CHEMISTRY

BOOKS - MTG WBJEE CHEMISTRY (HINGLISH)

CHEMICAL DYNAMICS

Wb Jee Workout Category 1 Single Option Correct Type 1 Mark

1. In the reaction, 3A $\rightarrow$ 2B rate of reaction, $+\dfrac{d[B]}{dt}$ is equal to

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

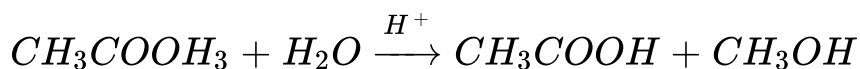B. $-\dfrac{2}{3}\dfrac{d[A]}{dt}$

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

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

Answer: b

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2. The reaction

$$CH_3COOH_3 + H_2O \xrightarrow{H^+} CH_3COOH + CH_3OH$$

is found to be
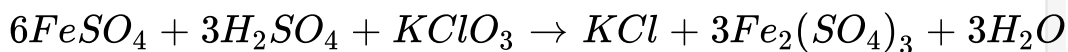
    A. a reaction of the second order

    B. a reaction of the zero order

    C. a reaction of the first order

    D. a reaction with molecularity.

Answer: c

3. The molecularity of the reaction,

$$6FeSO_4 + 3H_2SO_4 + KClO_3 \rightarrow KCl + 3Fe_2(SO_4)_3 + 3H_2O$$

is

A. 6

B. 3

C. 10

D. 7

Answer: c

4. On increasing the temperature, the rate of reaction increases because

    A. the activation energy of the reaction increases

    B. the activation energy of the reaction decreases

    C. at higher temperature, the fraction of molecules with energies greater than the activation energy increases.

    D. concentration of the reacting molecules increases.

Answer: c

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5. For an endothermic reaction, where ΔH represents the enthalpy of the reaction in kJ/mol, the minimum value for

energy of activation will be

A. less than ΔH

B. zero

C. more than ΔH

D. equal to ΔH

Answer: c

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6. For the half-life period of a first order reaction, which of the following statements is false?

A. It is independent of initial concentration.

B. It is independent of temperature.

C. It decreases with the introduction of a catalyst.

D. None of these

Answer: b

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7. The catalytic decomposition of hydrogen peroxide is a .... order reaction.

A. zero

B. first

C. second

D. third

Answer: b

8. In the hydrolysis of an organic chloride in presence of large excess of water,

$$RCl + H_2O \rightarrow ROH + HCl$$
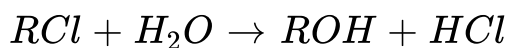
    A. molecularity and order of reaction both are 2

    B. molecularity is 2 but order of reaction is 1

    C. molecularity is 1 but order of reaction is 2

    D. molecularity is 1 and order of reaction is also 1.

Answer: b

9. Which of the following statements is incorrect?

A. Order of a reaction may be even zero.

B. Molecularity of a reaction is always a whole number

C. Molecularity and order always have same values for a

reaction.

D. Order of a reaction depends upon the mechanism of

the reaction.

Answer: c

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10. Which one of the following is wrong about molecularity of a reaction?

    A. It may be whole number or fractional.

    B. It is calculated from reaction mechanism.

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

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

Answer: a

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11. The velocity of a reaction is doubled for every $10°C$ rise in temperature. If the temperature is raised by $50°C$ the

reaction velocity increases by about

A. 12 times

B. 16 times

C. 32 times

D. 50 times

Answer: c

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12. Reaction $A+B \rightarrow C+D$ 38 kcal has activation energy 20 kcal. Activation energy for reaction, $C+D \rightarrow A+B$ is

A. 20 kcal

B. $-20 kcal$

C. 58 kcal

D. 18 kcal

Answer: c

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13. The rate of reaction, A + 2B $\rightarrow$ products is given by the following equation :

$$-\frac{d[A]}{dt} = k[A][B]^2$$

If B is present in large excess, the order of the reaction is

A. zero

B. first

C. second

D. third.

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14. The rate of the reaction,

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

$r = \dfrac{-d[A]}{dt} = k[A]^{1/2}[B]^{1/3}[C]^{1/4}$. The order of the

reaction is

A. $\dfrac{1}{3}$

B. $\dfrac{1}{4}$

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

D. $\dfrac{13}{12}$

Answer: d

15. The enzyme-catalyzed reaction is faster than a metal catalyzed reaction because its activation energy is

A. greater

B. lower

C. same as that of metal-catalyzed reaction

D. none of these.

Answer: b

16. The units of rate of reaction and rate constant are identical for a

    A. fractional order reaction

    B. zero order reaction

    C. first order reaction

    D. second order reaction.

Answer: b

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17. For a reaction, the threshold energy is equal to

    A. Activation energy + initial potential energy of reactants

B. Activation energy - norinal initial potential energy of

reactants

C. Activation energy

D. Normal energy of reactants.

Answer: a

18. According to collision theory,

A. collisions are sufficiently violent

B. all collisions are responsible for reaction

C. all collisions are effective

D. only highly energetic molecules have enough energy to

react.

Answer: d

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19. A positive catalyst increases the rate of a chemical

reaction by

A. increasing the activation energy

B. decreasing the activation energy

C. increasing the average K.E. of the molecules

D. none of these

Answer: b

20. Which of the following rate laws has an overall order of 0.5 for the reaction A + B + C $\rightarrow$ product?

A. $k[A][B][C]^{0.5}$

B. $k[A]^{0.5}[B]^{0.5}[C]^{0.5}$

C. $k[A]^{1.5}[B]^{-1}[C]^{0}$

D. $k[A][B]^{0}[C]^{0.5}$

Answer: c

21. If the concentration is expressed in mol dm^{-3} and time in seconds, the unit of the rate constant for a first-order reaction will be

    A. mol $dm^{-3}s^{-1}$

    B. s^{-1}

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

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

Answer: b

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22. The minimum energy required for molecules to enter into chemical reaction is called

A. kinetic energy

B. potential energy

C. threshold energy

D. activation energy.

Answer: c

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23. Rate of a chemical reaction can be kept constant by

A. stirring the compounds

B. keeping the temperature constant

C. both (a) and (b)

D. none of these

Answer: b

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24. Collision theory satisfactorily explains

    A. first order reactions

    B. unimolecular reactions

    C. bimolecular reactions

    D. any order reactions.

Answer: c

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25. If concentration of reactants is increased by X the rate constant k becomes

A. $e^{k/X}$

B. k/X

C. k

D. X/E

Answer: c

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26. Two reactions proceed at $25°C$ at the same rate. The temperature coefficient of the rate of first reaction is 2 and

that of second reaction is 2.5. The ratio of rates of these reactions at $95°C$ is

A. 5.6

B. 9.85

C. 4.768

D. 70

Answer: c

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27. For a reaction, the rate of reaction was found to increase about 1.8 times when the temperature was increased by $10°C$. The increase in rate is not due to

A. increase in number of active molecules

B. increase in activation energy of reactants

C. decrease in activation energy of reactants

D. increase in the number of collisions between reacting molecules.

Answer: b

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28. The half-life of a first order reaction is 10 minutes. If initial amount is 0.08 mol/L and concentration at some instant is 0.01 mol/L, then t is

A. 10 minutes

B. 30 minutes

C. 20 minutes

D. 40 minutes.

Answer: b

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29. The rate of reaction

$Cl_3CCHO + NO \rightarrow CHCl_3 + NO + CO$ is given by

equation,

Rate=$k[Cl_3CCHO][NO]$

If concentration is expressed in moles/litre, the units of k are

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

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

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

D. $\sec^{-1}$

Answer: c

30. Rate of a reaction can be expressed by Arrhenius equation as: $k = Ae^{-E/RT}$. In this equation, E represents

A. the energy below which colliding molecules will not react

B. the fractional 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. none of these.

Answer: a

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1. If the volume of the vessel in which the reaction

$2NO_{(g)} + O2_{(g)} \rightarrow 2NO_{2(g)}$ is occurring is diminished to

$1/3^{rd}$ of its initial volume. The rate of the reaction will be

increased by

A. 3 times

B. 9 times

C. 27 times

D. 36 times

Answer: c

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2. When the temperature is increased by $10°$ the rate of a reaction

A. increases 4 times

B. increases 2-3 times

C. decreases to half its original value

D. does not change.

Answer: b

3. For the reaction 2A+B $\rightarrow$ product, doubling the initial concentrations of both the reactants increases the rate by a factor of 8 and doubling the concentration of B above double the rate. This rate-law for the reaction is

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

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

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

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

Answer: d

4. The half-life period, $t_{1/2}$ is related to the order n and initial concentration a according to the equation
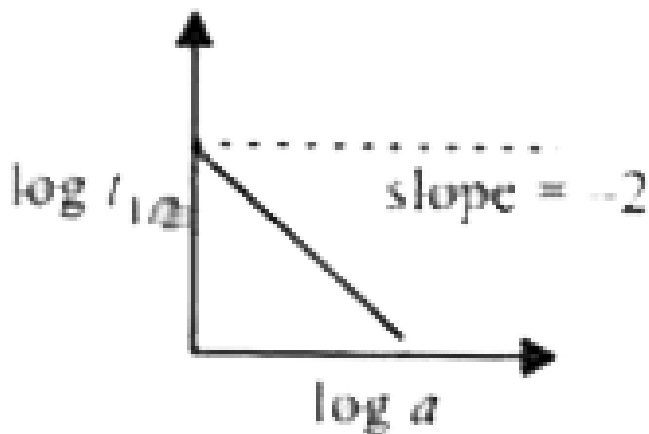
A. $f_{1/2} \propto \dfrac{a}{n}$

B. $f_{1/2} \propto an$

C. $f_{1/2} \propto a^{n+1}$

D. $f_{1/2} \propto \dfrac{1}{a^{n-1}}$

Answer: d

5. A graph between $\log t_{1/2}$ and $\log a$ (abscissa), a being the initial concentration of A in the reaction A $\rightarrow$ product, is depicted in the figure. The rate law is

A. $-\dfrac{d[A]}{dt} = k$

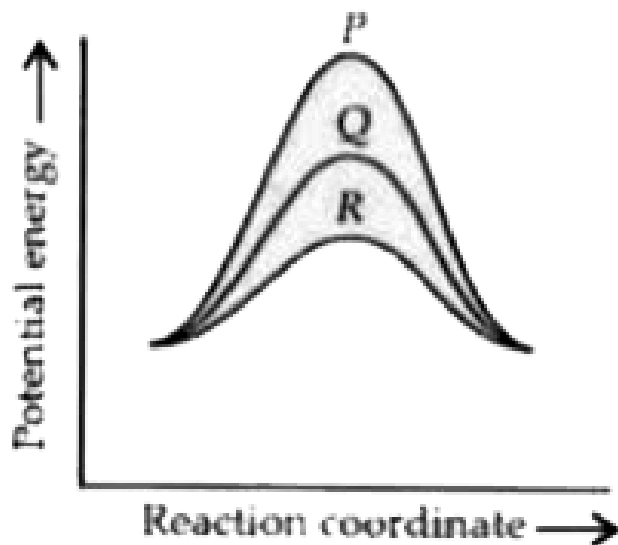B. $-\dfrac{d[A]}{dt} = k[A]$

C. $-\dfrac{d[A]}{dt} = k[A]^2$

D. $-\dfrac{d[A]}{dt} = k[A]^3$

Answer: d

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

A. PgtQgtR

B. QgtPgtR

C. PgtRgtQ

D. RgtQgtP

Answer: d

7. The rate expression for the reaction

$A_{(g)} + B_{(g)} \rightarrow C_{(g)}$ is rate $= k[A]^2[B]^{1/2}$. What

changes in the initial concentrations of A and B will cause the

rate of reaction to increase by a factor of eight?

A. $[A] = [A] : [B] = 2[B]$

B. $[A] = 2[A] : [B] = 4[B]$

C. $[A] = [A] : [B] = 4[B]$

D. $[A] = 4[A] : [B] = [B]$

Answer: b

8. The rate constant (k') of one of the reaction is found to be double that of the rate constant (k") of another reaction. Then the relationship between the corresponding activation energies of the two reactions can be represented as

A. $(E_a > E_a)$

B. $(E_a < E_a)$

C. $(E_a = E_a)$

D. none of these.

Answer: b

9. The rate of a gaseous reaction is given by the is expression k[A][B].If the volume of the reaction vessel is suddenly reduced to $1/4$ of the initial volume, the reaction rate relating to original rate will be
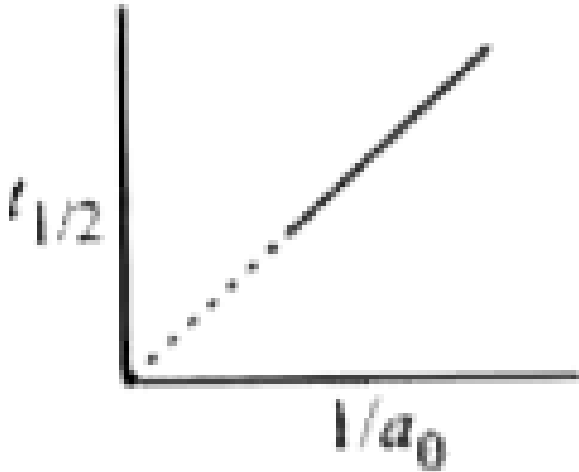
A. $1/10$

B. $1/8$

C. 8

D. 16

Answer: d

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

A. 0

B. 1

C. 2

D. 3

Answer: c

11. For a zero order reaction, A $\rightarrow$ Product with specific rate constant k_0, linear plot was obitaned for [A] vs t. The slope of the line is equal to

   A. k_0

   B. $-k_0$

   C. $0.693/k_0$

   D. $-k_0/2.303$

Answer: b

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

    A. 40 mins

    B. 60 mins

    C. 30 mins

    D. 50 mins

Answer: a

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13. For a reversible chemical reaction where the forward process is exothermic. Which of the following statements is

correct?

A. The backward reaction has higher activation energy than the forward reaction

B. The backward and the forward processes have the same activation energy

C. The backward reaction has lower activation energy

D. No activation energy is required at all since energy is liberated in the process.

Answer: a

14. The half-life period of radioactive element is 140 days. After 560 days, 1 g of element will reduce to

A. $\dfrac{1}{2}$ g

B. $\dfrac{1}{4}$ g

C. $\dfrac{1}{8}$ g

D. $\dfrac{1}{16}$ g

Answer: d

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15. The bacterial growth follows the rate law, $\dfrac{dN}{dt} = kN$, where k is a constant and N is the number of bacterial cell at any time. If the population of bacteria (no. of cell) is doubled

in 5 minutes then the time by which the population will be eight times of the initial one.

A. 15 mins

B. 10 mins

C. 12 mins

D. 18 mins

Answer: a

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16. At $380°C$, the half-life period for the first order decomposition of H_2O_2 is 360 minute. The energy of activation of the reaction is 200 kJ mol^{-1}. What will be the time required for 75% decomposition at $450°$ C?

A. 20.39 min

B. 30.03 min

C. 1223.4 s

D. 2000 s

Answer: a,c

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17. Which of the following statements are correct?

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. $\log_e$ k vs T is a straight line.

D. $\log_e$ k vs $\dfrac{1}{T}$ is a straight line.

Answer: b,d

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18. Which of the following is/are correct regarding activation energy?

A. Larger the activation energy, smaller is the value of rate constant.

B. The higher the E_a, higher the value of temperature coefficient, $\dfrac{k_T + 10}{k_T}$.

C. At lower temperature, increase in temperature causes more change in the value of k than at higher temperature.

D. A plot made between lnk and $1/T$ gives a straight line of slope $-\dfrac{E_a}{R}$

Answer: a,c,d

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19. The rate constants k_1 and k_2 for two different reactions are $10^{16} \cdot e^{-2000/T}$ and $10^{15} \cdot e^{-1000/T}$, respectively. The temperature at which kı = ky is

A. 2000 K

B. $\dfrac{1000}{2.303}$K

C. 434.22 K

D. $\dfrac{2000}{2.303}$K

Answer: b,c

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20. The activation energies of two reactions are E_1 and $E_2(E_1 > E_2)$. If the temperature of the system is increased from T_1 to T_2, the rate constant changes from k_1 to k'_1 in the first reaction and k_2 to k'_2 in the second reaction. Predict which of the following expressions is/are incorrect?

A. $\dfrac{k'_1}{k_1} = \dfrac{k'_2}{k_2}$

B. $\dfrac{k'_1}{k_1} > \dfrac{k'_2}{k_2}$

C. $\dfrac{k'_1}{k_1} < \dfrac{k'_2}{k_2}$

D. $\dfrac{k'_1}{k_1} = \dfrac{k'_2}{k_2} = 1$

Answer: a,c,d

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21. Arrhenius equation may be represented as

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

B. $\dfrac{dInk}{dT} = \dfrac{E_a}{RT^2}$

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

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

Answer: a,b,c

22. Which of the following statements is/are incorrect regarding order of a reaction?

   A. Order of a reaction may be zero, integer or fractional.

   B. For an elementary process order of the reaction is never fractional.

   C. The order of an elementary step is not equal to its molecularity.

   D. For the chemical equation $N_2 + 3H_2 \rightarrow 2NH_3$ the order of reaction is 4

Answer: c,d

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

A. T

B. Z

C. E_a

D. P

Answer: c

24. Consider a chemical reaction $2X + Y \rightarrow X_2Y$. The reactant X will decrease at

    A. twice the rate at which Y will decrease

    B. the same rate at which Y will decrease

    C. twice the rate at which X_2Y will form

    D. half the rate at which Y will decrease.

Answer: a,c

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25. If for a first order reaction, the values of A and E_a are $4x10^{13} \sec^{-1}$ and 98.6 kJ/mol respectively, then at what

temperature will its half-life period be 10 minutes?

A. 330 K

B. $33°C$

C. $57°$

D. 311.15 K

Answer: d

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1. Acid catalysed hydrolysis of ethyl acetate follows a pseudo-first order kinetics with respect to ester. If the reaction is

carried out with large excess of ester, the order with respect to ester will be

A. 1.5

B. 0

C. 2

D. 1

Answer: b

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2. The rate of a certain reaction is given by, rate = $k\left[H^+\right]^n$. The rate increases 100 times when the pH changes from 3 to 1. The order (n) of the reaction is

A. 2

B. 0

C. 1

D. 1.5

Answer: c

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3. For the reaction $A + 2B \rightarrow C$, the reaction rate is doubled if the concentration of A is doubled. The rate is increased by four times when concentrations of both A and B are increased by four times. The order of the reaction is

A. 3

B. 0

C. 1

D. 2

Answer: c

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4. Consider the following two first order reactions occurring

at 298 K with same initial concentration of A:

(1) $A \rightarrow B$, rate constant, k = 0.693 min^{-1}

(2) $A \rightarrow C$, half-life, $t_{1/2}$ = 0.693 min

Choose the correct option.

A. Reaction (1) is faster than reaction (2).

B. Reaction (1) is slower than reaction (2).

C. Both reactions proceed at the same rate.

D. Since two different products are formed, rates cannot

be compared.

Answer: b

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1. For a chemical reaction at $27°\,C$, the activation energy is

600 R. The ratio of the rate constants at $327°\,C$ to that of at

$27°\,C$ will be

A. 2

B. 40

C. e

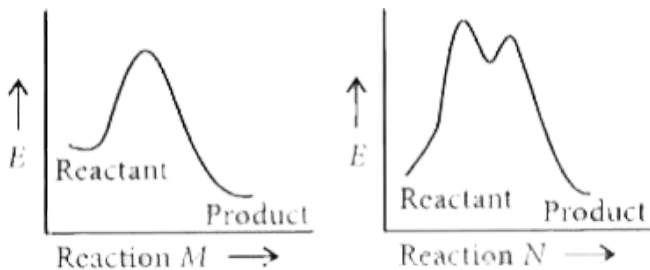D. e^2

Answer: c

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2. The correct statement regarding the following energy diagrams is

A. reaction M is faster and less exothermic than reaction

N

B. reaction M is slower and less exothermic than reaction

N

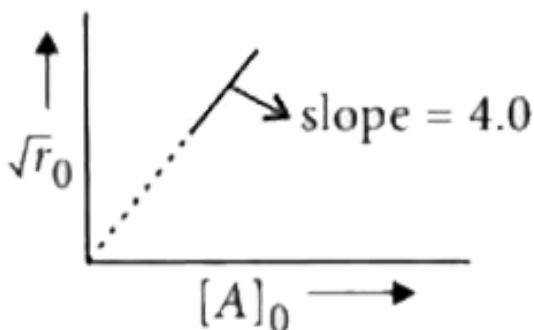C. reaction M is faster and more exothermic than reaction

N

D. reaction M is slower and more exothermic than

reaction N.

Answer: c

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3. The kinetic study of a reaction like $\nu A \rightarrow P$ at 300 K provides the following curve, where concentration is taken in mol dm^{-3} and time in min.

r_0 = Initial rate

$[A]_0$: Initial concentration of A

A. $n = 0$, $k = 4.0$ mol dm^{-3} $\min^{-1}$

B. $n = (1/2)$, $k = 2.0 mol^{\frac{1}{2}} dm^{-3/2}$ $\min^{-1}$

C. $n = 1$, $k = 8.0$ $\min^{-1}$

D. $n - 2$, $k = 16.0$ $dm^3 mol^{-1}$ $\min$ (-1)

Answer: d

Wb Jee Previous Years Questions Category 3 One Or More Than One Option Correct Type 2 Marks

1. Consider the following reaction for

$2NO_{2(g)} + F_{2(g)} \rightarrow 2NO_2F_{(g)}$. The expression for the rate of reaction in terms of the rate of change of partial pressures of reactant and product is/are

A. $rate = -1/2[dp(NO_2)/dt]$

B. $rate = 1/2[dp(NO_2)/dt]$

C. $rate = -1/2[dp(NO_2F)/dt]$

D. $rate = 1/2[dp(NO_2F)/dt]$

Answer: a,d

2. The increase in rate constant of a chemical reaction with increasing temperature is(are) due to the fact(s) that

    A. the number of collisions among the reactant molecules increases with increasing temperature

    B. the activation cnergy of the reaction decreases with increasing temperature

    C. the concentration of the reactant molecules increases with increasing temperature

D. the number of reactant molecules acquiring the activation energy increases with increasing temperature.

Answer: a,d

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