac{1}{0.693}$

C. $k.\, t_{1/2} = 0.693$

D. $6.93 \times k \times t_{1/2} = 1$

Answer: C

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21. The half life for a given reaction was doubled as the initial concentration of the reaction was doubled. The order of the reactio is

A. Zero

B. 1st

C. 2nd

D. 3rd

Answer: A

Watch Video Solution

22. The inversion of cane sugar into glucose and fructose is

A. 1st order

B. 2nd order

C. 3rd order

D. zero order

Answer: A

Watch Video Solution

23. The half life of a first order reaction is

A. independent of the initial concentration of the reactant

B. directly proportional to the initial concentration of the reactant

C. inversely proportional to the initial concentration of the reactant

D. directly proportional to the square of the initial concentration of the reactant.

Answer: A

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24. The hydrolysis of ester in the presence of alklai solution is a ....order reaction

A. 1

B. 2

C. 0

D. 3

Answer: B

Watch Video Solution

25. $CH_4 + Cl_2 \xrightarrow{hv} CH_3Cl + HCl$ the order of this reaction is

A. 0

B. 1

C. 2

D. 3

Answer: A

Watch Video Solution

26. $RCOOR + H_2O \xrightarrow{HCl} RCOOH + ROH$ follows..........reaction kinetics

A. 2^{nd} order

B. unimolecular

C. Pseudo unimolecular

D. Zero order

Answer: C

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27. (A) Molecularity has no meaning for a complex reaction.

(R) The overall molecularity of a complex reaction is equal to the molecularity of the slow step.

A. Both A & R are true, R is the correct explanation of A

B. Both A & R are true, R is not correct explanation of A

C. A is true, R is false

D. A is false, R is true

Answer: C

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28. $2A \rightarrow B + C$ would be a zero order reaction when rate of reaction

A. is directly proportional [A]

B. is directly proportional $[A]^2$

C. is independent of change of [A]

D. is independent of [B] & [C]

Answer: C

Watch Video Solution

29. Which of the following is a first order reaction

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

B. $2H_2O_2 \rightarrow 2H_2O + O_2$

C. $CH_3COOC_2H_5 + H_2O \xrightarrow{H^+}$ products

D. All the above

Answer: D

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30. If a reaction obeys the following equation $k - \frac{2.303}{t}\log\frac{a}{a - x}$ the order of the reaction will be

A. zero

B. one

C. two

D. three

Answer: B

Watch Video Solution

31. The rate constant for a reaction is 2.05×10^{-5} mole $\text{lit}^{-1}.\text{sec}^{-1}$. The rection obeys ......order

A. First

B. Second

C. Zero

D. Half

Answer: C

Watch Video Solution

32. A reaction involves two reactants. The rate of reaction is directly proportional to the concentration of one of them and inversely proportional to the concentration of the other. The overall order of reaction will be

A. One

B. Two

C. Zero

D. fractional

Answer: C

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33. In the reaction $2A + B \rightarrow$ Products the order w.r.t A is found toi be 1 and w.r.t equal to 2. Concentration of A is doubled and that of B is halved, the rate of reaction will be

A. Doubled

B. Halved

C. Remain unaffected

D. Four times

Answer: B

Watch Video Solution

34. While studyging the decomposition of gaseous N_2O_5 it is observed that a plot of logarithmof its partial pressure versus time is linear.The kenetic parameter obtained from this observation is

A. Specific rate

B. Reaction rate

C. Energy of activation

D. Molecularity

Answer: A

Watch Video Solution

35. The correct expression for the rate constant for reactions of zero order is

A. $k - \left[A_o\right]/2t$

B. $k = \frac{1}{t}\left\{\left[A_0\right] - [A]\right\}$

C. $k = \frac{1}{t}\left\{[A] - \left[A_0\right]\right\}$

D. $k = \frac{2.303}{t}\log\left\{\left[A_0\right] - [A]\right\}$

Answer: B

Watch Video Solution

36. If a is the initial concentration of the reactant, the time taken for completion of the reaction if it is of zero order will be

A. a/k

B. a/2k

C. 2a/k

D. k/a

Answer: A

Watch Video Solution

37. The slowest step of a particular reaction is found to be $\frac{1}{2}X_2 + Y_2 \rightarrow XY_2$ the order of the reaction is

A. 2

B. 3

C. 3.5

D. 1.5

Answer: D

Watch Video Solution

38. 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 concentration.

Answer: B

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39. What are the units of the rate constant of a reaction in which the half life is doubled by halving the initial concentration of reactants.

A. $M\text{-}s^{-1}$

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

C. $\sec^{-1}$

D. $M^{-2}s^{-1}$

Answer: B

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40. Which of the following represents the expression for 3/4 th life of 1st order reaction

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

B. $\dfrac{2.3030}{k}\log 3$

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

D. $\dfrac{K}{2.303}\log 4$

Answer: C

Watch Video Solution

41. The rare law for a reaction between th substances A and B is given by Rate $= k[A]^m[B]^n$ 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 will be as

A. $(m + n)$

B. $(n - m)$

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

D. $\frac{1}{2^{(m+n)}}$

Answer: C

Watch Video Solution

42. The formation of gas at the surface of tungsten due to adsorption is ------------------order reaction

A. 0

B. 1

C. 2

D. Insufficient data

Answer: A

Watch Video Solution

43. For the reaction $2NO(g) + O_2(g) \rightarrow 2NO_{2(g)}$ volume is suddenly reduced to half its value by increasing the pressure on it. If the reaction is of first order with respect to O_2 and second order with respect to NO, the rate of reaction will

A. diminish to one - eighth of its initial value

B. increase to eight times of its initial value

C. increase to four times of its nintial value

D. diminish to one-fourth of its initial value

Answer: B

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OBJECTIVE EXERCISE - 2 (Reaction rates and influencing factors)

1. Consider the following reaction $N_{2(g)} + 3H_{2(g)} \rightarrow 2NH_{3(g)}$. The rate of the reaction in terms in terms of N_2 at $T(k)$ is $-\frac{d[N_2]}{dt} = 0.02$ mole $\text{lit}^{-1}\text{sec}^{-1}$. What is the value of $-\frac{d[H_2]}{dt}$ (in mole $\text{lit}^{-1}\text{sec}^{-1}$) at the same temperature?

A. 0.02

B. 50

C. 0.06

D. 0.04

Answer: C

Watch Video Solution

2. What is the rate of the reaction for $2A \rightarrow B$

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

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

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

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

Answer: B

Watch Video Solution

3. For the reaction $4NH_3 + 5O_2 \rightarrow 4NO + 6H_2O$ the rate of reaction with respection with respect to NH_3 is $2 \times 10^{-3} Ms^{-1}$. Then the rate of the reaction with respect to oxygen is ______Ms^{-1}

A. 2×10^{-3}

B. 1.5×10^{-3}

C. 2.5×10^{-3}

D. 3×10^{-3}

Answer: A

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4. Concetration of a reactant A is changed from 0.044 M to 0.032 M in 25 minutes, the average rate of the reactio during this interval is

A. 0.0048 mole/lit/min

B. 0.00048 mole/lit/sec

C. 4.8×10^{-4} mole/lit/min

D. 0.0048 mole/lit/sec

Answer: C

Watch Video Solution

5. In the reaction $A \rightarrow 2B$ the concentration of a falls from 1.0M to 0.98

2M in one minute what is the rate of in moles $\text{litre}^{-1}\text{sec}^{-1}$

A. 1.8×10^{-3}

B. 3.0×10^{-5}

C. 3.6×10^{-3}

D. 6.0×10^{-5}

Answer: B

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6. The rate of formation of SO_3 in the reaction $2SO_2 + O_2 \rightarrow 2SO_3$ is 100

g min^{-1} Hence rate of disappearance of O_2 is

A. 50 g min^{-1}

B. 100 g min^{-1}

C. 20 g min^{-1}

D. 40 g min^{-1}

Answer: C

Watch Video Solution

7. $1dm^3$ of $2MCH_3COOH$ is mixed with $1dm^3$ of 3M 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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8. The rate law of the reaction $RCl + NaOH \rightarrow ROH + NaCl$ is given by Rate =k[RCI]. The rate of this reaction

A. A & B

B. B & C

C. C & D

D. B & D

Answer: B

Watch Video Solution

9. The rate of reaction becomes 2 times for evergy $10^\circ C$ rise in temperature. How many times the rate of reaction will increase when temperature is increased from $30^\circ C$ to $80^\circ C$

A. 16

B. 32

C. 64

D. 28

Answer: B

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10. An endothermic reaction $A \rightarrow B$ has an activatio energy 15 kaca/mole and the heat of reaction is 5kcal/mole. The activation energy of the reaction $B \rightarrow A$ is

A. 20 kcal/mole

B. 15 kcal/mole

C. 10 kcal/mole

D. zero

Answer: C

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11. The activation energy of a reaction is 58.3 kJ/mole. The ratio of the rate constnat at 205 K and 300 K is about (R=8.31Jk^{-1}mole^{-1})(Antilog 0.1667=1.468)

A. 1.25

B. 1.75

C. 1.5

D. 2.0

Answer: C

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12. Decompositon of NH_3 on gold surface follows zero order kinetics. If rate constant is $5 \times 10^{-4} Ms^{-1}$, rate of formation of N_2 will be

A. 10^{-3}M-s^{-1}

B. 2.5×10^{-4}M-s^{-1}

C. 5×10^{-4}M-s^{-1}

D. Zero

Answer: C

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13. For $X \rightarrow Y \frac{k_{t+10}}{k_t} = 3$. If the rate constant at 300 k is Q min^{-1}, at what temperature rate constant becomes $9Q\text{min}^{-1}$?

A. $47^0 C$

B. $320^0 C$

C. 280K

D. $\sqrt{9 \times 300K}$

Answer: A

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14. At 300 K rate constant for $A \rightarrow$ products at t=50 min is $0.02s^{-1}$, then rate constant at t=75 min and 310 K will be (in s^{-1})

A. $\frac{0.04}{25}$

B. $\left(\frac{0.02}{25}\right)$

C. 0.04

D. 0.04×25

Answer: C

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15. The rate constant of a first order reaction at $27^\circ C$ is $10^{-3}min^{-1}$. The temperature coefficient of this reaction is 2. What is the rate constant (in min^{-1}) at $17^\circ C$ for this reaction?

A. 10^{-3}

B. 5×10^{-4}

C. 2×10^{-3}

D. 10^{-2}

Answer: B

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OBJECTIVE EXERCISE - 2 (Collision theory)

1. The minimum energy required for molecules to enter into chemical reactionn is called

A. Kinetic energy

B. Potential energy

C. Threshold energy

D. Activation energy

Answer: C

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2. In the equilibrium reaction $A + B \Leftrightarrow C + D$, the activation energy for the forward reaction is 25 kcals mole^{-1} and that of backward reaction is 15 kcals mole^{-1}. Which one of the following statements is correct?

A. it is an exothermic process

B. it is an exothermic process

C. it is a reaction for which $\Delta H = 0$

D. it is a sublimation process

Answer: B

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OBJECTIVE EXERCISE - 2 (Order, molecularity, Half life)

1. Sucrose decompose in acid solution into glucose and fructose according to the first order rate law, with $t_{\frac{1}{2}} = 3.00$ hours. What fraction of sample of sucrose remains after 8 hours ?

A. 1.158M

B. 0.518M

C. 0.158M

D. 3.182M

Answer: C

Watch Video Solution

2. For an elementary reaction $2A + B \rightarrow C + D$ the active mass of B is kept constant but that 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. decrease by 6 times

Answer: B

Watch Video Solution

3. For a chemical reaction $Y_2 + 2Z \rightarrow$ Product rate controlling step is $Y + 1/2Z \rightarrow Q$. If the concenntration of Z is doubled the rate of reactin will

A. Remain the same

B. Become four times

C. Become 1.414 times

D. Become double

Answer: C

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4. In a reaction $A \rightarrow B$ when the concentration of reaction is made 8 times, the rate got doubled. The order of reaction is

A. $1/3$

B. 1

C. $1/2$

D. 2

Answer: A

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5. The rate of reaction $A + 2B \rightarrow$ Products is given by - $\frac{d[A]}{dt} = k[A][B]^2$.If B is present in large excess, the order of reaction is

A. 3

B. 2

C. 1

D. zero

Answer: C

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6. For the reaction $2A + B \rightarrow$ Products, it is found that doubling the concentration of both reactants increases the rate by a factor of 8. But doubling the concentration of B alone, only doubles the rate. What is the order of the reaction w.r.t to A?

A. 2

B. 3

C. 0

D. 1

Answer: A

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7. The increase in rate constant of a reaction is more when the temperature increases from

A. 290K - 300K

B. 300K - 310K

C. 310K - 320K

D. 320K - 330K

Answer: A

Watch Video Solution

8. The initial rates for gaseous reaction $A + 3B \rightarrow AB_3$ are given below

$[A](M)$ $[B](M)$ $\text{Rate}(\text{Msec}^{-1})$

0.1 0.1 0.002

0.2 0.1 0.002

$0.3 \quad 0.2 \quad 0.008$

$0.4 \quad 0.3 \quad 0.018$

order of reaction is

A. zero

B. three

C. one

D. two

Answer: D

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9. Based on the following data for a reaction what is its order (A → products)

$\text{Conc.A} \quad 2M \quad 0.2M \quad 0.02M \quad 0.00$

$\text{Time in min} \quad 0 \quad 10 \quad 20 \quad \propto$

A. 1 st

B. 2 nd

C. 3rd

D. zero

Answer: A

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10. $[A](M)\quad[B](M)\quad\text{Initial rate}\left(Ms^{-1}\right)$

$0.4\quad 0.3\quad 2\times10^{-3}$

$0.8\quad 0.3\quad 0.8\times10^{-2}$

$1.2\quad 0.9\quad 0.54\times10^{-1}$

From the above dat athe rate law for the equation $A+B\rightarrow$ products is equal to

A. K[A][B]

B. $K[A]^2[B]^2$

C. $K[A]^2[B]$

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

Answer: C

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11. In the initial cocnentration is reduced to 1/4th of the initial value of a zero order reaction the half life of the reaction

A. remain constant

B. Becomes 1/4 th

C. becomes double

D. Becomes fourfold

Answer: B

Watch Video Solution

12. If $\frac{dx}{dt} = k\left[H_3O^+\right]^n$ and rate becomes 100 times when pH changes form 2 to 1. Hence order of reaction is

A. 1

B. 2

C. 3

D. 0

Answer: B

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13. The initial concentration of cane sugar is presence of an acid was reduced from 0.20 to 0.10 M in 5 hours and to 0.05 M in 10 hours, value of K ? (in hr^{-1})

A. 0.693

B. 1.386

C. 0.1386

D. 3.465

Answer: C

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14. 50% completion of a first order reaction takes place in 16 minutes. Then fraction that would react in 32 minutes from the beginning

A. $1/2$

B. $1/4$

C. $1/8$

D. $3/4$

Answer: D

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15. The time needed for the completion of 2/3 of a 1st order reaction, when rate constant is $4.771 \times 10^{-2} \text{min}^{-1}$ is

A. 23.03 min

B. 2.303 min

C. 6.93 min

D. 69.3 min

Answer: A

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16. The rate constant of a first order reaction of 0.0693min^{-1}. What is the time (in min) required for reducing an initial concentration of 20 mole lit^{-1} to 2.5 mole lit^{-1}?

A. 40

B. 10

C. 20

D. 30

Answer: D

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17. The half life of a first order reaction is 100 seconds. What is the time required for 90% completion of the reaction?

A. 100 sec.

B. 200 sec.

C. 333 sec.

D. 500 sec.

Answer: C

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18. For the reaction $2N_2O_5 \rightarrow 4NO_2 + O_2$, rate and rate constant are $1.02 \times 10^{-4} M\sec^{-1}$ and $3.4 \times 10^{-5}\sec^{-1}$ respectively then concentration of N_2O_5 at that time will be (in moles /lit)

A. 3 M

B. 4 M

C. 1 M

D. 1.5 M

Answer: A

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19. The half life periods of four reactions labelled by A,B, C & D are 30 sec, 4.8 in, 180 sec and 16 min respectively. The fastest reaction is

A. A

B. B

C. C

D. D

Answer: A

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20. 3/4 th of first order reaction was completed in 32 min 15/16 the part will be completed in

A. 24 min

B. 64 min

C. 16 min

D. 32 min

Answer: B

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21. Initial concentration of the reactant is 1.0 M. The concentration becomes 0.9 M, 0.8 M and 0.7 M in 2 hours, 4 hours and 6 hours respectively. Then the oerder of reaction is

A. 2

B. 1

C. zero

D. 3

Answer: C

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22. The product of half life $\left(t_{1/2}\right)$ and the square of initial concentration of the reactant is constant. Then the order of reaction is

A. zero

B. 1

C. 2

D. 3

Answer: C

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23. For first order reaction $t_{0.75}$ is 138.6 sec. Its specific rate constant is (in s^{-1})

A. 10^{-2}

B. 10^{-4}

C. 10^{-5}

D. 10^{-6}

Answer: A

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24. 20% first order reaction is completed in 50 minute. Time required for the completion of 60% of the reaction is

A. 100

B. 150

C. 262

D. 205

Answer: D

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25. In a first order reaction, 20% reaction is completed in 24 minutes.The percentage of reactat remaining after 48 minutes is

A. 60

B. 64

C. 81

D. 80

Answer: B

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26. A first order reaction is half completed is 45 minutes. How long does it need for 99.9% of the reaction tobe completed?

A. 20 hours

B. 10 hours

C. $7 \quad 1/2$ hours

D. 5 hours

Answer: C

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27. For a first order reaction $A \rightarrow B$ the reaction rate at reactant concetration of 0.01 M is found to be 2.0×10^{-5}mol $L^{-1}s^{-1}$. The half life period of the reactionis

A. 220s

B. 30s

C. 374s

D. 347s

Answer: D

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28. 99% of a first order reaction was completed in 32 in. When wil 99.9% of the reaction complete?

A. 50 min

B. 46 min

C. 49 min

D. 48 min

Answer: D

Watch Video Solution

29. For a first order reaction with half life of 150 seconds, the time taken for the concentration of the reactant to fall from M/10 to M/100 will be approximately

A. 1500s

B. 500s

C. 900s

D. 600s

Answer: B

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30. A reaction which is of first order w.r.t reactant A has a rate constnat is 6min^{-1}. If we start with $[A] = 0.5\text{mol}L^{-1}$ when would [A] reach the value of $0.05\text{mol}L^{-1}$

A. 0.384 min

B. 15 min

C. 20 min

D. 3.84 min

Answer: A

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31. 99% of a 1st order reaction completed in 2.303 minutes. What is the rate constant and half life of the reaction

A. 2.303 and 0.3010

B. 2 and 0.3465

C. 2 and 0.693

D. 0.3010 and 0.693

Answer: B

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32. In the case of a first order reaction, the ratio of the time required for 99.9% completion of the reaction to its half life is nearly

A. 1

B. 10

C. 20

D. 8

Answer: B

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33. Out og 300 g substance [decomposes as per 1st order], hou much will remains after 18 hr? ($t_{0.5} = 3$hr)

A. 4.6 gm

B. 5.6 gm

C. 9.2 gm

D. 6.4 gm

Answer: A

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34. 75% of a first order process is completed in 30 min. The time required for 93.75% completion of same process (in hr) ?

A. 1

B. 120

C. 2

D. 0.25

Answer: A

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35. For a first order reaction at 27°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. 0.477

Answer: C

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

A. 23.03 minutes

B. 46.06 minutes

C. 460.6 minutes

D. 230.3 minutes

Answer: B

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37. In a first order reaction, the concentration of the reactant, decreases from 0.8 M to 0.4 M in 15 minutes. The time taken for the concentration to hange from 0.1 M to 0.025 M is

A. 7.5 minutes

B. 15 minutes

C. 30 minutes

D. 60 minutes

Answer: C

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38. The half life of a first order reaction is 100 seconds at 280 K. If the temperature coefficient is 3.0 its rate constant at 290 K in s^{-1} is

A. 2.08×10^{-3}

B. 2.08×10^{-2}

C. 6.93×10^{-3}

D. 6.93×10^{-2}

Answer: B

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PRACTICE EXERCISE

1. In the reaction, $2A + B \rightarrow 2C + D$, the rate of disappearance of 'A' is 2.6×10^{-2}M-S^{-1}. Then the rate of disappearance of B and the rate of appearance of C and D are respectively

A. $5.2 \times 10^{-2}, 5.2 \times 10^{-2}, 2.6 \times 10^{-2}$

B. $1.3 \times 10^{-2}, 2.6 \times 10^{-2}, 1.3 \times 10^{-2}$

C. $2.6 \times 10^{-2}, 2.6 \times 10^{-2}, 2.6 \times 10^{-2}$

D. $2.6 \times 10^{-2}, 5.2 \times 10^{-2}, 5.2 \times 10^{-2}$

Answer: B

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2. In a reaction $N_2 + 3H_2 \rightarrow 2NH_3$, the rate of appearance of ammonia is 2.5×10^{-4} M sec^{-1} the rate of disappearance of N_2 will be

A. 7.5×10^{-4}

B. 1.25×10^{-4}

C. 5×10^{-4}

D. 2.5×10^{-4}

Answer: B

Watch Video Solution

3. For the reaction $N_2 + 3H_2 \rightarrow 2NH_3$, the rate of disappearance of H_2 is $0.01 \text{ mol lit}^{-1}\text{min}^{-1}$. The rate of appearance of NH_3 would be

A. $0.001 \text{ mol lit}^{-1}\text{min}^{-1}$

B. $0.02 \text{ mol lit}^{-1}\text{min}^{-1}$

C. $0.007 \text{ mol lit}^{-1}\text{min}^{-1}$

D. $0.002 \text{ mol lit}^{-1}\text{min}^{-1}$

Answer: C

Watch Video Solution

4. Observe the following reaction:

$2A + B \rightarrow C$

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

A. 2.2×10^{-3}

B. 1.1×10^{-3}

C. 4.4×10^{-3}

D. 5.5×10^{-3}

Answer: C

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5. Rate of the reaction $A \rightarrow$ products is 0.5M-S^{-1} at time $t = 15$ sec, then rate at time $t = 5$ sec will be $\left(\text{in M - s}^{-1}\right)$

A. 0.15

B. 0.164

C. > 0.5

D. $(0.5)^2$

Answer: C

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6. For the raction $A + 3B \rightarrow 2C + D$, which one of the following is not correct ?

A. Rate of disappearance of A = Rate of formation of D

B. Rate of formation of C = $\frac{2}{3} \times$ Rate of disappearance of B

C. Rate of formation of D = $\frac{1}{3} \times$ Rate of disappearance of B

D. Rate of disappearance of A = $2 \times$ Rate of formation of C

Answer: D

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7. For $A \rightarrow$ Products, pressure of A t = 0 and t = 10 min respectively are 760 mm & 740 mm, rate of reaction during this time interval is (in mm/min)

A. 2

B. 200

C. 20

D. $\frac{20}{10 \times 760}$

Answer: A

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8. For $A \rightarrow$ Products (order = 1), rate of reaction is $4 \times 10^{-2} \text{M-s}^{-1}$ when [A] = 0.5 M, then, rate constant of the reaction is $\left(\text{in sec}^{-1}\right)$

A. 0.08

B. 0.02

C. 4×10^{-2}

D. 0.05

Answer: A

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9. In the reaction $2NO + O_2 \rightarrow 2NO_2$, if the rate of disappearance of O_2 is 16 gm min^{-1}, then the rate of appearance of NO_2 is

A. 90 gm. min^{-1}

B. 46 gm. min^{-1}

C. 28 gm. min^{-1}

D. 32 gm. min^{-1}

Answer: B

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10. 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 $-\frac{d[O_2]}{dt} = 2.5 \times 10^{-4} \text{ M sec}^{-1}$. The rate of disappearance $\left(\text{in mol L s}^{-1}\right)$ of SO_2 will be

A. 5.0×10^{-4}

B. 2.25×10^{-4}

C. 3.75×10^{-4}

D. 50.0×10^{-4}

Answer: A

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11. Observe the following reaction $A_{(g)} + 3B_{(g)} \rightarrow 2C_{(g)}$ The rate of this reaction $-\frac{d[A]}{dt}$ is $3 \times 0^{-3} \text{mol. lit}^{-1}.\text{min}^{-1}$. What is the value of $-\frac{d[B]}{dt}$ in $\text{mol. lit}^{-1}.\text{min}^{-1}$?

A. 3×10^{-3}

B. 9×10^{-3}

C. 10^{-3}

D. 1.5×10^{-3}

Answer: B

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12. For a gaseous reaction, the rate expression is k[A][B]. If the volume of the reaction vessel is reduced to $1/4^{th}$ of the initial volume, the reaction rate, relating to original rate will be . .. . times

A. 10

B. 8

C. $1/10$

D. 16

Answer: D

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13. $2SO_2 + O_2 \Leftrightarrow 2SO_3$, if the volume of the reaction vessel is doubled, the rate of forward reaction will be

A. $1/4$ th of initial value

B. $1/8$ th of initial value

C. 4 times of its initial value

D. 8 times of its initial value

Answer: B

Watch Video Solution

14. The rate of reaction for $A \rightarrow$ products is 10 mol. $\text{lit}^{-1}.\text{min}^{-1}$ at time $t_1 = 2$ minutes. What will be the rate $\left(\text{in mol. lit}^{-1}\text{min}^{-1}\right)$ at time $t_2 = 12$ minutes ?

A. > 10

B. < 10

C. 10

D. 20

Answer: B

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15. For $xA \rightarrow yB$ (gaseous phase) reaction rate of reaction is doubled when [A] is quadrapled. Then 'rate law' is given by

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

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

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

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

Answer: B

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16. For an elementary reaction with respect to $2A_{(g)} + B_{(g)} \rightarrow C_{(g)}$, initial rate with respect to A is 0.04 M.s^{-1}. when volume of vessel is doubled, final rate B will be $\left(\text{in M.s}^{-1}\right)$

A. 0.04

B. 0.08

C. 0.01

D. 0.1

Answer: C

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17. Rate constant (k) for x $A \rightarrow$ products is $0.04 \text{ M - min}^{-1}$. When [A] changes form 0.08 M to 0.02M, ratio of initial to final rate is

A. $1/4$

B. $1/16$

C. 1

D. 4

Answer: C

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18. For the first order reaction $A \rightarrow$ product. When the concentration of A is 2.5×10^{-2} M the activation energy is 20K. Cal/mole. If the conc. of [A] is doubled, at same temperature the activation energy becomes equal to

A. 40K. cal/mole

B. 10K.Cal/mole

C. 20K. cal/mole

D. $\frac{-20}{2RT}$K. cal/mole

Answer: C

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19. In a reaction vessel, the reactants have attained a potential energy of 80K. cal/mole and unable to give even traces of products. The threshold energy of the reaction may be

A. 60K.cal

B. 70 K.cal

C. 40 K.cal

D. 100K.cal

Answer: D

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20. For a reaction, $K = 2 \times 10^{13} e^{-30000/RT}$. When log K (y-axis) is ploted against 1/T (x-axis) slope of line be . . . .. Cal

A. $\frac{30000}{4.6}$

B. $\frac{-30000}{4.6}$

C. $\frac{-30000}{2.3030}$

D. $\frac{-30000}{4.6}$

Answer: D

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21. $N_{2(g)} + 3H_{2(g)} \Leftrightarrow 2NH_3(g) + 22k.\,cal.$

The activation energy for the forward reaction is 50 k. cal What is the activation energy for the backward reaction ?

A. -72 k.cal

B. -28 k. cal

C. $+28$ k.cal

D. $+72$k.cal

Answer: D

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22. For $xA + yB \rightarrow$ products, change of concentration of either A or B brings no change in reaction rate. Then

A. $x = y = 0$

B. $x = 0, y \neq 0$

C. $x \neq 0, y = 0$

D. Order = 0

Answer: D

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23. $A + B \rightarrow$ products is an elementary reaction. When excess of A is taken in this reaction, then the molecularity and other are respectively

A. 2 & 2

B. 2 & 1

C. 1 & 2

D. 1 & 1

Answer: B

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24. For the reaction $A + B \rightarrow$ products, it is found that order of A is 1 and order of B is $1/2$. When concentrations of both A and B are increased four times the rate will increase by a factor

A. 6

B. 8

C. 4

D. 16

Answer: B

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25. For $2NH_3 \xrightarrow{Au} N_2 + 3H_2$, rate w.r.t N_2 is $2 \times 10^{-3} \mathrm{M - min}^{-1}$, then rate w.r.t N_2 after 20 minutes will be $\left(\mathrm{in\ M - min}^{-1}\right)$

A. 2×10^{-3}

B. $> 2 \times 10^{-3}$

C. 10^{-4}

D. $< 2 \times 10^{-3}$

Answer: A

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26. For a given reaction of first order, it takes 20 min for the concentration to drop from 1.0M to 0.6. The time required for the concentration to drop from 0.6M to 0.36M will be

A. more than 20 minutes

B. less than 20 minutes

C. equal to 20 minute

D. infinity

Answer: C

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27. For a reaction the following mechanism has been proposed ,

$2A + B \rightarrow D + E$

$A + B \rightarrow C + D$ (slow), $A + C \rightarrow E$(fast)

The rate law a expression for the reaction 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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28. For the reaction, $A \rightarrow$ products the rate of reaction is 7.5×10^{-4} mole. lit^{-1}sec^{-1}. If the concentration of A is 0.5 mole lit^{-1}, the rate constant is

A. $1.5 \times 10^{-3} \sec^{-1}$

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

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

D. $8 \times 10^{-4} \sec^{-1}$

Answer: A

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29. A first order decomposition reaction takes 40min. For 30% decomposition. Calculate it's $t_{1/2}$ value.

A. 17.69 min

B. 7.77 min

C. 77.69 min

D. 27.69 min

Answer: C

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30. $A + B \rightarrow$ products, the kinetic data of the reaction is

$A\left(\text{m. lit}^{-1}\right)$	$B\left(\text{m. lit}^{-1}\right)$	$\text{Rate}\left(\text{m. lit}^{-1}\text{sec}^{-1}\right)$
(1)0.5	0.5	$2. \times 10^{-4}$
(2)0.5	1.0	1.99×10^{-4}
(3)1.0	0.5	2.01×10^{-4}

The order of the reaction is

A. one

B. zero

C. two

D. fractional

Answer: B

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31. The conversion of A to B follows second order kinetics. Doubling the conc. of A will increase the rate of formation of B by factor

A. 4

B. 2

C. $1/4$

D. $1/2$

Answer: A

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32. $nA \rightarrow$ products is a first order reaction with $k = 10 \text{ min}^{-1}$. If the reaction is started with $[A] = 0.4M$, after . . .. min, [A] would become 0.04 M.

A. 4.606

B. 2.303

C. 0.2303

D. 6.99

Answer: C

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33. $2HI \xrightarrow{Au} H_2 + I_2$ following n^{th} order kinetics. If rate of the reaction is given by rate $= -\frac{1}{2}\frac{d[HI]}{dt}$ and concentration of HI drops from 1.5M to 0.3 M in 7.3 sec, value K is

A. 8×10^{-2}M -s^{-1}

B. $8 \times 10^{-2} M^{-1} - s^{-1}$

C. $8 \times 10^{-2} M^{-2} - s^{-1}$

D. $8 \times 10^{-2} s^{-1}$

Answer: A

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34. Observe the following data regarding

$$2NH_3 \xrightarrow{W} N_2 + 3H_2$$

Pressure (in atm) : 5 10 20

Half life (min) : 3.6 1.8 0.9

The unit of K is

A. min^{-1}

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

C. $(\text{atm} - \text{min})^{-1}$

D. $\text{atm}^{-2} - \text{min}^{-1}$

Answer: B

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35. For $2A + B + C \rightarrow$ Products, rate law is given by rate $= \text{k}\,[\text{A}]\,[\text{B}]^2$ & rate constant (k) is $2 \times 10^{-6} M^{-2} - s^{-1}$. Then rate of the reaction become $2 \times 10^{-9}\text{M} - \text{s}^{-1}$ only when

A. $\begin{array}{ccc} [A] & [B] & [C] \\ 0.1M & 01.\,M & 0.2M \end{array}$

B. $\begin{array}{ccc} [A] & [B] & [C] \\ 0.2M & 0.1M & 0.2M \end{array}$

C. $\begin{array}{ccc} [A] & [B] & [C] \\ 0.1M & 0.1M & \text{any value} \end{array}$

D. $\begin{array}{ccc} [A] & [B] & [C] \\ 0.2M & 0.2M & 0.1M \end{array}$

Answer: C

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36. For $A \rightarrow B$, a first order reaction, $k = 10^{-2}\text{min}^{-1}$. If initial concentration of A is 1M, rate of the reaction after 2.31 hrs will be $\left(\text{in M-min}^{-1}\right)$

A. 2.5×10^{-4}

B. 5×10^{-3}

C. 2.5×10^{-1}

D. 2.5×10^{-3}

Answer: D

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37. $A_{(g)} \rightarrow B_{(g)}$ is a first order reaction. The initial concentration of A is 0.2 mol. lit^{-1}. After 10 minutes the concentration of B is found to be 0.18mol. lit^{-1}. The rate constant $\left(\text{in min}^{-1}\right)$ for the reaction is

A. 0.2303

B. 2.303

C. 0.693

D. 0.01

Answer: A

Watch Video Solution

38. Rate expression for $xA + yB \rightarrow$ prodcuts is Rate $= k[A]^m[B]^n$. Units of K with respect to A and B respectively are s^{-1} and $M^{-1}. s^{-1}$ when concentration of A and B are increased by 4 times, then

A. $R_f = 16R_i$

B. $R_i = 16R_f$

C. $R_f = 8R_i$

D. $R_f = 64R_i$

Answer: D

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39. For $SO_2Cl_{2(g)} \rightarrow SO_{2(g)} + Cl_{2(g)}$, time required for 99.9% completion of the process is found to be 100 sec, then specific rate ?

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

B. $6.93 \times 10^{-2} M. s^{-1}$

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

D. $6.93 \times 10^{-2} M^{-1}. s^{-1}$

Answer: B

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40. A reaction rate is found to depend upon the two concentration terms. The order of the reaction is

A. 1

B. 3

C. 2

D. can't be predicted

Answer: D

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41. For the rate of the reaction

$2H_2O_2 \rightarrow 2H_2O + O_2, r = K\left[H_2O_2\right]$ it is

A. Zero order reaction

B. First order reaction

C. Second order reaction

D. Third order reaction

Answer: B

Watch Video Solution

42. 75% of a first order reaction completed in 32 minutes then, the time required to complete 99.9% of a reaction in seconds is

A. 9600

B. 96500

C. 16

D. 1660

Answer: A

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

A. $0.10/k$

B. $1.4/k$

C. $0.29/k$

D. $0.75/k$

Answer: B

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44. Rate of a reaction, $A + B \rightarrow$ Product is given as a fundtion of different initial concentrations of A and B

$[A] \mid mol.L^{-1}$	$[B] \mid mol.L^{-1}$	Rate $\left[mol.L^{-1}. min^{-1}\right]$
0.01	0.01	0.005
0.02	0.01	0.010
0.01	0.02	0.005

The half - life of in the reaction is

A. 0.693 min

B. 1.386 min

C. 2.079 min

D. 0.3465 min

Answer: B

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45. In the first order reaction 10% of the reaction is completed in 10 hours. The percentage of the reaction completed in 20 hours is

A. 20%

B. 19%

C. 38%

D. 81%

Answer: B

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46. For the first order reaction, half-life is 14 s. The time required for the initial concentration to reduce to $1/8$th of its value is

A. 28 s

B. 42 s

C. $(14)^3 s$

D. $(14)^2 s$

Answer: B

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47. The time taken for the completion of 90% of a first order reaction is 't' min . What is the time (in sec) taken for the completion of 99% of the reaction ?

A. $2t$

B. $t/30$

C. $120t$

D. $60t$

Answer: C

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48. The half - life for the reaction.

$N_2O_5 \rightarrow 2NO_2 + \frac{1}{2}O_2$ is 24 hrs. at $30^\circ C$. Starting with 10 g of N_2O_5 how many grams of N_2O_5 will remain after a period of 96 hours ?

A. 1.25 g

B. 0.63 g

C. 1.77 g

D. 0.5 g

Answer: B

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49. The half life of a first order reaction $A \rightarrow B + C$ is 10 minutes. The concentration of 'A' would be reduced to 10% of the original concentration in

A. 10 minutes

B. 33 minutes

C. 90 minutes

D. 70 minutes

Answer: B

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50. In a first order reaction, 0.16 moles of reactant decreases to 0.02 moles in 144 minutes, its half life is

A. 24 min

B. 12 min

C. 72 min

D. 48 min

Answer: D

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51. For a first order reaction we have $K = 100s^{-1}$. The time for completion of 50% reaction is

A. $10^{-2}s$

B. $4 \times 10^{-5}s$

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

D. $7 \times 10^{-5}s$

Answer: C

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52. The product of half life $\left(t_{1/2}\right)$ and the square of initial concentration of the reactant is constant. Then the order of reaction is

A. 2

B. 3

C. 0

D. 1

Answer: B

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53. For $C_{12}H_{22}O_{11(aq)} \xrightarrow{H^+}$ Products, the concentration of sucrose changes from $0.06M$ to $0.03M$ in 30 minutes. Then, concentration of sucrose at the end of 60 minutes will be

A. Zero

B. $0.015M$

C. $0.09M$

D. $0.12M$

Answer: B

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54. The temperature coefficient of a reaction is 2.5 . If its rate constant at T_1K is $2.5 \times 10^{-3}s^{-1}$, the rate constant at T_2K in s^{-1} is $\left(T_2 > T_1\right)$

A. 1.0×10^{-3}

B. 6.25×10^{-3}

C. 1.0×10^{-2}

D. 6.25×10^{-2}

Answer: B

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55. The rate of reaction for $A \rightarrow$ products is 10 mol. $\text{lit}^{-1}.\ \text{min}^{-1}$ at time $t_1 = 2$ minutes. What will be the rate $\left(\text{in mol. lit}^{-1}\text{min}^{-1}\right)$ at time $t_2 = 12$ minutes ?

A. more than 10

B. 10

C. less than 10

D. 20

Answer: C

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Example

1. Formation of water from its elements is spontaneous, but is slow. Comment .

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2. Express the rate of the reaction between bromide and bromate ions in acid medium.

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3. $N_2 + 3H_2 \rightarrow 2NH_3$. The rate of disappearance of nitrogen is $0.02 mol L^{-1} s^{-1}$. What is the rate of apperance of ammonia ?

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4. $2CO(g) + O_2(g) \rightarrow 2CO_2(g), 2NO(g) + O_2(g) \rightarrow 2NO_2(g)$. Which is relatively faster ? Why ?

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5. Decolourisation of acidified permaganate in fast by Mohr's salt , but is solw by oxalate . Expalin .

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6. At $27^\circ C$ and $37^\circ C$, the rates of a reaction are given as $1.6 \times 10^{-2} molL^{-1}s^{-1}$ and 3.2×10^{-2} mol $L^{-1}s^{-1}$. Calculate the energy of activation for the given reaction .

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7. The temperature coefficient of a reaction in 2 and the rate of the reaction at $25^{\circ}C$ is $3 mol L^{-1} \text{min}^{-1}$ Calculate the rate at $75^{\circ}C$.

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8. Pre -exponential factor for a reaction is $8.4 \times 10^{21} mol L^{-1} s^{-1}$. What will be the specific rate at temperature of one million degree ?

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9. A_2B is an ideal gas , which decompase according f to the equation : $A_2B \rightarrow A_2 + \frac{1}{2}B_2$. At start , the initial pressure is 100 mm Hg and after 5 minutes , the pressure is 120 mm Hg. What is the average rate of decomposition of A_2B ? Assume T and V are constant .

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10. What is the difference between activated complex and unstable intermediate ?

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11. Energy of activation and orientation of molecule together determine the criteria for effective collision . Explain.

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12. An increase in temperature by 10° , can increase the number of collisions only by 2% , but the rate of reaction increases by 100%. Why?

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13. At $25^{\circ}C$ the activation energy for a catalysed reaction is $126KJmol^{-1}$ and for uncatalysed reaction is $350KJmol^{-1}$. How many times the rates is increased in the presence of catalyst ?

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14. Rate of a chemical reaction depends on concentration of reactant is independent on concentration. Why?

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15. For a reaction a,$A \rightarrow$ Products , the units of rate constant are given as $Lmol^{-1}s^{-1}$. Write the rate expression .

Watch Video Solution

16. Units of rate constnat is the same for the elementary reactions :

Reaction (1) $A + B + C \rightarrow$ products,

Reaction (2) , $A + 2B \rightarrow$ products,

Reaction (3), $3A \rightarrow$ products. Substantiate.

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17. Rate expression for two reaction are : (a) $\text{rate}_a = k_a[A]$ and (b) $\text{rate}_b = k_b[B]^2$. When [A] = [B] $= 1 moll^{-1}, k_a = k_b molL^{-1}$. If [A] = [B] = 2 mol L^{-1} , write the relation between rate_a and rate_b .

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18. The decomposition of nitrogen pentoxide is given as $2N_2O_5 \rightarrow 4NO_2 + O_2$. The rates of reaction are $\frac{\left[N_2O_5\right]}{\Delta t} = k_1\left[N_2O_5\right], \frac{\Delta\left[NO_2\right]}{\Delta t} = k_2\left[N_2O_5\right]$ and $\frac{\Delta\left[O_2\right]}{\Delta t} = k_3\left[N_2O_5\right]$ Relate the rate constants k_1, k_2 and k_3 .

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19. The experimental data for the reaction $2A + B_2 \rightarrow 2AB$ is given below. Based on the data write the rate equation.

[A], mol L^{-1}	$[B_2]$, mol L^{-1}	Rate, mol $L^{-1}s^{-1}$
0.5	0.5	1.6×10^{-4}
0.5	1.0	3.2×10^{-4}
1.0	1.0	3.2×10^{-4}

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20. $4HBr + O_2 \rightarrow 2H_2O + 2Br_2$. The molecularity of the reaction appears as 5, but experimentally, it is 2.

Explain.

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21. 75%. of a first order reaction is complete is 30 min. Calculate (a) half life, (b) rate constant and (c) time required for 99.9% completion of the reaction.

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22. A first order reaction is 20% complete in 10 min. How long it takes to complete 80% ?

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23. The rate constant of a reaction is $2.5 \times 10^{-2} \text{ L mol}^{-1} s^{-1}$. Calculate the initial rate with concentration 0.2 mol L^{-1}.

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24. At $193^{\circ} C$, the rate law for the reaction $2Cl_2O \rightarrow 2Cl_2 + O_2$ is rate $= k\left[Cl_2O\right]^2$.

(a) How the rate changes if $\left[Cl_2O\right]$ is raised to therefold of the original ?

(b) How should $\left[Cl_2O\right]$ be changed in order to order to double the rate ?

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25. The initial concentration of ethyl acetane is $0.85 mol L^{-1}$. Following the acid catalysed hydrolysis the , concentrations of ester after 30 min and 60 min of the reaction are respectively 0.8 and $0.754 mol L^{-1}$. Calculate the rate constant and pseudo rate constant.

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26. $2NO + H_2 \rightarrow N_2O + H_2O$, The reaction , follows third order kinetics.

Write (a) rate law and (b) units of rate constant.

What happens to the rate if the volume of vessel is reduce to one - half at constnat temperature ?

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27. The rate of a reaction is given as , rate $= k[X]^{3/2}[Y]^{-1/2}$

What is the order of the reaction ? If Y is taken large in excess , write the rate equation.

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28. A and B are two radioctive substance with half lives 20 min and d30 min respectively. Starting from equal number of moles A and B , after 1hr , what is the (a) ratio of moles of A and B and (b) ratio of activity of A and B ?

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29. A reaction is first order in A and second order in B. How the rate is affected (a) on increasing concentration of B three times and (b) on increasing concentration of both A and B twice ?

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30. For the reaction $X \to Y + Z$ if the initial concentration of X was reduced form 2M to 1M in 20 min and from 1M to 0.25M in 40min , find the order .

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31. Half-life of ^{210}Pb is 22 years. 2gram of lead is allowed decay for 11 years. (a) How much lead is left ?and (b) What is the percentage decay ?

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32. Radium disintegrates to give radon. Write chemical equation as well as rate equation.

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Subjective Exercise-I(Long answer question)

1. Define rate of chemical reaction and explain the factors that effect the rate of reaction.

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Subjective Exercise-I(Short answer question)

1. Mention different types of reation based on their speeds . Give examples .

Watch Video Solution

2. What are everage rate and instant rate ? How is rate determined graphically ?

Watch Video Solution

3. How nature and concentration of reactants influence the rate of a reaction .

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4. Discuss the effect of temperature on the rate of a reaction.

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Subjective Exercise-I(Very Short answer question)

1. What is catalyst ? How does it influences the rate ?

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2. Define rates with respect to substance and rate of the reaction for Haber's process. $N_2 + 3H_2 \rightarrow 2NH_3$.

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3. Express the relation between the rates measured with respect to the disppearance of N_2, H_2 and formation of NH_3 for $N_2 + 3H_2 \rightarrow 2NH_3$

Watch Video Solution

4. How does the rate of reaction change with time.

Watch Video Solution

Subjective Exercise-2 (Long answer question)

1. What is activated complex ?

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2. What is activated complex ? Discuss its formation and transformation .

Watch Video Solution

3. Write the main points of collision theory of reaction rates .

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4. Distinguish between a proper and an imporper collision .

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Subjective Exercise-2(Short answer question)

1. How is the reaction rate influenced by energy of activation ?

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2. What are threshold energy and energy of activation ?

Watch Video Solution

Subjective Exercise-3(Short answer question)

1. Define rate law . How is it related to the stoichiometric equation and experimental result ?

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2. What are (a) rate constant and (b) specific rate ? Write the units of rate constant.

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3. Write four main difference between reaction rate and reaction rate constant.

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4. Write the rate law and units of rate constant for the following elementary reactions.

a) A to products

b) A+B to Products

c) 2A to Products

d) A+2B to Products

e) 2A+B to Products

f) 3A to products

g) A+B+C to products

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Subjective Exercise-3(Very Short answer question)

1. Give the units for rate constant if the rate law rate $= \mathrm{k}[\mathrm{reactant}]^3$

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Subjective Exercise-4(Long answer question)

1. Discuss the methods of determining the order of reaction .

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2. Derive an expression for the integral rate constant of a first order reaction.

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Subjective Exercise-4 (Short answer question)

1. Write the difference between elementary and complex reactions. What is rate limiting step ?

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2. What are the main differences between order and molecularity ?

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3. Define half-life. How is it related to the rate constant of zero and first order rate constants ?

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4. How is half life method useful in the determination of the order of a reaction ?

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5. Derive the relation between rate constant and half life period for a first order reaction.

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Subjective Exercise-4(Very Short answer question)

1. Define reaction rate.

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2. The rate equation for the reaction is established experimentally as $V = K[A]^2[B]^{1/2}$. What is the total order ?

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3. Name two first order reactions.

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4. What is zero order reaction ? Give an example.

Watch Video Solution

5. Give the integrated form of rate equation of first order reaction.

Watch Video Solution

6. Write the slope and intercept of the plot of ln(a-x) against time for a first order reaction.

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7. Write an first order gas phase reactions.

Watch Video Solution

8. The graphs for a zero order reaction are different from other order reactions. Substantiate.

Watch Video Solution

9. Define half - life of a reaction.

Watch Video Solution

10. In an experiment the half time is found to be the same with any initial concentration of the reactant. What is the order ?

Watch Video Solution

11. $H_{2(g)}$ reacts with $I_{2(g)}$ to give $HI_{(g)}$. Write the rate equation and predict order of the reaction with respect to H_2 and I_2.

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12. For any radioactive element the half time of half life is not dependent on the initial amount of the element taken. Why ?

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13. In a reaction, the rate did not change with concentration of reactants. What is your inference ?

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Subjective Exercise-4 (Numerical Problems)

1. The initial concentration of [A] = 0.3 mol/lit. The concentration after 2.3 min is 0.15 moles/lit. What is the value of rate constant.

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2. Rate constant for a reaction, $X \rightarrow Y$, is $4.5 \times 10^{-3}\ \text{min}^{-1}$. If the initial concentration of X is 1 M, what is the rate of reaction after one hour ?

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3. A first order reaction has rate constant $1.15 \times 10^{-1} s^{-1}$. How long will 10 grams of this reactant take to reduce 6 grams ?

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4. Half life of a first order reaction is $2.1 \times 10^{12} s^{-1}$. Calculate the rate constant of the reaction.

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5. Rate constant of first order reaction is 0.693sec^{-1}. What is the half - life ?

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6. $N_2O_{5(g)}$ is at a pressure of 0.5 atm. After 100 s the pressure of the decomposition mixture is 0.512 atm. Calculate the rate constant.

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7. $C_4H_8 \rightarrow 2C_2H_4$. The rate constant is $2.84 \times 10^{-4} s^{-1}$. Calculate the time required to attain a molar ratio of the mixture, ethylene to cyclobutane is equal to $1:100$.

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Objective Exercise - 1

1. Which of the following reactions occurs at measurable rate?

A. reactions between H^{+} and OH^{-} ions in aqueous solution

B. reactions between $AgNO_3$ and $NaCl$ aqueous solution

C. hydrolysis of methil acetate

D. reaction between hydrogen and oxygen gases at room temperature

Answer: C

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2. Which of the following reaction is spontaneous at room temperature

A. $I_2 + H_2O \rightarrow$

B. $2H_2 + O_2 \xrightarrow{pt} 2H_2O$

C. $N_2 + O_2 \rightarrow 2NO$

D. $2HCl \rightarrow H_2 + Cl_2$

Answer: B

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3. Among the following slowest reaction under idetical conditions is

A. $H^+ + OH^- \rightarrow H_2O$

B. $2KMnO_4 + 5H_2C_2O_4 + 3H_2SO_4 \rightarrow$

$K_2SO_4 + 10CO_2 + 2MnSO_4 + 8H_2O$

C. $2KMnO_4 + 10FeSO_4 + 8H_2SO_4 \rightarrow$

$K_2SO_4 + 2MnSO_4 + 5Fe_2\left(SO_4\right)_3 + 8H_2O$

D. $AgNO_{3(aq)} + NaCl_{(aq)} \rightarrow AgCl_{(s)} + NaNO_{3(aq)}$

Answer: B

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4. The rate of reaction for $N_2 + 3H_2 \rightarrow 2NH_3$ may be represented as

A. $r = \dfrac{d[N_2]}{dt} = -\dfrac{1}{3}\dfrac{d[H_2]}{dt} = +\dfrac{1}{2}\dfrac{d[NH_3]}{dt}$

B. $r = \dfrac{d[N_2]}{dt} = \dfrac{1}{3}\dfrac{d[H_2]}{dt} = +\dfrac{1}{2}\dfrac{d[NH_3]}{dt}$

C. $r = \dfrac{d[N_2]}{dt} = 3\dfrac{d[H_2]}{dt} = +\dfrac{1}{2}\dfrac{d[NH_3]}{dt}$

D. $r = -\dfrac{d[N_2]}{dt} = -\dfrac{1}{3}\dfrac{d[H_2]}{dt} = +2\dfrac{d[NH_3]}{dt}$

Answer: A

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5. The chemical reaction occurring between covalent moleculse a involves

A. breaking of existing bonds

B. formations of new bonds

C. evaluation of heat energy

D. both 1 and 2

Answer: D

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6. The rate of a chemical reaction decreases as the reaction proceeds. This is because

A. The reactant concentration remain constant as the reaction proceeds.

B. The product concentration remains constant as the reaction proceeds.

C. Concentration of reactant decreases from time to time, as the reaction progresses

D. Concentration of product decreases from time to time, as the reaction progresses

Answer: C

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7. In a reaction $2A + b \rightarrow A_2B$ the reaction A will disappear at

A. half the rate of which B disappears

B. the same rate at which B disappears

C. the same rate at which A_2B is formed

D. twice the rate at which B disappears

Answer: D

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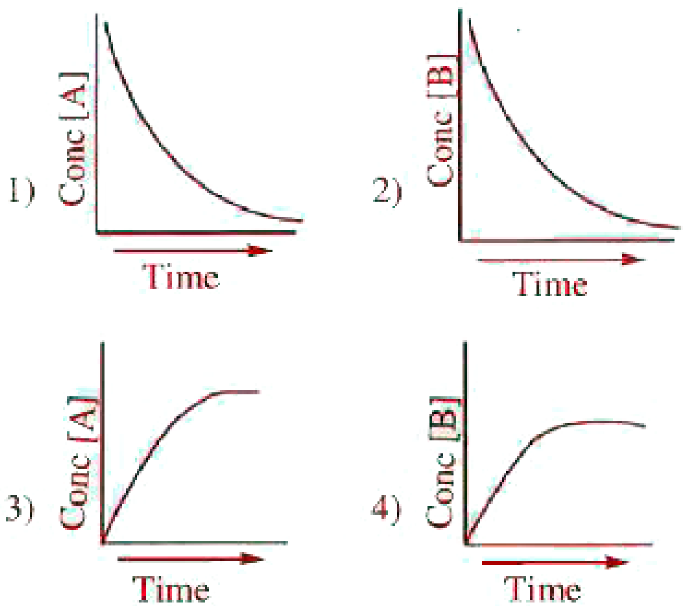
8. For the reaction A to B, following curves represent reaction



The correct curves are

A. 1, 2 only

B. 2, 3 only

C. 1, 4 only

D. 3, 4 only

Answer: C

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9. The reaction $2NO + O_2 \rightarrow 2NO_2, 2CO + O_2 \rightarrow 2CO_2$ 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. The first reaction has higher activation energy than the second

Answer: C

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10. If the first order reaction involves gaseous reactant & 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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11. Burning of coal is reprsented 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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12. For a hypothetical reaction $A \rightarrow L$ the rate expression is rate $= -\dfrac{dC_A}{dt}$

A. Negative sign represents that rate is negative

B. Negative sign pertains to the decrease in the concentrations of reactant

C. Negative sign indicates the attractive forces between reactants

D. All of the above are correct

Answer: B

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13. For the reaction $2HI \rightarrow H_2 + I_2$ the expression $-\frac{1}{2}\frac{d[HI]}{dt}$ 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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14. For $3A \rightarrow xB$, $\frac{d[B]}{dt}$ is found to be 2/3rd of $\frac{d[A]}{dt}$,. Then the value of x is

A. 1.5

B. 3

C. $1/2$

D. 2

Answer: D

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15. For a reaction $A \rightarrow 2B$, as time proceeds

A. [A] decreases, but [B] increases

B. Rate of disapperance of A decreases, but that of rate appearance of B increases

C. Rate of disappearance of A increases, but that of rate of apparance of B deacreases

D. Rate with respect to A and B remain same

Answer: C

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16. At 298 K, atm among

A. $H_2 + O_2 \rightarrow 2H_2O$ B. $H_2 + Cl_2 \rightarrow 2HCl$

c. $N_2 + O_2 \rightarrow 2NO$ D. $H_2SO_4 + KOH \rightarrow K_2SO_4$ products, correct order of reaction rates is

A. $D > A > C > B$

B. $D < A < B < C$

C. $D > B > A > C$

D. $D > B = C > A$

Answer: C

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17. In which of the following cases, rate of disappearance of any reactant at a given instant equals to rate of appearance of any product

A. $H_2 + F_2 \rightarrow 2HF$

B. $N_2 + 3H_2 \rightarrow 2NH_3$

C. $PCl_5 \rightarrow PCl_3 + Cl_2$

D. $H_2 + \frac{1}{2}O_2 \rightarrow H_2O$

Answer: C

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18. For $\frac{1}{2}X_2 + Y_2 \rightarrow XY_2$ relartive rates of species is given as

A. $\text{Rate} = \frac{-d[x_2]}{dt} = \frac{-d[y_2]}{dt} = +\frac{d[xy_2]}{dt}$

B. $\text{Rate} = -2\frac{d[x_2]}{dt} = \frac{-d[y_2]}{dt} = +\frac{d[xy_2]}{dt}$

C. $\text{Rate} = \frac{-1}{2}\frac{d[x_2]}{dt} = \frac{-d[y_2]}{dt} = +\frac{d[xy_2]}{dt}$

D. $\text{Rate} = -\frac{1}{2}\frac{d[x_2]}{dt} = \frac{+d[y_2]}{dt} = +\frac{d[xy_2]}{dt}$

Answer: B

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19. For $N_2 + 3H_2 \rightarrow 2NH_3$ rates of disappearance of N_2 and H_2 and rate of appearance of NH_3 respectively, are a,b and c then

A. $a > b > c$

B. $a < c < b$

C. $a = b > c$

D. $a = b = c$

Answer: B

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20. The reaction $CH_3COOC_2H_5 + H_2O \xrightarrow{H^+}$ products is a/an_____process

a. Instantantaneous B. Spontaneous C. Moderately slow

Then correct statement(s) is/are

A. A & C

B. B & C

C. A only

D. C only

Answer: B

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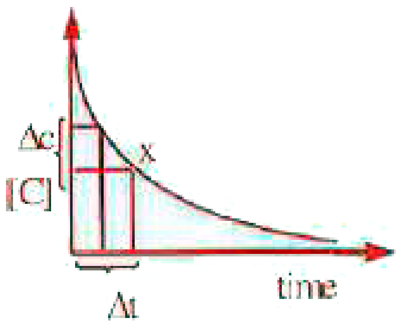
21. From the graph the value $\frac{\Delta c}{\Delta t}$ and the value of rate reaction at X respectively are called



A. Average rate and instantaneous rate

B. Instantaneous rate and average rate

C. Average rate

D. Instantaneous rate

Answer: A

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22. The rate of reaction which does not involve gases, does not depend upon

A. temperature

B. concentration

C. pressure

D. catalyst

Answer: C

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23. The specific rate constant of a reaction depends on the

A. concentration of reactant

B. time

C. temperature

D. concentration of the product

Answer: C

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24. A catalyst accelerates the reaction, because

A. it brings the reactants closer

B. it lowers the activation energy

C. it changes the heat of reaction

D. it increases the activation energy

Answer: B

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25. The unit of rate constant depends on

A. number of reactants

B. concentration terms

C. order of reaction

D. molecularity of reaction

Answer: C

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26. The temperature coefficient of a reaction is

A. the rate of constant at a fixed temperature

B. the ratio of rate condtants at two tepmeratures

C. the ratio of rate condtants at two different tepmeratures differing by 10° C

D. the ratio of rate constants at two pressures

Answer: C

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27. If concentration of reactants is made x times the rate constant k becomes

A. $e^{k/x}$

B. k/x

C. unchanged

D. `x/k

Answer: C

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

A. $1 \& 3$

B. $2 \& 3$

C. $1 \& 4$

D. $2 \& 4$

Answer: B

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29. For a reaction $\frac{K_{(1+10)}}{K_{(1)}} = x$. When temperature is increased from $10^{\circ} C$ to $100^{\circ} C$ rate constnat (K) increased by a factor of 512. Then value of x is

A. 1.5

B. 2.5

C. 3

D. 2

Answer: D

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30. Increase of temperature will increase the reaction rate due to

A. increase of number of effective collisions

B. increase of mean free path

C. increase of number of molecules

D. increase of number of collisions

Answer: A

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31. The rate constants of a reaction at 300K and 280 K respectively are K_1 and K_2. Then

A. $K_1 = 20K_2$

B. $K_2 = 4K_1$

C. $K_1 = 4K_2$

D. $K_1 = 0.5K_2$

Answer: C

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32. The rate constant K_1 of a reaction is found to be double that of rate constant K_2 of another reaction. The relationship between corresponding activation energies of the two reactions E_1 and E_2 can be represented as

A. $E_1 > E_2$

B. $E_1 < E_2$

C. $E_1 = E_2$

D. $E_1 = 2E_2$

Answer: B

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33. The Arrhenius equation expressing the effect of temperature on the rate constant of reaction is

A. $K = Ea/RT$

B. $K = Ae^{-Ea/RT}$

C. $K = \log_e . \frac{Ea}{RT}$

D. $K = e^{-Ea/RT}$

Answer: B

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34. Activation energy depends on

A. pressure

B. concentration of reactants

C. concentration of product

D. nature of reactants

Answer: D

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35. A catalyst in a chemical reaction does not change

A. Average energy of reactants or products

B. Enthalpy of the reaction

C. Activation energy of the reaction

D. both 1 and 2

Answer: D

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36. In general the rate of a given reaction can be increased by all the factors except

A. Increasing the temperature

B. Increasing the concentration of reactants

C. Increasing the activation energy

D. Using a positive catalyst

Answer: C

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37. The effect of temperature on a reaction rate for whilch Ea is zero is give by

A. with increase of temperature rate increases

B. with increase of temperature rate decreases

C. rate is independent of temperature

D. reaction never occurs

Answer: C

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38. The rate expression gives the relation between rate of reaction and

A. conc. Of reactants

B. conc. Of products

C. rate constant

D. rate law

Answer: A

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39. In the graph drawn between log K and 1/T, intercept equalst o

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

B. log A

C. In A

D. $(\log A)/2.303$

Answer: B

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40. In the Arrhenius equation equation,the Boltzmann factor $e^{Ea/RT}$ represents the..............of the molecules possessing energ in excess of activation energy

A. number

B. fraction

C. weight

D. percentage

Answer: B

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41. Activationenergies for different reactions are give below

a. $A \rightarrow$ products Ea=14K.Cal b. $B \rightarrow$ products, Ea=15K.cal

c. $C \rightarrow$ products, Ea=1K.Cal d. $D \rightarrow$ products, Ea=10K.cal

IF the temperature increases by $10^{\circ} C$ for which reactions the temperature coefficients $\left(\frac{k_1 + 10}{k_1}\right)$ are maximum and minimum respectively.

A. a & b

B. b & c

C. b & d

D. d & b

Answer: C

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42. Which of the following parameters of a chemical readtion are increased when a catalyst is used?

A. Rate & activation energy

B. Rate constant & enthalpy

C. Enthalpy & time duration

D. Rate & Rate constant

Answer: D

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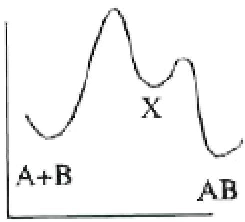
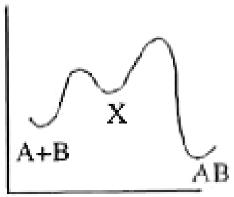
43. The process $2A + B \rightarrow C$ taking place in two steps:

$1 : 2A \rightarrow D \quad 2 : D + B \rightarrow C$(slow)

then rate of reaction gets

A. 

B. 

C. 

D. All are correct

Answer: B

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44. Which of the following influence the rate of reaction

a. Nature of reactants b. Concentration of rectants

c. Temperature D. Molecularity

A. A, B

B. B, C, D

C. C, D

D. A, B, C

Answer: D

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

A. Amount of the reactants taken

B. Physical state of the reactants

C. Δ H of reaction

D. Size of the vessel

Answer: C

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46. What is the rate of the reaction for $2A \rightarrow B$

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

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

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

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

Answer: B

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47. Rate constant of a reaction can be expressed by Arrhenius equation as $K = Ae(-E/R)$. In this equation, E represents

A. The energy above which not all the colliding molecules will react

B. The energy below which colliding molecules will not reacts

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

D. The function of molecules which energy greater than the activation energy of the reaction

Answer: B

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48. For N_2O_5 (In $CCl_4\big) \rightarrow 2NO_2 + \frac{1}{2}O_2, K = 6 \times 10^{-4}s^{-1}$ at 350 K and $K = 1.2 \times 10^{-3}s^{-1}$ at 360 K. Then when temperature is changed to 380 K, value of K (in s^{-1})

A. 1.2×10^{-3}

B. 2.4×10^{-3}

C. 4.8×10^{-4}

D. 4.8×10^{-3}

Answer: D

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49. For a reaction $\frac{1}{2}A \rightarrow 2B$ rate of disappearance of A is related to rate of apperarance of B by the expression

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

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

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

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

Answer: C

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50. SO_2 reacts with O_2 as follows $2SO_2 + O_2 \rightarrow 2SO_3$, the rate of disappearance of SO_2 is 2.4×10^{-4} mole $\text{lit}^{-1}\text{min}^{-1}$. Then

A. $2 \times 10^{-4} molL^{-1}s^{-1}$

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

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

D. $6 \times 10^{-4} molL^{-1}s^{-1}$

Answer: C

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51. The minimum energy required for molecules to enter into chemical reactionn is called

A. Kinetic energy

B. Potential energy

C. Threshold energy

D. Activation energy

Answer: C

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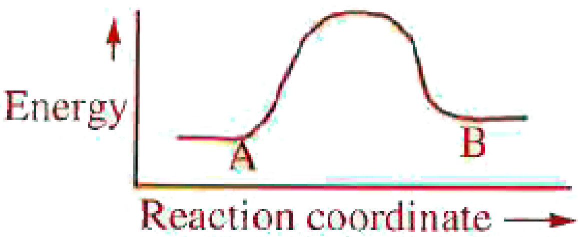
52. For a reversible reaction, $A \Leftrightarrow B$, which one of the following statements is wrong from given energy profile diagram ?



A. Activation energy of forward reaction is greater than that of backward reaction.

B. The threshold energy is less than that of activation energy

C. The forward reaction is endothermic

D. Activation energy of forward reaction is equal to the sum of heat of reaction and the activation energy of backward reaction.

Answer: B

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53. In a reaction, threshold energy is equal to

A. Activation energy of forward reaction is greater than that of backward reaction.

B. normal energy of thr reactants

C. activation energy + energy of reactants

D. activation energy - energy of reactants `

Answer: C

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54. The value of activation energy for a chemical reaction primarily depends on

A. temperature

B. nature of the reacting species

C. the collision frequency

D. concentration of the reacting species

Answer: B

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55. Wrong statement among the following is

A. effective collisions are more if activation energy is less

B. zero order reaction proceeds at a constant rate independent of concentration or time

C. reaction with highest rate constant values have lowest activation energies

D. if initial concentration increases half life decreases in zero order

Answer: D

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56. The rate of a reaction triples when temperature changes from $20^\circ C$ to $50^\circ C$. Calculate the energy of activation.

A. 50

B. 54

C. 100

D. 34

Answer: B

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57. The temperature dependence on rate constant (k) of a chemical reaction is written in terms of Arrhenius equation, $k = A.\, e^{-E^0/RT}$. Activation energy $\left(E^0\right)$ of the reaction can be calculated by plotting

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

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

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

D. kvsT

Answer: C

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58. For the reaction $A + B \Leftrightarrow C + D$, the forward reaction is exothermic. The activation energy of formation of A+B is ....that for the formation of $C + D$

A. equal to

B. less than

C. greater than

D. double

Answer: C

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59. Collision theory satisfactorily explains

A. First order reaction

B. zero order reaction

C. Bimolecular reaction

D. any order reaction

Answer: C

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60. According to collision theory of reaction rates, the activation energy is

A. the energy gained by the molecule on colliding with other molecules.

B. the energy that molecule should possess in order to undergo reaction

C. the energy it should possess so that it can enter into an effective collision

D. the energy it has to acquire so that it can enter into an effective collision.

Answer: D

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61. Increase in the concentration of the reactants leads to the change in

A. Heat of reaction

B. Activation energy

C. Collision frequency

D. Threshold energy

Answer: C

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62. The population of activated molecules can be increased by

A) increase in temperature

B) using a catalyst

C) increase of concentration of reactants

A. A only

B. B only

C. C only

D. A, B, C

Answer: D

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63. Consider an endothermic reaction $X \rightarrow Y$ with the activation energies E_b and E_f for the backward and forward reactions, respectively. In general

A. $E_b < E_f$

B. $E_b > E_f$

C. $E_b = E_f$

D. no definite relation

Answer: A

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64. An endothermic reactio $A \rightarrow B$ ha s an activation energy as $kKJ\text{mol}^{-1}$ of A. If energy change of the reaction is yKJ, the activation energy of the reverse reaction is

A. $-x$

B. $x - y$

C. $x + y$

D. $y - x$

Answer: B

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65. Which of the following expkains the increase of reaction rate by a catalyst?

A. Catalyst provides the necessary energy to the collision molecules to cross the barrier

B. Catalyst decreases the rate of backward reaction so that the rate of forward reaction increases

C. Catalyst decreases the enthalpy change of the reaction

D. Catalyst provides an alternative path of lower activation energy

Answer: D

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66. The plot of log k vs $\frac{1}{T}$ helps to calculate

A. Energy of activation

B. Rate constant of the reaction

C. order of reaction

D. Energy of activation as well as the frequency factor

Answer: D

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67. 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

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68. Chemical reactions with very high E_a values are generally

A. moderately fast

B. Very fast

C. Very slow

D. spontaneous

Answer: C

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69. Pick the appropriate choice about collision theory of reaction rates.

I) It explains the effect of temperature onrate of reaction

II) It assumes that the reactants must be in correct orientation to react.

III) It says rate depends upon the frequency at which reactants collide.

IV) The collisions having energy heigher than the threshold value will give successful reactions.

The correct points are

A. I, II, III and IV

B. II and IV

C. I and IV

D. I, III and IV

Answer: A

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70. The Arrhenius equation expressing the effect of temperature on the rate constant of reaction is

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

B. $k = E_a/RT$

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

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

Answer: A

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71. If the activation energy for the forward reaction is $150kJmol^{-1}$ and that of the reverse reaction is $260kJmol^{-1}$. What is the enthalpy change for the reaction

A. $410 kJmol^{-1}$

B. $-110 kJmol^{-1}$

C. $110 kJmol^{-1}$

D. $-410 kJmol^{-1}$

Answer: B

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72. In collision theory according to arrhenius plot, intercept is equal to

A. $\log_{10} K$

B. In A

C. In K

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

Answer: B

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73. Which of the following statement is in accordance with the Arrhenius equation ?

A. Rate of reaction does not change with increase in activation energy

B. Rate of reaction decreases exponentially with increase in temperature

C. Rate of a reaction decreases with increase in temperature

D. Rate of a reaction increases with decrease in activation energy

Answer: D

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74. If the first order rate constants for the decomposition of enthy 1 iodide at 600 K and 700 K are $2.0 \times 10^{-5}s^{-1}$ and $2.0 \times 10^{-4}s^{-1}$ respectively, the activation energy for this reaction in kJ mol^{-1} is

A. 80.4

B. 40.2

C. 20.1

D. 60.3

Answer: A

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75. For the reaction $H_2 + Br_2 \rightarrow 2HBr$, the rate expression is rate $= K[H_2][Br_2]^{1/2}$ which statement is true about this reaction

A. The reaction is of second order

B. Order of the reaction is $3/2$

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

D. molecularity of the reaction is 2

Answer: B

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76. For the following elementary step $\left(CH_3\right)_3 CHr_{(aq)} \rightarrow \left(CH_3\right)C^{+}_{(aq)} + Br^{-}_{(aq)}$ the molecularity is

A. Zero

B. 1

C. 2

D. fractional

Answer: B

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77. The units of rate constant for the reaction obeying rate expression $r = k[A][B]^{2/3}$ is

A. $\text{mole}^{-2/3}\text{lit}^{2/3}\text{time}^{-1}$

B. $mole^{2/3}lit^{-2/3}time^{-1}$

C. $mole^{-5/3}lit^{5/3}time^{-1}$

D. $mole^{2/3}lit^{2/3}time^{-1}$

Answer: A

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78. In the following sequence of reactions $M \xrightarrow{K_1} N \xrightarrow{K_2} O \xrightarrow{K_3} P : K_1 < K_2 < K_3$ then the rate determining step is

A. $M \rightarrow N$

B. $N \rightarrow O$

C. $O \rightarrow P$

D. $M \rightarrow P$

Answer: A

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79. Two gases A and B are in a container. The experimental rate law for the reaction between them has been found to be rate $= k[A]^2[B\}$. Predict the effect on the rate of the reaction when the partial pressure of each reactant is doubled.

A. the rate is doubled

B. rate becomes four times

C. the rate becomes six times

D. the rate becomes eight times

Answer: D

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80. ....of a reaction cannot be determined experimentally.

A. order

B. rate

C. rate constant

D. molecularity

Answer: D

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81. The rate expression for the reaction $A_{(g)} + B_{(g)} \rightarrow C_{(g)}$ is rate $= kC_A^2 C_B^{1/2}$ what changes in the initial concentrations of A and B will cause the rate of reaction to increase by a factor of eight?

A. $C_A \times 2, C_B \times 2$

B. $C_A \times 2, C_B \times 4$

C. $C_A \times 1, C_B \times 4$

D. $C_A \times 4, C_B \times 1$

Answer: B

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82. For a reaction $pA + qB \rightarrow$ products the rate law expression is $r = k[A]^1[B]^m$ then

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

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

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

D. $(p + q) \neq (1 + m)$

Answer: C

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83. For $H_2 + Cl_2 \xrightarrow{x} 2HCl$ rate law is given R=K. Then X is

A. Pt

B. Ni

C. hu

D. Water

Answer: C

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84. If both $\frac{dc}{dt}$ & specific rate have same units then rate law is

A. $R = K[A]^2$

B. $R = K[A]^{1/2}$

C. $R = K[a]^{-2}$

D. $R = K$

Answer: D

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85. For $A + B \rightarrow C + D$ when [A] alone is doubled rate gets doubled but when [B] alone is increased by 9 times rate gets tripled. Then orders of reaction is

A. $3/4$

B. $3/2$

C. $4/9$

D. 2

Answer: B

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86. Rate law for $2A + B \rightarrow C + D$ from following data:

S.No.	$[A](M)$	$[B](M)$	$\text{Rate}(M/s)$
1	0.01	0.01	2.5
2	0.01	0.02	5
3.	0.03	0.02	45

A. $r = K[A]^{1/3}[B]$

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

C. $r = K[A][B]^{1/3}$

D. $r = K[A]^{2/3}[B]^{1/3}$

Answer: B

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

(k=rate constant, r=rate of reaction , c=conc. Of reactat

A. $k = r \times c^2$

B. $k = r \times c$

C. $k = \frac{c}{r}$

D. $k = \frac{r}{c}$

Answer: D

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88. $\frac{dc}{dt}$ of a first order reaction depends on

A. Time

B. Concentration

C. Temperature

D. All

Answer: D

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

A. unit of k must be $\sec^{-1}$

B. `value of k is independent of the initial concentrations 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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90. Which of the following statements is correct regarding order of reaction

A. first order reaction should be bimolecular

B. Order of the reaction must be positive

C. order depends upon stoichiometry

D. order is determined by experimental results

Answer: D

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91. The increase in rate constant of a reaction is more when the temperature increases from

A. $290K$ - $300K$

B. $300K$ - $310K$

C. $310K$ - $320K$

D. $320K$ - $330K$

Answer: A

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92. The time required for 100% complection of a zero order reaction is

A. $k = \frac{r}{c}$

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

C. ak

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

Answer: D

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93. For second order reaction

A. $K = \frac{2.303}{t} \log. \frac{b(a - x)}{a(b - x)}$

B. $K = \frac{2.303}{t(a - b)} \log. \frac{b(a - x)}{a(b - x)}$

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

D. $K = \frac{2.303}{t(b - a)} \log. \frac{a(a - x)}{b(b - x)}$

Answer: B

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94. The half life for a given reaction was doubled as the initial concentration of the reaction was doubled. The order of the reactio is

A. Zero

B. $1st$

C. $2nd$

D. $3rd$

Answer: A

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95. The inversion of cane sugar into glucose and fructose is

A. $1st$ order

B. $2nd$ order

C. $3rd$ order

D. zero order

Answer: A

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96. The half life of a first order reaction is

A. independent of the initial concentration of the reactant

B. directly proportional to the initial concentration of the reactant

C. inversely proportional to the initial concentration of the reactant

D. directly proportional to the square of the initial concentration of the reactant.

Answer: A

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97. The hydrolysis of ester in the presence of alklai solution is a ....order reaction

A. 1

B. 2

C. 0

D. 3

Answer: B

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98. $CH_4 + Cl_2 \xrightarrow{hv} CH_3Cl + HCl$ the order of this reaction is

A. 0

B. 1

C. 2

D. 3

Answer: A

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99. $RCOOR + H_2O \xrightarrow{HCl} RCOOH + ROH$ follows..........reaction kinetics

A. Second order

B. Unimolecular

C. Pseudo unimolecular

D. zero order

Answer: C

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100. Order of a reaction is decided by

A. Molecularity

B. Reaction mechanism

C. Performing experiment

D. Lechatlier principle

Answer: C

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101. $2A \rightarrow B + C$ would be a zero order reaction when rate of reaction

A. is directly proportional [A]

B. is directly proportional $[A]^2$

C. is independent of change of [A]

D. is independent of [B] & [C]

Answer: C

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102. Which of the following is a first order reaction

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

B. $2H_2O_2 \rightarrow 2H_2O + O_2$

C. $CH_3COOC_2H_5 + H_2O \xrightarrow{H^+}$ products

D. All of the above

Answer: D

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103. If a reaction obeys the following equation $k - \frac{2.303}{t}\log\frac{a}{a - x}$ the order of the reaction will be

A. Zero

B. one

C. two

D. three

Answer: B

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104. The rate constant for a reaction is 2.05×10^{-5} mole $\text{lit}^{-1}.\ \text{sec}^{-1}$. The rection obeys ......order

A. First

B. Second

C. Zero

D. Half

Answer: C

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105. A reaction involves two reactants. The rate of reaction is directly proportional to the concentration of one of them and inversely proportional to the concentration of the other. The overall order of reaction will be

A. One

B. Two

C. Zero

D. fractional

Answer: C

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106. In the reaction $2A + B \rightarrow$ Products the order w.r.t A is found toi be 1 and w.r.t equal to 2. Concentration of A is doubled and that of B is halved, the rate of reaction will be

A. Doubled

B. Havaled

C. Remain unaffected

D. Four times

Answer: B

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107. What are the units of the rate constant of a reaction in which the half life is doubled by halving the initial concentration of reactants.

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

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

C. $\sec^{-1}$

D. $M^{-2}s^{-1}$

Answer: B

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108. Which of the following represents the expression for 3/4 th life of 1st order reaction

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

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

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

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

Answer: C

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109. Give relation between half reaction time $\left(t_{1/2}\right)$ and initial concentration of reactant for $(n - 1)$ order reaction

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

B. $t_{1/2} \propto [R]_0^{2-n}$

C. $t_{1/2} \propto [R]_0^{n+1}$

D. $t_{1/2} \propto [R]_0$

Answer: B

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

A. Order of reaction is always whole number

B. Order can be determined only experimentally

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

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

Answer: A

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111. If a is the initial concentration of the reactant, the time taken for completion of the reaction if it is of zero order will be

A. 0

B. 1

C. 1.5

D. 2

Answer: A

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112. The slowest step of a particular reaction is found to be $\frac{1}{2}X_2 + Y_2 \rightarrow XY_2$ the order of the reaction is

A. 2

B. 3

C. 3.5

D. 1.5

Answer: D

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113. 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 concentration.

Answer: B

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114. Which of the following is correct for a first order reaction? (K=rate constant $t_{\frac{1}{2}} =$ half life)

A. $t_{1/2} = 0.693 \times K$

B. $k.\, t_{1/2} = \dfrac{1}{0.693}$

C. $t_{1/2} = 0.693$

D. $6.93 \times k \times t_{1/2} = 1$

Answer: C

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115. If a substance with half life 3 days is taken at other place in 12 days. What amount of substance is left now, if it follows first order kinetics

A. $\dfrac{1}{32}$

B. $\dfrac{1}{8}$

C. $\dfrac{1}{16}$

D. $\frac{1}{4}$

Answer: C

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116. Which one is not correct ?

A. $t_{1/2}$ of zero order reaction is dependent of initial concentration of reactant

B. $t_{1/2}$ of first order reaction is dependent of initial concentration of reactant

C. Rate of zero order reaction does not depend upon initial concentration of reactant

D. Rate of zero order reaction depend upon initial concentration of reactant

Answer: D

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117. The half life periods of four reactions labelled by A,B, C & D are 30 sec, 4.8 in, 180 sec and 16 min respectively. The fastest reaction is

A. A

B. B

C. C

D. D

Answer: A

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118. In the case of a first order reaction, the ratio of the time required for 99.9% completion of the reaction to its half life is nearly

A. 1

B. 10

C. 20

D. 8

Answer: B

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119. Which of the following is correct ?

A. Molecularity of a reaction is always same as the order of reaction

B. In some cases molecularity of the reaction is same as the order of reaction

C. Molecularity of the reaction is always more than other of reaction

D. Molecularity never be equal to order

Answer: B

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120. If the rate for the chemical reaction is expresssed at Rate =K[A][B]" then

A. one

B. n

C. $1 + n$

D. $1 - n$

Answer: C

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121. If the rate of gaseous reaction is independent of pressure, the order of raction is

A. 0

B. 1

C. 2

D. 3

Answer: A

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122. The half life of a 1^{st} order reaction is 1 min 40 seconds. Calculate its rate constant (k)

A. $k = 6.9 \times 10^{-3} \text{min}^{-1}$

B. $k = 6.9 \times 10^{-3} s^{-1}$

C. $k = 6.9 \times 10^{-3} s$

D. $k = 100 s$

Answer: B

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123. The value of rate constant of a pseudo first order reaction

A. Depends only on temperature

B. Depends on the concentration of reactants present in small amounts

C. Depends on the concentration of reactants present in excess

D. Is independent of the concentration of reactants

Answer: C

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124. The ratio of any colligative property for KCl solution to that of sugar solution of same molality is

A. 1

B. 0.5

C. 2

D. 3

Answer: C

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Objective Exercise - 2

1. Consider the following reaction $N_{2(g)} + 3H_{2(g)} \rightarrow 2NH_{3(g)}$. The rate of the reaction in terms in terms of N_2 at $T(k)$ is $-\frac{d[N_2]}{dt} = 0.02$ mole $\text{lit}^{-1}\text{sec}^{-1}$. What is the value of $-\frac{d[H_2]}{dt}$ (in mole $\text{lit}^{-1}\text{sec}^{-1}$) at the same temperature?

A. 0.02

B. 50

C. 0.06

D. 0.04

Answer: C

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2. For $N_2 + 3H_2 \rightarrow 2NH_3$ rates of disappearance of N_2 and H_2 and rate of appearance of NH_3 respectively, are a,b and c then

A. -0.02mol

B. zero

C. $0.1132g$

D. $0.17g$

Answer: C

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3. For the reaction $4NH_3 + 5O_2 \rightarrow 4NO + 6H_2O$ the rate of reaction with respection with respect to NH_3 is $2 \times 10^{-3} Ms^{-1}$. Then the rate of the reaction with respect to oxygen is ______Ms^{-1}

A. 2×10^{-3}

B. 1.5×10^{-3}

C. 2.5×10^{-3}

D. 3×10^{-3}

Answer: A

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4. Concetration of a reactant A is changed from 0.044 M to 0.032 M in 25 minutes, the average rate of the reactio during this interval is

A. $0.0048 \text{mole/lit/min}$

B. $0.00048 \text{mole/lit/sec}$

C. $4.8 \times 10^{-4} \text{mole/lit/min}$

D. $0.0048 \text{mole/lit/sec}$

Answer: C

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5. In the reaction $A \rightarrow 2B$ the concentration of a falls from 1.0M to 0.98

2M in one minute what is the rate of in moles $\text{litre}^{-1}\text{sec}^{-1}$

A. 1.8×10^{-3}

B. 3.0×10^{-5}

C. 3.6×10^{-3}

D. 6.0×10^{-5}

Answer: B

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6. The rate of formation of SO_3 in the reaction $2SO_2 + O_2 \rightarrow 2SO_3$ is 100

g min^{-1} Hence rate of disappearance of O_2 is

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

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

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

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

Answer: C

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7. The rate law of the reaction $RCl + NaOH \rightarrow ROH + NaCl$ is given by Rate =k[RCI]. The rate of this reaction

A. A & B

B. B & C

C. C & D

D. B & D

Answer: B

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8. $1dm^3$ of $2MCH_3COOH$ is mixed with $1dm^3$ of 3M 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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9. The rate of reaction becomes two times for every $10^{\circ}C$ rise in temperature. If the rate of reaction increases by 32 times when the temperature is increased from $30^{\circ}C$ to $(10x)^2C$. Then X=

A. 16

B. 32

C. 64

D. 28

Answer: B

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10. An endothermic reaction $A \rightarrow B$ has an activatio energy 15 kaca/mole and the heat of reaction is 5kcal/mole. The activation energy of the reaction $B \rightarrow A$ is

A. 20 kcal/mole

B. 15 kcal/mole

C. 10 kcal/mole

D. zero

Answer: C

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11. The activation energy of a reaction is $58.3k\frac{J}{\text{mole}}$. The ratio of the rate constants at 305 K and 300 K is about $\left(R = 8.3Jk^{-1}mol^{-1}\right)$

$(\text{Antilog}0.1667 = 1.468)$

A. 1.25

B. 1.75

C. 1.5

D. 2.0

Answer: C

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12. Decompositon of NH_3 on gold surface follows zero order kinetics. If rate constant is $5 \times 10^{-4} Ms^{-1}$, rate of formation of N_2 will be

A. $10^{-3} M - s^{-1}$

B. $2.5 \times 10^{-4} M - s^{-1}$

C. $5 \times 10^{-4} M - s^{-1}$

D. Zero

Answer: C

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13. For $X \rightarrow Y \frac{k_{t+10}}{k_t} = 3$. If the rate constant at 300 k is Q $\min^{-1}$, at what temperature rate constant becomes $9Q\min^{-1}$?

A. $47^0 C$

B. $320^0 C$

C. $280K$

D. $\sqrt{9 \times 300}K$

Answer: A

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14. At 300 K rate constant for $A \rightarrow$ products at t=50 min is $0.02s^{-1}$, then rate constant at t=75 min and 310 K will be (in s^{-1})

A. $\frac{0.04}{25}$

B. $\left(\frac{0.02}{25}\right)$

C. 0.04

D. 0.04×25

Answer: C

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15. The rate constant of a first order reaction at $27^{\circ} C$ is $10^{-3} min^{-1}$. The temperature coefficient of this reaction is 2. What is the rate constant (in $\min^{-1}$) at $17^{\circ} C$ for this reaction?

A. 10^{-3}

B. 5×10^{-4}

C. 2×10^{-3}

D. 10^{-2}

Answer: B

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16. For $A \rightarrow B$, [A] changed from $4.4 \times 10^{-2} M$ to $3.2 \times 10^{-2} M$ in 25 min. Now $\frac{-\Delta[A]}{\Delta t}$ will be

A. $4.8 \times 10^{-4} M. \min^{-1}$

B. $4.8 \times 10^{-4} M. s^{-1}$

C. $9.6 \times 10^{-3} M. s^{-1}$

D. $2.4 \times 10^{-4} M. \min^{-1}$

Answer: A

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17. A gaseous phase reaction $A_2 \rightarrow B + 0.5C$ shows an increase in pressure from 100 mm to 120 mm in 5 min. Now, $-\frac{\Delta[A_2]}{\Delta t}$ should be

A. $8mm - \min^{-1}$

B. $4mm - \min^{-1}$

C. $16mm - \min^{-1}$

D. $2mm - \min^{-1}$

Answer: A

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18. For the reaction $N_2O_5 \rightarrow 2NO_2 + \frac{1}{2}O_2$, Given

$$\frac{-d[N_2O_5]}{dt} = K_1[N_2O_5], \frac{d[NO_2]}{dt} = K_2[N_2O_5] \text{ and } \frac{d[O_2]}{dt} = K_3[N_2O_4].$$

The relation in between K_1, K_2 and K_3 is

A. $k_1 = 2k_2 = 3k_3$

B. $2k_1 = 4k_2 = k_3$

C. $2k_1 = k_2 = 4k_3$

D. $k_1 = k_2 = k_3$

Answer: C

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19. The process $2A + B \rightarrow C$ taking place in two steps:

$1:2A \rightarrow D \quad 2:D + B \rightarrow C$(slow)

then rate of reaction gets

A. doubled when $[B]$ is halved

B. doubled when [A] is doubled

C. doubled when [B] is doubled

D. quadrapled when [A] is doubled

Answer: C

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20. Thermal decomposition for $N_2O_5(g)$ follows 1st order kinetics as per $N_2O_5(g) \rightarrow 2NO_2(g) + \frac{1}{2}O_2(g)$. Initial pressure of N_2O_5 is 100mm. After 10 minutes, the pressure developed is 130mm, what is rate constant?

A. 0.693min^{-1}

B. 0.025min^{-1}

C. $2.303 \times 10^{-4} \text{min}^{-1}$

D. 0.03min^{-1}

Answer: B

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21. For the process 2A $\rightarrow$ products, rate of reaction w.r.t A at 10th second is $2 \times 10^{-2} M - s^{-1}$ then rates of same process at 5th & 15th seconds (order $\neq$ 0) respectively are (in M/s)

A. 10^{-1} and 4×10^{-2}

B. 2.7×10^{-2} and 1.6×10^{-2}

C. 1.6×10^{-2} and 2.7×10^{-2}

D. 2×10^{-2} and 2×10^{-2}

Answer: B

Watch Video Solution

22. For $N_2 + O_2 \rightarrow 2NO$, initially N_2 & O_2 are at pressures 500mm & 700 mm at t = 0. If the pressure of N_2 is 480 mm at t = 20 min average rate of reaction is

A. 5

B. 1

C. 2

D. 4

Answer: B

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23. For $H_2 + Cl_2 \xrightarrow{hv} 2HCl$, rate of reaction at t=0 is given by rate= $-\frac{d}{dt}\left[H_2\right] = 6 \times 10^{-3}M - \min^{-1}$ then rate of the reaction at t = 30 min is

A. $\frac{-d}{dt}\left[Cl_2\right] = 2 \times 10^{-4}M - \min^{-1}$

B. $\frac{1}{2}\frac{d}{dt}[HCl] = 12 \times 10^{-3}M - \min^{-1}$

C. $\frac{-d}{dt}\left[Cl_2\right] = 6 \times 10^{-3}M - \min^{-1}$

D. Zero

Answer: C

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24. For $SO_2Cl_2(g) \rightarrow SO_2(g) + Cl_2(g)$, Pressure of SO_2Cl_2 changed from 5 atm to 4 atm in 10 min. Then, pressure of SO_2Cl_2 at the end of 30 minutes will be (in atm)

A. 2.56

B. 3.56

C. 4.56

D. 5.56

Answer: A

Watch Video Solution

25. For $SO_2Cl_2(g) \rightarrow SO_2(g) + Cl_2(g)$ Pressures of SO_2Cl_2 at t = 0 and t =20 minutes respectively are 700 mm & 350 mm. When log $\left(P_0/p\right)$ is plotted against time (t), slope equals to

A. $1.505 \times 10^{-2} s^{-1}$

B. $1.202 \times 10^{-3} \text{min}^{-1}$

C. $1.505 \times 10^{-2} \text{min}^{-1}$

D. 0.3465min^{-1}

Answer: C

Watch Video Solution

26. For $2H_2O_2 \rightarrow 2H_2O + O_2, t_{0.5} = 0.301hr$. When $\left[H_2O_2\right]$ at t =0 is 0.5 M, initial rate is

A. $2.303M. h^{-1}$

B. $1.151M. h^{-1}$

C. $4.606M. h^{-1}$

D. $0.301M. h^{-1}$

Answer: B

Watch Video Solution

27. For $2SO_2 + O_2 \rightarrow 2SO_3$, rate of disappearance of SO_2 is $4 \times 10^{-3} M - s^{-1}$ at t=10 sec. Then, the amount of SO_3 formed & amount of O_2 consumed at t = 10 sec respectively are

A. $0.1g, 0.1g$

B. $0.1g, 0.2g$

C. $0.016g, 0.064g$

D. $0.32g, 0.064g$

Answer: D

Watch Video Solution

28. For $CH_4 + Cl_2 \xrightarrow{hv}$ product, rate of reaction at t=0 is given by rate $= \frac{-d}{dt}\left[CH_4\right] = 2 \times 10^{-4} M - \min^{-1}$, then rate of the reaction at t = 20 min is

A. rate $= \frac{-d}{dt}\left[CH_4\right] = 10^{-4}$

B. rate $= \frac{-d}{dt}\left[Cl_2\right] = 2 \times 10^{-4}$

C. rate $= \frac{-d}{dt}\left[CH_4\right] = 4 \times 10^{-4}$

D. rate $= \frac{-d}{dt}\left[Cl_2\right] =$ zero

Answer: B

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29. The rate of reaction $A \rightarrow$ products is 10mole/lit/min at time $\left(t_1\right) = 2\text{min}$. What will be the rate in mole/lit/min at time $\left(t_2\right)$ - 12 min

A. more than 10

B. 10

C. less than 10

D. 20

Answer: C

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30. $3A \rightarrow 2B$, rate of reaction $+\frac{d[B]}{dt}$ is equal to

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

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

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

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

Answer: B

Watch Video Solution

31. For a reaction the activation energy is zero. What is the value of rate constant at $300K$. $\left[\text{Given}k_{280K} = 1.6 \times 10^{6} s^{-1}, R = 8.314 J\text{mol}^{-1} K^{-1}\right]$

A. 2.08×10^{-3}

B. 2.08×10^{-2}

C. 6.93×10^{-3}

D. 6.93×10^{-2}

Answer: C

Watch Video Solution

32. The temperature coefficient of a reaction is 2.5. If its rate constant at T_1K is $2.5 \times 10^{-3}s^{-1}$, the rate constant at T_2K in s^{-1} is $\left(T_2 = 10 + T_1\right)$

A. 1.0×10^{-3}

B. 6.25×10^{-3}

C. 1.0×10^{-2}

D. 6.25×10^{-2}

Answer: B

Watch Video Solution

33. In the equilibrium reaction $A + B \Leftrightarrow C + D$, the activation energy for the forward reaction is 25 kcals mole^{-1} and that of backward reaction is 15 kcals mole^{-1}. Which one of the following statements is correct?

A. it is an exothermic process

B. it is an endothermic process

C. it is a reaction for which $\Delta H = 0$

D. it is a sublimation process

Answer: B

Watch Video Solution

34. For a first order process, $\frac{-Ea}{RT}$ value is -23.03, then value of $\frac{K}{A}$ is

A. $10^{2.303}$

B. 10^{-10}

C. $10^{-23.03}$

D. 10^{10}

Answer: B

Watch Video Solution

35. For producing the 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. both threshold energy and proper orientation

Answer: D

Watch Video Solution

36. K, A & E_a of a process at $25^\circ C$ respectively are $5 \times 10^{-4} s^{-1}$, $6 \times 10^{14} s^{-1}$ & 108 kJ/mol. Then the value of rate constant as time $\rightarrow \infty$ will be

A. 1.2×10^{18}

B. zero

C. 6×10^{14}

D. 5×10^{-4}

Answer: D

Watch Video Solution

37. The half life of a first order reaction is 100 seconds at 280 K. If the temperature coefficient is 3.0 its rate constant at 290 K in s^{-1} is

A. 2.08×10^{-3}

B. 2.08×10^{-2}

C. 6.93×10^{-3}

D. 6.93×10^{-2}

Answer: B

Watch Video Solution

38. The temperature coefficient of a reaction is 2. When the temperature is increased from $30\,^\circ C$ to $90\,^\circ C$, the rate of reaction is increased by

A. 150 times

B. 410 times

C. 72 times

D. 64 times

Answer: D

View Text Solution

39. For a chemical reaction $Y_2 + 2Z \rightarrow$ Product rate controlling step is $Y + 1/2Z \rightarrow Q$. If the concenntration of Z is doubled the rate of reactin will

A. Remain the same

B. Become four times

C. Become 1.414 times

D. Become double

Answer: C

Watch Video Solution

40. In a reaction $A \rightarrow B$ when the concentration of reaction is made 8 times, the rate got doubled. The order of reaction is

A. $1/3$

B. 1

C. $1/2$

D. 2

Answer: A

Watch Video Solution

41. The rate of reaction $A + 2B \rightarrow$ Products is given by $-\frac{d[A]}{dt} = k[A][B]^2$.If B is present in large excess, the order of reaction is

A. 3

B. 2

C. 1

D. zero

Answer: C

Watch Video Solution

42. For the reaction $2A + B \rightarrow$ Products, it is found that doubling the concentration of both reactants increases the rate by a factor of 8. But doubling the concentration of B alone, only doubles the rate. What is the order of the reaction w.r.t to A?

A. 2

B. 3

C. 0

D. 1

Answer: A

Watch Video Solution

43. The initial rates for gaseous reaction $A + 3B \rightarrow AB_3$ are given below

$[A](M)$ $[B](M)$ $\text{Rate}(\text{Msec}^{-1})$

0.1 0.1 0.002

0.2 0.1 0.002

0.3 0.2 0.008

0.4 0.3 0.018

order of reaction is

A. zero

B. three

C. one

D. two

Answer: D

Watch Video Solution

44. The half life of a first order reaction is 100 seconds. What is the time required for 90% completion of the reaction?

A. 100 sec.

B. 200 sec.

C. 333 sec.

D. 500 sec.

Answer: C

Watch Video Solution

45. For the reaction $2N_2O_5 \rightarrow 4NO_2 + O_2$, rate and rate constant are $1.02 \times 10^{-4} M \sec^{-1}$ and $3.4 \times 10^{-5} \sec^{-1}$ respectively then concentration of N_2O_5 at that time will be (in moles /lit)

A. 3 M

B. 4 M

C. 1 M

D. 1.5 M

Answer: A

Watch Video Solution

46. Decomposition of NH_3 on Pt surface follows zero order kinetics. If the initial pressure is 4 atm, the product of $t_{1/2}$ and k equals to

A. 2 atm

B. 4 atm

C. 16 atm

D. 1.414 atm

Answer: A

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47. 3/4 th of first order reaction was completed in 32 min 15/16 the part will be completed in

A. 24 min

B. 64 min

C. 16 min

D. 32 min

Answer: B

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48. Initial concentration of the reactant is 1.0 M. The concentration becomes 0.9 M, 0.8 M and 0.7 M in 2 hours, 4 hours and 6 hours respectively. Then the oerder of reaction is

A. 2

B. 1

C. zero

D. 3

Answer: C

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49. Half life periods for a reaction at initial concentration of 0.1 M and 0.01 M are 5 and 50 minutes respectively. Then the order of reaction is

A. zero

B. 1

C. 2

D. 3

Answer: C

Watch Video Solution

50. For first order reaction $t_{0.75}$ is 138.6 sec. Its specific rate constant is (in s^{-1})

A. 10^{-2}

B. 10^{-4}

C. 10^{-5}

D. 10^{-6}

Answer: A

Watch Video Solution

51. 20% first order reaction is completed in 50 minute. Time required for the completion of 60% of the reaction is

A. 100

B. 150

C. 262

D. 205

Answer: D

Watch Video Solution

52. In a first order reaction, 20% reaction is completed in 24 minutes.The percentage of reactat remaining after 48 minutes is

A. 60

B. 64

C. 81

D. 80

Answer: B

Watch Video Solution

53. A first order reaction is half completed is 45 minutes. How long does it need for 99.9% of the reaction tobe completed?

A. 20 hours

B. 10 hours

C. $7.\frac{1}{2}$ hours

D. 5 hours

Answer: C

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54. For a first order reaction $A \to B$ the reaction rate at reactant concetration of 0.01 M is found to be 2.0×10^{-5}mol $L^{-1}s^{-1}$. The half life period of the reactionis

A. 220s

B. 30 s

C. 374 s

D. 347 s

Answer: D

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55. 99% of a first order reaction was completed in 32 in. When wil 99.9% of the reaction complete?

A. 50 min

B. 46 min

C. 49 min

D. 48 min

Answer: D

Watch Video Solution

56. For a first order reaction with half life of 150 seconds, the time taken for the concentration of the reactant to fall from M/10 to M/100 will be approximately

A. 1500 s

B. 500 s

C. 900 s

D. 600 s

Answer: B

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57. A reaction which is of first order w.r.t reactant A has a rate constnat is 6min^{-1}. If we start with $[A] = 0.5\text{mol}L^{-1}$ when would [A] reach the value of $0.05\text{mol}L^{-1}$

A. 0.384 min

B. 15 min

C. 20 min

D. 3.84 min

Answer: A

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

$A_2 \Leftrightarrow A + A$ (fast) $A + B_2 \rightarrow AB + B$(slow)

$A + B \rightarrow AB$ (fast)`

The order of the over all reaction is :

A. 2

B. 1

C. 1.5

D. 0

Answer: C

Watch Video Solution

59. Depletion of ozone occurs as :

$2O_3 \rightarrow 3O_2$

Step 1: $O_3 \overset{K_c}{\Leftrightarrow} O_2(O)$ (fast)

Step 2: $O_3 + (O) \overset{K_c}{\Leftrightarrow} 2O_2$ (slow)

What is the order of the reaction

A. 1

B. 2

C. 3

D. 0.5

Answer: A

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60. For a first order process $A \rightarrow B$, rate constant $k_1 = 0.693\text{min}^{-1}$ & another first order process $C \rightarrow D, k_2 = x\text{min}^{-1}$. If 99.9% of C $\rightarrow$ D requires time same as 50% of reaction A $\rightarrow$ B, value of x?

A. 0.0693

B. 6.93

C. 23.03

D. 13.86

Answer: B

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61. For Products, the concentration of sucrose changes from 0.06 M to 0.03 M in 30 minutes. Then, concentration of sucrose at the end of 60 minutes will be

A. Zero

B. 0.015 M

C. 0.09 M

D. 0.12 M

Answer: B

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62. 99% of a 1st order reaction completed in 2.303 minutes. What is the rate constant and half life of the reaction

A. 2.303 and 0.3010

B. 2 and 0.3465

C. 2 and 0.693

D. 0.3010 and 0.693

Answer: B

Watch Video Solution

63. The rate constant of a reaction at 200K is 10 times less than rate constant at 400K. Value of E_a? [R = gas constant]

A. 1842.4 R

B. 921.2 R

C. 460.6 R

D. 230.3 R

Answer: B

Watch Video Solution

64. Out og 300 g substance [decomposes as per 1st order], hou much will remains after 18 hr? ($t_{0.5} = 3$hr)

A. 4.6 gm

B. 5.6 gm

C. 9.2 gm

D. 6.4 gm

Answer: A

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65. 75% of a first order process is completed in 30 min. The time required for 93.75% completion of same process (in hr) ?

A. 1

B. 120

C. 2

D. 0.25

Answer: A

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66. For a first order reaction at 27°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. 0.477

Answer: C

Watch Video Solution

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

A. 23.03 minutes

B. 46.06 minutes

C. 460.6 minutes

D. 230.3 minutes

Answer: B

Watch Video Solution

68. In a first order reaction, the concentration of the reactant, decreases from 0.8 M to 0.4 M in 15 minutes. The time taken for the concentration to hange from 0.1 M to 0.025 M is

A. 7.5 minutes

B. 15 minutes

C. 30 minutes

D. 60 minutes

Answer: C

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69. The chemical recation $2O_3 \rightarrow 3O_2$ proceeds as follows :

$O_3 \xrightarrow{\text{Fast}} O_2 + O \& O + O_3 \xrightarrow{\text{Slow}} 2O_2$ the rate law expression should be

A. $r = K\left[O_3\right]^2$

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

C. $r = K[O_3][O_2]^2$

D. $r = K[O_3][O_2]^2$

Answer: B

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70. 90% of first order process X $\rightarrow$ Y is completed in a time equals to 99% of another first order process Y $\rightarrow$ Q. If K value of Y $\rightarrow$ Q is 0.09 $\sec^{-1}$, K value of X $\rightarrow$ Y will be

A. 0.27

B. 0.3

C. 0.03

D. 0.045

Answer: D

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71. Based on the following data for a reaction what is its order (A → products)

Conc.A $2M$ $0.2M$ $0.02M$ 0.00

Time in min 0 10 20 $\propto$

A. $1st$

B. $2nd$

C. $3rd$

D. zero

Answer: A

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72. $[A](M)$ $[B](M)$ Initial rate $\left(Ms^{-1}\right)$

0.4 0.3 2×10^{-3}

$0.8 \quad 0.3 \quad 0.8 \times 10^{-2}$

$1.2 \quad 0.9 \quad 0.54 \times 10^{-1}$

From the above dat athe rate law for the equation $A + B \rightarrow$ products is equal to

A. $K[A][B]$

B. $K[A]^2[B]^2$

C. $K[A]^2[B]$

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

Answer: C

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73. In the initial cocnentration is reduced to 1/4th of the initial value of a zero order reaction the half life of the reaction

A. remain constant

B. Becomes $1/4$ th

C. becomes double

D. Becomes fourfold

Answer: B

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74. If $\frac{dx}{dt} = k\left[H_3O^+\right]^n$ and rate becomes 100 times when pH changes form 2 to 1. Hence order of reaction is

A. 1

B. 2

C. 3

D. 0

Answer: B

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75. The initial concentration of cane sugar is presence of an acid was reduced from 0.20 to 0.10 M in 5 hours and to 0.05 M in 10 hours, value of K ? (in hr^{-1})

A. 0.693

B. 1.386

C. 0.1386

D. 3.465

Answer: C

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76. 50% completion of a first order reaction takes place in 16 minutes. Then fraction that would react in 32 minutes from the beginning

A. $1/2$

B. $1/4$

C. $1/8$

D. $3/4$

Answer: D

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77. For the process $X(g) \rightarrow$ products, (order $\neq$ 0), rates of disappearances of X at t = 0,t = 50sec & t = 30 sec respectively are p, q&r mol/lit/sec then

A. $p < q < r$

B. $r < p < q$

C. $q > r > p$

D. $p > r > q$

Answer: D

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78. The temperature coefficient of a reaction is 2.5 . If its rate constant at $T_1 K$ is $2.5 \times 10^{-3} s^{-1}$, the rate constant at $T_2 K$ in s^{-1} is $\left(T_2 > T_1\right)$

A. 1.0×10^{-3}

B. 6.25×10^{-3}

C. 1.0×10^{-2}

D. 6.25×10^{-2}

Answer: B

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79. $A \rightarrow B, K_1 = 0.693 \mathrm{sec}^{-1} C \rightarrow D, K_2 = 0.693 \mathrm{min}^{-1}$ If t_1 and t_2 are half lives of two reactions, then

A. $t_1 = t_2$

B. $t_1 = 60 t_2$

C. $t_2 = 60t_1$

D. $t_2 = 2.303t_1$

Answer: C

Watch Video Solution

80. For $2NH_3(g) \xrightarrow[\Delta]{Pt}$ products follows zero order kinetics. If $t_{1/2}$ at p = 4 atm is 25 sec, $t_{1/2}$ at p = 16 atm will be (in sec)

A. 6.25

B. 625

C. 100

D. $(25)^{\frac{1}{4}}$

Answer: C

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81. The time needed for the completion of 2/3 of a 1st order reaction, when rate constant is $4.771 \times 10^{-2} \text{min}^{-1}$ is

A. 23.03 min

B. 2.303 min

C. 6.93 min

D. 69.3 min

Answer: A

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82. The rate constant of a first order reaction of 0.0693min^{-1}. What is the time (in min) required for reducing an initial concentration of 20 mole lit^{-1} to 2.5 mole lit^{-1}?

A. 40

B. 10

C. 20

D. 30

Answer: D

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83. Thermal decomposition of HI(g) on Gold surface follows Zero order kinetics. With initial pressure 1000 mm. If the pressure after 20 sec is 960 mm w.r.t HI(g) rate constant is

A. 40

B. 20

C. 2

D. $\sqrt{28}$

Answer: C

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84. $A \rightarrow B$ and $C \rightarrow D$ are first order reactions. Ratio of $t_{99.9\%}$ values is 4:1, then, ratio of rate constants K_1 to K_2 is

A. $4:1$

B. $2:1$

C. $1:1$

D. $1:4$

Answer: D

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85. For a first order reaction temperature coefficient is 2. If the value of K at 310K is $2 \times 10^{-2} \text{ min }''^{-1}$, $t_{1/2}$ of reaction at 300K will be (in min)

A. 69.3 min

B. 23.03 min

C. 46.06 min

D. 69.1 min

Answer: A

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86. Sucrose decompose in acid solution into glucose and fructose according to the first order rate law, with $t_{\frac{1}{2}} = 3.00$ hours. What fraction of sample of sucrose remains after 8 hours ?

A. 1.158 M

B. 0.518 M

C. 0.158 M

D. 3.182 M

Answer: C

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87. For an elementary reaction $2A + B \rightarrow C + D$ the active mass of B is kept constant but that 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. decrease by 6 times

Answer: B

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88. The half-life period of a 1^{st} order reaction is 60 minutes. What percentage will be left over after 240 minutes ?

A. $6.25\ \%$

B. $4.25\ \%$

C. 5 %

D. 6 %

Answer: A

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89. A particular reaction has a rate constant of $1.3 \times 10^{-2} s^{-1}$. Find out the ratio of $\dfrac{t_{1/2}}{t_{99.9}}$

A. 10

B. 1/10

C. 100

D. 1

Answer: B

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90. For a general gaseous reaction of the type $R \rightarrow P$, if the initial concentration of R is doubled, half life of the reaction is also doubled, the order of that reaction is

A. 0

B. 1

C. 2

D. 3

Answer: A

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91. If the half life of a first order reaction is 60 min, the approximate time in min, required to complete 90% of the reaction is $(\log 2 = 0.3)$

A. 200

B. 240

C. 50

D. 100

Answer: A

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92. Which of the following statement is incorrect ?

A. The rate law for any reaction cannot be determined experimentally

B. Complex reactions have fractional order

C. Bimolecular reactions involve simultaneous collision between two species

D. Molecularity is only applicable for elementary reaction.

Answer: A

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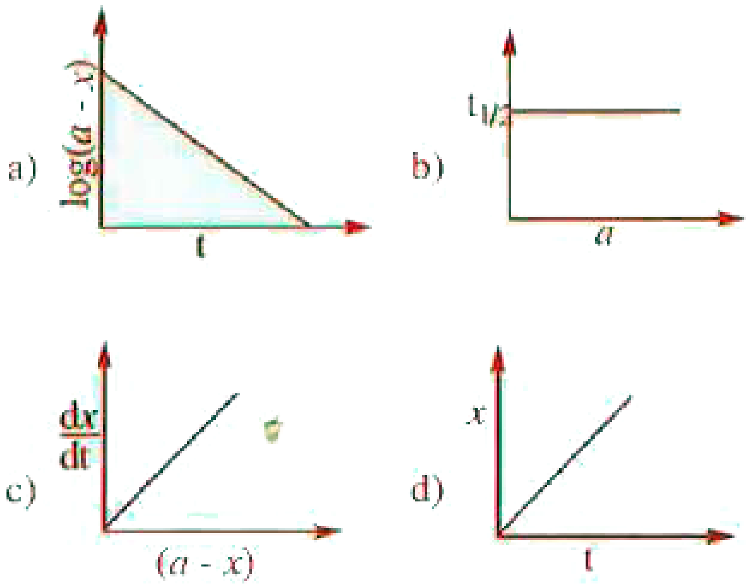
93. Which of the following graphs represent a first order reaction (a=initial concentration of reactant, x=concentration of reactant consumed, t=time)



A. a,b,d

B. c,d

C. b,c

D. a,b

Answer: C

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Objective Exercise - 3 (Previous NEET/AIPMT Questions)

1. For a first order reaction $A \rightarrow B$ the reaction rate at reactant concetration of 0.01 M is found to be 2.0×10^{-5}mol $L^{-1}s^{-1}$. The half life period of the reactionis

A. 220 s

B. 30 s

C. 300 s

D. 3468 s

Answer: D

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

A. -1

B. -2

C. 1

D. 2

Answer: B

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3. Which of the following does not express the reaction rate ?

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

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

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

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

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

Answer: C

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4. In the equation $N_2 + 3H_2 \Leftrightarrow 2NH_3$ the equality realationship between $\frac{d\left[NH_3\right]}{dt}$ and - $\frac{d\left[H_2\right]}{dt}$ is

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

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

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

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

Answer: D

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5. The reaction obey 1 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 consistent with the given fact ?

Mechanism A : $H_{2(g)} + 2ICl \rightarrow 2HCl_{(g)} + I_{2(g)}$

Mechanism B : (i) $H_{2(g)} + ICl_{(g)} \xrightarrow{\text{slow}} HCl_{(g)} + HI_{(g)}$

(ii) $HI_{(g)} + ICl_{(g)} \rightarrow HCl_{(g)} + I_2$

A. A and B both

B. Neither A nor B

C. A only

D. B only

Answer: D

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

A. $\frac{\text{In}2}{K}$

B. $\frac{\text{In}2}{K\sqrt{0.5}}$

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

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

Answer: A

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7. If 60% of a first order reaction was completed in 60 min, 50% of the same reaction would be completed in approximately

A. 45 min

B. 60 min

C. 40 min

D. 50 min

Answer: A

Watch Video Solution

8. The rate constant K_1 and K_2 for two different reactions are are $10^{16}e^{-2000/T}$ and $10^{15}e^{-1000/T}$, respectively. The temperature at which $K_1 = K_2$ is

A. $1000K$

B. $2000K$

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

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

Answer: C

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

$CH_3COCH_3Br(aq) + Br_2(aq) \rightarrow$

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

These kinetic data were obtained for given reaction concentrations.

Initial concentrations, M

$[CH_3COCH_3]$	$[Br_2]$	$[H^+]$	Initial rate, disappearance of Br_2
0.30	0.05	0.05	5.7×10^{-5}
0.30	0.10	0.05	5.7×10^{-5}
0.30	0.10	0.10	1.2×10^{-4}
0.40	0.05	0.20	3.1×10^{-4}

Based on these data, the rate equation is

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

B. rate $= k[CH_3COCH_3][Br_2][H^-]^2$

C. rate $= k[CH_3COCH_3][Br_2][H^-]$

D. rate $= k[CH_3COCH_3][H^+]$

Answer: D

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10. In the reaction $BrO_3.^-(aq) + 5Br^-(aq) + 6H^+ \rightarrow 3Br_2(l) + 3H_2O(l)$ The rate of appearance of bromine $\left(Br_2\right)$ is related to rate of disappearance of bromide ions as following

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

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

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

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

Answer: B

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

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

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

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

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

Answer: B

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12. For the reaction A+B products, it is observed that

(a) On doubling the initial concentration of A only, the rate of reaction is also doubled

(b) On doubling the initial concentration of both A and B, there is a change by a factor of 8 in the rate of the reaction.

The rate of this reaction is given by

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

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

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

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

Answer: C

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

A. $< \Delta H$

B. $= \Delta H$

C. $> \Delta H$

D. $= 0$

Answer: C

Watch Video Solution

15. For the reaction

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

the rate of disappearance of N_2O_5 is $6.25 \times 10^{-3} \text{mol} L^{-1} s^{-1}$. The rate of formation of NO_2 and O_2 will be respectively

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

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

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

$3.125 \times 10^{-3} \text{mol} L^{-1} s^{-1}$

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

`3.125xx10^(-3)"mol"L^(-1)s^(-1)

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

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

Answer: B

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16. The rate of reaction :

$2NO + Cl_2 \rightarrow 2NOCl$ is given by the rate equation $\text{rate} = k[NO]^2\left[Cl_2\right]$.

The value of the rate constant can be increased by

A. increasing the temperature

B. increasing the concentration of NO

C. increasing the concentration of the Cl_2

D. doing all of these

Answer: A

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

S.NO.	$[A]$	$[B]$in	Minitial 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 $= k[A]^2[B]$

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

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

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

Answer: D

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

A. Order of reaction is always whole number

B. Order can be determined only experimentally

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

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

Answer: A

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19. The rate of the reaction $2N_2O_5 \rightarrow 4NO_2 + O_2$ can be written in three ways

$$\frac{-d[N_2O_5]}{dt} = k[N_2O_5], \frac{d[N_2O_5]}{dt} = k'[N_2O_5]\frac{d[O_2]}{dt} = k''[N_2O_5]$$

The relationship between k and k' and between k and k'' are

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

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

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

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

Answer: B

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20. Activation energy $\left(E_a\right)$ and rate constants $\left(k_1 \text{and} k_2\right)$ of a chemical reaction at two different temperatures $\left(T_1 \text{and} T_2\right)$ are realted by

A. $1n\frac{k_2}{k_1} = -\frac{E_0}{R}\left(\frac{1}{T_1} - \frac{1}{T_2}\right)$

B. $1n\frac{k_2}{k_1} = -\frac{E_0}{R}\left(\frac{1}{T_2} - \frac{1}{T_1}\right)$

C. $1n\frac{k_2}{k_1} = -\frac{E_0}{R}\left(\frac{1}{T_2} + \frac{1}{T_1}\right)$

D. $-1n\frac{k_2}{k_1} = \frac{E_0}{R}\left(\frac{1}{T_1} - \frac{1}{T_2}\right)$

Answer: B

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

A. 64 times

B. 512 times

C. 256 times

D. 128 times

Answer: B

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

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

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

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

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

Answer: A

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23. What is the activation energy for a reaction if its rate oubles when the temperature is aised from $20\,^{\circ}C$ to $35\,^{\circ}C$? $\left(R = 8.314 J\text{mol}^{-1}K^{-1}\right)$

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

B. $34.7 kJ\text{mol}^{-1}$

C. $15.1 kJ\text{mol}^{-1}$

D. $342 kJ \text{mol}^{-1}$

Answer: B

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

A. $1nk \text{vs} \frac{1}{T}$

B. $\frac{T}{1nk} \text{vs} \frac{1}{T}$

C. $1nk \text{vs} T$

D. $\frac{1nk}{T} \text{vs} T$

Answer: A

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

A. second

B. more than zero but less than first

C. zero

D. first

Answer: D

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

A. $\Delta G = 0$

B. $\Delta H = 0$

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

D. $\Delta S = 0$

Answer: B

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

A. 0.36 M

B. 0.72 M

C. 1.08 M

D. 3.60 M

Answer: B

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28. The decomposition of phosphine (PH_3) on tungsten at low pressure is a first - order reaction. It is because the

A. Rate is proportional to the surface coverage

B. Rate is inversely proportional to the surface coverage

C. Rate is independent of the surface coverage

D. Rate of decomposition is very slow

Answer: A

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

A. 693.0sec

B. 238.6sec

C. 138.6sec

D. 346.5sec

Answer: A

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30. Mechanism of a hypothetical recation $X_2 + Y_2 \rightarrow 2XY$ is given below

(i) $X_2 \rightarrow X + X(\text{fast})$

(ii) $X + Y_2 \Leftrightarrow XY + Y(\text{Slow})$

(iii) $X + Y \rightarrow XY(\text{fast})$

The overall order of the reaction will be

A. 15

B. 1

C. 2

D. 0

Answer: A

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31. The connect difference between first and second-order reactions is that

A. a first - order reaction can be catalyzed, a second-order reaction cannot be catalyzed

B. the half-life of a first-order reaction does not depend on $[A]_0$, the half-life of a second-order reaction does depend on $[A]_0$

C. the rate of a first-order reaction does not depend on reactant concentrations, the rate of a second-order reaction does depend on reactant concentrations

D. the rate of a first-order reaction does depend on reactant concentrations, the rate of a second-order reaction does not depend on reactant concentrations

Answer: B

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

A. is tripled

B. is doubled

C. is halved

D. remains unchanged

Answer: B

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Objective Exercise - 4 (Assertion (A) & Reason (R) Type Questions)

1. (A) Spontaneous reaction may be slow or fast.

(R) Spontaneous nature deals with feasibility of the reaction but not rate.

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: A

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2. A: Rate of reaction increases with increasse in concentration of reactants.

R: Number of effective collisions increases with increase in concentration of reactants.

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: A

Watch Video Solution

3. A: Hydrolysis of an ester is a slow reaction

R: Reactions between covalent species involve breaking and making of bonds.

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: A

Watch Video Solution

4. (A) All collisions lead to chemical reaction

(R) All molecules bring about effective collisions

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: D

Watch Video Solution

5. A: Order of reaction is evaluated from the mechanism of a reaction

R: Order of reaction can be zero

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: D

Watch Video Solution

6. A: A catalyst increases the rate of a reaction.

R: In presence of a catalyst, the activation energy of the reaction increases.

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: C

Watch Video Solution

7. (A) The rate of the reaction is the rate of change of concentration of a reactant or a product.

(R) Rate of reaction remains constant during the complete reaction.

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: C

Watch Video Solution

8. (A) If in a zero order reaction, the concentration of the reactant is doubled, the half-life period is also doubled.

(R) For a zero order reaction, the rate of reaction is independent of initial concentration.

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: B

Watch Video Solution

9. (A) The addition of catalyst lowers the activation barrier, yet there is no change in the enthalpy of reaction.

(R) Enthalpy change is equal to the difference in the activation energy for the forward and the backward reactions.

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: B

Watch Video Solution

10. (A) In a multiple reaction, the rate determining step is the fast step.

(R) In multistep reaction order for each step can be defined.

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: D

Watch Video Solution

11. (A) Half-life period of a reaction of first order is independent of initial concentration.

(R) Half-life period for a first order reaction is equal to $\frac{2.303}{K}\log 2$

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: A

Watch Video Solution

12. (A) Order of recation is related to molecularity of reaction

(R) Molecularity of recation can be fractional.

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: D

Watch Video Solution

13. (A) The rate law equation can be found only by experiment.

(R) Rate equations can be written from stoichiometric equation.

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: C

Watch Video Solution

14. (A) Reactions of higher order are rare

(R) The chances of multimolecular collisions are extremely less.

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: A

Watch Video Solution

15. (A) Rate of reaction increases with increase in temperature.

(R) Number of collisions increases with increase in temperature.

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: B

Watch Video Solution

16. (A) The mass of the products formed in a reaction depends upon the limiting reactant.

(R) Limiting reactant reacts completely 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 and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: A

Watch Video Solution

17. (A) Order with respect to any reactant or product can be zero or positive but it is never negative.

(R) Rate does not decrease with increase in concentration of a reactant or product.

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: D

Watch Video Solution

18. (A) The rections $2NO + O_2 \rightarrow 2NO_2$ and $2CO + O_2 \rightarrow 2CO_2$, proceed at the same rate because they are similar.

(R) Both the oxidations of NO and CO have the same activation energy.

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: D

Watch Video Solution

19. (A) Hydrolysis of ethyl acetate in presence of acid is a reaction of first order whereas in presence of alkali, it is a reaction of second order.

(R) Acid only acts as a catalyst whereas alkali acts as one of the reactants.

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: A

Watch Video Solution

20. (A) The rate of reaction is always negative.

(R) Minus sign used in expressing the rate shows that concentration of product is decreasing

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: D

Watch Video Solution

21. (A) A pseudo first order recation occurs slowly.

(R) Reactions of higher order can follow kinetics of first order under special conditions.

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: D

Watch Video Solution

22. (A) Half-life period is always independent of initial concentration.

(R) Half-life period is inversely proportional to rate constant.

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: D

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23. (A) 25% of the first order reaction will be completed in 50% of the half - life period.

(R) Half-life of first order reaction depends on concentration of reactant

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: D

Watch Video Solution

24. (A) All instantaneous reactions are spontaneous

(R) Spontaneous recations get completed in a fraction of minute

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: C

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25. (A) All Ionic reactions are Instantaneous

(R) Ionic reactions do not involve bond rearrangements

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: A

Watch Video Solution

26. (A) Most of the molecular reactions occur with moderate rates

(R) Molecular reactions involve bond rearrange-ments

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: A

Watch Video Solution

27. (A) Units of rate of reaction are independent of order of the reaction

(R) Rate of reaction is the change in concentration of reactants in unit time

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: A

Watch Video Solution

28. (A) A first order reaction is always unimolecular

(R) A unimolecular reaction is always a first order reaction

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: D

Watch Video Solution

29. (A) Acidic hydrolysis of ethyl acetate with excess water is a first order reaction

(R) Concentration changes in water with time are negligibly small

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: A

Watch Video Solution

30. (A) Decomposition of Ammonia on platinum surface at high pressure is a zero order reaction

(R) At high pressure, metal surface gets saturated with gas molecules

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: A

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31. (A) Radioactive disintegration process can never go to completion

(R) Radio disintegration process follows first order kinetics

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: A

Watch Video Solution

32. (A) Alkaline hydrolysis of ethyl acetate follows first order kinetic

(R) Rate= K [ester] for saponification reactions

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: D

Watch Video Solution

33. (A) Rate of constant of a reaction increases with increase in temperature

(R) Increase in temperature increases in the number of activated molecules

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: A

Watch Video Solution

34. (A) Presence of catalyst increases the rate of reaction

(R) Presence of catalyst increases the enthalpy of reaction

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: D

Watch Video Solution

35. (A) The rate law of a reaction cannot be predicted from its balanced chemical equation, but must be determined experimentally only.

(R) The order of a reaction is always an integer like, $0, 1, 2$ and 3.

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: C

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36. (A) Half life period of first order reaction is independent of concentration of the reactant

(R) 99.9% reaction of first order reaction completes in 10 half lives (A.P Agri - 2017)

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: B

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37. A: Rate constant of a reaction at a particular temperature is constant

R: The value of rate constant K is indepdnent of initial concentration.

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: B

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38. A: Lesser the activation energy, greater is the rate of reaction

R: Activation energy of a reaction is independent of temperature

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: B

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39. (A) Molecularity has no meaning for a complex reaction.

(R) The overall molecularity of a complex reaction is equal to the molecularity of the slow step.

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: C

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40. (A) If the activation energy of a reaction is zero, temperature has no effect on the rate constant.

(R) Lower the activation energy, faster is the reaction.

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: B

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41. (A) The overall order of the reaction is the sum of the exponents of all the reactants in the rate expression.

(R) There are many higher order reactions

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: C

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42. (A) Rate of reaction can also increase with the formation of product, if one of the products acts as a catalyst.

(R) A catalyst lowers the activation 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 and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: B

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43. (A) Order and molecularity are always equal

(R) Complex reactions take place in steps and the fastest step determines rate of reaction.

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: D

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44. (A) The order of a reaction may be nagative.

(R) In some cases, the rate of reaction decreases as the concentration of the reactant increases.

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

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: A

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