CHEMISTRY

BOOKS - MHTCET PREVIOUS YEAR PAPERS AND PRACTICE PAPERS

CHEMICAL KINETICS

Example

1. A reaction is of second order with respect to a reactant . How is its effected if the concentration of the reactant is (i)doubled (ii) reduced to half ?

A. Becomes 2 times and $\frac{1}{2}$ times respectively

B. Becomes $\frac{1}{2}$timses and $\frac{1}{2}$ times respectively

C. Becomes 2 times and 4 times, respectively

D. Becomes 4 time and 2 times, respectively

Answer:

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

A. 3.35×10^{-4} and 1.25×10^{-4}, respectively

B. 1.25×10^{-4} and 3.75×10^{-4}, respectively

C. 3.75×10^{-3} and 2.45×10^{-3}, respectively

D. 1.25×10^{-3} and 3.25×10^{-3}, respectively

Answer:

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3. The initial concentration of N_2O_5 in the following first order reaction:

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

was $1.24 \times 10^{-2} molL^{-1}$ at $318K$. The concentration of N_2O_5 after $60\ \min$ was $0.20 \times 10^{-2} molL^{-1}$. Calculate the rate constant of the reaction at $318K$.

A. $0.0304 \quad \min^{-1}$

B. $0.0204 \quad \min^{-1}$

C. $0.0034 \quad \min^{-1}$

D. $1.0304 \quad \min^{-1}$

Answer:

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4. The following data were obtained during the first thermal decompoistion of $N_2O_5(g)$ at constant volume.

$2N_2O_5(g) \rightarrow 2N_2O_4(g) + O_2(g)$

S.No.	Time (s)	Total pressure (atm)
$i.$	0	0.5
$ii.$	100	0.512

Calculate the rate constant.

A. $3.39 \times 10^{-4} S^{-1}$

B. $1.39 \times 10^{-5} S^{-1}$

C. $5.45 \times 10^{-4} S^{-1}$

D. $4.91 \times 10^{-4} S^{-1}$

Answer:

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5. A first order reaction takes 40 min for $30\,\%$ decomposition. Calculate $t_{1/2}$. (Given $\log 7 = 0.845$)

A. 77.78 min

B. 78.34 min

C. 84.36 min

D. 65.34 min

Answer:

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Exercise 1

1. Rate of a reaction can be defined as

A. change in concentration of a reactant in unit time

B. change in concentration of a product in unit time

C. Both (a) and (b)

D. None of the above

Answer: C

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2. Identify the incorrect statements .

A. rusting of iron in the presence of the air and moisture, is a slow reaction

B. inversio of a cane sugar occurs at a moderate rate

C. hydrolysis of starch is a fast reaction

D. ionic reactions are the examples of fast reactions

Answer: C

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3. For a general reaction $R \rightarrow P$, then r_{inst} will be?

A. $\frac{d[R]}{dt} = \frac{d[P]}{dt}$

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

C. $-\frac{d[R]}{dt} = +\frac{d[P]}{dt}$

D. $\frac{d[R] + d[P]}{dt}$

Answer: C

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4. For a gaseous reaction at constant temperature

A. concentration $\propto \frac{1}{\text{partial pressure of species}}$

B. concentration $\propto$ partial pressure of species

C. concentration=partial pressure of species

D. None of the above

Answer: B

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5. Unit of rate of a reaction is

A. concentration $time^{-1}$

B. concentration^(-1) time

C. concentration time

D. concentration^(-1) tmie^(-1)

Answer: A

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6. In the reaction alternative.

$2Hl(g) \rightarrow H_2(g) + l_2(g)$ Choose the correct alternative.

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

B. Stoichiometric coefficients of HI (reactant) and H_2 and l_2 (products) are not same.

C. Rate of consumption of HI=2 (rate of formation of H_2Orl_2)

D. All of the above

Answer: D

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7. Rate of a reaction can be expressed by following rate expression, Rate $=K[A]^2[B]$, if conentration of A is incereased by 3 times and concentration of B is incereased by 2 times, how many times rate of reaction increses?

A. 9 times

B. 27 times

C. 18 times

D. 8 times

Answer: C

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8. A + 2B `rarr C, the rate equation for this reaction is given as

Rate = k[A] [B].

If the concentration of A is kept the same but that of B is doubled what will happen to the rate itelf?

A. Halved

B. Same

C. Deubled

D. Quadrupled

Answer: C

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9. The rate constant for the reaction

$2N_2O_5 \rightarrow 4NO_2 + O_2$, is $3.0 \times 10^{-5} S^{-1}$. If the rate is $2.40 \times 10^{-5} \text{mol} L^{-1} s^{-1}$ then the concentration of $N_2O_5 \left(\text{in mol} L^{-1}\right)$ is

A. 1.4

B. 1.2

C. 0.04

D. 0.8

Answer: D

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10. In a reaction, $2A \rightarrow \text{products}$, the concentration of A decreases from 0.5 mol $L^{-1} \rightarrow 0.4 mol L^{-1}$ in 10 min.

The rate during this interval is

A. $0.05 \text{mol} L^{-1} \text{min}^{-1}$

B. $0.42 \text{mol} \quad L^{-1} \text{min}^{-1}$

C. $0.005 \text{mol} \quad L^{-1} \text{min}^{-1}$

D. $0.5 \text{mol} \quad L^{-1} \text{min}^{-1}$

Answer: C

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11. The reaction, $2NO(g) + O_2(g) \Leftrightarrow 2NO_2(g)$, is of first order. If the volume of reaction vessel is reduced to $\frac{1}{3}$, the

rate of reaction would be

A. $\frac{1}{3}\text{times}$

B. $\frac{2}{3}\text{times}$

C. 3 times

D. 6 times

Answer: C

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12. On increasing the pressure three fold, the rate of reaction of $2H_2S + O_2 \rightarrow \text{products would incerease}$

A. 3 times

B. 39times

C. 12 times

D. 27 times

Answer: D

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13. Which of these does not influence the rate of reaction?

A. Nature of the reactants

B. Concentration of the reactants

C. Temperature of the reaction

D. Molecularity of the reaction

Answer: D

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

A. s^{-1}, Ms^{-1}

B. s^{-1},M

C. Ms^{-1}

D. M, s^{-1}

Answer: A

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15. With increase in temperature , rate of reaction

A. increases

B. decreases

C. remains same

D. may increase

Answer: A

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16. $2N_2O_5(g) \rightarrow 4NO_2 + O_2(g)$

What is the ratio of the rate of decomposition of N_2O_5 to rate of formation of NO_2

A. $1:2$

B. $2:1$

C. $1:4$

D. $4:1$

Answer: B

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17. Order of a chemical reaction is define as the

A. defference in powers of the concentration of the reactants in the rate law expression

B. sum of powers of the concentration of the reactants in the rate law expression

C. sum of powers of the concentration of the products in the rate law expression

D. defference in powers of the concentration of the products in the rate law expression

Answer: B

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

A. Order of reaction is always whole number

B. Order can be determined only expermentally

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

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

Answer: A

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19. The order of a reaction with rate equal to $KC_A^{3/2}C_B^{-1/2}$ is

A. 1

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

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

D. 2

Answer: A

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

A. 0

B. 2

C. 1

D. 3

Answer: A

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21. The relative order of rate of esterification of acids is

A. 0

B. first

C. second order

D. pseudo first order

Answer: C

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22. Decomposition of ammonium nitrite is an examle of

A. bimolecular reaction

B. unimolecular reaction

C. Both (a) and (b)

D. None of the above

Answer: B

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23. When one reactant is present in excess in a chemical reaction between two substances, then the reaction is known as

A. first order reaction

B. second order reaction

C. zero order reaction

D. pseudo first order reaction

Answer: D

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24. Foe the rate law, $=K[A]^{3/2}[B]^{-1}$ the overall order of a reaction is

A. zero

B. half

C. one

D. two

Answer: B

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25. For a zero order reaction a graph of conc. (along Y axis) and time (along X-axis) is linear with

A. a zero intercept and a+ ve slope

B. a zero intercept and a - ve slope

C. a non-zero intercept and a- ve slope

D. a non-zero intercept and a + ve slope

Answer: C

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

A. half-life

B. milecularity

C. Order

D. rate constant

Answer: B

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

A. (x+y)

B. (m+n)

C. (c+d)

D. $\frac{x}{y}$

Answer: C

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28. For which type of the reactions, order and molecularity have the same value ?

A. first order reaction

B. Bimolecular reaction

C. Termolecular reaction

D. Elementary reaction

Answer: D

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29. Zero order reaction means that

A. rate of reaction $\propto \frac{1}{\text{zero power of concentration of reactants}}$

B. rate of reaction $\propto$ zero power of concentration of reactants

C. rate of reaction = zero power of cencentration of products

D. None of the above

Answer: B

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30. Value of $t_{1/2}$ for first order reaction is

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

B. $\frac{0.2303}{K}$

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

D. $\frac{0.301}{k}$

Answer: A

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31. In a first ordr reaction, reactant concentration 'C' varies with time 't' as

A. C decreases with $\frac{1}{t}$

B. log C decreases with $\frac{1}{t}$

C. $\frac{1}{c}$ increases linearly with t

D. log C decreases lineary with t

Answer: D

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32. Which of the following statement (s) `is//are true?

A. For zero order reaction, $t_{1/2} \propto [R]_0$

B. For first order reaction, $t_{1/2}$ is independent of $[R]_0$

C. Both (a) and (b)

D. None of the above

Answer: C

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33. $\cdots A \cdots$ dependence of rate is caled defferential rate equation. Choose the suitable word to replace A.

A. Concentration

B. Volume

C. Order

D. Pressure

Answer: A

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34. Consider the following,

$C_2H_2(g) + H_2(g) \rightarrow C_2H_6(g)$.

(I) The above reaction is an example of first order kinetics.

(II) Rate of the reaction will be given as $Rate = k[C_2H_4]$.

Which of the above stetement(s) is/are correct? Choose the correct option.

A. Only I

B. Only II

C. Both (a) and (b)

D. None of the above

Answer: C

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35. A first order reaction is found to have a rate constant, $k = 4.2 \times 10^{-12} s^{-1}$. Find the half-life of the reaction.

A. $1.26 \times 10^{13} s$

B. $1.65 \times 10^{11} s$

C. $1.65 \times 10^{11} s$

D. $1.26 \times 10^{13} s$

Answer: B

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36. The rate of the backward reaction in a reversible reaction

A. positive

B. negative

C. Either (a) or (b)

D. None of the above

Answer: A

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37. Expression for the half-life of zero order reaction is given as

A. $t_{1/2} = \frac{2[R]_0}{K}$

B. $t_{1/2} = \frac{[R]_0}{2K}$

C. $t_{1/2} = \frac{0.693}{K}$

D. $t_{1/2} = \frac{0.301}{K}$

Answer: B

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38. The rate constant of a zero order reaction is $0.2 mol L^{-3} h^{-1}$. If the concentration of the reactant after

30 min is 0.05 mol dm^{-3}, then its initial concentration would be

A. 0.01mol dm^{-3}

B. 0.15mol dm^{-3}

C. 0.25mol dm^{-3}

D. 4.00mol dm^{-3}

Answer: B

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39. The rate constant for the first order reaction is $60s^{-1}$. How much time will it take to reduce the concentration of the reactant to $1/16th$ value ?

A. 0.046 s

B. 0.025 s

C. 0.098 s

D. 0.060 s

Answer: A

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40. Inversion of cane sugar is a $\cdots A \cdots$ order reaction

$$\underset{\text{Cane sugar}}{C_{12}H_{22}O_{11}} + H_2O \xrightarrow{H^+} \underset{B}{C_6H_{12}O_6} + \underset{\text{Fructose}}{C}$$

Rate =D

Here A,B,C and D respectively are

A. $A = \text{first}$,B=fructose, $C = C_6H_{12}O_6$, $D = K[H_2O]$

B.

$A = \text{second}, \text{B=fructose}, C = C_7H_{14}O_7, D = K[H_2O]$

C. $A = \text{pseudo first}, \text{B=glucose}, C = C_6H_{12}O_6,$

$D = K[C_{12}H_{22}O_{11}]$

D. $A = \text{pseudo first}, \text{B=fructose}, C = C_6H_{12}O_6,$

$D = K[C_{12}H_{22}O_{11}][H_2O]$

Answer: C

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41. The rate constant 'K' for pseudo first order reaction is

A. $\frac{2.303}{t}\log C_0 - C$

B. $\frac{2.303}{t}\log\frac{C}{C_0}$

C. $\frac{2.303}{t}\log C_0 + C$

D. $\frac{2.303}{t}\log\frac{C_0}{C}$

Answer: D

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42. Half-life period of a first order reaction is 10 min. Starting with initial concentration 12 M, the rate after 20 min is

A. 0.693M min^{-1}

B. $0.693 \times 3\text{M min}^{-1}$

C. $0.0693 \times 3\text{M min}^{-1}$

D. $0.0693 \times 4\mathrm{M\ min}^{-1}$

Answer: C

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

A. 0.383 min

B. 23.1 min

C. 8.73 min

D. 7.53 min

Answer: B

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

A. $(14)^3 s$

B. 28s

C. 42

D. $(14)^2 s$

Answer: C

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45. The half life period of a substance is 50 minutes at a certain initial concentration. When the concentration is reduced to one half of the initial value, the half-life period is 25 minutes. Calculate the order of the reaction.

A. 0

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

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

D. 2

Answer: C

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46. How much time is requred for two - third completion of a first order reaction having, $K = 5.48 \times 10^{-14} S^{-1}$?

A. $2.01 \times 10^{11} s$

B. $2.01 \times 10^{13} s$

C. $8.08 \times 10^{13} s$

D. $16.04 \times 10^{11} s$

Answer: B

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47. $t_{1/4}$ can be taken as the time taken for concentration of reactant to drop to $.^{3}/_{4}$ of its initial value. If the rate

constant for a first order reaction is K, then $t_{1/4}$ can be written as:

A. $0.75/k$

B. $0.69/k$

C. $029/k$

D. $0.10/k$

Answer: C

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48. For a reaction, the rate constant is $2.34s^{-1}$. The half-life period for the reaction is

A. 0.30s

B. 0.60s

C. 3.3s

D. data is insufficient

Answer: A

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49. 75% of a first order reaction was completed in 32 min. When was 50% of the reaction completed ?

A. 16 min

B. 8 min

C. 4 min

D. 32 min

Answer: A

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50. Rate constant for a reaction is $10^{-3}S^{-1}$. How much time is required to reduce the initial concentration of reactant to 25%

A. 693 s

B. 1386 s

C. 6930 s

D. 2029 s

Answer: B

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51. A first order reaction is 10% complete in 20 min. the time taken for 19% completion is :

A. 30 min

B. 40 min

C. 50 min

D. 38 min

Answer: B

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52. For a zero order reaction, the integrated rate equation is

A. $kt = \frac{[A]}{[A]_0}$

B. $kt = [A] - [A]$

C. $[A] = -kt + [A]_0$

D. $[A] = kt - [A]_0$

Answer: C

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53. If the half-time for a particular reaction is found to be constant and independent of the initial concentration of the reactants, then the reaction is of

A. first order

B. zero order

C. second order

D. None of the above

Answer: A

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54. The integrated rate equation is kt=$\log C_0 - \log C_t$.

The straight line graph is obtained by plotting

A. $\log C_t$ vs time

B. $\frac{1}{(\text{time})} \text{vs} C_t$

C. time vs C_t

D. $\frac{1}{(\text{time})} \text{vs} \frac{1}{C_t}$

Answer: A

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55. On the basis of Arrhenius equation, consider the following statement (s)

I. E_a is activation energy.

II. Unit of $E_a is j mol^{-1}$

III. R is gas constant.

Which of these is/are true statement(s)?

A. I and II

B. II and III

C. I and III

D. I,II and III

Answer: D

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56. What will happen, on increasing the temperature or decreasing the activation energy (answer on the basis of Arrhenius equation)?

A. Rate of reaction will increase

B. An exponential increase in rate constant

C. Both (a) and (b)

D. None of the above

Answer: C

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57. The potential energy diagrams for four reaction are given below

Which one of the following statement about these diagrams is incorrect?

A. I has the largest rate constant for an exothermic reaction

B. II has the smallest rate constant for the reverse reaction

C. III will have the most rapid establishment of equilibrium

D. IV has the largest rate constant for an endothermic reaction

Answer: D

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58. Rate constant k of a reaction is dependent on temperatur:

$k = Ae^{Ea/RT}$

K has the least value at

A. high T and high E_a

B. high T and small E_a

C. low T and low E_a

D. low T and high E_a

Answer: D

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59. In the graph of Arrhenius equation , the intercept and slope are

A. $-\frac{E_a}{R}$ = intercept, In A =slope

B. $-\frac{E_a}{R}$ = slope, In A =intercept

C. $\frac{E_a}{R}$ = slope, -In A =intercept

D. $\frac{E_a}{R}$ = slope, In A =intercept

Answer: B

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

A. log K vs $1/T$ will be a curvad line with solpe $= -\frac{2700}{2.303R}$

B. log k vs $1/T$ will be a straight line with intercept on log K axis -log2.1×10^{10}

C. the number of effective collisions are $2.1 \times 1 - 0^{10} \mathrm{cm}^{-3} s^{-1}$

D. half-life of the reaction increases with encrease of temperature

Answer: B

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

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

In this equation, E_a represents:

A. the energy above which all the colloding molecules

B. the energy below which colloiding molecules will not react

C. the total energy of the reaction molecules at a temperature, T

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

Answer: A

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62. The decomposition of hydrocarbon follows the equation

$k = \left(4.5 \times 10^{11} s^{-1}\right) e^{-28000K/T}$

Calculate E_a.

A. $232.79 \quad \text{kJ mol}^{-1}$

B. $425.25 \quad \text{kJ mol}^{-1}$

C. $300 \quad \mathrm{kJ\ mol^{-1}}$

D. $885.2 \quad \mathrm{kJ\ mol^{-1}}$

Answer: A

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

A. 0.01

B. 0.1

C. 0.02

D. 0.001

Answer: B

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Exercise 2

1. The activation energy for the reaction : ltbr. $2Hl(g) \rightarrow H_2(g) + I_2(g)$ is $209.5kJmol^{-1}$ at $581K$. Calculate the fraction of molecules of reactants having energy equal to or greater than activation energy ?

A. 1.82×10^{-18}

B. 1.47×10^{19}

C. 2.67×10^{16}

D. 3.89×10^{19}

Answer: B

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2. The chemical reaction $2O_3 \rightarrow 3O_2$ proceeds as follows :

$O_3 \rightarrow O_2O$ (fast)

$O + O_3 \rightarrow 2O_2$ (slow)

The rate law expression should be :

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

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

C. $r = k'[O_3][O_2]^{-1}$

D. Unpredictable

Answer: B

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3. The rate constant of a reaction increases by 5% when its temperature is raised from $27^{\circ}c$ to $28^{\circ}c$. The activation energy of the reaction is

A. $36.6kJ/mol$

B. $16.6kJ/mol$

C. $46.6kJ/mol$

D. $26.6kJ/mol$

Answer: A

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4. The time required for 10% completion of a first order reaction at 298 K is equal to that required for its 25% completion at 308 k. If the value of A is $4 \times 10^{10} s^{-1}$.

Calculate the rate constant, k at 318 k.

$2.89 \times 10^{-2} s^{-1}$

$3.26 \times 10^{-2} s^{-1}$

$1.03 \times 10^{-2} s^{-1}$

$0.03 \times 10^{-2} s^{-1}$

A. the energy below which colloiding molecules will not react

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

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

D. $0.03 \times 10^{-2} S^{-1}$

Answer: C

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5. The following data were obtained during the first order thermal decomposition of SO_2CI_2 at a constant volume.

$SO_2CI_2(g) \rightarrow SO_2(g) + CI_2(g)$

A. $2.84 \times 10^{-7} atm \ \ s^{-1}$

B. $7.80 \times 10^{-4} atm \ \ s^{-1}$

C. $4.42 \times 10^{-7} atm \ \ s^{-1}$

D. $5.62 \times 10^{-4} atm \ \ s^{-1}$

Answer: B

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

A. zero

B. first

C. second

D. more than zero but less than first

Answer: B

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7. For the decomposition of azoisopropane to hexane and nitrogen at 543 K, the following data are obtained.

A. $2.21 \times 10^{-3} s^{-1}$

B. $3.48 \times 10^{-3} s^{-1}$

C. $1.26 \times 10^{-3} s^{-1}$

D. $8.46 \times 10^{-3} s^{-1}$

Answer: A

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8. 1 g of ${}_{79}AU^{198\,(t_{1/2}=65h)}$ gives stable mercury by $\beta - emission.$ What amount of mercury will left after 260 h?

A. 0.9374 g

B. 0.3758 g

C. 0.7586 g

D. 0.9000 g

Answer: A

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9. An endothermic reaction, $A \rightarrow B$ have an activation energy $15kcal/mol$ and the heat of the reaction is $5kcal/mol$. The activation energy of the reaction, $B \rightarrow A$ is:

A. $20kcal/mol$

B. $15kcal/mol$

C. $10kcal/mol$

D. zero

Answer: C

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10. The rate of a reaction quadruples when the temperature changes from $293K$ to $313K$. Calculate the energy of activation of the reaction assuming that it does not change with temperature.

A. $48.625kJ \ \ \text{mol}^{-1}$

B. $654.35kJ \ \ \text{mol}^{-1}$

C. $354.20kJ \ \ \text{mol}^{-1}$

D. $52.854kJ \ \ \text{mol}^{-1}$

Answer: D

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11. The rate law for the reaction

$RCl + NaOH(aq) \rightarrow ROH + NaCl$ is given by

Rate $= k[RCl]$. The rate of the reaction will be

A. is doubled by doubling the concentration of NaOH

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

C. is increased by increasing the temperature of the reaction

D. is unaffected by change in temperature

Answer: B

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12. The decomposition of A into product has value of k as $4.5 \times 10^3 s^{-1}$ at $10^\circ C$ and energy of activation of $60 kJ mol^{-1}$. At what temperature would k be $1.5 \times 10^4 s^{-1}$?

A. 273.15 k

B. $24.01^\circ C$

C. 280.39 K

D. $45.29^\circ C$

Answer: B

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

A. $E_a > E_a$

B. $E_a' = 4E$

C. $E_1 = E_a$

D. $E_a < E_a$

Answer: D

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14. The rate constant of the chemical reaction doubled for an increase of 10 k in absolute temperature from 295 k. Calculate the (activation energy),E_a.

A. $51.8kJ \ \ \text{mol}^{-1}$

B. $82.1kJ \ \ \text{mol}^{-1}$

C. $23.8kJ \ \ \text{mol}^{-1}$

D. $62.1kJ \ \ \text{mol}^{-1}$

Answer: A

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15. Powdered magnesium element catches fire more repidly than magnesium wire of the same mass because

A. Surface area of magnesium wire is larger than their powdered form

B. density of magnesium wire is greater than that of their powdered form

C. powdered magnesium have larger surface area

D. None of above

Answer: C

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16. Compounds A and B react according to the following chemical equation,

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

Concentration of either A or B were changed keeping the concentrations of one of the reactants as constant and rates were measured as a function of initial concentration. ltbgt Following results were obtained . Choose the correct option for the rate equations for this reaction.

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

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

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

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

Answer: B

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17. For the reaction $2H_2 + O_2 \rightarrow 2H_2O$, the rate law expression is , $r = k[H_2]^n$. When the concentration of H_2 is doubled, the rate of reaction found to be quadrupled. The value of n is

A. 0

B. 1

C. 2

D. 3

Answer: C

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18. consider the following reaction,

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

The rate of change of concentration for nitrogen is $-0.3 \times 10^{-4} Ms^{-1}$. The rate of change of concentration of ammonia is

A. $0.2 \times 10^{-4} Ms^{-1}$

B. $0.4 \times 10^{-4} Ms^{-1}$

C. $0.6 \times 10^{-4} Ms^{-1}$

D. $-0.6 \times 10^{-4} Ms^{-1}$

Answer: C

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19. For a reaction $R \rightarrow P$, the concentration of a reactant changes from 0.03 M to 0.02M in 25 minutes. Calculate the average rate of the reaction using the units of seconds.

A. 6.66×10^{-5}

B. 6.6×10^{-6}

C. 5.67×10^{-5}

D. 7.26×10^{-6}

Answer: B

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20. Consider the following reaction,

$2P_2O_5 \rightarrow 4PO_2(g) + O_2(g)$

If the concentration of PO_(2) increases by $5.2 \times 10^{-3} M$ in 100 s, the rate of a reaction is

A. $0.5 \times 10^{-4} Ms^{-1}$

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

C. $1.3 \times 10^{-5} Ms^{-1}$

D. $2 \times 10^{3} Ms^{-1}$

Answer: C

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21. For the reaction, $A + B \rightarrow \text{product}$

If concentration of A is doubled, rate increases 4 times. If concentrations of A and B both are doubled, rate increases

8 times . The differential rate equation of the reaction will be

A. $\frac{dc}{dt} - kC_A \times C_B$

B. $\frac{dC}{dt} = \mathrm{k}\ \ C_A^2 \times C_B^3$

C. $\frac{dC}{dt} = kC_A^2 \times C_B$

D. $\frac{dC}{dt} = kC_A^2 \times C_B^2$

Answer: C

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22. The rate constant for the first order decomposition of ethylene oxide into CH_4 and CO,

- $2,39 \times 10^5 kJ\mathrm{mol}^{-1}$

- $2.39 \times 10^3 kJ\text{mol}^{-1}$
- $4.78 \times 10^5 kJ\text{mol}^{-1}$
- $4.78 \times 10^2 kJ\text{mol}^{-1}$

Answer: B

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23.

On the basis of the curve shown above, identify the correct statement(s).

A. Catalyst provides an alternate pathway or reaction mechanism

B. It increases the activation energy between reactants and products

C. It lowers the potential energy barrier

D. Catalyst reduces the activation energy between reactants and products

Answer: D

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24. Consider the following reaction,

$N_2(g) + 3H_2(g) \Leftrightarrow 2NH_3(g) + 22kcal \quad \text{mol}^{-1}$

The activation energy for the forward reaction is 50 kcal. What is the activation energy for the backward reaction?

A. $-28kcal \quad \text{mol}^{-1}$

B. $+28kcal\text{mol}^{-1}$

C. $-72kcal\text{mol}^{-1}$

D. $+72kcal \quad \text{mol}^{-1}$

Answer: D

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25. Consider the following reaction,

$2A + B + C \rightarrow$ Products

How will the rate of reaction changes when the concentration of A is doubled and that of B is triplet while C is taken in excess ?

A. The rate reduces 8 times of its original value

B. The rate reduces 12 times of its original value

C. The rate increases 8 times of its original value

D. The rate increases 12 times of its original value

Answer: D

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26. Which of the following expression is correct for the rate of reaction given below ?

$5Br^-(aq) + BrO_3^-(aq) + 6H^+(aq) \rightarrow 3Br_2(aq) + 3H_2O(l)$

.

A. $\frac{\Delta[Br^-]}{\Delta t} = 6\frac{\Delta[H^+]}{\Delta t}$

B. $\frac{\Delta[Br^-]}{\Delta t} = \frac{6}{5}\frac{\Delta[H^+]}{\Delta t}$

C. $\frac{\Delta[Br^-]}{\Delta t} = 5\frac{\Delta[H^+]}{\Delta t}$

D. $\frac{\Delta[Br]}{\Delta t} = \frac{5}{6}\frac{\Delta[H^+]}{\Delta t}$

Answer: D

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

A. 0.5 h

B. 0.25 h

C. 1 h

D. 2 h

Answer: C

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28. The rate of formation of SO_3 in the following reaction is

$100g \ \ \min^{-1}.2SO_2 + O_2 \rightarrow 2SO_3$

The rate of disappearance of O_2 is

A. 29 g $\min^{-1}$

B. 20 g $\min^{-1}$

C. 200 g $\min^{-1}$

D. 50 g $\min^{-1}$

Answer: B

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29. Consider the following reaction,

$2N_2O_5 \rightarrow 4NO_2 + O_2$, $\frac{d[NO_2]}{dt} = k_2[N_2O_5]$,

$\frac{d[O_2]}{dt} = k_3[N_2O_5]$ and $\frac{d}{dt}[N_2O_5] = k_1$

The relation between k_1, k_2 and k_3 is

A. $k_1 = k_2 = k_3$

B. $2k_1 = k_2 = 4k_3$

C. $2k_1 = 4k_2 = k_3$

D. None of these

Answer: B

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30. For a hypothetical reaction, $A \rightarrow P$

the rate constant is 0.12 s^{-1}. which of the following relation is correct, if $[R]_0$ is the initial concentration?

A. $t_{1/2} = \dfrac{[R]_0}{0.12 \times 12}$

B. $t_{1/2} = \dfrac{3}{2(0.12)[R]_0^2}$

C. $t_{1/2} = \dfrac{0.693}{0.12}$

D. $t_{1/2} = \dfrac{0.693}{0.12 \times 3}$

Answer: C

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31. The initial concentration of N_2O_5 in the following first order reaction:

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

was $1.24 \times 10^{-2} molL^{-1}$ at $318K$. The concentration of N_2O_5 after 60 min was $0.20 \times 10^{-2} molL^{-1}$. Calculate the rate constant of the reaction at $318K$.

A. $0.0104 \ \text{min}^{-1}$

B. $0.0204 \ \text{min}^{-1}$

C. $0.0304 \ \text{min}^{-1}$

D. $0.0404 \ \text{min}^{-1}$

Answer: C

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32. A following mechanism has been proposed for a reaction

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

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

$A + C \rightarrow E$ (fast)

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

A. $r = k[P][Q]$

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

C. $r = k[P][T]$

D. $r = k[P]^2[Q]$

Answer: A

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33. The half-time of the following first order decomposition of nitramide is 2.1 h at $15^{\circ}C$:

$NH_2NO_2(aq) \rightarrow N_2O(g) + H_2O(l)$

If 6.2 g of nitramide is allowed to decompose then time taken for it to decompose 99%, will be

A. 2.1 h

B. 12 h

C. 13.96 h

D. 33 h

Answer: C

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

A. 3

B. 2

C. 1

D. 0

Answer: A

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35. Find out two-third $(2/3)$ life of a first order reaction in which $k = 5.48 \times 10^{-14} s^{-1}$

A. $2.01 \times 10^{11} s$

B. $2.01 \times 10^{13} s$

C. $8.08 \times 10^{13} s$

D. $16.04 \times 10^{11} s$

Answer: B

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36. Rate constant $k = 1.2 \times 10^{3} mol^{-1} L s^{-1}$ and $E_a = 2.0 \times 10^{2} kJ mol^{-1}$. When $T \to \infty$:

A. $A = 2.0 \times 10^2 kJ \text{mol}^{-1}$

B. $A = 1.2 \times 10^3 \ \text{mol} \ L^{-1} S^{-1}$

C. $A = 1.2 \times 10^3 \ \text{mol}^{-1} L S^{-1}$

D. $A = 2.4 \times 10^3 kJ \ \text{mol}^{-1} S^{-1}$

Answer: C

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37. A given sample of milk turns sour at room temperature $(27^\circ C)$ in five hours. In a refrigerator at $-3^\circ C$, it can be stored 10 times longer. The energy of acrivation for the souring of milk is

A. $2.303 \times 5RkJ \ \text{mol}^{-1}$

B. $2.303 \times 3RkJ \ \ \text{mol}^{-1}$

C. $2.303 \times 2.7RkJ \ \ \text{mol}^{-1}$

D. $2.303 \times 10RkJ \ \ \text{mol}^{-1}$

Answer: C

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

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

B. (m+n)

C. (n-m)

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

Answer: D

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

A. ak

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

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

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

Answer: C

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40. For a reaction $2A \rightarrow 3B,$ if the rate of formation of B is $x \text{mol} / L,$ the rate of consumption of A is

A. x

B. $\frac{3x}{2}$

C. 3x

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

Answer: D

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41. .....A..... Is the expression in which reaction rate is given in term of molar concentration of reactants with each term raised to some power, which may or may not be same as the stoichiometric coefficient of the reacting species in a balanced chemical equation. Here, A is

A. Rate law

B. Rate equation

C. Differential rate equation

D. None of these

Answer: A

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42. In the graph,

slope will be

A. $r_{\text{inst}} = \dfrac{d[R]}{dt}$

B. $r(\text{inst}) = \dfrac{d[R]}{d[P]}$

C. $r_{\text{inst}} = \dfrac{d[P]}{dt}$

D. $r_{\text{inst}} = \dfrac{-d[P]}{dt}$

Answer: C

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43. Consider some facts about decomposition of H_2O_2.

It is catalysed by iodide ion in acidic medium.

It is second order reaction with respect to both H_2O_2. and I^{-1}.

Rate equation of this particular reaction will be

$$Rate = \frac{-d[H_2O_2]^2}{dt} = k[H_2O_2]^2[I^-]$$

It completes in two steps and both steps are unimolecular elementary reactions.

Which of the above written facts are correct, regarding decomposition of H_2O_2? Choose the correct option.

A. I and II

B. II and III

C. III and IV

D. I and Iv

Answer: D

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44. If rate constant is numerically the same for three reaction of first, second and third order respectively, then which of the following is correct?

A. if $[A] > 1, r_3 > r_2 > r_1$

B. if $[A] = 1, r_1 = r_2 = r_3$

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

D. All of these

Answer: D

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45. For the reaction,

Half-life does not depend on the concentration of the reactant. After 10 min, volume of N_2 gas is 20L and afer the completion of reaction, it is 100 L Hence, rate constant is

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

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

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

D. $\frac{2.303}{10}\log\ 20\ \ \min^{-1}$

Answer: A

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46. The rate constant of a reaction is given as

$k = 2.1 \times 10^{10} e^{-2700/RT}$

It means that

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

Number of effective collisions of temperature are $2.1 \times 10^{10} cm^{-3} s^{-1}$.

Half-life of a reaction increases of temperature.

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

Which of the above statements are true? Choose the correct option.

A. I and II

B. II and III

C. III and IV

D. I and IV

Answer: d

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47. A graph of volume of hydrogen released vs time for the reaction between zinc and dil. HCI is given in figure. On the basis of this mark the correct option

A. Average rate upto 40 s is $\frac{V_3 - V_2}{40}$

B. Average rate upto 40 s is $\frac{V_3 - V_2}{40 - 30}$

C. Average rate upto 40 s is $\frac{V_3}{40}$

D. Average rate upto s is $\frac{V_3 - V_1}{40 - 20}$

Answer: C

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48. On mixing 1 dm^3 of 3M ethanol with 1 dm^3 of 2 M ethanoic acid, an ester is formed.

$C_2H_5OH + CH_3COOH \rightarrow CH_3COOC_2H_5 + H_2O$

If each solution is diluted with an equal volume of water , the decrease in the initial rate would be

A. 0.5 times

B. 4 times

C. 0.25 times

D. 2 times

Answer: C

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49. In a reversible reaction $2NO_2 \underset{k_2}{\overset{k_1}{\rightleftharpoons}} N_2O_4$, 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. $2k_2[NO_2]^2 - k_2[N_2O_4]$

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

Answer: B

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50. The conversion of molecules X to Y follows second order kinetics. If the concenration of X is increased to three times, how will it affect the rate of formation of Y ?

A. increased by three times

B. decreased by three times

C. increases by nine times

D. decrease by nine times

Answer: C

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51. In the sequence of reaction,

$$L \xrightarrow{k_1} M \xrightarrow{k_2} N \xrightarrow{k_3} O$$

$$k_3 > k_2 > k_1$$

The rate determining step of the reaction is :

A. $A \rightarrow B$

B. $B \rightarrow C$

C. $C \rightarrow D$

D. $A \rightarrow D$

Answer: A

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

A. 4

B. 3

C. 5

D. 2

Answer: A

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53. For an exothermic chemical process occurring in two as

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

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

The process of the reaction can be best described by

A. 

B. 

C. 

D. All are correct

Answer: C

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54. A reactant (A) forms two products

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

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

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

A. $K_1 = 2k_2 e^{Ea2,1/RT}$

B. $k_1 = k_2 e^{2Ea1/RT}$

C. $k_2 = k_1 e^{Ea2,1R/T}$

D. $k_1 = Ak_2 e^{Ea2,1/RT}$

Answer: B

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55. In a first order reaction, $A \rightarrow P$, the ratio of $a/(a-x)$ was found to be 8 after 60 m in. If the concentration is 0.1 M then the rate of reaction is

A. $2.226 \times 10^{3} \ \text{mol} \ L^{-1} \ \text{min}^{-1}$

B. $4.455 \times 10^{-3} \ \text{mol} \ L^{-1} \ \text{min}^{-1}$

C. $3.466 \times 10^{-3} \ \text{mol} \ L^{-1} \ \text{min}^{-1}$

D. $5.532 \times 10^{-3} \ \text{mol} \ L^{-1} \ \text{min}^{-1}$

Answer: C

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56. The rate of a chemical reaction becomes double for every 10° rise in temperature. If the tempeature is raised by 50° C, the rate of reaction increases by about:

A. 10 times

B. 24 times

C. 32 times

D. 64 times

Answer: C

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57. For a reaction $1/2A \rightarrow 2B$, rate of disappearance of A is related to the rate of appearance of B by the expression:

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

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

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

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

Answer: B

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

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

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

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

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

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

Answer: A

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59. A plot of Ink v/s $1/\mathrm{T}$ for a reaction gives the slope $-1 \times 10^4 k$. The energy of activation for the reaction is $\left(Given, R = 8.314 k^{-1} \text{ mol}^{-1}\right)$

A. $8314 kJ \text{ mol}^{-1}$

B. $1.202 kJ \text{ mol}^{-1}$

C. $1202 kJ \text{ mol}^{-1}$

D. $83.14 kJ \text{ mol}^{-1}$

Answer: D

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60. 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. 256 times

B. 512 times

C. 64 times

D. 128 times

Answer: B

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

Based on the above data which one of the following is correct?

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

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

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

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

Answer: A

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62. The inversion of cane sugar is first order in [sugar] and proceeds with half-life of 600 min at pH=4 for a given concentration of sugar. However , if pH=5, the half-life changes to 60 min. The rate law expression for the sugar inversion can be written as

A. $rate = k[sugar]^1\left[H^+\right]^2$

B. $rate = k[sugar]\left[H^+\right]^1$

C. $rate = k[sugar]\left[H^+\right]^4$

D. $rate = k[sugar]\left[H^+\right]^0$

Answer: D

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

Initial rate, MS^{-1}	$\|A_0\|M$	$\|B_0\|M$	$\|C_0\|M$
5.0×10^{-3}	0.010	0.005	0.010
5.0×10^{-3}	0.010	0.005	0.015
1.0×10^{-2}	0.010	0.010	0.010
1.25×10^{-3}	0.005	0.005	0.010

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

A. 3.2.0

B. 3,2,1

C. 2,2,0

D. 2,1,0

Answer: D

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64. For a reaction , $2N_2O_5 \rightarrow 4NO_2 + O_2$, the rate is directly proportional to $[N_2O_5]$. At $45^\circ C, 90\,\%$ of the N_2O_5 react in 3600 s. The value of the rate constant is

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

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

C. $8.5 \times 10^{-4} s^{-1}$

D. $12.8 \times 10^{-4} s^{-1}$

Answer: B

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

A. zero

B. one

C. two

D. three

Answer: A

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66. The energies of activation for forward and reverse reaction for $A_2 + B_2 \Leftrightarrow 2AB$ are $180kJ\text{mol}^{-1}$ and

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

A. 300

B. 120

C. 280

D. -20

Answer: D

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

A. remain unchanged

B. triple

C. increase by a factor of four

D. double

Answer: C

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68. For the second order reaction,

$A + B \rightarrow \text{products}$

when a moles of A react with b moles of B, the rate equation is given by

$$k_2 t = \frac{1}{a-b} In \frac{b(a-x)}{a(b-x)}$$

when $a > > b$, the rate expression becomes that of

A. first order

B. zero order

C. unchanged, second order

D. third order

Answer: A

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69. $A(g) \xrightarrow{\Delta} P(g) + Q(g) + R(g)$, follows first order kinetics with a half-life of 69.3 s at $500^\circ C$. Starting from the gas A enclosed in a container at $500^\circ C$ and at a pressure of 0.4 atm, the total pressure of the system after 230 s will be

A. 1.15 atm

B. 1.32 atm

C. 1.22 atm

D. 1.12 atm

Answer: D

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70. The value of rate constant for a first order reaction is $2.303 \times 10^{-2} \sec^{-1}$. What will be time required to reduce the concentration to $\frac{1}{10}$ th of its initial concentration ?

A. 100 s

B. 10 s

C. 2303 s

D. 230.3 s

Answer: A

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71. The rate of a certain reaction is given by , rate $= K[H^+]^n$. The rate increases 100 times when the pH

changes from 3 to 1 . The order (n) of the reaction is _____.

A. 3

B. 0

C. 1

D. 1.5

Answer: C

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72. For the elementary reaction $M \rightarrow N$, the rate of disappearance of M increases by a factor of 8 upon doubling the concentration of M. The order of the reaction will respect to M is

A. 4

B. 3

C. 2

D. 1

Answer: B

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73. The initial rate, $-\frac{d[A]}{dt}$ at t=o was found to be $2.6 \times 10^2 \ \text{mol} \ L^{-1}s^{-1}$ for the reaction

$A + 2B \rightarrow \text{products}$

The initial rate, $-\frac{d[B]}{dt}$, at t=o is

A. $0.10 \ \text{mol} \ L^{-1}s^{-1}$

B. $2.6 \times 10^2 \ \text{mol} \ L^{-1}s^{-1}$

C. $5.2 \times 10^2 \ \text{mol} \ L^{-1}s^{-1}$

D. $6.5 \times 10^{-3} \ \text{mol} \ L^{-1}s^{-1}$

Answer: C

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74. A chemical reaction was carried out at 300 K and 280 K. The rate constants were found to be k_1 and k_2 respectively. Then

A. $k_2 = 0.25k_1$

B. $k_2 = 0.5k_1$

C. $k_2 = 4k_1$

D. $k_2 = 2k_1$

Answer: A

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

A. 45

B. 120

C. 90

D. 60

Answer: D

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

A. 0.5

B. 1

C. 2

D. 0

Answer: C

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77. The half-life of 2 sample are 0.1 and 0.4 seconds. Their respctive concentration are 200 and 50 respectively. What is the order of the reaction

A. 0

B. 2

C. 1

D. 4

Answer: B

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78. A first order reaction is 60% complete in 20 min. How long will the reaction take to be 84% complete?

A. 68 min

B. 40 min

C. 76 min

D. 54 min

Answer: B

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79. An organic compound undergoes first decompoistion. The time taken for its decompoistion to $1/8$ and $1/10$ of its

initial concentration are $t_{1/8}$ and $t_{1/10}$, respectively. What is the value of $\frac{[t_{1/8}]}{[t_{1/10}]} \times 10$? $(\log_{10} 2 = 0.3)$

A. 2

B. 3

C. 3

D. 9

Answer: D

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

A. 

B. 

C. 

D. 

Answer: C

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81. The reaction, $2NO + Br_2 \rightarrow 2NOBr$, is supposed to follow the following mechanism,

(i) $NO + Br_2 \overset{\text{fast}}{\Longleftrightarrow} NOBr_2$

(ii) $NOBr_2 + NO \overset{slow}{\longrightarrow} 2NOBr$

suggest the rate law expression.

A. $r = k[NO]^2[Br_2]$

B. $r = k[NO][Br_2]$

C. $r = k[NO][Br_2]^2$

D. $r = k[NOBr_2]$

Answer: A

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82. The inversion of a sugar follows first order rate equation which can be followed by noting the change in the rotation of the plane of polarization of light in the polarimeter. If r_∞, r_f and r_0 are the rotations at $t = \infty$, $t = t$, and $t = 0$, then the first order reaction can be written as

A. $k = \frac{1}{t} In \frac{r_1 - r_\infty}{r_0 - r_\infty}$

B. $k = \frac{1}{1} In \frac{r_0 - r_\infty}{rt - r_\infty}$

C. $k = \frac{1}{t} In \frac{r_o - r_t}{r_\infty - r_t}$

D. $k = \frac{1}{1} In \frac{r_\infty - r_t}{r_{\infty - r_o}}$

Answer: B

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83. The unit of the rate constant for first order reaction is

A. mol^{-1}

B. s^{-1}

C. $s^{-1}\text{mol}^{-1}dm^3$

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

Answer: B

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

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

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

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

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

Answer: A

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Mht Cet Corner

1. The rate constant and half - life of a first order reaction are related to each other as _____.

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

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

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

D. $kt_{1/2} = \frac{1}{0.693}$

Answer: A

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2. Average rate of reaction for the following reaction, $2SO_2(g) + O_2(g) \rightarrow 2SO_3(g)$ is written as

A. $\frac{\Delta[SO_2]}{\Delta t}$

B. $-\frac{\Delta[O_2]}{\Delta t}$

C. $\frac{1}{2}\frac{\Delta[SO_2]}{\Delta t}$

D. $\frac{\Delta[SO_3]}{\Delta t}$

Answer: B

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3. For the reaction $O_{3(g)} + O_{(g)} \rightarrow 2O_{2(g)}$, if the rate law expression is , rate $= k[O_3][O]$ the molecularity and order of the reaction are respectively _____.

A. 2 and 2

B. 2 and 1.33

C. 2 and 1

D. 1 and 2

Answer: A

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4. The relationship between rate constant and half life period of zero order reaction is given by _____.

A. $t_{1/2} = [A]_O 2k$

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

C. $t_{1/2} = \frac{[A]_O}{k}$

D. $t_{1/2} = \frac{[A]_O}{2k}$

Answer: C

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5. Half life period of a first order reaction $A \rightarrow$ product is 6.93 hour . What is the value of rate constant ?

A. $1.596h^1$

B. $0.1h^{-1}$

C. $4.802h^{-1}$

D. $10h^{-1}$

Answer: B

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6. Rate law for the reaction $A + B \rightarrow$ product is rate $= K[A]^2[B]$. What is the rate of reaction at a given temperature is $0.22 Ms^{-1}$, when [A]=1 M and [B]=0.25 M?

A. $3.52 M^{-2} s^{-1}$

B. $0.88 M^{-2} s^{-1}$

C. $1.136 M^{-2} s^{-1}$

D. $0.05 M^{-2} s^{-1}$

Answer: B

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

A. $342 kJ \ \ \text{mol}^{-1}$

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

C. $34.7 kJ \text{mol}^{-1}$

D. $15.1 kJ \text{mol}^{-1}$

Answer: C

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8. In a multistpes reaction, the overall rate of reaction is equal to the

A. rate of slowest step

B. rate of fastest step

C. average rate of various step

D. the rate of last step

Answer: A

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9. The first order integrated rate equation is

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

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

C. $k = \frac{1}{t}In\frac{a}{a-x}$

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

Answer: C

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

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

B. s^{-1}

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

D. $L_2\text{mol}^{-2}s^{-1}$

Answer: B

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11. The unit of rate constant for a zero order reaction is s^{-1}.

A. Zero order

B. First order

C. Second order

D. third order

Answer: B

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12. Which is a correct integrated rate equation?

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

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

C. $-d(a-x) = kdt$

D. All are integrated rate equations

Answer: B

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13. After how many seconds will the concentration of the reactant in a first order reaction be halved if the rate constant is $1.155 \times 10^{-3} s^{-1}$?

A. 600

B. 100

C. 60

D. 10

Answer: A

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14. A certain nuclide has a half life period of 30 min. If a sample containing 600 atoms is allowed to decay for 90 min, how many atoms will remains?

A. 200 atoms

B. 450 atoms

C. 75 atoms

D. 150 atoms

Answer: C

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15. If 50% of a radioactive substance dissociates in 15 min, then the time taken by substance to dissociate 99% will be

A. 50 min

B. 100 min

C. 99 min

D. 150 min

Answer: C

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16. The disintegration constant of radium with half-life 1600 yr is

A. $2.12 \times 10^{-4} yr^{-1}$

B. $4.33 \times 10^{-4} yr^{-1}$

C. $3.26 \times 10^{-3} yr^{-1}$

D. $4.33 \times 10^{-12} yr^{-1}$

Answer: B

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17. The half-life period of a radioactive element is 1 h. After 3 h, what fraction of it will remain?

A. $\frac{1}{8}$

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

C. $\frac{1}{64}$

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

Answer: A

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18. If the half-life period of a first order reaction is 138.6 min, then the value of decay constant for the reaction will be $\left(\text{in } \text{min}^{-1}\right)$

A. 5

B. 0.5

C. 0.05

D. 0.005

Answer: D

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19. 20 mg of C-14 has half-life of 5760 yr. 100 mg of sample containing C-14 is reduced to 25 mg in

A. 280 yr

B. 1440 yr

C. 2880 yr

D. 11520 yr

Answer: D

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

A. a^{n-2}

B. a^{1-n}

C. a^{n-1}

D. a^{n}

Answer: B

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