

[MHT-CET 2008]

1. After how many seconds will the concentration of the reactant in a first order reaction be halved if the rate constant is $1.155 \times 10^{-3} \text{ s}^{-1}$?
- a) 600 b) 100 c) 60 d) 10

[MHT-CET 2009]

2. Which is a correct integrated rate equation ?
- a) $k = -\frac{2.303}{t} \log \frac{a}{a-x}$ b) $k = \frac{-2.303}{t} \log \frac{a-x}{a}$
- c) $-d(a-x) = k dt$ d) All are integrated rate equations
3. For which order reaction, the unit of rate constant is time^{-1} ?
- a) Zero order b) First order c) Second order d) Third order

[MHT-CET 2011]

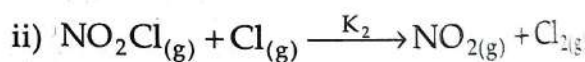
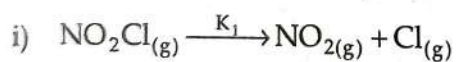
4. In a multistep reaction, the overall rate of reaction is equal to the
- a) rate of slowest step b) rate of fastest step
- c) average rate of various steps d) the rate of last step

[MHT-CET 2014]

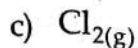
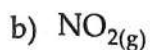
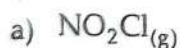
5. Rate law for the reaction $A + B \rightarrow \text{product}$ is $\text{rate} = k[A]^2[B]$. What is the rate constant if the rate of reaction at a given temperature is 0.22 Ms^{-1} , when $[A] = 1 \text{ M}$ and $[B] = 0.25 \text{ M}$?
- a) $3.52 \text{ M}^{-2}\text{s}^{-1}$ b) $0.88 \text{ M}^{-2}\text{s}^{-1}$ c) $1.136 \text{ M}^{-2}\text{s}^{-1}$ d) $0.05 \text{ M}^{-2}\text{s}^{-1}$

[MHT-CET 2016]

6. The reaction takes place in two steps as



Identify the reaction intermediate.



7. Average of reaction, $2\text{SO}_{2(g)} + \text{O}_{2(g)} \rightarrow 2\text{SO}_{3(g)}$ is written as

a) $\frac{\Delta[\text{SO}_2]}{\Delta t}$

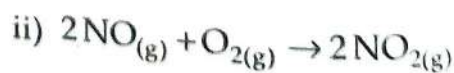
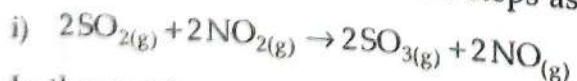
b) $-\frac{\Delta[\text{O}_2]}{\Delta t}$

c) $\frac{1}{2} \frac{\Delta[\text{SO}_2]}{\Delta t}$

d) $\frac{\Delta[\text{SO}_3]}{\Delta t}$

[MHT-CET 2018]

8. A certain reaction occurs in two steps as



In the reaction,

a) $\text{NO}_{2(g)}$ is intermediate

c) $\text{NO}_{(g)}$ is catalyst

b) $\text{NO}_{(g)}$ is intermediate

d) $\text{O}_{2(g)}$ is intermediate

9. For the elementary reaction $2\text{SO}_{2(g)} + \text{O}_{2(g)} \rightarrow 2\text{SO}_{3(g)}$, identify the correct among the following relations :

a) $\frac{+d[\text{SO}_{3(g)}]}{dt} = \frac{-2d[\text{O}_{2(g)}]}{dt}$

b) $\frac{+d[\text{SO}_{2(g)}]}{dt} = \frac{-d[\text{O}_{2(g)}]}{dt}$

c) $\frac{+1}{2} \frac{d[\text{SO}_{3(g)}]}{dt} = \frac{d[\text{SO}_{2(g)}]}{dt}$

d) $\frac{-d[\text{SO}_{2(g)}]}{dt} = \frac{-d[\text{SO}_{2(g)}]}{dt}$

10. For a chemical reaction rate law is, $\text{rate} = k [\text{A}]^2 [\text{B}]$. If $[\text{A}]$ is doubled at constant $[\text{B}]$, the rate of reaction.

a) increases by a factor of 4

b) increases by a factor of 3

c) increases by a factor of 8

d) increases by a factor of 2

11. For the elementary reaction, $3\text{H}_{2(g)} + \text{N}_{2(g)} \rightarrow 2\text{NH}_{3(g)}$ identify the correct relation among the following relations.

a) $\frac{-3}{2} \frac{d[\text{H}_{2(g)}]}{dt} = \frac{d[\text{NH}_{3(g)}]}{dt}$

b) $\frac{d[\text{H}_{3(g)}]}{dt} = \frac{-1}{3} \frac{d[\text{H}_{2(g)}]}{dt}$

c) $\frac{-2}{3} \frac{d[\text{H}_{2(g)}]}{dt} = \frac{d[\text{NH}_{3(g)}]}{dt}$

d) $\frac{-d[\text{H}_{2(g)}]}{dt} = \frac{d[\text{NH}_{3(g)}]}{dt}$

12. Consider the reaction $2\text{A} + 2\text{B} \rightarrow \text{C} + 2\text{D}$. If concentration of A is doubled at constant $[\text{B}]$, rate increases by a factor 4. If concentration of B is doubled at constant $[\text{A}]$ the rate is doubled. Rate law of the reaction is

a) $\text{rate} = k [\text{A}]^2 [\text{B}]$ b) $\text{rate} = k [\text{A}] [\text{B}]^2$ c) $\text{rate} = k [\text{A}]^2 [\text{B}]^2$ d) $\text{rate} = k [\text{A}] [\text{B}]$

13. If the rate of reaction is expressed as, $-\frac{1}{3} \frac{d[\text{A}]}{dt} = -\frac{1}{2} \frac{d[\text{B}]}{dt} = \frac{d[\text{C}]}{dt}$, the reaction is

a) $2\text{A} + 2\text{B} \rightarrow \text{C}$ b) $2\text{B} \rightarrow 3\text{A} + \text{C}$ c) $2\text{B} + \text{C} \rightarrow 3\text{A}$ d) $3\text{A} \rightarrow 2\text{B} + \text{C}$

14. $\text{A} \rightarrow \text{B}$ is first order reaction with rate equal to $6.6 \times 10^{-5} \text{ M s}^{-1}$. When $[\text{A}]$ is 0.6 M, rate constant of the reaction is

a) $9 \times 10^{-5} \text{ s}^{-1}$ b) $9 \times 10^{-4} \text{ s}^{-1}$ c) $1.1 \times 10^{-4} \text{ s}^{-1}$ d) $1.1 \times 10^{-5} \text{ s}^{-1}$

[MHT-CET 2020]

15. In the reaction $\text{N}_2 + 3\text{H}_2 \rightarrow 2\text{NH}_3$, the rate of disappearance of H_2 is 0.02 M/s. The rate of appearance of NH_3 is

a) 0.0133 M/s b) 0.004 M/s c) 0.032 M/s d) 0.023 M/s

16. The rate law for the reaction $2\text{NO}_{(g)} + \text{O}_{2(g)} \rightarrow 2\text{NO}_{2(g)}$ is $\text{rate} = k [\text{NO}]^2 [\text{O}_2]$, then which among the following statements is correct ?

a) The reaction is first order in O_2 , first order in NO and second order overall.

b) The reaction is second order in NO, zero order in O_2 and second order overall.

c) The reaction is second order in NO, first order in O_2 and third order overall.

d) The reaction is zero order overall.

Chemical Kinetics

17. The rate law for the reaction $A + B + C \rightarrow \text{Product}$ is expressed as $\text{Rate} = k [A]^2 [B] [C]$. What is the overall order of the reaction?
 a) 3 b) 1 c) 2 d) 0
18. If concentration of reactant 'A' is increased by 10 times, the rate of reaction becomes 100 times. What is the order of reaction if rate law is $\text{rate} = k [A]^x$?
 a) 2 b) 1 c) 3 d) 4
19. For the reaction $2\text{NOBr(g)} \rightarrow 2\text{NO(g)} + \text{Br}_2\text{(g)}$, rate law is $r = k [\text{NOBr}]^2$. If rate constant is $1.62 \text{ M}^{-1}\text{s}^{-1}$ and concentration of NOBr is $2.00 \times 10^{-3} \text{ M}$, what is the rate of reaction?
 a) $2.46 \times 10^{-6} \text{ M s}^{-1}$ b) $5.24 \times 10^{-6} \text{ M s}^{-1}$ c) $6.48 \times 10^{-6} \text{ M s}^{-1}$ d) $4.05 \times 10^{-5} \text{ M s}^{-1}$
20. In the reaction $2\text{SO}_2 + \text{O}_2 \rightarrow 2\text{SO}_3$ the rate of appearance of SO_3 is $4 \times 10^{-4} \text{ M/s}$, the rate of disappearance of O_2 is
 a) $1.0 \times 10^{-4} \text{ M/s}$ b) $4.0 \times 10^{-4} \text{ M/s}$ c) $2.0 \times 10^{-4} \text{ M/s}$ d) $6.0 \times 10^{-4} \text{ M/s}$
21. What is the average rate of reaction when the change in concentration of product is 0.05 M in 20 seconds?
 a) 4.0 M/s b) 0.05 M/s c) 0.0025 M/s d) 1.0 M/s
22. In the reaction $A + B_2 \rightarrow AB + B$, the rate of reaction is directly proportional to the concentration of A and independent of the concentration of B_2 . What is the rate law expression?
 a) $\text{rate} = k [A]$ b) $\text{rate} = k [B_2]$ c) $\text{rate} = k [A][B_2]$ d) $\text{rate} = k [A]^2 [B_2]$
23. The rate for a reaction is $r_1 = k[A]^a[B]^b$. If the concentration of A is doubled and that of B is halved, the new rate is r_2 . Then what is the ratio of r_2/r_1 ?
 a) $2^{(a-b)}$ b) $a-b$ c) $a+b$ d) $\frac{1}{2^{(a+b)}}$
24. The reaction $2\text{NO}_2\text{Cl(g)} \rightarrow 2\text{NO}_2\text{(g)} + \text{Cl}_2\text{(g)}$ takes place in two steps as
 i) $\text{NO}_2\text{Cl(g)} \rightarrow \text{NO}_2\text{(g)} + \text{Cl(g)}$ ii) $\text{NO}_2\text{Cl(g)} + \text{Cl(g)} \rightarrow \text{NO}_2\text{(g)} + \text{Cl}_2\text{(g)}$
 Identify the reaction intermediate.
 a) $\text{NO}_2\text{(g)}$ b) $\text{NO}_2\text{Cl(g)}$ c) Cl(g) d) $\text{Cl}_2\text{(g)}$
25. In the reaction $2\text{SO}_2\text{(g)} + \text{O}_2\text{(g)} \rightarrow 2\text{SO}_3\text{(g)}$, the rate of disappearance of SO_2 is $1.28 \times 10^{-5} \text{ M/s}$. What is the rate of appearance of SO_3 ?
 a) $2.56 \times 10^{-5} \text{ M/s}$ b) $1.25 \times 10^{-5} \text{ M/s}$ c) $0.64 \times 10^{-5} \text{ M/s}$ d) $0.32 \times 10^{-5} \text{ M/s}$
26. In a reaction $\text{N}_2\text{(g)} + 3\text{H}_2\text{(g)} \rightarrow 2\text{NH}_3\text{(g)}$, if the rate of disappearance of N_2 is $2.6 \times 10^{-4} \text{ M/s}$, the rate of disappearance of H_2 in M/s is
 a) $8.6 \times 10^{-4} \text{ M/s}$ b) $5.2 \times 10^{-4} \text{ M/s}$ c) $2.6 \times 10^{-4} \text{ M/s}$ d) $7.8 \times 10^{-4} \text{ M/s}$
27. Reaction given below follows first order kinetics: $2\text{N}_2\text{O}_2 \rightarrow 4\text{NO}_2 + \text{O}_2$. Calculate rate constant of reaction if concentration of N_2O_2 is 0.05 M and rate of reaction is $1.5 \times 10^{-6} \text{ mol L}^{-1} \text{ s}^{-1}$.
 a) $2.5 \times 10^{-5} \text{ s}^{-1}$ b) $3.0 \times 10^{-5} \text{ s}^{-1}$ c) $1.5 \times 10^{-5} \text{ s}^{-1}$ d) $2.0 \times 10^{-5} \text{ s}^{-1}$
28. Consider the reaction: $2\text{N}_2\text{O}_5\text{(g)} \rightarrow 4\text{NO}_2\text{(g)} + \text{O}_2\text{(g)}$. What is the rate of reaction when the concentration of NO_2 increases to $5.2 \times 10^{-3} \text{ M}$ in 100 sec?
 a) $2 \times 10^{-5} \text{ M/s}$ b) $7.6 \times 10^{-4} \text{ M/s}$ c) $5 \times 10^{-4} \text{ M/s}$ d) $1.3 \times 10^{-5} \text{ M/s}$

29. For the reaction $2A + B \longrightarrow 3C + D$, which among the following is NOT the correct rate law expression ?

a) $-\frac{d[A]}{2dt}$ b) $-\frac{d[B]}{dt}$ c) $\frac{d[D]}{dt}$ d) $-\frac{d[C]}{3dt}$

[MHT-CET 2021]

30. The rate law for a reaction between reactants A, B and C is $r = k [A] [B] [C]^2$. If concentration of C is doubled then new rate of reaction

a) decreases by $\frac{1}{2}$ b) increases 4 times c) increases 2 times d) increases 8 times

31. For a reaction $r = k[A]^2 [B]$, if concentration of A is doubled then rate of reaction

a) decreases by $\frac{1}{2}$ b) increases by 2 c) increases by 4 d) decreases by 4

32. For the reaction $N_{2(g)} + 3H_{2(g)} \longrightarrow 2NH_{3(g)}$, what is relation between $\frac{d[N_2]}{dt}$ and $\frac{d[NH_3]}{dt}$?

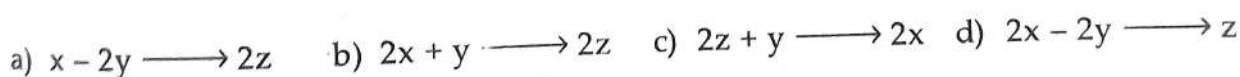
a) $\frac{d[NH_3]}{dt} = \frac{1}{2} \frac{d[N_2]}{dt}$

b) $3 \frac{d[NH_3]}{dt} = \frac{d[N_2]}{dt}$

c) $\frac{d[NH_3]}{dt} = 2 \frac{d[N_2]}{dt}$

d) $\frac{d[NH_3]}{dt} = \frac{d[N_2]}{dt}$

33. Instantaneous rate of a reaction is $-\frac{1}{2} \frac{d[x]}{dt} = -\frac{d[y]}{dt} = \frac{1}{2} \frac{d[z]}{dt}$, identify the reaction.



34. For the reaction $2NO + Cl_2 \rightarrow 2NOCl$

What is the relation between $\frac{d[NO]}{dt}$ and $\frac{d[NOCl]}{dt}$?

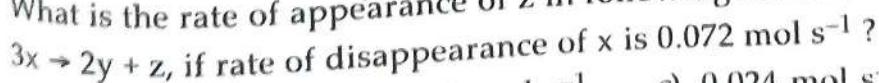
a) $\frac{d[NO]}{dt} = 2 \frac{d[NOCl]}{dt}$

b) $\frac{d[NO]}{dt} = \frac{d[NOCl]}{dt}$

c) $\frac{1}{4} \frac{d[NO]}{dt} = \frac{d[NOCl]}{dt}$

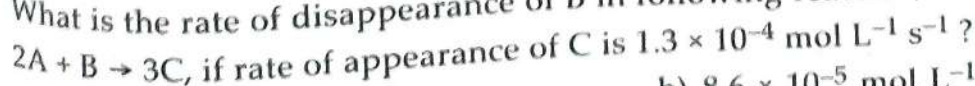
d) $4 \frac{d[NO]}{dt} = \frac{d[NOCl]}{dt}$

35. What is the rate of appearance of z in following reaction



a) 0.072 mol s^{-1} b) 0.048 mol s^{-1} c) 0.024 mol s^{-1} d) 0.096 mol s^{-1}

36. What is the rate of disappearance of B in following reaction,



a) $4.33 \times 10^{-5} \text{ mol L}^{-1} \text{ s}^{-1}$ b) $8.6 \times 10^{-5} \text{ mol L}^{-1} \text{ s}^{-1}$
c) $2.6 \times 10^{-4} \text{ mol L}^{-1} \text{ s}^{-1}$ d) $5.2 \times 10^{-5} \text{ mol L}^{-1} \text{ s}^{-1}$

[MHT-CET 2022]

The instantaneous rate for reaction $2A + B \rightarrow C + 3D$, is given by

- a) $\frac{1}{3} \frac{d[D]}{dt}$ b) $\frac{1}{2} \frac{d[A]}{dt}$ c) $\frac{d[A]}{dt}$ d) $\frac{d[B]}{dt}$

Rate law equation for a reaction is $r = k [x] [y]$, rate of reaction doubles when

- a) conc. of x is doubled and conc. of y is kept constant
b) conc. of both x and y is doubled
c) conc. of x is kept constant and conc. of y is halved
d) conc. of y is doubled and conc. of x is halved

Identify the correct expression for rate of following reaction.



- a) $-\frac{d[NO_2]}{dt}$ b) $-\frac{1}{2} \frac{d[N_2O_5]}{dt}$ c) $\frac{1}{2} \frac{d[N_2O_5]}{dt}$ d) $\frac{1}{4} \frac{d[O_2]}{dt}$

The rate law for a reaction between reactants A, B and C is $r = k[A][B][C]^2$. If concentration of A is halved, then rate of reaction

- a) remains the same b) increases 2 times
c) decreases $\frac{1}{2}$ times d) increases $\frac{1}{2}$ times

For a reaction $2A + B \rightarrow 2C$, rate of disappearance of A is $0.076 \text{ mol dm}^{-3} \text{ s}^{-1}$. What is the rate of disappearance of B ?

- a) $0.076 \text{ mol dm}^{-3} \text{ s}^{-1}$ b) $0.038 \text{ mol dm}^{-3} \text{ s}^{-1}$
c) $0.152 \text{ mol dm}^{-3} \text{ s}^{-1}$ d) $0.114 \text{ mol dm}^{-3} \text{ s}^{-1}$

What is order of reaction if unit of rate constant is s^{-1} ?

- a) 1 b) 2 c) 3 d) 0

Rate of a chemical reaction can be expressed in terms of

- a) rate of formation of products only.
b) rate of consumption of reactant only.
c) rate of consumption of catalyst.
d) rate of consumption of reactant and formation of product.

If rate of reaction is given as $\frac{1}{3} \frac{d[x]}{dt} = -\frac{1}{2} \frac{d[y]}{dt} = -\frac{d[z]}{dt}$, the reaction can be represented as

- a) $2y \rightarrow 3x + z$ b) $3x + 2y \rightarrow z$ c) $3x \rightarrow 2y + z$ d) $2y + z \rightarrow 3x$

Which among the following reactions is an example having overall order of reaction two ?

- a) $C_2H_5I(g) \longrightarrow C_2H_4(g) + HI(g)$ b) $2H_2O_2(l) \longrightarrow 2H_2O(l) + O_2(g)$
c) $CH_3CHO(g) \longrightarrow CH_4(g) + CO(g)$ d) $NO_2(g) + CO(g) \longrightarrow NO(g) + CO_2(g)$

[MHT-CET 2017]

Which among the following reactions is an example of pseudo first order reaction ?

- a) Inversion of cane sugar
b) Decomposition of H_2O_2
c) Conversion of cyclopropane to propene
d) Decomposition of N_2O_5

The rate constant for a first order reaction is $7.0 \times 10^{-4} \text{ s}^{-1}$. If initial concentration of reactant is 0.080 M, what is the half-life of reaction ?

- a) 990 s
b) 79.2 s
c) 12375 s
d) $10.10 \times 10^{-4} \text{ s}$

[MHT-CET 2019]

The integrated rate equation for first order reaction, $\text{A} \rightarrow \text{Product}$, is

- a) $k = 2.303 t \log_{10} \frac{[\text{A}]_0}{[\text{A}]_t}$
b) $k = -\frac{1}{t} \ln \frac{[\text{A}]_t}{[\text{A}]_0}$
c) $k = \frac{2.303}{t} + \log_{10} \frac{[\text{A}]_0}{[\text{A}]_t}$
d) $k = \frac{1}{t} \ln \frac{[\text{A}]_t}{[\text{A}]_0}$

If the half-life period of a first order reaction is 200 minutes, the rate constant will be

- a) $9.605 \times 10^{-2} \text{ min}^{-1}$
b) $3.465 \times 10^{-3} \text{ min}^{-1}$
c) $1.374 \times 10^{-3} \text{ min}^{-1}$
d) 288.6 min^{-1}

[MHT-CET 2020]

Half-life of first order reaction is 20 minutes. What is the time taken to reduce the initial concentration of the reactant to $\frac{1}{10}$ th ?

- a) 66.56 min
b) 6.6 min
c) 150 min
d) 79.68 min

The half - life of a first order reaction is 6.0 hours. How long will it take for the concentration of reactant to decrease from 0.4 M to 0.12 M ?

- a) 10.42 h
b) 9.51 h
c) 30.36 h
d) 4.25 h

For the first order reaction $\text{A} \rightarrow \text{B}$, the rate constant is 0.25 s^{-1} , if the concentration of A is reduced to half, the value of rate constant will be

- a) 0.25 s^{-1}
b) 0.30 s^{-1}
c) 2.25 s^{-1}
d) 0.075 s^{-1}

The rate constant for first order reaction is 0.02232 min^{-1} . Calculate the time required for 75 % completion of the reaction.

- a) 62.12 min
b) 38.31 min
c) 48.12 min
d) 12.77 min

For first order reaction the slope of the graph of $\log_{10}[\text{A}]_t$ Vs. time is equal to

- a) k
b) -k
c) $-\frac{k}{2.303}$
d) $\frac{k}{2.303}$

A first order reaction has rate constant $1 \times 10^{-2} \text{ s}^{-1}$. What time will it take for 20 g of reactant to reduce to 5 g ?

- a) 138.6 s
b) 238.6 s
c) 693.0 s
d) 346.5 s

What is the value of rate constant of first order reaction, if it takes 15 minutes for consumption of 20% of reactants ?

- a) $1.07 \times 10^{-2} \text{ min}^{-1}$
b) $1.48 \times 10^{-2} \text{ min}^{-1}$
c) $1.84 \times 10^{-2} \text{ min}^{-1}$
d) $1.38 \times 10^{-2} \text{ min}^{-1}$