Multiple Choice Q

[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 $1.155 \times 10^{-3} s^{-1}$?
   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 → product is 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] = 1M and [B] = 0.25 M
   a) 3.52 $M^{-2}s^{-1}$ b) 0.88 $M^{-2}s^{-1}$ c) 1.136 $M^{-2}s^{-1}$ d) 0.05 $M^{-2}s^{-1}$

[MHT-CET 2016]

6. The reaction takes place in two steps as
   i) $NO_2Cl_{(g)} \xrightarrow{K_1} NO_{2(g)} + Cl_{(g)}$ ii) $NO_2Cl_{(g)} + Cl_{(g)} \xrightarrow{K_2} NO_{2(g)} + Cl_{2(g)}$
   Identify the reaction intermediate.
   a) $NO_2Cl_{(g)}$ b) $NO_{2(g)}$ c) $Cl_{2(g)}$ d) $Cl_{(g)}$

7. Average of reaction, $2SO_{2(g)} + O_{2(g)} \rightarrow 2\,SO_{3(g)}$ is written as
   a) $\frac{\Delta[SO_2]}{\Delta t}$ b) $-\frac{\Delta[O_2]}{\Delta t}$ c) $\frac{1}{2}\frac{\Delta[SO_2]}{\Delta t}$ d) $\frac{\Delta[SO_3]}{\Delta t}$

[MHT-CET 2018]

8. A certain reaction occurs in two steps as
   i) $2SO_{2(g)} + 2NO_{2(g)} \rightarrow 2SO_{3(g)} + 2NO_{(g)}$ ii) $2NO_{(g)} + O_{2(g)} \rightarrow 2NO_{2(g)}$
   In the reaction,
   a) $NO_{2(g)}$ is intermediate b) $NO_{(g)}$ is intermediate
   c) $NO_{(g)}$ is catalyst d) $O_{2(g)}$ is intermediate

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

a) $\frac{+d[SO_{3(g)}]}{dt} = \frac{-2d[O_{2(g)}]}{dt}$

b) $\frac{+d[SO_{2(g)}]}{dt} = \frac{-d[O_{2(g)}]}{dt}$

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

d) $\frac{-d[SO_{2(g)}]}{dt} = \frac{-d[SO_{2(g)}]}{dt}$

10. For a chemical reaction rate law is, rate = $k\,[A]^2\,[B]$. If [A] is doubled at constant [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, $3\,H_{2(g)} + N_{2(g)} \rightarrow 2\,NH_{3(g)}$ identify the correct relation among the following relations.

a) $\frac{-3}{2}\frac{d[H_{2(g)}]}{dt} = \frac{d[NH_{3(g)}]}{dt}$

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

c) $\frac{-2}{3}\frac{d[H_{2(g)}]}{dt} = \frac{d[NH_{3(g)}]}{dt}$

d) $\frac{-d[H_{2(g)}]}{dt} = \frac{d[NH_{3(g)}]}{dt}$

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

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

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

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

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

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

[MHT-CET 2020]

15. In the reaction $N_2 + 3H_2 \longrightarrow 2NH_3$, 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 $2NO_{(g)} + O_{2(g)} \longrightarrow 2NO_{2(g)}$ is rate = $k\,[NO]^2\,[O_2]$, 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.

17. The rate law for the reaction A + B + C → Product is expressed as Rate = k [A]^2 [B]^1 [C]^0. 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 rate = k [A]^x ?
a) 2 b) 1 c) 3 d) 4

19. For the reaction $2NOBr_{(g)} \rightarrow 2\,NO_{(g)} + Br_{2(g)}$, rate law is r = k [NOBr]^2. If rate constant is 1.62 $M^{-1}s^{-1}$ and concentration of NOBr is 2.00×10^{-3}M, what is the rate of reaction ?
a) 2.46×10^{-6} M s^{-1} b) 5.24×10^{-6} M s^{-1} c) 6.48×10^{-6} M s^{-1} d) 4.05×10^{-5} M s^{-1}

20. In the reaction $2SO_2 + O_2 \rightarrow 2SO_3$ the rate of appearance of SO_3 is 4×10^{-4} M/s, the rate of disappearance of O_2 is
a) 1.0×10^{-4} M/s b) 4.0×10^{-4} M/s c) 2.0×10^{-4} M/s d) 6.0×10^{-4} 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 $A + B_2 \longrightarrow AB + B$, 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) rate = k [A] b) rate = k [B_2] c) rate = k[A][B_2] d) 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 $2NO_2Cl_{(g)} \longrightarrow 2NO_{2(g)} + Cl_{2(g)}$ takes place in two steps as
i) $NO_2Cl_{(g)} \longrightarrow NO_{2(g)} + Cl_{(g)}$ ii) $NO_2Cl_{(g)} + Cl_{(g)} \longrightarrow NO_{2(g)} + Cl_{2(g)}$
Identify the reaction intermediate.
a) $NO_{2(g)}$ b) $NO_2Cl_{(g)}$ c) $Cl_{(g)}$ d) $Cl_{2(g)}$

25. In the reaction $2SO_{2(g)} + O_{2(g)} \rightarrow 2SO_{3(g)}$, the rate of disappearance of SO_2 is 1.28×10^{-5} M/s. What is the rate of appearance of SO_3 ?
a) 2.56×10^{-5} M/s b) 1.25×10^{-5} M/s c) 0.64×10^{-5} M/s d) 0.32×10^{-5} M/s

26. In a reaction $N_{2(g)} + 3H_{2(g)} \longrightarrow 2NH_{3(g)}$, if the rate of disappearance of N_2 is 2.6×10^{-4} M/s, the rate of disappearance of $H_{2(g)}$ in M/s is
a) 8.6×10^{-4} M/s b) 5.2×10^{-4} M/s c) 2.6×10^{-4} M/s d) 7.8×10^{-4} M/s

27. Reaction given below follows first order kinetics : $2\,N_2O_2 \rightarrow 4NO_2 + O_2$
Calculate rate constant of reaction if concentration of N_2O_2 is 0.05 M and rate of reaction is 1.5×10^{-6} mol L^{-1} s^{-1}.
a) 2.5×10^{-5} s^{-1} b) 3.0×10^{-5} s^{-1} c) 1.5×10^{-5} s^{-1} b) 2.0×10^{-5} s^{-1}

28. Consider the reaction ; $2N_2O_{5(g)} \longrightarrow 4NO_{2(g)} + O_{2(g)}$. What is the rate of reaction when the concentration of NO_2 increases to 5.2×10^{-3} M in 100 sec. ?
a) 2×10^{-5} M/s b) 7.6×10^{-4} M/s c) 5×10^{-4} M/s d) 1.3×10^{-5} 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.

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

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
$3x \rightarrow 2y + z$, if rate of disappearance of x is 0.072 mol s^{-1} ?
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,
$2A + B \rightarrow 3C$, if rate of appearance of C is 1.3×10^{-4} mol L^{-1} s^{-1} ?
a) 4.33×10^{-5} mol L^{-1} s^{-1} b) 8.6×10^{-5} mol L^{-1} s^{-1}
c) 2.6×10^{-4} mol L^{-1} s^{-1} d) 5.2×10^{-5} mol L^{-1} 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.

$2N_2O_{5(g)} \longrightarrow 4NO_{2(g)} + O_{2(g)}$

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 mol dm^{-3} s^{-1}. What is the rate of disappearance of B ?

a) 0.076 mol dm^{-3} s^{-1}

b) 0.038 mol dm^{-3} s^{-1}

c) 0.152 mol dm^{-3} s^{-1}

d) 0.114 mol dm^{-3} 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) $2H_2O_{2(l)} \longrightarrow 2H_2O_{(l)} + O2_{(g)}$

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 $7.0 \times 10^{-4}\ s^{-1}$. 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) 10.10×10^{-4} s

[MHT-CET 2019]

The integrated rate equation for first order reaction, A → Product, is

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

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

a) $9.605 \times 10^{-2}\ min^{-1}$
b) $3.465 \times 10^{-3}\ min^{-1}$
c) $1.374 \times 10^{-3}\ min^{-1}$
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 A → 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 $\log_{10}[A]_t$ 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 $1 \times 10^{-2}\ s^{-1}$. 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) $1.07 \times 10^{-2}\ min^{-1}$
b) $1.48 \times 10^{-2}\ min^{-1}$
c) $1.84 \times 10^{-2}\ min^{-1}$
d) $1.38 \times 10^{-2}\ min^{-1}$