CHEMISTRY

BOOKS - UNIVERSAL BOOK DEPOT 1960 CHEMISTRY (HINGLISH)

CHEMICAL KINETICS

Ordinary Thinking Objective Questions Rate Of A Reaction

1. In the reaction $2A + B \rightarrow A_2B$, if the concentration of A is doubled and of B is halved, then the rate of the reaction will:

A. Increase by four times

B. Decrease by two times

C. Increase by two times

D. Remain the same

Answer: C

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

$CH_3COCH_3(aq) + Br_2(aq) \rightarrow CH_3COCH_2Br(aq) + H^+(aq) + Br^-(aq$

These kinetic data were obtained for given reaction concentrations .Initial concentrations , M

$[CH_3COCH_3]$	$[Br_2]$	$[H^+]$
0.30	0.05	0.05
0.30	0.10	0.05
0.30	0.10	0.10
0.40	0.05	0.20

Initial rate , disappearance of Br_2, Ms^{-1}

A. 5.7×10^{-5}

B. 5.7×10^{-5}

C. 1.2×10^{-4}

D. 3.1×10^{-4}

Answer: c

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

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

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

The rate of this reaction is given by

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

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

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

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

Answer: B

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4. In the reaction

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

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

A. $\frac{dBr_2}{dt} = -\frac{3}{5}\frac{d(Br^-)}{dt}$

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

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

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

Answer: a

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

A. 1.25×10^{-2} mol $L^{-1}S^{-1}$ and 6.25×10^{-3} mol $L^{-1}S^{-1}$

B. 6.25×10^{-3} mol $L^{-1}S^{-1}$ and 6.25×10^{-3} mol $L^{-1}S^{-1}$

C. 1.25×10^{-2} mol $L^{-1}S^{-1}$ and 3.125×10^{-3} mol $L^{-1}S^{-1}$

D. 6.25×10^{-2} mol $L^{-1}S^{-1}$ and 3.125×10^{-3} mol $L^{-1}S^{-1}$

Answer: C

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6. The rate of reaction.

$2N_2O_5 \rightarrow 4NO_2 + O_2$

can be written in three ways.

$$\frac{-d[N_2O_5]}{dt} = k[N_2O_5]$$
$$\frac{d[N_2O_5]}{dt} = \left(k'[N_2O_5]\right)$$
$$\frac{d[O_2]}{dt} = \left(k'[N_2O_5]\right)$$

The relation between k and k' are:

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

B. k' = k , k'' = k

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

D. k' = 2k , k'' = k/2

Answer: D

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

A. Concentration of A

B. Square of concentration of A

C. Under root of the concentration of A

D. Cube of concentration of A

Answer: B

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8. The rate at which a substance reacts, depends on its:

A. Atomic weight

B. Equivalent weight

C. Molecular weight

D. Active mass

Answer: d

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9. A gaseous hypothetical chemical equations , is carried out in a closed vessel . The concentration of B is found to increase by $5 \times 10^{-3} moll^{-1}$ in 10 second . The rate of appearance of B is

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

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

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

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

Answer: a

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10. 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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11. The rate of a reaction that not involve gases is not dependent on

A. Pressure

B. Temperature

C. Concentration

D. Catalyst

Answer: a

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12. A catalyst increases the rate of a chemical reaction by

A. Increasing the activation energy

B. Decreasing the activation energy

C. Reacting with reactants

D. Reacting with products

Answer: B

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

A. 112

B. 512

C. 400

D. 614

Answer: b

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14. The initial rate of reaction $3A + 2B + C \rightarrow$ Products , at different initial concentrations 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 with respect to the reactants , 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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15. The rate of the reaction $A \rightarrow$ products, at the initial concentration of $3.24 \times 10^{-2} M$ is nine times its rate at another initial concentration of

$1.2 \times 10^{-3} M$. The order of reaction is

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

B. $\frac{3}{4}$

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

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

Answer: d

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

$A + 2B \rightarrow$ products

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

A. 0.01 mol $L^{-1}s^{-1}$

B. 2.6×10^{-2} mol $L^{-1}s^{-1}$

C. 5.2×10^{-2} mol $L^{-1}s^{-1}$

D. 6.5×10^{-3} mol $L^{-1}s^{-1}$

Answer: c

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17. The term $\left(-\frac{dc}{dt}\right)$ in a rate equation refers to the :

A. Concentration of the reactant

B. Decrease in concentration of the reactant with time

C. Increase in concentration of the reactant with time

D. Velocity constant of the reaction

Answer: B

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18. Which of the following statement is FALSE in relation to enzyme ?

A. pH affects their functioning

B. Temperature in concentration of the reactant with time

C. They always increase activation energy

D. Their reactions are specific

Answer: c

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

A. 1.28×10^{-2}

B. 9.6×10^{-3}

C. 6.4×10^{-3}

D. 3.2×10^{-4}

Answer: a

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20. In the reaction $Cl_2 + CH_4 \xrightarrow{hv} CH_3Cl + HCl$, presence of a small amount of oxygen

A. Increases the rate of reaction for a brief period of time

B. Decreases the rate of reaction for a brief period of time

C. Does not affect the rate of reaction

D. Completely stops the reaction

Answer: d

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21. In the synthesis of ammonia by Harber's process. If 60 moles of ammonia is obtained in one hour, then the rate of disappearence of

nitrogen is:

A. 30 mol/min

B. 6 mol/min

C. 0.5 mol/min

D. 60 mol/min

Answer: c

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22. In a reaction , $A + B \rightarrow C$, the rate expression is R = $K[A][B]^2$. If the concentration of both the reactants is doubled at constant volume then the rate of reaction will be

A. Eight times

B. Double

C. Quadruple

D. Triple

Answer: a

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23. The reaction , $2NO(g) + O_2(g) \rightarrow 2NO_2(g)$, is second order with respect to NO and first order with respect to O_2 . If the volume of reactants is suddenly reduced to half value , the rate of reaction would be

A. One-fourth of original value

B. One-eighth of original value

C. Eight times of original value

D. Four times of original value

Answer: c

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

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

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

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

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

Answer: A

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25. For a given reaction $3A + B \rightarrow C + D$ the rate of reaction can be represented by

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

B. $-\frac{1}{3}\frac{d[A]}{dt} = \frac{d[C]}{dt} = K[A]^m[B]^n$

C. $+\frac{1}{3}\frac{d[A]}{dt} = \frac{-d[C]}{dt} = K[A]^n[B]^m$

D. None of these

Answer: a

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26. which of the following reaction characteristics at constant temperature are changing by addition of a catalyst to a reaction

(i) Activation energy

(ii) Equilibrium constant

(iii) Reaction entropy

(iv) Reaction enthalpy

A. (i) only

B. (iii) only

C. (i) and (ii) only

D. All of these

Answer: a

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27. If the volume of the vessel in which the reaction $2NO + O_2 \rightarrow 2NO_2$ 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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28. For the reaction $2A + B \rightarrow A_2B$, the rate law given is

A. $k[2A][B]$

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

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

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

Answer: d

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29. The rate of reaction increases with temperature due to

A. Decrease in activation energy

B. Increase in activation energy

C. Increase in collision frequency

D. Increase in concentration

Answer: c

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30. In which of the following case does the reaction go farthest to completion?

A. $K = 10^3$

B. $K = 10^{-2}$

C. $K = 10$

D. $K = 1$

Answer: a

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

A. 0.64×10^{-3} g /sec

B. 0.80×10^{-3} g /sec

C. 1.28×10^{-3} g /sec

D. 1.60×10^{-3} g /sec

Answer: c

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32. For the raction $A + B \rightarrow$ products, it is found that order of A is 2 and the order of B is 3. In the rate expression when the concentration of both A and B are doubled the rate will increases by a factor

A. 12

B. 16

C. 32

D. 10

Answer: c

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33. For the reaction : $2N_2O_5 \rightarrow 4NO_g + O_2(g)$ if the concentration of NO_2 increases by $5.2 \times 10^{-3}M$ in 100 sec, then the rate of reaction is :

A. $1.3 \times 10^{-5}ms^{-1}$

B. $5 \times 10^{-4}ms^{-1}$

C. $7.6 \times 10^{-4}ms^{-1}$

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

Answer: a

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34. The rate of chemical reaction at constant temperature is proportional to:

A. The amount of products formed

B. The product of masses of the reactants

C. The product of the molar concentration of the reactants

D. The mean free path of the reaction

Answer: c

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35. The concentration of a reactant decreases from 0.2 M to 0.1 M in 10 minutes . The rate of the reaction is _____.

A. $0.01M$

B. 10^{-2}

C. 0.01 mol $dm^{-3}\min^{-1}$

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

Answer: c

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36. When a reaction is progressing.

A. The rate of the reaction goes on increasing

B. The concentration of the products goes on decreasing

C. The concentration of the reactants goes on decreasing

D. The reaction rate always remain constant

Answer: c

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37. Time required for completion of ionic reactions in comparison to molecular reaction is

A. Maximum

B. Minimum

C. Equal

D. None

Answer: b

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38. The temperature coefficient of a reaction is :

A. Specific reaction rate at $25^\circ C$

B. Rate of the reaction at $100^\circ C$

C. Ratio of the rate constants at temperature $35^\circ C$ and $25^\circ C$

D. Ratio of the rate constants at two temperature differing by $1^\circ C$

Answer: c

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39. Assertion : Instantaneous rate of reaction is equal to dx/dt .

Reason : It is the rate of reaction at any particular instant of time

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

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

C. If assertion is true but reason is false

D. If assertion and reason both are false .

Answer: B

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40. Assertion : The rate of reaction is always negative .

Reason : Minus sign used in expressing the rate shows that concentration of product is decreasing .

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

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

C. If assertion is true but reason is false

D. If assertion and reason both are false .

Answer: D

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41. Mechanism of a hypothetical reaction

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

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

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

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

The overall order of the reaction will be :

A. 2

B. 0

C. 1.5

D. 1

Answer: C

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Ordinary Thinking Rate Law And Rate Constant

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

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

B. It is calculated from the reaction mechanism

C. It may be either a whole number of fractional

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

Answer: C

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2. The half life of a first order reaction is 69.35 sec. The value of the rate constant of the reaction is

A. $1.0s^{-1}$

B. $0.1s^{-1}$

C. $0.01s^{-1}$

D. $0.001s^{-1}$

Answer: C

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3. The data for the reaction $A + B \rightarrow C$ is

Exp.	$[A]_0$	$[B]_0$	Initial rate
(1)	0.012	0.035	0.10
(2)	0.024	0.070	0.80
(3)	0.024	0.035	0.10
(4)	0.012	0.070	0.80

The rate law corresponds to the above data is

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

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

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

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

Answer: a

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

A. First order reaction

B. Second order reaction

C. Third order reaction

D. None of these

Answer: c

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5. The experimental data for the reaction $2A + B_2 \rightarrow 2AB$ is

Exp.	$[A]_0$	$[B]_0$	Rate ($mole\ s^{-1}$)
(1)	0.50	0.50	1.6×10^{-4}
(2)	0.50	1.00	3.2×10^{-4}
(3)	1.00	1.00	3.2×10^{4}

The rate equation for the above data is

A. Rate = $k[B_2]$

B. Rate = $k[B_2]^2$

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

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

Answer: A

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6. 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. 100 sec

B. 200 sec

C. 400 sec

D. 600 sec

Answer: D

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

A. First order reaction

B. Second order reaction

C. Third order reaction

D. None of these

Answer: c

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

A. 3

B. 0

C. 1

D. 2

Answer: b

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9. The reaction A $\rightarrow$ B follows first order reaction. The time taken for 0.8 mole of A to produce 0.6 mole of B is 1 hour. What is the time taken for conversion of 0.9 mole of A to produce 0.675 moles of B?

A. 2hours

B. 1 hour

C. 0.5 hour

D. 0.25 hour

Answer: B

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

A. 8.73 min

B. 7.53 min

C. 0.383 min

D. 23.1 min

Answer: d

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

A. 220 s

B. 30 s

C. 300 s

D. 347 s

Answer: d

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

A. -1

B. -2

C. 1

D. 2

Answer: b

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

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

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

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

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

Answer: c

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

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

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

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

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

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

A. B only

B. A and B only

C. Neither A nor B

D. A only

Answer: a

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

A. 50 minutes

B. 45 minutes

C. 60 minutes

D. 40 minutes

Answer: B

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

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

B. $\frac{\log 2}{K}$

C. $\frac{\log 2}{K\sqrt{0.5}}$

D. $\frac{\text{In}2}{K}$

Answer: b

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

A. 2000 K

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

C. 1000 K

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

Answer: B

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

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

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

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

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

Answer: c

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19. The rate of the reaction

$2NO + Cl_2 \rightarrow 2NOCl$

is given by the rate equation

$Rate = k[NO]^2[Cl_2]$

The value of the rate constant can be increased by

A. Increasing the temperature

B. Increasing the concentration of NO

C. Increasing the concentration of the Cl_2

D. Doing all of these

Answer: a

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20. The unit of rate constant for a zero order reaction is

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

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

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

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

Answer: c

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21. The half life of a substance in a certain enzyme catalyzed reaction is 138s. The time required for the concentration of the substance to fall from $1.28 mgL^{-1} \rightarrow 0.04 mgL^{-1}$:

A. 690s

B. 276 s

C. 414 s

D. 552 s

Answer: a

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

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

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

C. Rate = k [A] [B]

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

Answer: d

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23. 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. First

B. Second

C. More than zero but less than first

D. Zero

Answer: a

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

minutes is:

A. 1.08 M

B. 3.60 M

C. 0.36 M

D. 0.72 M

Answer: d

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

A. 24.1 s

B. 34.1 s

C. 44.1 s

D. 54.1 s

Answer: A

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26. The decomposition of phosphine $[PH_3]$ on tungsten at low pressure is a first-order reaction. It is because the

A. Rate of decomposition is very slow

B. Rate is proportional to the surface coverage

C. Rate is inversely proportional to the surface coverage

D. Rate is independent of the surface coverage

Answer: d

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

A. 1

B. 2

C. 3

D. 0

Answer: a

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

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

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

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

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

Answer: c

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29. For a chemical reaction $A \rightarrow B$ it is found that the rate of reaction doubles , when the concentration of A is increased four times . The order in A for this reaction is

A. Two

B. One

C. Half

D. Zero

Answer: c

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30. The rate constant of a reaction is $0.69 \times 10^{-1}\ \text{min}^{-1}$ and the initial concentration is $0.2\text{mol}\ \text{l}^{-1}$. The half-life period is

A. 400 sec

B. 600 sec

C. 800 sec

D. 1200 sec

Answer: b

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

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

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

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

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

Answer: d

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

A. 5 hours

B. 7.5 hours

C. 10 hours

D. 20 hours

Answer: B

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33. A subtance $'A'$ decomposes by a first-order reaction starting initially with $[A] = 2.00m$ and after $200\ \min$ $[A] = 0.15m$. For this reaction what is the value of k

A. $1.29 \times 10^{-2}\text{min}^{-1}$

B. $2.29 \times 10^{-2}\text{min}^{-1}$

C. $3.29 \times 10^{-2}\text{min}^{-1}$

D. $4.40 \times 10^{-2}\text{min}^{-1}$

Answer: A

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34. For the reaction : $H_2 + Cl \xrightarrow{\text{sunlight}} 2HCl$ the order of reaction is

A. 1

B. 2

C. 3

D. 0

Answer: d

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

A. 1.5

B. 2.0

C. 2.5

D. 3.0

Answer: b

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36. The half-life for the reaction $N_2O_5 \rightarrow 2NO_2 + \frac{1}{2}O_2$ is 2.4 h at STP . Starting with 10.8 g of N_2O_5 how much oxygen will be obtained after a period of 9.6 h

A. 1.5 L

B. 3.36 L

C. 1.05 L

D. 0.07 L

Answer: c

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37. For a first order reaction, we obtain a straight line with positive slope, what we need to plot?

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

B. $-\log_e[A]$ vs t

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

D. [A] vs t

Answer: B

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38. T_{50} of first order reaction is 10 min. starting with 10 mol^{-1} rate after 20 min is :

A. 0.0693 mol $L^{-1}\mathrm{min}^{-1}$

B. $0.0693 \times 2.5 molL^{-1}\mathrm{min}^{-1}$

C. $0.0693 \times 5 molL^{-2}\mathrm{min}^{-1}$

D. $0.0693 \times 10 molL^{-1}\mathrm{min}^{-1}$

Answer: b

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39. If initial concentration is reduced to its 1/4th in a zero order reaction, the time taken for half of the reaction to complete

A. Remains same

B. Becomes 4 times

C. Becomes one-fourth

D. Doubles

Answer: C

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40. The rate constant of a reaction depends on

A. Temperature

B. Mass

C. Weight

D. Time

Answer: a

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41. The half life of a first order reaction having rate constant $k = 1.7 \times 10^{-5} \sec^{-1}$ is :

A. 12.1 h

B. 9.7 h

C. 11.3 h

D. 1.8 h

Answer: c

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

of reaction w.r.t. A is

A. 10

B. 1

C. 4

D. 2

Answer: d

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43. For the reaction $H_{2(g)} + Br_2(g) \rightarrow 2HBr(g)$ experimental data suggest , rate = $K[H_2][Br_2]^{1/2}$, molecularity and order of the reaction are respectively

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

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

C. $1, 1$

D. $1, \frac{1}{2}$

Answer: a

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

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

B. mol litre^{-1}

C. sec^{-1}

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

Answer: c

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45. The inversion of cane sugar is represented by

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

It is a reaction of

A. Second order

B. Unimolecular

C. Pseudo unimolecular

D. None of the three

Answer: C

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46. The reaction

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

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

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

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

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

Answer: a

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47. If a substance with hlaf life 3 days is taken at other place in 12 days. What amount of substance is laft now ?

A. $1/4$

B. $1/8$

C. $1/16$

D. $1/32$

Answer: c

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

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

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

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

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

Answer: c

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49. A substance reacts with initial concentration of a mol dm^{-3} accroding to zero order kinetics. The time it takes for the completion of the reaction is : (k = rate constant)

A. k/a

B. a/2k

C. a/k

D. 2k/a

Answer: c

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

A. 1,2

B. 2,3

C. 3,2

D. 2,2

Answer: b

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

A. Linear with +ve slope and zero intercept

B. Linear with -ve slope and zero intercept

C. Linear with -ve slope and non-zero intercept

D. Linear with +ve slope and non-zero intercept

Answer: c

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52. Which among the following plots are linear (a -x) is the concentration of reactant remaining after time , t

(a) (a - x) vs t , for a first order reaction

(b) (a - x) vs t , for a zero order reaction

(c) (a - x) vs t , for a second order reaction

(d) 1/(a - x) vs t , for a second order reaction

A. 1 and 2

B. 1 and 3

C. 2 and 3

D. 2 and 4

Answer: d

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53. Half-lives of a first order and a zero order reaction are same. Then the ratio of the initial rates of the first order reaction to that of zero order reaction is

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

B. 2×0.693

C. 0.693

D. $\frac{2}{0.693}$

Answer: b

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54. for a first order reaction , the time taken to reduce the initial concentration by a factor of $\frac{1}{4}$ is 20 minutes . The time required to reduce intitial concentration by a factor of $\frac{1}{16}$ is

A. 20 min

B. 10 min

C. 80 min

D. 40 min

Answer: d

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

A. (x + y)

B. (m + n)

C. (c + d)

D. x/y

Answer: c

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56. The decomposition of ammonia on tungsten surface at 500 K follows zero order kinetics. The half-life period of this reaction is 45 minutes when the initial pressure is 4 bar. Find the half-life period (in minutes) of the reaction when the initial pressure is 16 bar at the same temperature.

A. 120

B. 60

C. 240

D. 180

Answer: d

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57. For a reaction $A + B \rightarrow C + 2D$, experimental results were collected for three trials and the data obtained are given below:

Trial	[A], M	[B], M	Initial Rate, M s^{-1}
(i)	0.40	0.20	5.5×10^{-4}
(ii)	0.80	0.20	5.5×10^{-4}
(iii)	0.40	0.40	2.2×10^{-3}

The correct rate law of the reaction is

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

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

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

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

Answer: A

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58. In a first order reaction, The concentration of reactant is reduced to 1/8th of the initial concentration in 75 minutea at 298 K. What is the half period of the reaction in minutes?

A. 50

B. 15

C. 45

D. 25

Answer: D

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59. The rate constant of a first order reaction is doubled when the temperature is increased from $20^{\circ}C$ to $25^{\circ}C$. How many times the rate constant will increase if the temperature is raised from $20^{\circ}C$ to $40^{\circ}C$

A. 4

B. 8

C. 16

D. 32

Answer: C

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60. In the following reaction , the initial concentration of the reactant and initial rate at 298 K are given

$2A \rightarrow C + D$

$[A]_0 \text{mol} L^{-1}$	Initial rate in $\text{mol} L^{-1} s^{-1}$
0.01	5.0×10^{-5}
0.02	2×10^{-4}

The value of rate constant of this reaction at 298 K is

A. $0.01 s^{-1}$

B. $5 \times 10^{-3} mol L^{-1} s^{-1}$

C. $2.0 \times 10^{-2} mol^{-1} L s^{-1}$

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

Answer: d

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61. Order of a reaction can have _____ values .

A. 0

B. Fraction

C. Whole number

D. Integer , fraction , zero

Answer: d

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62. A reactions is of second order with respect to a reactant. How is the rate of reaction affected if the concentration of the reactant is reduced to half?

A. The rate of the reaction is proportional to [X]

B. The rate of the reaction is proportional to $[X]^2$

C. Two molecules of X are present in the stoichiometric equation

D. The reaction occurs in two steps

Answer: b

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

A. 0 order

B. 1st order

C. 2nd order

D. 3rd order

Answer: a

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64. $A + 2B \rightarrow C + D$. if $-\frac{d[A]}{dt} = 5 \times 10^{-4}$ mol $l^{-1}s^{-1}$, then $-\frac{d[B]}{dt}$ is

A. 2.5×10^{-4} mol $l^{-1}s^{-1}$

B. 5.0×10^{-4} mol $l^{-1}s^{-1}$

C. 2.5×10^{-3} mol $l^{-1}s^{-1}$

D. 1.0×10^{-3} mol $l^{-1}s^{-1}$

Answer: d

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65. The concentration of an organic compound in chloroform is 6.15 g per 100 mL of solution . A portion of this solution in a 5 cm polarimeter tube causes an observed rotation of -1.2° . What is the specific rotation of the compound

A. $+12^\circ$

B. -3.9°

C. -39°

D. $+61.5^\circ$

Answer: c

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66. For the reaction $2HI \Leftrightarrow H_2 + I_2$

A. Unimolecular

B. Bimolecular

C. Of first order

D. Of second order

Answer: d

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67. Sucrose is

A. Zero order reaction

B. First order reaction

C. Second order reaction

D. Third order reaction

Answer: b

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68. The rate law of the reaction $A + 2B \rightarrow$ Product is given by $\frac{d(\text{Product})}{dt} = k[A]^2[B]$. A is taken in large excess, the order of the reqaction will be

A. 1

B. 2

C. 3

D. 0

Answer: b

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

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

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

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

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

Answer: c

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

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

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

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

D. $K = 3.98 \times 10^{-5} \text{lit mole}^{-2} \sec^{-1}$

Answer: c

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71. If the rate of a reaction is "5" at 10^oC,then on increasing the temperature to 30^oC ,new rate is "

A. 20

B. 10

C. 50

D. 40

Answer: a

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72. Rate of the given reaction,

(1) $A + B \xrightarrow{r_1 = 0.05} X$

(2) $X + B \xrightarrow{r_2 = 0.89} Y$

(3) $Y + A \xrightarrow{r_3 = 0.001} AY$

(4) $AY + B \xrightarrow{r_4 = 0.10} AYB$ will be determined by

A. Step(i) Because the reaction starts with the formation of X

B. Step (ii) because it is fastest step

C. Step (iii) because it is the slowest step

D. Step (iv) because it ends the reaction

Answer: c

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73. Which of the following is the correct statement

A. Order of a reaction has always an integral value

B. Mechanism of a reaction proposed is always final

C. Zero order reaction are multi-step reactions

D. Order of reactions can be predicted even without knowing the rate law

Answer: d

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74. For the reaction, $2A + B \rightarrow C + D$, the order of reaction is

A. One with respect to [B]

B. Two with respect to [A]

C. Three

D. Can't be predicted

Answer: d

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75. Consider the decomposition of N_2O_5 as

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

The rate of reaction is given by

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

$$= k_1[N_2O_5]$$

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

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

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

Choose the correct option

A. $k_1 = k'_1 = k''_1$

B. $k_1 = 2k'_1 = k'_1$

C. $4k_1 = k'_1 = 2k''_1$

D. None of these

Answer: d

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

A. zero

B. 1

C. 2

D. 1.5

Answer: a

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77. A reacts to form P , A plot of the reciprocal of the concentration of A vs time is a straight line . When the initial concentration of A is $1.0 \times 10^{-2} M$, its half-life is found to be 20 min . When initial concentration of A is $3.0 \times 10^{-3} M$, the half -life will be

A. 20 min

B. 40 min

C. 56 min

D. 67 min

Answer: d

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78. The hydrolysis of ethyl acetate is a reaction of :

$$CH_3COOC_2H_5 + H_2O \xrightarrow{H^+} CH_3COOH + C_2H_5OH$$

A. Zero

B. Second

C. Third

D. Pseudo first order

Answer: D

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79. Which of the following is a first order reaction ?

A. $NH_4NO_2 \rightarrow N_2 + 2H_2O$

B. $2HI \rightarrow H_2 + I_2$

C. $2NO_2 \rightarrow 2NO + O_2$

D. $2NO + O_2 \rightarrow 2NO_2$

Answer: a

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80. For a first order reaction $A \rightarrow$ Products, the half life is 100 seconds.

The rate constant of the reaction is

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

B. $6.93 \times 10^{-4} s^{-1}$

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

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

Answer: c

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

A. 1

B. 2

C. 3

D. 4

Answer: c

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

A. 1/3 times

B. 2/3 times

C. 3 times

D. 6 times

Answer: c

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83. Correct order for a first order reaction is

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

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

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

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

Answer: c

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

A. Rate = k[A] [B]

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

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

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

Answer: b

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85. The unit of rate constant in case of zero order reaction is ____.

A. Concentration $\times \text{Time}^{-1}$

B. $\text{Concentration}^{-1} \times \text{Time}^{-1}$

C. Concentration $\times \text{Time}^2$

D. $\text{Concentration}^{-1} \times \text{Time}$

Answer: a

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86. Starting with one mole of a compound A, it is found that the reaction is $3/4$ completed in $1hr$. Find the rate constant if the reaction is of II order.

A. $2.31\ \text{min}^{-1}$

B. 0.231min^{-1}

C. 0.0231min^{-1}

D. 0.00231min^{-1}

Answer: c

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87. The half life of radioactive sodium is 15 hours its disintegration constant is

A. $0.0462h^{-1}$

B. $0.0642h^{-1}$

C. $0.0462s^{-1}$

D. 0.0462min^{-1}

Answer: a

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88. In a first order reaction the $\frac{a}{(a-x)}$ value was found to be 10 after 15 minutes . The rate constant of the reaction is

A. 0.153min^{-1}

B. 0.135min^{-1}

C. 0.315min^{-1}

D. 0.351min^{-1}

Answer: a

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89. Unit of the constant of zero order reaction is

A. One reaction will be more in it

B. Reactants do not participate in it

C. Rate of reaction is proportional to velocity of molecules

D. Reactants concentration do not change with time

Answer: d

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90. In a reaction the initial concentration of the reactants increase four fold and the rate becomes eight times its initial value . The order of the reaction is

A. 2.0

B. 3.5

C. 2.5

D. 1.5

Answer: d

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91. The thermal decomposition of a compound is of first order. If $50\ \%$ of a sample of the compound is decomposed in 120 minutes, how long it take for $90\ \%$ of the compounds to decompose.

A. Nearly 240 minutes

B. Nearly 480 minutes

C. Nearly 450 minutes

D. Nearly 400 minutes

Answer: d

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92. For a hypothetical reaction $A + B \rightarrow$ products

The rate law is , $R = R[A]^{\circ}[B]$, The order of reaction is

A. 1

B. 2

C. 1.5

D. Zero

Answer: a

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93. The overall rate of a reaction is governed by :

A. Slowest step

B. Fastest step

C. Sum of rate of all steps

D. Molecularity of all steps

Answer: a

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

A. 1

B. 0

C. 3

D. 2

Answer: d

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

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

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

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

B. $\frac{1}{15} \ln \frac{44}{56}$

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

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

Answer: d

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96. In hydrolysis of organic cholride with excess of water

$$RCl + H_2O \rightarrow ROH + HCl$$

A. Molecularity is 2 , order of reaction is also 2

B. Molecularity is 2 , order of reaction is 1

C. Molecularity is 1 , order of reaction is 2

D. Molecularity is 1 , order of reaction is also1

Answer: b

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97. What is the order of a reaction whose rate $= K[C]_A^{3/2}[C]_B^{-1/2}$?

A. 2

B. 1

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

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

Answer: b

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

A. 1117.7

B. 111.7

C. 223.4

D. 160

Answer: a

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

A. $1/4$

B. 2

C. $1/2$

D. 4

Answer: d

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

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

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

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

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

Answer: c

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

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

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

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

D. $0.001\,\sec^{-1}$

Answer: c

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102. For a first order reaction velocity constant , $K = 10^{-3}s^{-1}$. Two third life for it would be

A. 1100 s

B. 2200 s

C. 3300 s

D. 4400 s

Answer: a

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103. The time for 90% of a first order reaction to complete is approximately

A. 1.1 times that of half-life

B. 2.2 times that of half-life

C. 3.3 times that of half - life

D. 4.4 times that of half-life

Answer: c

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104. What is the half-life of ${}_6C^{14}$, if its disintegration constant is $2.31 \times 10^{-4} yr^{-1}$?

A. 0.3×10^4 years

B. 0.3×10^3 years

C. 0.3×10^8 years

D. 0.3×10^2 years

Answer: a

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105. Show that in case of a first order reaction, the time required for $99.9\,\%$ of the reaction to take place is about 10 times that the required for half the reaction.

A. 10 times that required for half of the reaction

B. 100 times that required for two-third of the reaction

C. 10 times that required for one-fourth of the reaction

D. 20 times that required for half of the reaction

Answer: a

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

A. Zero

B. 1

C. 2

D. 4

Answer: a

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107. The difference rate law for the reaction

$H_2 + I_2 \rightarrow 2HI$ is

A. $-\frac{d[H_2]}{dt} = -\frac{d[I_2]}{dt} = +\frac{1}{2}\frac{d[H]}{dt}$

B. $\frac{d[H_2]}{dt} = \frac{d[HI]}{dt} = \frac{1}{2}\frac{d[HI]}{dt}$

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

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

Answer: ad

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108. The decomposition of phosphine $[PH_3]$ on tungsten at low pressure is a first-order reaction. It is because the

A. 0

B. 1

C. 2

D. Insufficient data

Answer: a

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

A. 3

B. 6

C. 5

D. 7

Answer: a

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

A. Diminish to one fourth of its initial value

B. Diminish to one-eighth of its initial value

C. Increase to eight times of initial value

D. Increase to four times of its initial value

Answer: c

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111. 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 change form 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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112. The rate equation for the reactions $2A + B \rightarrow C$ is found to be: rate = $k[A][B]$. The correct statement in relation to this reaction is that the

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

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

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

D. Value of k is independent of the initial concentration of A and B

Answer: d

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

A. 0.10 /K

B. 0.29/K

C. 0.69/K

D. 0.75/K

Answer: b

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

A. Can never be a second order reaction

B. Can never be a unimolecular reaction

C. Can never be a bimolecular reaction

D. Can never be a first order reaction

Answer: b

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115. 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 4

D. Double

Answer: c

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

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

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

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

A. 1

B. 0

C. 3

D. 2

Answer: d

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

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

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

B. No unit

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

D. s^{-1}

Answer: a

Watch Video Solution

118. Consider the reaction,

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

The rate equation for this reaction is,

Rate $= k[Cl_2][H_2S]$

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

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

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

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

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

A. A only

B. B only

C. Both A and B

D. Neither A nor B

Answer: a

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119. The time for half-life period of a certain reaction, $A \rightarrow$ products is $1h$. When the initial concentration of the reactant $'A'$ is $2.0 \text{mol} L^{-1}$,

how much time does it take for its concentration to come from 0.50 to $0.25 \mathrm{mol} L^{-1}$, if it is zero order reaction ?

A. 1h

B. 4 h

C. 0.5 h

D. 0.25 h

Answer: d

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120. For a first order reaction , $A \rightarrow$ Products, the concentrations 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. 1.73×10^{-5} M/min

B. 3.47×10^{-4} M / min

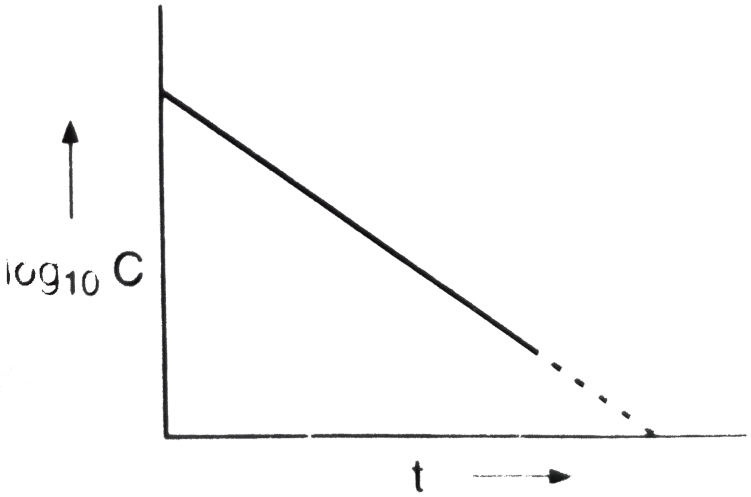
C. 3.47×10^{-5} M/min

D. 1.73×10^{-4} M/min

Answer: b

Watch Video Solution

121. If a plant of $\log_{10}$ C versust t gives a straight line for a given reaction, then the reaction is :



A. Zero order

B. First order

C. Second order

D. Third order

Answer: b

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

A. A first order reaction

B. A second order reaction

C. Independent of the initial concentration of the salt

D. A zero order reaction

Answer: a

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

A. The reaction is said to follow first order kinetics

B. The half life of the reaction will depend on the initial concentration of the reactant

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

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

Answer: b

Watch Video Solution

124. The mechanism for the reaction is given below

$2P + Q \rightarrow S + T$

$P + Q \rightarrow R + S$ (slow)

$P + R \rightarrow T$ (fast)

The rate law expression for the reaction is

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

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

C. r = k[A] [R]

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

Answer: b

Watch Video Solution

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

A. Reaction is independent of temperature

B. Formation of activated complex is zero

C. Reaction is independent of the concentration of reacting species

D. Decomposition of activated complex is zero

Answer: c

Watch Video Solution

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

A. $T \propto a^{n-1}$

B. $T \propto a^{n}$

C. $T \propto \frac{1}{a^{n}}$

D. $T \propto \frac{1}{a^{n-1}}$

Answer: d

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

to $0.5M$

A. 8×10^{-5} min

B. 8.665×10^{3} min

C. 4×10^{-5} min

D. 1.25×10^{4}min

Answer: d

Watch Video Solution

128. The rate constant of a second order reactions

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

A. 10

B. 1000

C. 100

D. 10^6

Answer: d

Watch Video Solution

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

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

B. $\frac{2}{3}$ log 4

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

D. $\frac{3}{2}$ log 4

Answer: a

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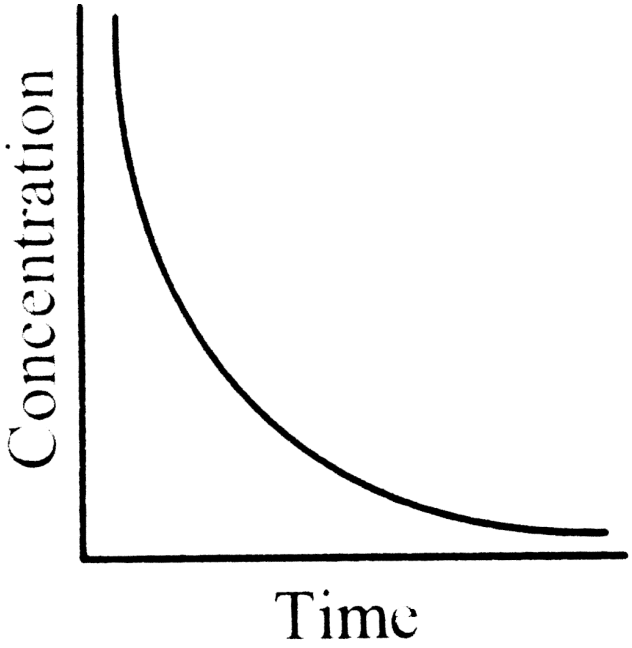
130. Certain reactions follow the relation between concentrations of the reactant vs time as



What is the expected order for such reactions

A. 0

B. 1

C. 2

D. Infinity

Answer: b

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131. In the first order reaction, the concentration of the reactent is redduced to 25% in one hour. The half life period of the reactiion is a)2 hr b)4hr c)1/2 hr d)1/4 hr

A. 2 hr

B. 4 hr

C. 1/2 hr

D. 1/4 hr

Answer: c

Watch Video Solution

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

A. 0.384 min

B. 0.15 min

C. 3 min

D. 3.84 min

Answer: a

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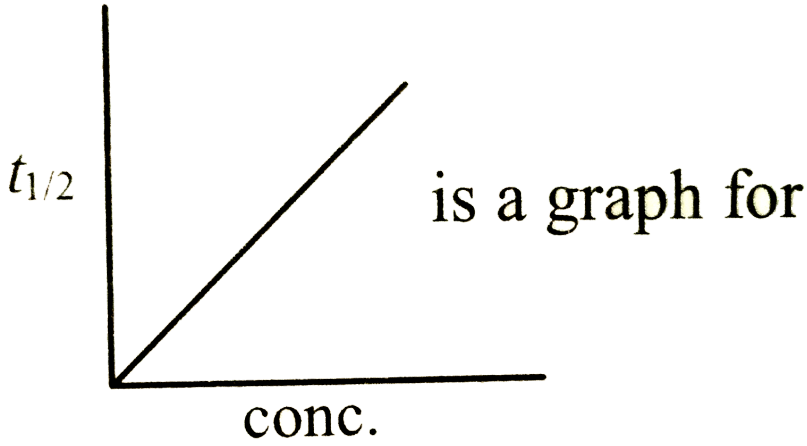

133.

is a graph for

A. Zero order reaction

B. 1^{st} order reaction

C. 1/2 order reaction

D. 2^{nd} order reaction

Answer: a

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134. Which one is not correct

A. Rate of zero order reaction depends upon initial concentration of reactant

B. Rate of zero order reaction does not depend upon initial concentration of reactant

C. $t_{1/2}$ of first order reaction is independent of initial concentration of reactant

D. $t_{1/2}$ of zero order reaction is dependent of initial concentration of reactant

Answer: a

Watch Video Solution

135. Which expression is wrong for first order reaction

A. $k = \frac{2.303}{t}\log\left(\frac{A_0}{At}\right)$

B. $k = \frac{t}{2.303}\log\left(\frac{A_0}{At}\right)$

C. $-k = \frac{t}{2.303}\log\left(\frac{At}{A_0}\right)$

D. Rate = k[A]

Answer: bc

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

	$[A]$	$[B]$	Initial reaction rate
(i)	$0.20\ M$	$0.30\ M$	5×10^{-5}
(ii)	$0.20\ M$	$0.10\ M$	5×10^{-5}
(iii)	$0.40\ M$	$0.05\ M$	1×10^{-4}

The overall order of the reaction is

A. One

B. Two

C. Two or half

D. Three

Answer: a

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137. Given the hypothetical reaction mechanism

$A \xrightarrow{I} B \xrightarrow{II} B \xrightarrow{III} D \xrightarrow{IV} E$ and the data as

Species formed	Rate of its formation
B	0.002 mol/h, per mole of A
C	0.030 mol/h, per mole of B
D	0.011 mol/h. per mole of C
E	0.420 $mol\ h/$ per mole of D

The rate determining step is

A. Step I

B. Step II

C. Step III

D. Step IV

Answer: a

View Text Solution

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

A. 1.25 g

B. 0.63 g

C. 1.77 g

D. 0.5 g

Answer: b

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139. Certain bimolecular reactions which follow the first order kinetics are called _____.

A. First order reactions

B. Unimolecular reactions

C. Bimolecular reactions

D. Pseudounimolecular reactions

Answer: d

Watch Video Solution

140. Which among the following is a false statement

A. Half life of a third order reaction is inversely proportional to the square of initial concentration of the reactant

B. Molecularity of a reaction may be zero or fractional

C. For a first order reaction $t_{1/2} = \frac{0.693}{K}$

D. Rate of zero order reaction is independent of initial concentration of reactant

Answer: b

Watch Video Solution

141. 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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142. The order of reaction is decided by

A. Pressure

B. Temperature

C. Molecularity

D. Relative concentration of reactants

Answer: d

Watch Video Solution

143. Which one of the following is wrongly matched

A. Saponification of $CH_3COOC_2H_5$ - Second order reaction

B. Hydrolysis of CH_3COOCH_3 - First order reaction

C. Decomposition of H_2O_2- First order reaction

D. Combination of H_2 and Br_2 to give HBr- Zero order reaction

Answer: d

View Text Solution

144. 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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145. For the reaction $A + B \rightarrow C + D$, if concentratiton of A is doubled without altering the concentration of B, the rate gets doubling, If the

concentration of B is increased by nine times without altering the concentration of A, the rate gas tripled. The order of reaction is

A. 2

B. 1

C. $3/2$

D. $4/3$

Answer: c

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

A. 0

B. 3

C. 1

D. 2

Answer: b

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147. For the decomposition of a compound AB at 600 K , the following data were obtained

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

The order for the decomposition of AB is

A. 0

B. 1

C. 2

D. 0.5

Answer: c

View Text Solution

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

$r = k[A]^0$

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

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

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

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

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

Answer: d

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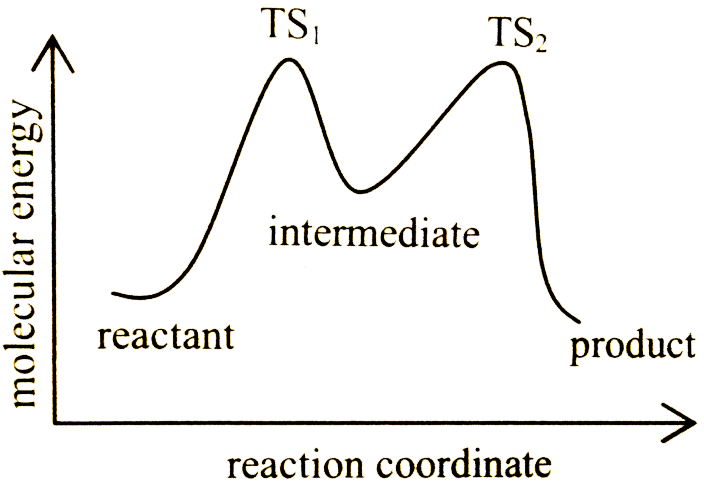
149. The following graph shows how $t_{1/2}$ (half-life) of a reactant R changes with the initial reactant concentration a_0 . The order of the reaction will be



A. 0

B. 1

C. 2

D. 3

Answer: c

View Text Solution

150. The activity of a sample of Ti(Z=22) decreased by 90% over a period of 10 years . The half life of the sample is

A. 5 years

B. 2 years

C. 3 years

D. 10 years

Answer: c

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151. 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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152. 75% of a first order reaction was completed in 32 min. When was 50% of the reaction completed ?

A. 24 min

B. 16 min

C. 8 min

D. 64 min

Answer: b

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153. Which of the statement (a)- (d) about the reaction profile below is false

A. The product is more stable than the reactant

B. The second step is rate determining

C. The reaction is exothermic

D. The equilibrium constant is greater than 1 if the molar entropy change is negligible

Answer: b

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154. Order of radioactive disintegration reaction is

A. Zero

B. First

C. Second

D. Third

Answer: b

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155. Which is correct about zero order reaction ?

A. Rate of reaction depends on decay constant

B. Rate of reaction is independent of concentration

C. Unit of rate constant is $\text{concentration}^{-1}$

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

Answer: b

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156. Decay of $_{92}U^{235}$ is .....order reaction.

A. zero

B. First

C. Second

D. Third

Answer: b

Watch Video Solution

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

A. 490 atm

B. 250 atm

C. 480 atm

D. 420 atm

Answer: a

Watch Video Solution

159. The decompostion of

$N_2O_{5\,(g)} \rightarrow NO_{3\,(g)}$

Proceeds as a first order reaction with a half-life period of 30 seconds at a certain temperature . If the initial concentration $[N_2O_5] = 0.4$ M , what is the rate constant of the reaction

A. $0.00924\,\text{sec}^{-1}$

B. $0.0231\,\text{sec}^{-1}$

C. $75\,\text{sec}^{-1}$

D. $12\,\text{sec}^{-1}$

Answer: b

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160. Cyclopropane rearranges to form propane :

$\Delta \rightarrow CH_3 - CH = CH_2$

This follows first order kinetics. The rate constant is $2.174 \times 10^{-3}\text{sec}^{-1}$.

The initial concentration of cyclopropane is $0.29M$. What will be the concentration of cyclopropane after 100 sec

A. 0.035 M

B. 0.22 M

C. 0.145 M

D. 0.0018 M

Answer: b

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161. Units of rate constant depend upon

A. Rate of reaction

B. Order of reaction

C. Molecularity of reaction

D. All of the above

Answer: b

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162. Which of these changes with time for a first-order reaction

A Rate of reaction B . Rate constant

C . Half-life

A. A only

B. C only

C. A and B only

D. B and C only

Answer: a

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163. In a reaction, the concentration of reactant is increased two times and three times than the increases in rate of reaction were four times and nine times respectively, order of reaction is

A. Zero

B. 1

C. 2

D. 3

Answer: c

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164. The order of the reaction occuring by following mechanism should be

(i) $A_2 \rightarrow A + A$ (fast) $(ii) A + B_2 \rightarrow AB + B$ (Slow)

(iii) A + B $\rightarrow$ (Fast)

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

B. $3\frac{1}{2}$

C. 2

D. None of these

Answer: a

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165. The alkaline hydrolysis of ethyl acetate is represented by the equation

$$CH_3COOC_2H_5 + NaOH \rightarrow CH_3COONa + C_2H_5OH$$

Experimentally it is found that for this reaction

$$\frac{dx}{dt} = k[CH_3COOC_2H_5][NaOH]$$

Then the reaction is

A. Bimolecular and of first order

B. Bimolecular and of second order

C. Pseudo-bimolecular

D. Pseudo- unimolecular

Answer: b

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

A. 6.932 min

B. 100 min

C. 0.6932×10^{-3} min

D. 0.6932×10^{-2} min

Answer: b

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167. Which of the following is not correct

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

B. N = N_(0)e^(-kt)`

C. $\frac{1}{N} - \frac{1}{N_0} = \ln k t_{1/2}$

D. None of these

Answer: c

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168. The decomposition of N_2O_5 occurs as, $2N_2O_5 \rightarrow 4NO_2 + O_2$ and follows I order kinetics, hence:

A. The reaction is unimolecular

B. The reaction is bimolecular

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

D. None of these

Answer: c

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169. Hydrolysis of DDT is a first order reaction , its half life is 10 years . Time to hydrolyse 10 g DDT to half is

A. 100 years

B. 50 years

C. 5 years

D. 10 years

Answer: d

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

A. Zero order reaction

B. First order reaction

C. Second order reaction

D. Third order reaction

Answer: b

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

A. 7

B. $1/49$

C. 49

D. 21

Answer: b

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172. For a first order reaction , rate constant is 0.6932hr^{-1} , then half-life for the reaction is

A. 0.01 hr

B. 1hr

C. 2hr

D. 10 hr

Answer: b

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173. Unit of K for third order reaction is

A. $\left(\frac{\text{litre}}{\text{mole}}\right)\text{sec}$

B. $\left(\frac{\text{mole}}{\text{litre}}\right)\text{sec}$

C. $\left(\frac{\text{litre}}{\text{mole}}\right)^{-1} \text{sec}^{-1}$

D. $\left(\frac{\text{mole}}{\text{litre}}\right)^{-1} \text{sec}^{-1}$

Answer: d

Watch Video Solution

174. A reaction is of the first order reaction to A and is of second order relative to B .what will be the effect on rate if the concentration of A and B are doubled

A. Velocity remains constant

B. 4 times

C. 2 times

D. 8 times

Answer: d

Watch Video Solution

175. The half-life period for a first order reaction is:

A. Proportional to concentration

B. Independent of concentration

C. Inversely proportional to concentration

D. Inversely proportional to the square of the concentration

Answer: b

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176. 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. 10 second

B. 100 second

C. 2303 second

D. 230.3 second

Answer: b

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

A. 1

B. 0

C. 3

D. 2

Answer: d

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

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

The reaction is

A. Zero order

B. First order

C. Second order

D. Third order

Answer: a

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179. By the overall order of a reaction , we mean

A. The number of concentration terms in the equation for the reaction

B. The sum of powers to which the concentration terms are raised in the velocity equation

C. The least number of molecules of the reactants needed for the reaction

D. The number of reactants which take part in the reaction

Answer: b

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

A. Zero

B. One

C. Two

D. None of these

Answer: b

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181. Integrated velocity equation for first order reaction is

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

B. $K = [A]_o e^{-A/t}$

C. $Kt = 2.303 \log \frac{[A]_o}{[A]}$

D. $\log \frac{[A]_o}{[A]} = -2.303Kt$

Answer: C

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182. Assertion. Average life of a radioactive element is that period in which $63\ \%$ of it is decayed.

Reason. Average life $\tau = 1.44\ \ t_{1/2}$.

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

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

C. If assertion is true but reason is false

D. If the assertion and reason both are false .

Answer: b

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183. Assertion : The hydrolysis of methyl acetate by dil. HCl is a pseudo first order reaction

Reason : HCl acts as a catalyst for the hydrolysis .

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

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

C. If assertion is true but reason is false

D. If the assertion and reason both are false .

Answer: b

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

Reason (R) : The order of a reaction cannot be written from balanced equation of a reaction.

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

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

C. If assertion is true but reason is false

D. If the assertion and reason both are false .

Answer: b

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185. Assertion : Molecularity greater than three is not observed.

Reason : The overall molecularity of complex reaction is equal to molecularity of the slowest step.

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

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

C. If assertion is true but reason is false

D. If the assertion and reason both are false .

Answer: b

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186. Assertion: Half-life period of a reaction of first order is independent of initial concentration.

Reason: Half-life period for a first order reaction $t_{1/2} = \frac{2.303}{K} \log 2.$

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

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

C. If assertion is true but reason is false

D. If the assertion and reason both are false .

Answer: a

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

A. 138.6 sec

B. 346. 5 sec

C. 693.0 sec

D. 238 . 6 sec

Answer: a

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188. The correct difference between first and second order reactions is that

A. The rate of a first order reaction does not depend on reactant concentration , the rate of a second order reaction does depend on reactant concentrations

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. A first order reaction can be catalyzed , a second order reaction cannot be catalyzed

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

A. Is halved

B. Is doubled

C. Is tripled

D. Remains unchanged

Answer: b

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Ordinary Thinking Collision Theory Energy Of Activation And Arrhenius Equation

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

A. Is always double of E_a

B. Is negative of E_a

C. Is always less than E_a

D. Can be less than or more than E_a

Answer: d

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2. For an endothermic reaction, energy of activation is E_a and enthalpy of reaction is ΔH (both of these in kJ/mol). Minimum value of E will be

A. Equal to zero

B. Less than ΔH

C. Equal to ΔH

D. More than ΔH

Answer: d

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

A. $\ln \frac{K_2}{K_1} = -\frac{E_a}{R}\left(\frac{1}{T_1} - \frac{1}{T_2}\right)$

B. $\ln \frac{K_2}{K_1} = \frac{E_a}{R}\left(\frac{1}{T_1} - \frac{1}{T_2}\right)$

C. $\ln \frac{K_2}{K_1} = -\frac{E_a}{R}\left(\frac{1}{T_1} + \frac{2}{T_1}\right)$

D. $\ln \frac{K_2}{K_1} = -\frac{E_a}{R}\left(\frac{1}{T_2} - \frac{1}{T_1}\right)$

Answer: bd

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

A. $\frac{\ln K}{T}$ vs. T

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

C. $\frac{T}{\ln K}$ vs. $\frac{1}{T}$

D. ln K vs. T

Answer: b

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5. According to law of photochemical equivalence the energy absorbed (in ergs/mole) is a given as (h = 6.62×10^{-27} ergs , c = $3 \times 10^{10} cms^{-1}$, $N_A = 6.02 \times 10^{23} mol^{-1}$)

A. $\frac{1.196 \times 10^4}{\lambda}$

B. $\frac{2.859 \times 10^5}{\lambda}$

C. $\frac{2.859 \times 10^{16}}{\lambda}$

D. $\frac{1.196 \times 10^{16}}{\lambda}$

Answer: a

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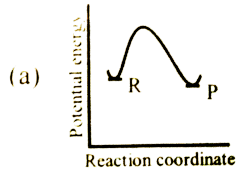
6. An endothermic reaction with high activation energy for the forward reaction is given by the diagram

A.



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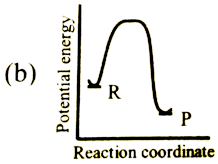

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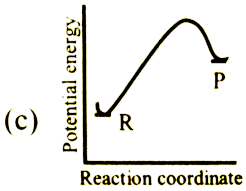
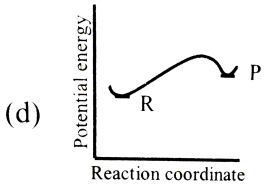


D.



Answer: c

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

A. $E_b < E_f$

B. $E_b > E_f$

C. $E_b = E_f$

D. There is no definite relation between E_b and E_f

Answer: a

Watch Video Solution

8. According to the adsorption theory of catalysis, the speed of the reaction increases because:

A. Adsorption produces heat which increases the speed of the reaction

B. Adsorption lowers the activation energy of the reaction

C. The concentration of reactant molecules at the active centres of the catalyst becomes high due to adsorption

D. In the process of adsorption , the activation energy of the molecules become large

Answer: b

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9. 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 colliding molecules will react

B. The energy below which colliding molecules will not react

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

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

Answer: b

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10. For a reaction taking place in three steps, the rate consatnt are $k_1, k_2 \text{ and } k_3$. The oveall constant $k = \frac{k_1 k_2}{k_3}$. If the energy of activation values of for the first, second and third stage are 40,50 and 60 kJ mol^{-1} is :

A. 30

B. 40

C. 60

D. 50

Answer: a

Watch Video Solution

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

A. 410 kJ mol^{-1}

B. $-110kJmol^{-1}$

C. 110 kJ mol^{-1}

D. $-410kJmol^{-1}$

Answer: b

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12. In the Arrhenius plot of ln k vs $\frac{1}{T}$, a linear plot is obtained with a slope of -2×10^4 K . The energy of activation of the reaction (in kJ mole^{-1}) is (R value is 8.3 J$K^{-1}mol^{-1}$)

A. 83

B. 166

C. 249

D. 332

Answer: b

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

A. The Free energy of activation is higher

B. The free energy of activation is lower

C. The entropy changes

D. The initial concentration of the reactants remains constant

Answer: b

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

A. The decrease in the number of collision

B. The increase in the number of activated molecules

C. The shortening of the mean free path

D. The lowering of the activation energy

Answer: b

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15. The minimum energy required for molecules to enter into the reaction is called

A. Potential energy

B. Kinetic energy

C. Nuclear energy

D. Activation energy

Answer: d

Watch Video Solution

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

A. 1842.4 R

B. 921.2 R

C. 460.6 R

D. 230.3 R

Answer: b

Watch Video Solution

17. On increasing the temperature, the rate of the reaction increases because of:

A. Decrease in the number of collisions

B. Decrease in the energy of activation

C. Decrease in the number of activated molecules

D. Increase in the number of effective collisions

Answer: d

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18. A reaction having equal energies of activation for forward and reverse reactions has

A. $\Delta H = 0$

B. $\Delta S = 0$

C. Zero order

D. None of these

Answer: a

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19. A reaction rate constant is given by : $K = 1.2 \times 10^{14} e^{\frac{-25000}{RT}} \sec^{-1}$. It means :

A. log k versus log T will give a straight line with slope as -25000

B. log k versus T will give a straight line with slope as -25000

C. log k versus log 1/T will give a straight line with slope -25000

D. log k versus 1/T will give a straight line

Answer: d

Watch Video Solution

20. The Arrhenius equation expressing the effect of temperature on the rate constant of a reaction is given as

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

B. $k = E_a/RT$

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

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

Answer: d

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

A. T

B. Z

C. E

D. P

Answer: c

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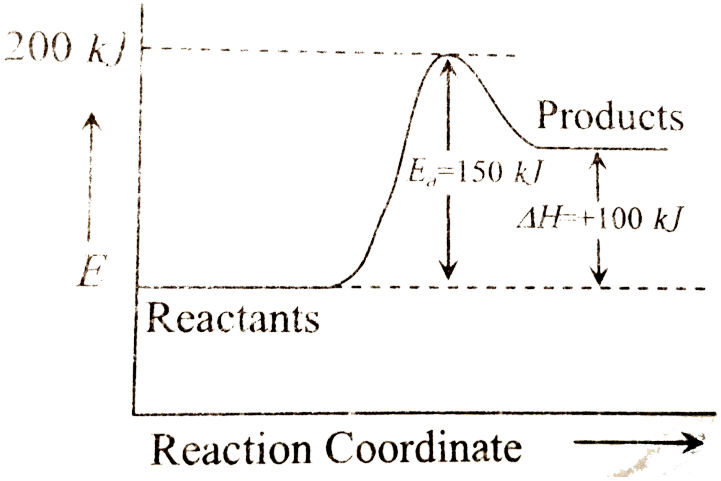
22. In the given graph the activation energy , E_a for the reverse reaction will be



A. 150 kJ

B. 50 kJ

C. 200 kJ

D. 100 kJ

Answer: b

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23. Catalyst in a reaction

A. Lowers the activation energy

B. Increases the rate of reaction

C. Both (a) and (b)

D. Initiates the reaction

Answer: c

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24. With respect to the equation, $k = Ae^{-\frac{E_a}{R}T}$ in chemical kinetics, which one of the following statements is correct?

A. k is equilibrium constant

B. A is adsorption factor

C. E_a is energy of activation

D. R is Rydberg's constant

Answer: c

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

A. 300

B. 120

C. 280

D. -20

Answer: d

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26. The reactions with low activation energy are always

A. Adiabatic

B. Slow

C. Non-spontaneous

D. Fast

Answer: d

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27. The minimum energy a molecule should possess in order to enter into a fruitful collision is known as:

A. Reaction energy

B. Collision energy

C. Activation energy

D. Threshold energy

Answer: D

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28. The reason for almost doubling the rate of reaction on increasing the temperature of the reaction system by $10^{\circ} C$ is :

A. The value of threshold energy increases

B. Collision frequency increases

C. The fraction of the molecules having energy equal to threshold energy or more increases

D. Activation energy decreases

Answer: c

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29. Why do most chemical reaction rates increase rapidly as the temperature rise ?

A. The fraction of molecules with kinetic energy greater than the activation energy increases rapidly with temperature

B. The average kinetic energy increases as temperature rises

C. The activation energy decreases as temperature rises

D. More collisions take place between particles so that the reaction can occur

Answer: A

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30. The rate of reactions exhibiting negative activation energy

A. Decreases with increasing temperature

B. Increases with the increasing temperature

C. Does not depend on temperature

D. Depends on the height of the potential barrier

Answer: a

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31. Which increases on increase of temperature

A. Energy of activation (E_a)

B. Collision frequency (Z)

C. Rate constant (k)

D. Both (b) and (c)

Answer: d

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32. For a reaction the activation energy $E_a = 0$ and the rate constant= $3.2 \times 10^6 \sec^{-1}$ at 300K. What is the value of rate constant at 310K?

A. $3.2 \times 10^{-12} s^{-1}$

B. $3.2 \times 10^{6} s^{-1}$

C. $6.4 \times 10^{12} s^{-1}$

D. $6.4 \times 10^{6} s^{-1}$

Answer: b

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33. Chemical reactions with very high E_a values are generally

A. Very fast

B. Very slow

C. Moderately fast

D. Spontaneous

Answer: B

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

A. 10^{-1}

B. 10^{-2}

C. 2×10^{-3}

D. 2×10^{-2}

Answer: a

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35. 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. $2.303 \times 10RkJmol^{-1}$

B. $2.303 \times 5RkJmol^{-1}$

C. $2.303 \times 3RkJmol^{-1}$

D. $2.303 \times 2.7RkJmol^{-1}$

Answer: d

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36. For a chemical reaction at $27^{\circ}C$, the activation energy is 600 R. The ratio of the rate constants at $327^{\circ}C$ to that of at $27^{\circ}C$ will be _____.

A. 2

B. 40

C. e

D. e^2

Answer: c

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37. A chemical reaction proceeds following the formula $k = Pze^{-E_a/RT}$

Which of the following processes will increase the rate of reaction

A. Lowering of E_a

B. Lowering of P

C. Lowering of Z

D. Independent of all the above factors

Answer: a

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38. Pick the appropriate choice about collision theory of reaction rates

A. It explains the effect of temperature on rate of reaction

B. It assumes that the reactants must be in correct orientation to react

C. It says rate depends upon the frequency at which reactants collide

D. The collision having energy higher than the threshold value give successful reaction

Answer: d

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

A. 15 KJ

B. 30 KJ

C. 68 KJ

D. 120 KJ

Answer: d

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

A. Collision of molecules is a precondition for any reactoni to occur

B. All collisions result in the formation of the products

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

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

Answer: b

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41. Energy of activation of a reactant is reduced by:

A. Increased temperature

B. Reduced temperature

C. Reduced pressure

D. Increased pressure

Answer: a

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42. Activation energy is:

A. The amount of energy to be added to the actual energy of a molecule so that the threshold energy is reached

B. The amount of energy the molecule must contains so that it reacts

C. The energy which a molecule should have in order to enter into an effective collision

D. The average kinetic energy of the molecule

Answer: A

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43. Arrhenius equation is:

A. $\frac{d\ln K}{dT} = \Delta E^* / RT$

B. $\frac{d\ln K}{dT} = \Delta E^* / RT^2$

C. $\frac{d\ln K}{dT} = -\Delta E^* / RT^2$

D. $\frac{d\ln K}{dT} = \Delta E^* / RT$

Answer: b

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44. Activation energy of any reaction depends on

A. Temperature

B. Nature of reactants

C. Number of collisions per unit time

D. Concentration of reactants

Answer: b

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

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

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

C. If assertion is true but reason is false .

D. If the assertion and reason both are false .

Answer: b

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Critical Thinking Objective Questions

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

A. Changing concentration of reactants

B. Evaluating rate constant at standard temperature

C. Evaluating rate constants at two different temperatures

D. Evaluating velocities of reaction at two different temperatures

Answer: c

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

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

B. k vs T

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

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

Answer: d

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3. The rate constant k , for the reaction $N_2O_5 \rightarrow 2NO_2(g) + \frac{1}{2}O_2(g)$ correspond to concentration of N_2O_5 initially and at time t .

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

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

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

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

Answer: d

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4. Which of the following is the fastest reaction

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

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

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

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

Answer: d

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

A. Photochemical change

B. Photocombustion

C. Chemiluminescence

D. None of the above

Answer: c

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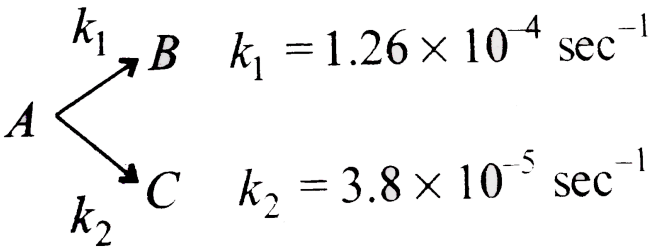
6. A substance undergoes first order decomposition. The decomposition follows two parallel first order reaction as :



The precentage distribution of B and C are :

A. 75% B and 25% C

B. 80% B and 20% C

C. 60% B and 40% C

D. 76.83% B and 23.17% C

Answer: d

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7. An example of photochemical reaction is

A. Darkening of silver chloride in light

B. Blackening of white lead upon prolonged exposure to air

C. Rusting of iron in moist air

D. Glowing of charcoal

Answer: a

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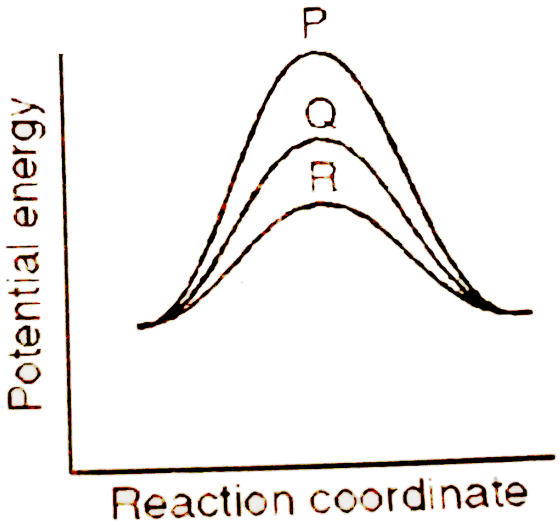
8. If a homogeneous catalytic reaction can take place through three alternative paths as depicted below, the catalytic efficiency of P,Q R representing the relative case would be



A. $P > Q > R$

B. $Q > P > R$

C. $P > R > Q$

D. $R > Q > P$

Answer: d

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

A. $E_1 > E_2$

B. $E_1 < E_2$

C. $E_1 = E_2$

D. ΔH is not related to E_1 and E_2

Answer: a

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10. 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. Second order

C. Unchanged , second order

D. Third order

Answer: a

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11. 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. $E_a = E_a$

C. $E_a < E_a$

D. $E_a = 4E_a$

Answer: c

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

A. 1

B. 2

C. 3

D. 0

Answer: a

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13. The intergrated rate equation is

$Rt = \log, C_0 - \log C_t$. The straight line graph is obtained by plotting:

A. time v/s log C_t

B. $\frac{1}{\text{time}}$ v/s C_t

C. time v/s C_t

D. $\frac{1}{\text{time}}$ v/s $\frac{1}{C_t}$

Answer: a

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14. In a reversible reaction , the enthalpy change and the activation energy in the forward direction are respectively $-xkJmol^{-1}$ and y kJ mol^{-1} is

A. y-x

B. (x + y)

C. (x-y)

D. $-x-y$

Answer: b

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

A. 2

B. 5

C. 3

D. 4

Answer: d

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16. At 300K,a gaseous reaction: $A \rightarrow B + C$ was found to follow first order kinetics. Starting with pure A,the total pressure at the end of 20 minutes was 100mm of Hg. The total pressure after the completion of the reaction is 180mm of Hg.The partial pressure of A (in mm of Hg) is

(A) 100 (B) 90

(C) 180 (D) 80

A. 100

B. 90

C. 180

D. 80

Answer: d

Watch Video Solution

17. 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: ad

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18. If we plot a graph between log K and $\frac{1}{T}$ by Arrhenius equation , the slope is

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

B. $+\frac{E_a}{R}$

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

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

Answer: c

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19. The activation energy of a reaction is $9.0kcal/mol.$

The increase in the rate consatnt when its temperature is increased from $298K$ to $308K$ is

A. 0.63

B. 0.5

C. 1

D. 0.1

Answer: a

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20. Among the following reactions, the fastest one is

A. Burning of coal

B. Rusting of iron in moist air

C. Conversion of monoclinic sulphur to rhombic sulphur

D. Precipitation of silver chloride by mixing of silver nitrate and sodium chloride solution

Answer: d

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Jee Section Only One Choice Correct Answer

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

A. Concentration of the reactant

B. Concentration of the product

C. Time

D. Temperature

Answer: d

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2. The half life of a first order reaction is 10 minutes. If initial amount is 0.08 mole/litre and concentration at some instant 't' is 0.01 mol/litre, then the value of 't' is :

A. 10 minutes

B. 30 minutes

C. 20 minutes

D. 40 minutes

Answer: b

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3. The rate of a gaseous reaction is given by the expression k [A] [B]. If the volume of the reaction vessel is suddenly reduced to $1/4th$ 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

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4. For the reaction $N_2(g) + 2H_2(g) \rightarrow 2NH_3(g)$ under certain conditions of temperature and partial pressure of the reactants , the rate of formation of NH_3 is $0.001 kgh^{-1}$. The rate of conversion of H_2 under the same conditions is

A. 1.82×10^{-4}kg/hr

B. 0.0015 kg/hr

C. 1.52×10^{4} kg/hr

D. 1.82×10^{-14} kg/hr

Answer: b

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5. The rate constant, the activation energy and the Arrhenius parameter of a chemical reaction at $25^{\circ}C$ are $3.0 \times 10^{-4} s^{-1}$, 104kJ mol^{-1} and

$6.0 \times 10^{14} s^{-1}$ respectively. The value of the rate constant as $T \to \infty$ is

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

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

C. Infinity

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

Answer: b

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6. For a first order reaction $A \to$ product the rate of reaction at [A] = $0.2 moll^{-1}$ is $1.0 \times 10^{-2} \min^{-1}$. The half life period for the reaction is

A. 832 s

B. 440 s

C. 416 s

D. 13.86 s

Answer: a

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

A. 1.4

B. 1.2

C. 0.04

D. 0.8

Answer: d

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

A. C

B. I

C. I^2

D. C.I.

Answer: b

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9. Conisder the chemical reaction

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

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

A. Rate = -d[N_2]/dt = $-1/3$ d [H_2] / dt = 1/2 [NH_3] /dt

B. Rate = $-d[N_2]$/dt = $-3d[H_2]$/dt = 3d $[NH_3]$/dt

C. Rate = d$[N_2]$ /dt = 1/3d$[H_2]$/dt = 1/2 d $[NH_3]$/dt

D. Rate = $-d[N_2]$/dt = $-d[H_2]$/dt = d$[NH_3]$/dt

Answer: c

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10. The reaction $X \to Y$ (Product) follows first order kinetics. In 40 minutes, the concentration of X changes from 0.1M to 0.025 M , then rate of reaction when concentration of X is 0.01M is :

A. $1.73 \times 10^{-4} M \min^{-1}$

B. $3.47 \times 10^{-5} M \min^{-1}$

C. $3.47 \times 10^{-4} M \min^{-1}$

D. $1.73 \times 10^{-5} M \min^{-1}$

Answer: c

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11. Which one the following statement for order of reactions is not correct ?

A. Order can be determined experimentally

B. Order of reaction is equal to sum of the powers of concentration terms in differential rate law

C. It is not affected with the stoichiometric coefficient of the reactants

D. Order cannot be fractional

Answer: d

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

A. 0

B. 1

C. 2

D. 3

Answer: d

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

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

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

B. $1.0 mol dm^{-3}$

C. $1.5 mol dm^{-3}$

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

Answer: a

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14. For a first order reaction $A \to P$, the temperature (T) dependent rate constant (k) was found to follow the equation $\log k = -2000(1/T) + 6.0$. The pre-exponential factor A and the activation energy E_a, respective, are

A. $1.0 \times 10^6 s^{-1}$ and $9.2 kJ mol^{-1}$

B. $6.0 s^{-1}$ and $16.6 kJ mol^{-1}$

C. $1.0 \times 10^6 s^{-1}$ and $16.6 kJ mol^{-1}$

D. $1.0 \times 10^6 s^{-1}$ and $38.3 kJ mol^{-1}$

Answer: d

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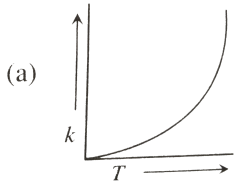
15. Plots showing the variation of the rate constant (k) with temperature (T) are given below. The plot that follows the Arrhenius equation is

A.



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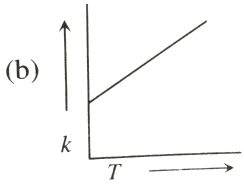
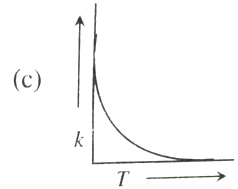
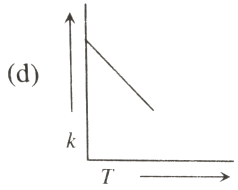


C.



D. 

Answer: a

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16. 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. $53.6kJmol^{-1}$

B. 48.6 kJ mol^{-1}

C. 58.5 kJ mol^{-1}

D. 60.5 kJ mol^{-1}

Answer: a

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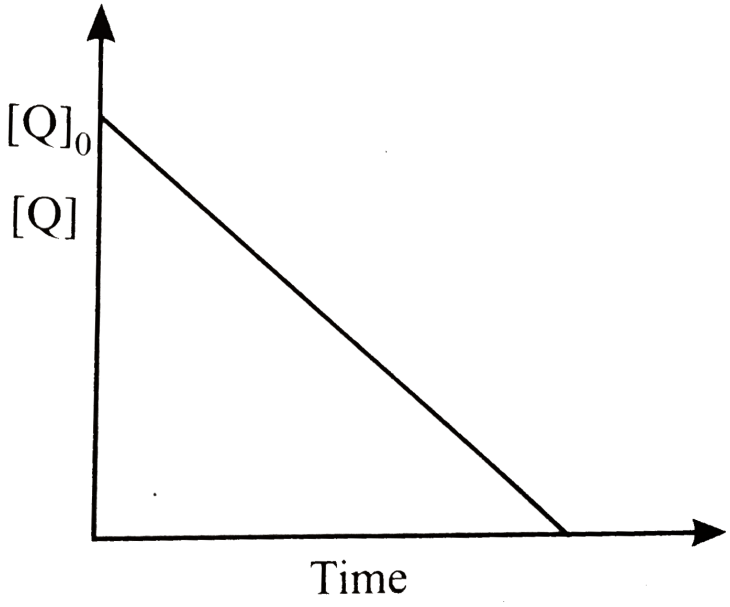
17. In the reaction, $P + Q \rightarrow R + S$

the time taken for $75\,\%$ reaction of P is twice the time taken for $50\,\%$ reaction of P. The concentration of Q varies with reaction time as shown in the figure. The overall order of the reaction is



A. 2

B. 3

C. 0

D. 1

Answer: d

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18. 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. 2

C. 2

D. 1

Answer: b

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19. For the non-stoichiometre reaction $2A + B \rightarrow C + D$, the following kinetic data were obtained in three separate experiments , all at 298 K

Initial Concentration (A)	Initial Concentration (B)	Initial rate of formation of C (mol L S)
$0.1\ M$	$0.1\ M$	1.2×10^{-3}
$0.1\ M$	$0.2\ M$	1.2×10^{-3}
$0.2\ M$	$0.1\ M$	2.4×10^{-3}

The rate law for the formation of C is

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

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

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

D. $\frac{dc}{dt} = k[A]$

Answer: d

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20. Higher order $(\ > 3)$ reaction are rare due to :

A. Low probability of simultaneous collision of all the reacting species

B. Increase in entropy and activation energy as more molecules are involved

C. Shifting of equilibrium towards reactants due to elastic collisions

D. Loss of active species on collision

Answer: a

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21. Decompsition of H_2O_2 follows a frist order reactions. In 50 min the concentrations of H_2O_2 decreases from 0.5 to 0.125 M in one such decomposition . When the concentration of H_2O_2 reaches 0.05 M, the rate of fromation of O_2 will be

A. $6.93 \times 10^{-4} mol \min^{-1}$

B. $2.66 L \min^{-1}$ at STP

C. $1.34 \times 10^{-2} mol \min^{-1}$

D. $6.93 \times 10^{-2} mol \min^{-1}$

Answer: a

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22. Two reactions R_2 and R_2 have identical pre - exponential factors. Activations enery of R_1 exceeds that of R_2 by 10 kJ mol_{-1}. If k_1 and k_2 are rate constants for rate constants for reactions R_1 and R_2 respectively at 300k, then In $\left(\frac{k_2}{k_1}\right)$ is equal to $\left(R = 8.314 J mol^{-1} K^{-1}\right)$

A. 12

B. 6

C. 4

D. 8

Answer: c

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23. At $518^{\circ}C$ the rate of decomposition of a sample of gaseous acetaldehyde initially at a pressure of 363 Torr, was $1.00T$ or rs^{-1} when $5\,\%$ had reacted and $0.5T$ or rs^{-1} when 33% had reacted. The order of the reaction is

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Jee Section More Than One Choice Correct Answer

1. A catalyst :

A. Increases the average kinetic energy of reacting molecules

B. Decreases the activation energy

C. Alters the reaction mechanism

D. Increases the frequency of collisions of reacting species

Answer: bc

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2. The rate law for the reaction

$RCl + NaOH(aq) \rightarrow ROH + NaCl$ is given by Rate $= K_1[RCl]$. The rate of the reaction will be

A. Doubled on doubling the concentration of sodium hydroxide

B. Halved on reducing the concentration of alkyl halide to one half

C. Increased on increasing the temperature of the reaction

D. Unaffected by increasing the temperature of the reaction.

Answer: bc

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3. For a first order reaction,

A. The degree of dissociation is equal to $\left(1 - e^{-kt}\right)$

B. A plot of reciprocal concentration of the reactant v/s time gives a straight line

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

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

Answer: ad

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4. The following statement(s) is (are) correct:

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

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

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

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

Answer: abd

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5. 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: abd

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6. According to the Arrhenius equation,

A. A high activation energy usually implies a fast reaction

B. Rate constant increases with increase in temperature . This is due to a greater number of collisions whose energy exceeds the activation energy

C. Higher the magnitude of activation energy , stronger is the temperature dependence of the rate constant

D. The pre-exponential factor is a measure of the rate at which collisions occur , irrespective of their energy

Answer: bcd

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7. In a bimolecular reaction, the steric factor P was experimentally determined to be 4.5. The correct options among the following is (are):

A. The activation energy of the reaction is unaffected by the value of the steric factor

B. Experimentally determined value of frequency factor is higher than that predicted by Arrhenius equation

C. The value of frequency factor predicted by Arrhenius equation is higher than that determined experimentally

D. Since P = 4.5 , the reaction will not proceed unless an effective catalyst is used

Answer: ab

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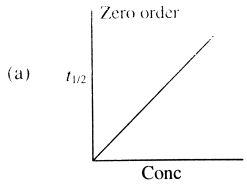
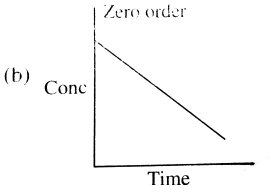
8. The correct plots among the following are

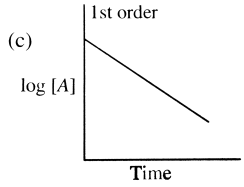
A.



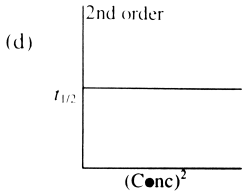
B.



C.



D.



Answer: abc

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Jee Section Reasoning Type Questions

1. Assertion (A): The rate of reaction increases generally by 2 to 3 times for every $10^{\circ} C$ rise in temperature.

Reason (R): An increase intemperature increases the colliison frequency.

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2. Statement 1 : The molecularity of the reaction $H_2 + Br_2 \rightarrow 2HBr$ is 2 .

Statement 2 : The order of the reaction is 3/2 .

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3. Assertion (A) : For: $aA + bB \rightarrow$ Product. The order of reaction is equal to $(a + b)$.

Reason (R): Rate of reaction $= k[A]^a[B]^b$.

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Jee Section Comprehension Type Questions

1. Keen observation of the rates of reaction about the series of steps leading to the formation of products is called the reaction mechanism . The reaction between H_2 and I_2 to form hydrogen iodide was originally postulated as a simple one step reaction

$H_2 + I_2 \rightarrow 2HI$

Rate = $k[H_2][I_2]$

but the formation of HI has been explained on the basis of the following mechanism

$$\begin{array}{lll} I_2 \longrightarrow 2I(\text{fast}) & ...(i) \\ H_2 + I \longrightarrow H_2I(\text{fast}) & ...(ii) \\ H_2I + I \longrightarrow 2HI(\text{slow}) & ...(iii) \\ \hline \text{overall} H_2 + I_2 \rightarrow 2HI \end{array}$$

For the reaction

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

the rate expressions can be written in the following ways

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

$-\frac{d[NO]}{dt} = k'_1 = [NO][H_2], -\frac{d[H_2]}{dt} = k''_1[NO][H_2]$

The relationship between k, k_1, k'_1, k''_1 is

A. $k = k_1 = k'_1 = k''_1$

B. $k = 2k_1 = k'_1 = k''_1$

C. $k = 2k'_1 = k_1 = k''_1$

D. $k = k_1 = k'_1 = 2k''_1$

Answer: b

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2. Keen observation of the rates of reaction about the series of steps leading to the formation of products is called the reaction mechanism . The reaction between H_2 and I_2 to form hydrogen iodide was originally postulated as a simple one step reaction

$H_2 + I_2 \rightarrow 2HI$

Rate = $k[H_2][I_2]$

but the formation of HI has been explained on the basis of the following mechanism

$$
\begin{array}{lll}
I_2 & \longrightarrow & 2I(\text{fast}) \quad ...(i) \\
H_2 + I & \longrightarrow & H_2I(\text{fast}) \quad ...(ii) \\
H_2I + I & \longrightarrow & 2HI(\text{slow}) \quad ...(iii) \\
\hline
\text{overall} H_2 + I_2 \rightarrow 2HI & &
\end{array}
$$

For the reaction $2NO_2 + F_2 \rightarrow 2NO_2F$

following mechanism has been provided

$NO_2 + F_2 \xrightarrow{\text{slow}} NO_2F + F$

$NO_2 + F \xrightarrow{\text{fast}} NO_2F$

Thus rate expression of the above reaction can be written as

A. $r = k[NO_2]^2[F_2]$

B. $r = k[NO_2]$

C. $r = k[NO_2][F_2]$

D. $r = k[F_2]$

Answer: c

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Jee Section Integer Type Questions

1. The concentration of R in the reaction $R \to P$ was measured as a function of time and the following data is obtained:

[R] (molar)	1. 0	0.75	0.4 0	0.1 0
t(min.)	0. 0	0.05	0.12	0.18

The order of the reaction is

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

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3. Following are two first order reaction with their half times given at $25^\circ C$.

$A \xrightarrow{t_{1/2}=30\,\text{min}}$ Products

$B \xrightarrow{t_{1/2}=40\,\text{min}}$ Products

The temperature coefficients of their reactions rates are 3 and 2, respectively, beween $25^\circ C$ and $35^\circ C$. IF the above two resctions are carried out taking $0.4M$ of each reactant but at different temperatures: $25^\circ C$ for the first order reaction and $35^\circ C$ for the second order reaction, find the ratio of the concentrations of A and B after an hour.

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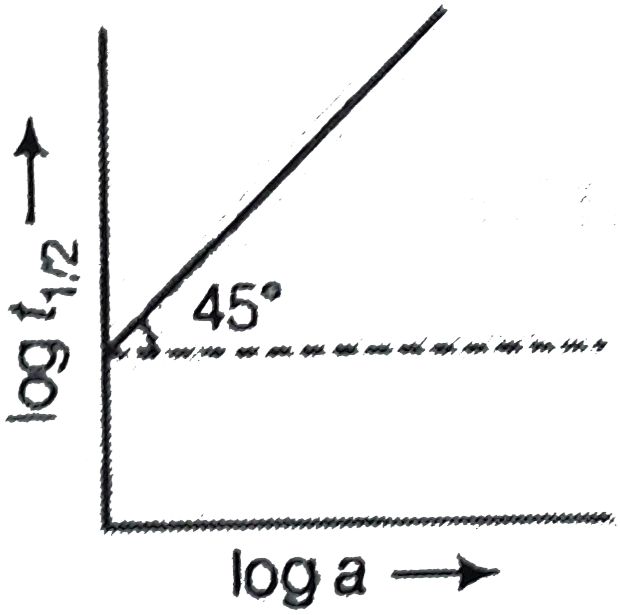
4. Following is the graph between log T_{50} and log a (a = initial concentration) for a given reaction at $27^\circ C$.



Hence, order is

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5. The rate constant (K) for the reaction, $2A + B \rightarrow$ Product was found to be $2.5 \times 10^{-5} litremol^{-1} \sec^{-1}$ after $15 \sec$, $2.60 \times 10^{-5} litremol^{-1} \sec^{-1}$ after 30 sec and $2.55 \times 10^{-5} litremol^{-1} \sec^{-1}$ after $50 \sec$. The order of reaction is:

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6. For a second order reaction , $t_{75\%} = xt_{50\%}$ find the value of x

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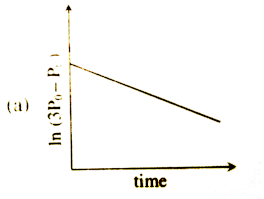
Jee Advanced 2018

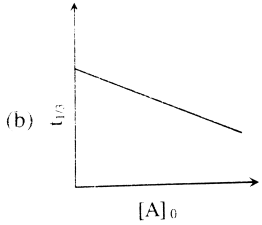
1. For a first order reaction $A(g) \rightarrow 2B(g) + C(g)$ at constant volume and 300 K, the total pressure at the beginning (t=0) and at time t ae P_0 and P_t respectively. Initially, only A is present with concentration $[A]_0$ and $t_{1/3}$ is the time required for the partial pressure of A to reach 1/3rd of its initial value. The correct options (s) is (are) :

(Assume that all these behave as ideal gases)

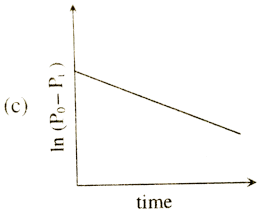
A.



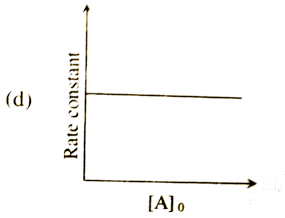
B.



C.



D.



Answer: ad

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