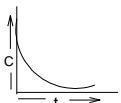
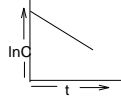
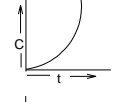
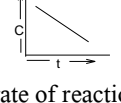


CHEMICAL KINETICS-MCQ

1. Chemical kinetics, a branch of physical chemistry, deals with:
 - a) heat changes in a reaction
 - b) physical changes in a reaction
 - c) rates of reactions
 - d) structure of molecules
2. The rate and which a substance reacts depends upon it:
 - a) atomic mass
 - b) equivalent mass
 - c) molecular mass
 - d) active mass
3. 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
4. For the reaction, $N_2 + 3H_2 \longrightarrow 2NH_3$, rate is expressed as:
 - a) $-3 \frac{d[N_2]}{dt} = -\frac{d[H_2]}{dt} = \frac{3}{2} \frac{d[NH_3]}{dt}$
 - b) $-\frac{d[N_2]}{dt} = -\frac{1}{3} \frac{d[H_2]}{dt} = \frac{1}{2} \frac{d[NH_3]}{dt}$
 - c) $-\frac{d[N_2]}{dt} = -\frac{3}{d[H_2]} \frac{dt}{dt} = \frac{2}{d[NH_3]} \frac{dt}{dt}$
 - d) $-\frac{d[N_2]}{dt} = -\frac{d[H_2]}{dt} = \frac{d[NH_3]}{dt}$
5. For the reaction, $2NO_2 \longrightarrow 2NO + O_2$, rate is expressed as:
 - a) $-1/2 \frac{d[NO_2]}{dt} = -1/2 \frac{d[NO]}{dt} = \frac{d[O_2]}{dt}$
 - b) $-1/2 \frac{d[NO_2]}{dt} = -1/2 \frac{d[NO]}{dt} = \frac{d[O_2]}{dt}$
 - c) $\frac{2d[NO_2]}{dt} = \frac{2d[NO]}{dt} = \frac{d[O_2]}{dt}$
 - d) $\frac{d[NO_2]}{dt} = \frac{d[NO]}{dt} = \frac{d[O_2]}{dt}$
6. The rate of reaction that does not involve gases, is not dependent on:
 - a) pressure
 - b) temperature
 - c) concentration
 - d) catalyst
7. For the reaction, $a + B \longrightarrow 2C + D$, which one is the incorrect statement?
 - a) Rate of disappearance of A = Rate of disappearance of B
 - b) Rate of disappearance of A = Rate of disappearance of D
 - c) Rate of disappearance of B = 2 X rate of disappearance of C
 - d) Rate of disappearance of B = 1/2 X rate of disappearance of C
8. In a reaction, $2A_2 + B_2 \longrightarrow 2A_2B$, the reactant A will disappear at:
 - a) half the rate that B will decrease
 - b) the same rate that B will decrease
 - c) double the rate that A_2B will form
 - d) twice the rate that B will decrease
9. In the reaction, $3A \longrightarrow 2B$, rate of reaction + $d[B]/dt$ is equal to:
 - a) $-1/3 d[A]/dt$
 - b) $-2/3 d[A]/dt$
 - c) $+2 d[A]/dt$
 - d) $-3/2 d[A]/dt$
10. For the reaction, $2NO \longrightarrow N_2 + O_2$, the expression $-1/2 d[NO]/dt$ represents:
 - a) the rate of formation of NO
 - b) the average rate of the reaction
 - c) the instantaneous rate of the reaction
11. The term $-dx/dt$ in the rate expression refers to the:
 - a) instantaneous rate of reaction
 - b) average rate of reaction
 - c) increase in the concentration of reactants
 - d) concentration of reactants
12. According to collision theory of reaction rates:
 - a) every collision between reactant molecules leads to a chemical reaction
 - b) rate of reaction is proportional to the velocity of the molecules
 - c) rate of reaction is proportional to the average energy of the molecules
 - d) rate of reaction is proportional to the number of collisions per second
13. According to collision theory:
 - a) all collisions are sufficiently violent
 - b) all collisions are responsible for product formation
 - c) all collisions are effective
 - d) only a fraction of collisions are effective which have enough energy to form products
14. Which of the following has been used to explain the subject of chemical kinetics?
 - a) collision theory of bimolecular reactions
 - b) The activation complex theory
 - c) Arrhenius equation
 - d) All the above
15. The activation energy for a chemical reaction depends upon:
 - a) temperature
 - b) nature of reacting species
 - c) concentration of the reacting species
 - d) collision frequency
16. In a reaction, the threshold energy is equal to:
 - a) activation energy + normal energy of reactants
 - b) activation energy – normal energy of the reactants
 - c) normal energy of reactants – activation energy
 - d) average kinetic energy of molecules of reactants

17. The influence of temperature on the rate of reaction is determined by:
- Nernst's equation
 - Gibbs-Helmholtz equation
 - Arrhenius equation
 - Van't Hoff equation
18. According to the collision theory of reaction rates, the rate of reaction increases with temperature due to:
- greater number of collisions
 - higher velocity of reacting molecules
 - greater number of molecules having the activation energy
 - decrease in the activation energy
19. The temperature coefficient of a reaction is:
- ratio of rate constants at two temperature differing by 1°C
 - ratio of rate constants at temperature 35°C and 25°C
 - ratio of rate constants at temperature 30°C and 25°C
 - specific reaction rate at 25°C
20. In general, with every 10°C rise in temperature, the rate of reaction becomes approximately
- ten times
 - double
 - half
 - one tenth
21. Activation energy of the reaction is:
- the energy released during the reaction
 - the energy evolved when activated complex is formed
 - minimum amount of energy needed to overcome the potential barrier
 - the energy needed to form one mole of the product
22. The temperature coefficient of most of the reactions lies between:
- 2 and 3
 - 1 and 2
 - 2 and 4
 - 3 and 4
23. According to Arrhenius equation, rate constant of a chemical reaction is equal to:
- $Ae^{-E_a/RT}$
 - $Ae^{E_a/RT}$
 - Ae^{RT/E_a}
 - Ae^{-RT/E_a}
24. The correct expression for Arrhenius equation showing the effect of temperature on the rate constant is (T_2/T_1):
- $\log_{10} \frac{k_2}{k_1} = \frac{E_a}{2.303R} \left[\frac{T_1 T_2}{T_2 - T_1} \right]$
 - $\log_{10} \frac{k_2}{k_1} = \frac{R}{2.303E_a} \left[\frac{T_2 - T_1}{T_1 T_2} \right]$
 - $\log_{10} \frac{k_2}{k_1} = \frac{E_a}{R} \left[\frac{T_2 - T_1}{T_1 T_2} \right]$
 - $\log_{10} \frac{k_2}{k_1} = \frac{E_a}{2.303R} \left[\frac{T_2 - T_1}{T_1 T_2} \right]$
25. In order to react, a molecule, at the time of collision, must possess a certain amount of energy known as:
- free energy
 - kinetic energy
 - threshold energy
 - internal energy
26. The activation energy of a reaction is zero. The rate constant of the reaction:
- increases with increase of temperature
 - decreases with decrease of temperature
 - decreases with increase of temperature
 - is nearly independent of temperature
27. The activation energy of a reaction can be lowered by:
- using a positive catalyst
 - increasing temperature
 - decreasing temperature
 - increasing concentration of the reactants
28. The activation energy for a hypothetical reaction A product is 12.49kcal/mol . If temperature is raised from 295 to 305 , the rate of reaction increases by:
- 60%
 - 100%
 - 50%
 - 20%
29. The plot between concentration versus time for a zero order reaction is represented by:
- 
 - 
 - 
 - 
30. The rate of reaction increases with rise in temperature because of:
- increase in the number of activated molecules
 - increase in the activation energy
 - decrease in the activation energy
 - increase in the number of molecular collisions
31. Which of the following is a first order reaction?
- $2\text{HI} \longrightarrow \text{H}_2 + \text{I}_2$
 - $2\text{NO}_2 \longrightarrow 2\text{NO} + \text{O}_2$
 - $2\text{NO} + \text{O}_2 \longrightarrow 2\text{NO}_2$
 - $\text{NH}_4\text{NO}_2 \longrightarrow \text{N}_2 + 2\text{H}_2\text{O}$

32. Which one of the following is not a first order reaction?

- a) $\text{CH}_3\text{COOCH}_3 + \text{H}_2\text{O} \xrightarrow{\text{H}^+} \text{CH}_3\text{COOH} + \text{CH}_3\text{OH}$
 b) $\text{CH}_3\text{COOC}_2\text{H}_5 + \text{NaOH} \longrightarrow \text{CH}_3\text{COONa} + \text{C}_2\text{H}_5\text{OH}$
 c) $2\text{H}_2\text{O}_2 \longrightarrow 2\text{H}_2\text{O} + \text{O}_2$
 d) $2\text{N}_2\text{O}_5 \longrightarrow 4\text{NO}_2 + \text{O}_2$

33. Rate expression of a chemical change is $-\text{dx}/\text{dt} = k[\text{A}]^2[\text{B}][\text{C}]^0$. The order of reaction is:

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

34. For a reaction, $2\text{A} + \text{B} \longrightarrow \text{C} + \text{D}$, the concentration of B is kept constant and that of A is tripled the new rate of reaction will be:

- a) nine times
 b) three times
 c) same
 d) zero

35. The rate of reaction, $\text{A} + \text{B} + \text{C} \longrightarrow \text{products}$, is given by $\frac{d[\text{A}]}{dt} = k[\text{A}]^{1/2}[\text{B}]^{1/3}[\text{C}]^{1/4}$. The order of the reaction is:

- a) $\frac{1}{2}$
 b) $\frac{13}{12}$
 c) 1
 d) 2

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

- a) $\text{Rate} = k[\text{C}_x][\text{C}_y][\text{C}_z]$
 b) $\text{Rate} = k[\text{C}_x]^{0.5}[\text{C}_y]^{0.5}[\text{C}_z]^{0.5}$
 c) $\text{Rate} = k[\text{C}_x]^{1.5}[\text{C}_y]^{-1}[\text{C}_z]^0$
 d) $\text{Rate} = k[\text{C}_x][\text{C}_y]^2[\text{C}_z]^0$

37. If the rate of reaction between A and B is given by rate $= [\text{A}][\text{B}]^2$, then the reaction is:

- a) first order in A
 b) second order in B
 c) third order overall
 d) all are correct

38. For the reaction $\text{A} \longrightarrow \text{B}$, the rate of reaction is quadrupled when the concentration of A is double, the rate of the reaction is $r = k[\text{A}]^n$; the value of n is:

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

39. Select the rate law that corresponds to the data shown for the following reaction:



Expt. No.	$[\text{A}]_0$	$[\text{B}]_0$	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

- a) $\text{rate} = k[\text{B}]^3$
 b) $\text{rate} = k[\text{B}]^4$
 c) $\text{rate} = [\text{A}][\text{B}]^3$
 d) $\text{rate} = [\text{A}]^2[\text{B}]^2$

40. For a chemical reaction, $\text{A} \longrightarrow \text{E}$, it is found that the rate of reaction is doubled when the concentration of A is increased four times. The order of the reaction is:

- a) 1
 b) 2
 c) $\frac{1}{2}$
 d) zero

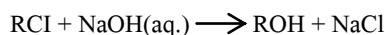
41. The rate of reaction, $\text{A} + \text{B} \longrightarrow \text{products}$, is given by the equation, $r = k[\text{A}][\text{B}]$. If B is taken in large excess, the order of reaction would be:

- a) 2
 b) 1
 c) zero
 d) unpredictable

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

- a) 10
 b) 2
 c) 1
 d) 20

43. The rate law for the reaction,



is given by, $\text{Rate} = k[\text{RCI}]$. The rate reaction will be:

- a) unaffected by increasing temperature of the reaction
 b) doubled on doubling the concentration of NaOH
 c) halved on reducing the concentration of NaOH to one half
 d) halved on reducing the concentration of RCI to one half

44. A zero order reaction is one:

- a) in which reactants do not react
 b) in which one of the reactants is in large excess
 c) whose rate is uniform and not effected by time
 d) whose rate increases with time

45. The rate of a certain reaction at different time intervals are as follows:

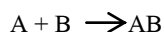
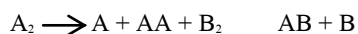
Time(second)	0	10	20
Rate	1.8×10^{-2}	1.82×10^{-2}	1.79×10^{-2}

$\text{mol L}^{-1} \text{s}^{-1}$ The reaction is of:

- a) zero order
 b) first order
 c) second order
 d) third order

46. For which of the following, the units of rate and rate constant of the reaction are identical?

61. The half-life period of a first order reaction is 10 minutes. The time required for the concentration of the reactant to change from 0.08 M to 0.02 M is:
- 10 min
 - 20 min
 - 30 min
 - 40 min
62. The rate constant for the hydrolysis reaction of an ester by dilute acid is $0.6931 \times 10^{-3} \text{ s}^{-1}$. The time required to change the concentration of ester from 0.04 M to 0.01 M is:
- 6931 sec
 - 4000 sec
 - 2000 sec
 - 1000 sec
63. The rate of a gaseous reaction is given by the expression $k[A][B]$. If the volume of the reaction vessel is suddenly reduce to one-fourth of the initial volume, the reaction rate relative to the original rate will be:
- 1/16
 - 1/8
 - 8
 - 16
64. The velocity of the reaction is doubled for every 10°C rise in temperature. If the temperature is raised to 50°C , the reaction velocity increases by about:
- 12 times
 - 16 times
 - 32 times
 - 50 times
65. If the rate expression for a reaction is $\frac{dx}{dt} = k[A]^{1/2}[B]^{3/2}$, the overall order of the reaction is:
- 2
 - $\frac{1}{2}$
 - $\frac{3}{2}$
 - 1
66. The rates of a certain reaction at different times are as follows:
- | Time | 0 | 10 | 20 | 30 | (second)Rate |
|------|---|----------------------|-----------------------|-----------------------|---|
| | | 2.8×10^{-2} | 2.78×10^{-2} | 2.81×10^{-2} | $2.79 \times 10^{-2} \text{ mol L}^{-1} \text{ s}^{-1}$ |
- The reaction is of:
- third order
 - second order
 - first order
 - zero order
67. The second order rate constant is usually expressed as:
- $\text{mol L}^{-1} \text{ s}^{-1}$
 - $\text{mol}^{-1} \text{ L}^{-1} \text{ s}^{-1}$
 - $\text{mol}^{-1} \text{ L s}^{-1}$
 - mol L s^{-1}
68. The hydrolysis of ethyl acetate is a reaction of:
- $$\text{CH}_3\text{COOC}_2\text{H}_5 + \text{H}_2\text{O} \xrightarrow{\text{H}^+} \text{CH}_3\text{COOH} + \text{C}_2\text{H}_5\text{OH}$$
- Zero order
 - First order
 - Second order
 - Third order
69. The inversion of cane sugar is represented by,
- $$\text{C}_{12}\text{H}_{22}\text{O}_{11} + \text{H}_2\text{O} \longrightarrow \text{C}_6\text{H}_{12}\text{O}_6 + \text{C}_6\text{H}_{12}\text{O}_6$$
- It is a reaction of:
- second order
 - unimolecular
 - pseudo-unimolecular
 - zero order
70. In a second order reaction, the time needed for the initial concentration of the reactant to reduce to half that value is:
- independent of the initial concentration
 - proportional to the initial concentration
 - inversely proportional to initial concentration
 - proportional to the square of the initial concentration
71. Which of the following statements regarding molecularity of the reaction is wrong?
- It may be either whole number or fraction
 - It is calculated from the reaction mechanism
 - It depends on the rate determining step
 - It is number of molecules of reactants taking part in a single step chemical reaction
72. For the reaction, $\text{H}_2(\text{g}) + \text{Br}_2(\text{g}) \longrightarrow 2\text{HBr}(\text{g})$, the reaction rate is:
- $$\text{rate} = k[\text{H}_2][\text{Br}_2]^{1/2}$$
- Which one of the following statements is true for the reaction?
- The reaction is of second order
 - The molecularity of the reaction is $3/2$
 - The unit of k is sec^{-1}
 - The molecularity of the reaction is two
73. Molecularity of the reaction:
- is always a whole number
 - is never a whole number
 - can have a fractional value
 - can be zero
74. For a single step reaction, $\text{A} + 2\text{B} \longrightarrow \text{products}$, the molecularity is:
- zero
 - three
 - two
 - one
75. The hypothetical reaction, $\text{A}_2 + \text{B}_2 \longrightarrow 2\text{AB}$, follows the following mechanism:



The order of the overall reaction is:

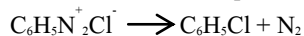
- a) zero
b) 1
c) 2
d) 3/2
76. The molecularity of a reaction is:
a) same as its order
b) different from order
c) may be same or different as compared to order
d) always zero
77. The chemical reaction, $2O_3 \rightarrow 3O_2$ proceeds as follows:
 $O_3 \rightarrow O_2 + O$
 $O + O_3 \rightarrow 2O_2$ The rate law expression should be:
a) $r = k[O_3]^2$
b) $r = k[O_3]^2 [O_2]^{-1}$
c) $r = k[O_3][O_2]$
d) $r = k[O_3][O_2]^2$
78. Time required to decompose half of the substance for nth order reaction is inversely proportional to:
a) a^{n+1}
b) a^{n-1}
c) a^{n-2}
d) a^n
79. What is the order of the reaction which obeys the expression $t_{1/2} = 1/ka$?
a) zero
b) third
c) first
d) second
80. The order of reaction can be deduced from:
a) experiment
b) chemical equation
c) rate constant
d) thermochemical equations
81. The order of a reaction may be determined by:
a) differential method
b) initial rate method
c) graphical method
d) all of those
82. A graph between time (t) and the substance consumed at any time is found to be a straight line passing through the origin. This indicates that the reaction is of:
a) second order
b) first order
c) zero order
d) fractional order
83. A plot of $\log(a-x)$ against time 't' is a straight line. This indicates that the reaction is of:
a) zero order
b) first order
c) second order
d) third order
84. If the initial concentration of the reactant is doubled, time for half reaction is also doubled; the order of reaction is:
a) zero
b) first
c) second
d) third
85. The ratio of the time required for 3/4th of the reaction of first order to complete to that required for half of the reaction:
a) 4:3
b) 3:2
c) 2:1
d) 1:2
86. In pseudo-unimolecular reactions:
a) one of the reactants is present in large excess
b) both the reactants have same concentration
c) both the reactants are present in low concentration
d) one of the reactants is less reactive
87. The reaction,
 $2N_2O_5(g) \longrightarrow 4NO_2(g) + O_2(g)$,
is first order with respect to N_2O_5 . Which of the following graph, would yield a straight line?
a) $\log(P_{N_2O_5})$ versus time with -ve slope
b) $(P_{N_2O_5})^{-1}$ versus time
c) $(P_{N_2O_5})$ versus time
d) $\log(P_{N_2O_5})$ versus time with +ve slope
88. Which plot can give us the value of activation energy?
a) k versus T
b) 1/k versus T
c) $\log k$ versus 1/T
d) C versus t
89. If we plot a graph between $\log k$ and 1/T by Arrhenius equation, the slope is:
a) $-E_a/R$
b) $+E_a/R$
c) $-\frac{E_a}{2.303R}$
d) $+\frac{E_a}{2.303R}$
90. The rate of the reaction,
 $CCl_3CHO + NO \longrightarrow CHCl_3 + NO + CO$.
is given by the equation, $\text{rate} = k[CCl_3CHO][NO]$. If concentration is expressed in mol/litre, units of k are:
a) $\text{mol}^{-2} \text{L}^2 \text{s}^{-1}$
b) $\text{mol} \text{L}^{-1} \text{s}^{-1}$
c) $\text{L mol}^{-1} \text{s}^{-1}$
d) s^{-1}
91. In a reaction, $2A + B \longrightarrow A_2B$, the reactant A will disappear at:
a) half the rate that B will decrease

- b) twice the rate that B will decrease
 c) the same rate that B will decrease
 d) the same rate that A₂B will form
92. The rate of the reaction, $2\text{NO} + \text{O}_2 \longrightarrow 2\text{NO}_2$, at 25°C is 0.028 mol L⁻¹ s⁻¹. The experimental rate is given by $r = k[\text{NO}]^2[\text{O}_2]$ if the initial concentrations of the reactants are $\text{O}_2 = 0.040 \text{ mol L}^{-1}$, the rate constant of the reaction is:
 a) $7.0 \times 10^{-2} \text{ L mol}^{-1} \text{ s}^{-1}$
 b) $7.0 \times 10^{-4} \text{ L}^2 \text{ mol}^{-2} \text{ s}^{-1}$
 c) $7.0 \times 10^2 \text{ L}^2 \text{ mol}^{-2} \text{ s}^{-1}$
 d) $7.0 \times 10^3 \text{ L}^2 \text{ mol}^{-2} \text{ s}^{-1}$
93. For the reaction, $2\text{NO} + \text{Cl}_2 \longrightarrow 2\text{NOCl}$, the following mechanism has been proposed.
 $\text{N}_2 + \text{Cl}_2 \rightleftharpoons \text{NOCl}_2 + \text{NO} \rightleftharpoons 2\text{NOCl}$
 The rate law for the reaction is:
 a) $\text{rate} = k[\text{NO}]^2[\text{Cl}_2]$
 b) $\text{rate} = k[\text{NO}][\text{Cl}_2]^2$
 c) $\text{rate} = k[\text{NOCl}_2]$
 d) $\text{rate} = k[\text{NOCl}]^2$
94. The rate of the reaction can be increased in general by all the following factors except:
 a) by increasing the temperature
 b) using a suitable catalyst
 c) by increasing the concentration of reactants
 d) by an increase in activation energy
95. How will the rate $r = k[\text{SO}_2][\text{O}_2]$ of reaction, $2\text{SO}_2 + \text{O}_2 \longrightarrow 2\text{SO}_3$, change if the volume of the reaction vessel is tripled?
 a) It will be 1/3rd of its initial value
 b) It will be three times of its initial value
 c) It will be nine times of its initial value
 d) It will be 19th of its initial value
96. Radioactive disintegration is an example of:
 a) zero order reaction
 b) first order reaction
 c) second order reaction
 d) third order reaction
97. In the formation of sulphur trioxide by the contact process, $2\text{SO}_2 + \text{O}_2 \rightleftharpoons 2\text{SO}_3$, the rate of reaction was measured as $-\frac{d[\text{O}_2]}{dt} = 30 \times 10^{-4} \text{ mol L}^{-1} \text{ s}^{-1}$. The rate of the reaction expressed in terms of SO₃ will be:
 a) $3.0 \times 10^{-4} \text{ mol L}^{-1} \text{ s}^{-1}$
 b) $6.0 \times 10^{-4} \text{ mol L}^{-1} \text{ s}^{-1}$
 c) $1.5 \times 10^{-4} \text{ mol L}^{-1} \text{ s}^{-1}$
 d) $4.5 \times 10^{-4} \text{ mol L}^{-1} \text{ s}^{-1}$
98. The rate constant for a first order reaction is 06.909 min⁻¹. Therefore, the time required in minutes for the participation of 75% of the initial reactant is:
 a) $2/3 \log 2$
 b) $2/3 \log 4$
 c) $3/2 \log 2$
 d) $3/2 \log 4$
99. For the reaction,
 $\text{A} + 2\text{B} \longrightarrow \text{C} + \text{D}$, $\frac{d[\text{A}]}{dt} = k[\text{A}][\text{B}]^2$
 the expression for $\frac{d[\text{B}]}{dt}$ will be:
 a) $2k[\text{A}][\text{B}]^2$
 b) $1/2k[\text{A}][\text{B}]^2$
 c) $k[\text{A}][\text{B}]^2$
 d) $k[\text{A}][\text{B}/2]^2$
100. Which of the following statements is not correct for the reaction,
 $4\text{A} + \text{B} \longrightarrow 2\text{C} + 2\text{D}$?
 a) The rate of appearance of C is one-half the rate of disappearance of B
 b) The rate of disappearance of B is one-fourth of the rate of disappearance of A
 c) The rate of formation of D is one-half of the rate of consumption of A
 d) The rates of formation of C and D are equal
101. The overall rate of a reaction is governed by:
 a) the rate of the fastest intermediate step
 b) the sum total of the rates of all the intermediate steps
 c) the average of the rates of all the intermediate steps
 d) the rate of the slowest intermediate step
102. The rate constant of a reaction does not depend upon:
 a) temperature
 b) activation energy
 c) catalyst
 d) concentration of reactants and products
103. The half-life period of a first order chemical reaction is 6.93 minutes. The time required for the completion of 99% of the chemical reaction will be: ($\log 2 = 0.301$)
 a) 230.3 minutes
 b) 23.03 minutes
 c) 46.06 minutes
 d) 406.6 minutes
104. For the chemical reaction $\text{x} \longrightarrow \text{y}$, it is found that the rate of reaction increases 2.25 times when the concentration of x is increased 1.5 times. What is the order of reaction?
 a) One
 b) Two
 c) Three
 d) Zero
105. The half-life period of a reaction is constant for:
 a) zero order
 b) first order
 c) second order
 d) none of these

106. For different sets of data of $t_{1/2}$ at different initial concentrations say 'a' for a given reaction, the $[t_{1/2} \times a]$ is found to be constant. The order of reaction is:

- zero
- 1
- 2
- 3

107. Diazonium salt decomposes as



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 first order reaction
- a second order reaction
- independent of the initial concentration of the salt
- a zero order reaction

108. For the reaction, $N_2(g) + 3H_2(g) \longrightarrow 2NH_3(g)$, under certain conditions of temperature and pressure of the reactants, the rate of formation of ammonia is 0.001 kg hr^{-1} . The rate of consumption of hydrogen under the same conditions is Kg hr^{-1} .

- 0.001
- 0.003
- 0.002
- 0.0015

109. The rate constant, the activation energy and the Arrhenius parameter of a chemical reaction at $25^\circ C$ are $3.0 \times 10^{-4} \text{ s}^{-1}$, $104.4 \text{ kJ mol}^{-1}$ and $6.0 \times 10^{14} \text{ s}^{-1}$

respectively. The value of rate constant at T is:

- $2.0 \times 10^{18} \text{ s}^{-1}$
- $6.0 \times 10^{14} \text{ s}^{-1}$
- infinity
- $3.6 \times 10^{30} \text{ s}^{-1}$

110. In the reaction $BrO_3^-(aq.) + 5Br^-(aq.) + 6H^+(aq.) \longrightarrow 3Br_2(l) + 3H_2O(l)$

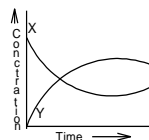
The rate appearance of bromine (Br_2) is related to rate of disappearance of bromide ions as following:

- $\frac{d[Br_2]}{dt} = 3/5 \frac{d[Br^-]}{dt}$
- $\frac{d[Br_2]}{dt} = -3/5 \frac{d[Br^-]}{dt}$
- $\frac{d[Br_2]}{dt} = 5/3 \frac{d[Br^-]}{dt}$
- $\frac{d[Br_2]}{dt} = +5/3 \frac{d[Br^-]}{dt}$

111. Given take k is the rate constant for some order of any reaction at temp. T , then the value of $\ln k$, (where, A is the Arrhenius constant) is:

- $A/2.303$
- A
- $2.303A$
- $\log A$

112. The curve depicts the change in concentration of species X and Y as a function of time. The point of intersection of the two curves represents:



- $t_{1/2}$
- $t_{3/4}$
- $t_{2/3}$
- data insufficient to predict

113. In gaseous reactions, important for the understanding of the upper atmosphere H_2O and O react

bimolecularly to form two OH radicals. ΔH for this reaction is 72 kJ at 500 K and E_a is 77 kJ mol^{-1} ; then E_a for the bimolecular recombination of two OH radicals to forms H_2O and O is:

- 3 kJ mol^{-1}
- 4 kJ mol^{-1}
- 5 kJ mol^{-1}
- 7 kJ mol^{-1}

114. From the following data, the activation energy for the reaction (cal/mol) is: $H_2 + I_2 \longrightarrow 2HI$

T (K)	1/T (K^{-1})	Log K
769	1.3×10^{-4}	2.9
667	1.5×10^{-4}	1.1

- 4×10^4
- 2×10^4
- 8×10^4
- 3×10^4

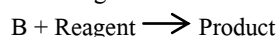
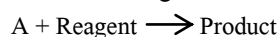
115. The hydrolysis of an ester was carried out separately with 0.05 N HCl and $0.05 \text{ N H}_2\text{SO}_4$. Which of the following will be true:

- $K_{HCl} > K_{H_2SO_4}$
- $K_{H_2SO_4} > K_{HCl}$
- $K_{H_2SO_4} = 2K_{HCl}$
- $K_{H_2SO_4} = K_{HCl}$

116. For an endothermic reaction, where, ΔH represents the enthalpy of the reaction in kJ/mol , the minimum value for the energy of activation will be:

- less than ΔH
- zero
- more than ΔH
- equal to ΔH

117. In the following first order competing reactions;



The ratio of k_1/k_2 if only 50% of B will have been reacted when 94% of A has been reacted is:

- 4.06
- 3.06
- 2.06
- 0.06

118. Two reactions $A \longrightarrow \text{Products}$ and $B \longrightarrow \text{Products}$, have rate constant k_A and k_B at temperature T and activation energy E_A and E_B respectively. If $k_A > k_B$ and $E_A < E_B$ and assuming that A for both the reactions is same, then:

- at higher temperatures k_A will be greater than k_B
- at lower temperatures k_A and k_B will be close to each other in magnitude
- as temperature rises, k_A and k_B will be close to each other in magnitude
- at lower temperature $k_A > k_B$

119. A substance undergoes first order decomposition. The decomposition follows two parallel first order



reactions as:

$$1.26 \times 10^{-4} \text{ s}^{-1} \text{ and } k_2 = 3.8 \times 10^{-5} \text{ s}^{-1}$$

$k_1 =$

The

percentage distributions of B and C are:

- 80% B and 20% C
- 76.83% B and 23.17% C
- 9% B and 10% C
- 60% B and 40% C

120. Inversion of a sugar follows first order rate equation which can be followed by noting the change in rotation of the plane of polarization of light in a

polarimeter. If r_∞ , r_t and r_0 are the rotations at $t = \infty$, $t = t$ and $t = 0$, then first order reaction can be written as:

- $k = 1/t \log_e \frac{r_t - r_\infty}{r_0 - r_\infty}$
- $k = 1/t \log_e \frac{r_t - r_0}{r_0 - r_\infty}$
- $k = 1/t \log_e \frac{r_\infty - r_0}{r_\infty - r_t}$
- $k = 1/t \log_e \frac{r_\infty - r_t}{r_\infty - r_0}$

121. Rate of a chemical reaction can be kept constant by:

- stirring the compounds
- keeping the temperature constant
- both (a) and (b)
- none of the above

122. The number of molecules of the reactants taking part in a single step of the reaction tells about:

- molecularity of the reaction
- mechanism of the reaction
- order of the reaction
- all of the above

123. Number of moles of a substance present in 1 litre volume is known as:

- activity
- molar concentration
- active mass
- none of these

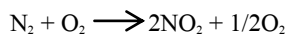
124. The inversion of cane sugar into glucose and fructose is:

- I order
- II order
- III order
- zero order

125. The unit of rate constant obeying the rate expression $r = k[A][B]$ is:

- $\text{mol}^{-2/3} \text{ litre}^{2/3} \text{ time}^{-1}$
- $\text{mol}^{2/3} \text{ litre}^{-2/3} \text{ time}^{-1}$
- $\text{mol}^{-5/3} \text{ litre}^{5/3} \text{ time}^{-1}$
- none of these

126. For the reaction,



$$-\frac{d[\text{N}_2\text{O}_5]}{dt} = k_1[\text{N}_2\text{O}_5]$$

$$\frac{d[\text{NO}_2]}{dt} = k_2[\text{N}_2\text{O}_5]$$

$$\frac{d[\text{O}_2]}{dt} = k_3[\text{N}_2\text{O}_5]$$

The relation in between k_1 , k_2 and k_3 is:

- $2k_1 = k_2 = 4k_3$
- $k_1 = k_2 = k_3$
- $2k_1 = 4k_2 = k_3$
- none of these

127. The rate constant is numerically the same for three reactions of first, second and third order respectively.

Which one is true for the rate of the three reactions if the concentration of the reactant is greater than 1 M?

- $r_1 = r_2 = r_3$
- $r_1 > r_2 > r_3$
- $r_1 < r_2 < r_3$
- All of these

128. In the Q.No. 127, if the concentration of the reactant is less than 1M, then:

- $r_1 = r_2 = r_3$
- $r_1 > r_2 > r_3$
- $r_1 < r_2 < r_3$
- all of these

129. In the Q.No. 127. If the concentration of the reactant is 1 M, then:

- $r_1 = r_2 = r_3$
- $r_1 > r_2 > r_3$
- $r_1 < r_2 < r_3$
- all of these

130. For a first order reaction, $A \longrightarrow \text{product}$, the rate of reaction at $[A] = 0.2 \text{ mol L}^{-1}$ is $1.0 \times 10^{-2} \text{ mol L}^{-1} \text{ min}^{-1}$.

The half-life period for the reaction is:

- 832 s
- 440 s
- 416 s
- 14 s

131. The rate constant of a first order reaction, $A \longrightarrow \text{products}$, is $60 \times 10^{-4} \text{ min}^{-1}$. Its rate at $[A] = 0.01 \text{ mol L}^{-1}$ would be:

- $60 \times 10^{-6} \text{ mol L}^{-1} \text{ min}^{-1}$
- $36 \times 10^{-4} \text{ mol L}^{-1} \text{ min}^{-1}$

- c) $60 \times 10^{-2} \text{ mol L}^{-1} \text{ min}^{-1}$
 d) $36 \times 10^{-1} \text{ mol L}^{-1} \text{ min}^{-1}$

132. For a first order reaction, the half-life is independent of:

- a) initial concentration
 b) cube root of initial concentration
 c) first power of final concentration
 d) square root of final concentration

133. Activation energy of a chemical reaction can be determined by:

- a) changing concentration of reactants
 b) evaluation rate constant at standard temperature
 c) evaluation rate constant at two different temperatures
 d) evaluation velocities of reaction at two different temperatures

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

Expt. No.	[A]	[B ₂]	Rate(mol s ⁻¹)
1.	0.50	0.50	1.6×10^{-4}
2.	0.50	1.00	3.2×10^{-4}
3.	1.0	1.00	3.2×10^{-4}

The rate equation for the above data is:

- a) $\text{rate} = k[B_2]^2$
 b) $\text{rate} = k[B_2]$
 c) $\text{rate} = k[A]^2[B]^2$
 d) $\text{rate} = k[A]^2[B]$

135. For the reaction, $A \rightarrow B$, the rate law is: $\text{rate} = k[A]$.

Which of the following statements is incorrect?

- a) The reaction follows first order kinetics
 b) The $t_{1/2}$ of the reaction depends on initial concentration
 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 at any time after the start of the reaction

136. Cyclopropanerearranges to form propene:



This follows first order kinetics. The rate constant is $2.714 \times 10^{-3} \text{ sec}^{-1}$. The initial concentration of cyclopropane is 0.29 M. 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

137. The rate constant for the reaction, $2\text{NO}_2(\text{g}) \rightarrow \text{N}_2\text{O}_4(\text{g})$ is $2.3 \times 10^{-2} \text{ sec}^{-1}$. Which equation given below describes the change of $[\text{N}_2\text{O}_4]$ with time $[\text{N}_2\text{O}_4]_0$ and $[\text{N}_2\text{O}_4]_t$ correspond to concentration of N_2O_4 initially and time 't'?

- a) $[\text{N}_2\text{O}_4]_t = [\text{N}_2\text{O}_4]_0 e^{kt}$
 b) $\log_e \frac{[\text{N}_2\text{O}_4]_0}{[\text{N}_2\text{O}_4]_t} = kt$
 c) $\log_{10} [\text{N}_2\text{O}_4]_t = \log_{10} [\text{N}_2\text{O}_4]_0 - kt$
 d) $[\text{N}_2\text{O}_4]_t = [\text{N}_2\text{O}_4]_0 + kt$

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

- a) $1.73 \times 10^{-4} \text{ M/min}$
 b) $3.47 \times 10^{-5} \text{ M/min}$
 c) $3.47 \times 10^{-4} \text{ M/min}$
 d) $1.73 \times 10^{-5} \text{ M/min}$

139. 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 from 0.1 M to 0.025 M is:

- a) 30 min
 b) 15 min
 c) 7.5 min
 d) 60 min

140. A substance undergoes first order decomposition. The decompositions follows two parallel first order



reactions as;

$k_1 = 1.26 \times 10^{-4} \text{ sec}^{-1}$ and $k_2 = 3.8 \times 10^{-5} \text{ sec}^{-1}$ The percentage 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) 90% B and 10% C

141. For a reaction $2\text{NH}_3 \rightarrow \text{N}_2 + 3\text{H}_2$, it is observed that

$$\frac{-d(\text{NH}_3)}{dt} = k_1(\text{NH}_3), \quad \frac{d(\text{N}_2)}{dt} = k_2(\text{NH}_3), \quad \frac{d(\text{H}_2)}{dt} = k_3(\text{NH}_3).$$

What is the relation between k_1 , k_2 and k_3 ?

- a) $k_1 = k_2 = k_3$
 b) $3k_1 = 6k_2 = 2k_3$
 c) $2k_1 = 3k_2 = 6k_3$
 d) $6k_1 = 3k_2 = 2k_3$

142. In Arrhenius equation $k = A e^{-E_a/RT}$, factor

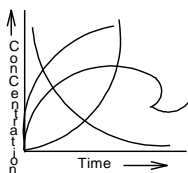
$e^{-E_a/RT}$ is known as:

- a) frequency factor
 b) activation factor
 c) pre-exponential factor
 d) Boltzmann factor

143. Unit of frequency factor (A) is:

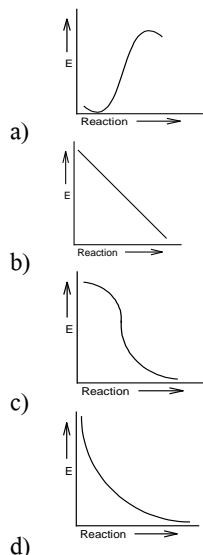
- a) moles/lit
 b) moles/lit/sec
 c) depends upon order
 d) no unit

144. For a reaction $A + B \rightarrow C + D$, the variation of the concentration of the products is given by the curve:



- a) x
b) y
c) z
d) w

145. Which graph shows zero activation energy?



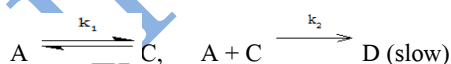
146. $E_{\text{Threshold}}$ can never be:

- a) $>E_R$
b) $>E_p$
c) $<E_p$
d) $>E_R$ as well as $>E_p$

147. A reaction takes place in three steps; the rate constant are k_1 , k_2 and k_3 . The overall rate constant $k = k_1 k_2 / k_3$. If energies of activation are 40, 30 and 20 kJ, the overall energy of activation is:

- a) 10
b) 15
c) 30
d) 60

148. For hypothetical reaction $A \xrightarrow{k_1} C$, $A + C \xrightarrow{k_2} D$ (slow) according to



Rate law will be:

- a) $k_2[A][C]$
b) $k_1 k_2 [A]$
c) $k_1 k_2 [A]^2$
d) $k_1 k_2 [A][C]$

149. If concentration of reactant is increased by 'm'; then k becomes:

- a) $E^{k/m}$
b) K
c) k/m
d) mk

150. $aA + bB \rightarrow P$; $dx/dt = k[A]^a[B]^b$. If conc. of A is doubled. Rate of doubled. If B is doubled, rate becomes four times. Which is correct?

- a) $\frac{-d[A]}{dt} = \frac{-d[B]}{dt}$
b) $\frac{-d[A]}{dt} = \frac{-2d[B]}{dt}$
c) $\frac{-2d[A]}{dt} = \frac{-d[B]}{dt}$
d) none of these

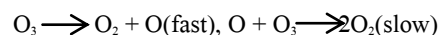
151. A drop of solution (volume 0.05mL) contains 3×10^{-6} mole of H^+ . If the rate constant disappearance of H^+ is $10^7 \text{ mol litre}^{-1} \text{ sec}^{-1}$, how long would it take for H^+ in the drop to disappear?

- a) $6 \times 10^{-8} \text{ sec}$
b) $6 \times 10^{-9} \text{ sec}$
c) $6 \times 10^{-10} \text{ sec}$
d) $6 \times 10^{-12} \text{ sec}$

152. For the reaction, $H_2 + I_2 \xrightleftharpoons[k_2]{k_1} 2HI$. The rate law expression is:

- a) $[-1/2 \frac{d[HI]}{dt}] = k_1[H_2][I_2]$
b) $[-1/2 \frac{d[HI]}{dt}] = \frac{k_1[HI]^2}{k_2[H_2]I_2}$
c) $[-1/2 \frac{d[HI]}{dt}] = k_1[H_2][I_2] - k_2[HI]^2$
d) $[-1/2 \frac{d[HI]}{dt}] = k_1 k_2$

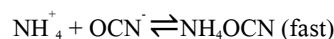
153. The chemical reaction, $2O_3 \rightarrow 3O_2$ proceeds on:



The rate law expression will be:

- a) rate = $k[O][O_3]$
b) rate = $k[O_3]^2$
c) rate = $k[O_3]^2[O_2]^{-1}$
d) can't be determined

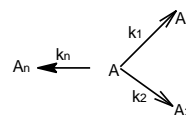
154. For the reaction $NH_4^+ + OCN^- \rightarrow NH_2CONH_2$, the probable mechanism is,



The rate law will be:

- a) rate = $k[NH_2CONH_2]$
b) rate = $k[NH_4^+][OCN^-]$
c) rate = $k[NH_4OCN]$
d) none of these

155. For a 1st order decomposition,



overall k will be given by:

- a) $k = k_1 + k_2 + \dots + k_n$
b) $k = (k_1 + k_2 + \dots + k_n)/n$
c) $k = k_1 \times k_2 \times \dots \times k_n$
d) none of these

156. For a reaction, $A + 3B \longrightarrow P$, Rate = $\frac{-d[A]}{dt}$, the expression for the rate of reaction in terms of change in the concentration of B, $\frac{-d[B]}{dt}$ will be:
- $k[A]^2[B]$
 - $k[A]^2[3B]$
 - $3k[A]^2[B]$
 - $(1/3)k[A]^2$

157. Which of the following statements is correct?

- Rate of reaction $\propto 1/E_a$
- At lower temp., increase in temp. causes more change in the value of k
- Both (a) and (b) are correct
- None is correct

158. For $X \longrightarrow Y$; $k = 10^{10} e^{-500/T}$, and for $W \longrightarrow Z$; $k = 10^{12} e^{-1000/T}$ at what temperature 'T' both reactions will have same value of k?

- 500 K
- 1500 K
- $\frac{4.606}{500} K$
- $\frac{2.303}{5000} K$

159. Which of the following is correct for a first order reaction?

- $t_{1/2} \propto a$
- $t_{1/2} \propto \frac{1}{a}$
- $t_{1/2} \propto a^0$
- $t^{1/2} \propto a^2$

160. $3A \longrightarrow 2B$, rate of reaction + $\frac{d[B]}{dt}$ is equal to:

- $-3/2 \frac{d[A]}{dt}$
- $-2/3 \frac{d[A]}{dt}$
- $-1/3 \frac{d[A]}{dt}$
- $+\frac{2d[A]}{dt}$

161. $2A \longrightarrow B + C$, Would be a zero order reaction when:

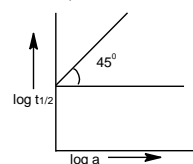
- the rate of reaction is proportional to square of concentration of 'A'
- the rate of reaction is same at any concentration of 'A'
- the rate remains unchanged at any concentration of 'B' and 'C'
- the rate of reaction doubles if concentration of 'B' is increased to double

162. Units of rate constants for first and zero order reactions in terms of molarity M unit are respectively:

- $\text{sec}^{-1}, \text{M sec}^{-1}$
- $\text{sec}^{-1}, \text{M}$
- $\text{M sec}^{-1}, \text{sec}^{-1}$
- $\text{M}, \text{sec}^{-1}$

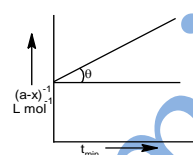
163. Following is the graph between $\log t_{1/2}$ and $\log a$ ($a =$ initial concentration) for a given reaction at 27°C .

Hence, order is:



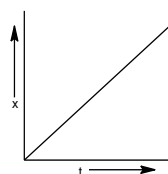
- 0
- 1
- 2
- 3

164. Following in the graph between $(a-x)^{-1}$ and time t for second order reaction. $\theta = \tan^{-1}(1/2)$; $OA = 2 \text{ L mol}^{-1}$, hence rate at the start of reaction will be:

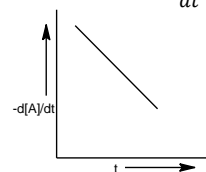


- $1.25 \text{ L mol}^{-1} \text{ min}^{-1}$
- $0.5 \text{ mol}^{-1} \text{ min}^{-1}$
- $0.125 \text{ mol}^{-1} \text{ min}^{-1}$
- $1.25 \text{ mol}^{-1} \text{ min}^{-1}$

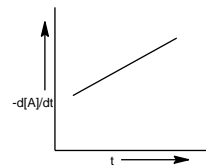
165. Graph between concentration of the product 'x' and time 't' for $A \longrightarrow B$ is given ahead:



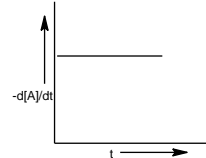
The graph between $-\frac{d[A]}{dt}$ and time will be of the type:



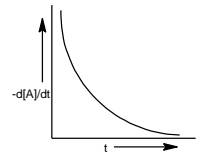
a)



b)

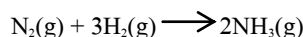


c)



d)

166. Consider the chemical reaction,



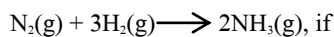
The rate of reaction can be expressed in terms of time

derivative of concentration of $N_2(g)$, $H_2(g)$ or $NH_3(g)$.

Identify the correct relationship amongst the rate expressions.

- a) $\text{rate} = -\frac{d[N_2]}{dt} = -1/3 \frac{d[H_2]}{dt} = +1/2 \frac{d[NH_3]}{dt}$
 b) $\text{rate} = -\frac{d[N_2]}{dt} = -3 \frac{d[H_2]}{dt} = +2 \frac{d[NH_3]}{dt}$
 c) $\text{rate} = \frac{d[N_2]}{dt} = 1/3 \frac{d[H_2]}{dt} = 1/2 \frac{d[NH_3]}{dt}$
 d) $\text{rate} = -\frac{d[N_2]}{dt} = -\frac{d[H_2]}{dt} = \frac{d[NH_3]}{dt}$

167. For the reaction,



$\frac{d[NH_3]}{dt} = 2 \times 10^{-4} \text{ mol L}^{-1} \text{ s}^{-1}$, the value of $-\frac{d[H_2]}{dt}$ would be:

- a) $1 \times 10^{-4} \text{ mol L}^{-1} \text{ s}^{-1}$
 b) $3 \times 10^{-4} \text{ mol L}^{-1} \text{ s}^{-1}$
 c) $4 \times 10^{-4} \text{ mol L}^{-1} \text{ s}^{-1}$
 d) $6 \times 10^{-4} \text{ mol L}^{-1} \text{ s}^{-1}$

168. Temperature dependent equation can be written as:

- a) $\ln k = \ln A - e^{E_a/RT}$
 b) $\ln k = \ln A + e^{E_a/RT}$
 c) $\ln k = \ln A - e^{RT/E_a}$
 d) all of these

169. If the rate of reaction $A \longrightarrow B$ doubles on increasing the concentration of A by 4 times, the order of reaction is:

- a) 2
 b) 1
 c) $1/2$
 d) 4

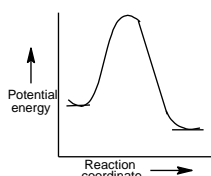
170. For the reaction, $2N_2O_5(g) \longrightarrow 4NO_2(g) + O_2(g)$ if the concentration of NO_2 is increases by $5.2 \times 10^{-3} \text{ M}$ in 100 sec, then the rate of reaction is:

- a) $1.3 \times 10^{-5} \text{ M s}^{-1}$
 b) $5 \times 10^{-4} \text{ M s}^{-1}$
 c) $7.6 \times 10^{-4} \text{ M s}^{-1}$
 d) $2 \times 10^{-3} \text{ M s}^{-1}$
 e) $2.5 \times 10^{-5} \text{ M s}^{-1}$

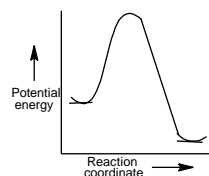
171. A first reaction is 10% complete in 20 min. The time taken for 19% completion is:

- a) 30 min
 b) 40 min
 c) 50 min
 d) 38 min
 e) 45 min

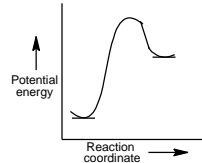
172. An endothermic reaction with high activation energy for the forward reaction is given by the diagram:



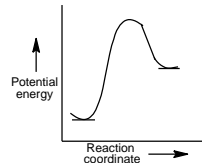
a)



b)



c)



d)

173. For reaction $aA \rightarrow P$, when $[A] = 2.2 \text{ M}$, the rate was found to be 2.4 M s^{-1} . On reducing concentration of A to half, the rate changes to 0.6 M s^{-1} . The order of reaction with respect to A is:

- a) 1.5
 b) 2.0
 c) 2.5
 d) 3.0

174. According to the law of mass action, rate of a chemical reaction is proportional to:

- a) concentration of reactants
 b) molar concentration of reactants
 c) concentration of products
 d) molar concentration of products

175. Consider the endothermic reaction $X \longrightarrow Y$ with the activation energies E_b and E_f for backward and forward reactions, 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_f and E_b

176. Which one of the following statements for order of reaction is not correct?

- a) Order can be determined experimentally
 b) Order of reaction is equal to sum of powers of concentration terms in differential rate law
 c) It is not effected by the stoichiometric coefficient of the reactants
 d) Order cannot be fractional

177. 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

178. In the first order reaction, the concentration of the reactants is reduced to 25% in one hour. The half-life period of the reaction is:

- a) 2 hrs

- b) 4 hrs
c) ½ hrs
d) ¼ hrs
179. A substance reacts with initial concentration of a mol m⁻³ according 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
180. Rate of a reaction can be expressed by Arrhenius equation as, $k = A e^{-E/RT}$. In this equation, E 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
181. The rate constant of a first order reaction at 27°C is 10⁻³ min⁻¹. The temperature coefficient of the reaction is 2. What is the rate constant (in min⁻¹) at 17°C for this reaction?
- a) 10⁻³
b) 5 X 10⁻⁴
c) 2 X 10⁻³
d) 10⁻²
182. In a chemical reaction, two reactants take part. The rate of reaction is directly proportional to the concentration of one of them and inversely proportional to the concentration of the other. The order of the reaction is:
- a) zero
b) 1
c) 2
d) 4
183. According to Arrhenius equation, the rate constant (k) is related to temperature (T) as:
- a) $\ln\left(\frac{k_2}{k_1}\right) = E_a/R (1/T_1 - 1/T_2)$
b) $\ln\left(\frac{k_2}{k_1}\right) = -E_a/R (1/T_1 - 1/T_2)$
c) $\ln\left(\frac{k_2}{k_1}\right) = E_a/R (1/T_1 + 1/T_2)$
d) $\ln\left(\frac{k_2}{k_1}\right) = -E_a/R (1/T_1 + 1/T_2)$
184. Consider a reaction $aG + bH \rightarrow$ Products. When concentration of both the reactants G and H are doubled, the rate increases by eight times. However, when the concentration of G is double keeping the concentration of H fixed, the rate is doubled. The overall order of reaction is:
- a) 0
b) 1
c) 2
d) 3
185. The temperature dependence of rate constant (k) of a chemical reaction is written in terms of Arrhenius equation $k = A e^{-E_a/RT}$. Activation energy (E_a) of the reaction can be calculated by plotting:
- a) log k vs T
b) log k vs 1/T
c) k vs T
d) k vs 1/log T
186. Consider the 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) s⁻¹
b) L mol⁻¹ s⁻¹
c) unitless
d) mol L⁻¹ s⁻¹
187. In a first order reaction $A \rightarrow B$, if k is rate constant and initial concentration of the reactant A is 0.5 M then half-life is:
- a) $\frac{\log 2}{k}$
b) $\frac{\log 2}{k\sqrt{0.5}}$
c) $\frac{\ln 2}{k}$
d) $\frac{0.693}{0.5k}$
188. For the first order reaction, half-life is 14 sec, the time required for the initial concentration to reduce to 1/8 of its value is:
- a) (14)³ sec
b) 28 sec
c) 42 sec
d) (14)² sec
189. 75% of the 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) 48 min
190. For a zero order reaction, $A \rightarrow P$ t_{1/2} is: (k is rate constant)
- a) $\frac{[A]_0}{2k}$
b) $\frac{k}{\ln 2}$
c) $\frac{1}{k[A]_0}$
d) $\frac{[A]_0}{k}$
191. The rate constant k₁ and k₂ for two different reaction are 10¹⁶ e^{-2000/T} and 10¹⁵ e^{-1000/T}, respectively. The temperature at which k₁ = k₂ is:
- a) 2000 K

- b) $\frac{1000}{2.303}$ K
 c) 1000 K
 d) $\frac{2000}{2.303}$ K

192. Under the same reaction conditions, initial concentration of $1.386 \text{ mol dm}^{-3}$ of a substance becomes half in 40 seconds and 20 seconds through first order reaction and zero order kinetics respectively. Ratio (k_1/k_0) of the rate constant for first order (k_1) and zero order (k_0) of the reaction is:

- a) $0.5 \text{ mol}^{-1} \text{ dm}^3$
 b) 1 mol dm^{-3}
 c) 1.5 mol dm^{-3}
 d) $2 \text{ mol}^{-1} \text{ dm}^3$

193. The decomposition of HI on the surface of gold is:

- a) Pseudofirst order
 b) zero order
 c) first order
 d) second order

194. Consider following two reactions $A \longrightarrow \text{Product}$, -

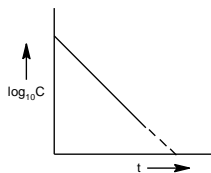
$$\frac{d[A]}{dt} = k_1[A]_0$$



k_1 and k_2 are expressed in terms of molarity (mol L^{-1}) and time (s^{-1}) as:

- a) $\text{s}^{-1}, \text{M s}^{-1} \text{ L}^{-1}$
 b) $\text{M s}^{-1}, \text{M s}^{-1}$
 c) $\text{s}^{-1}, \text{M}^{-1} \text{ s}^{-1}$
 d) $\text{M s}^{-1}, \text{s}^{-1}$

195. If a plot of $\log_{10}C$ versus 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

196. For a zero order reaction the plot of concentration of reactant versus 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

197. T_{50} of first order reaction is 10 min. Starting with 10 mol L^{-1} , rate after 20 min is:

- a) $0.0693 \text{ mol L}^{-1} \text{ min}^{-1}$
 b) $0.0693 \times 2.5 \text{ mol L}^{-1} \text{ min}^{-1}$
 c) $0.0693 \times 5 \text{ mol L}^{-1} \text{ min}^{-1}$

- d) $0.0693 \times 10 \text{ mol L}^{-1} \text{ min}^{-1}$

198. For the decomposition of AB and 600 K, the following data were obtained

[AB] mol dm^{-3}	Rate of decomposition of AB in $\text{mol dm}^{-3} \text{ s}^{-1}$
0.20	2.75×10^{-4}
0.40	11×10^{-4}
0.60	24.75×10^{-4}

The order of the decomposition of AB is:

- a) 0
 b) 1
 c) 2
 d) 1.5

199. 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:

Exp. No.	[A]	[B]	Initial reaction rate ($\text{mol L}^{-1} \text{ s}^{-1}$)
1.	0.2 M	0.3 M	5×10^{-4}
2.	0.2 M	0.1 M	5×10^{-4}
3.	0.4 M	0.05 M	7.5×10^{-4}

The overall order of the reaction is:

- a) one (1)
 b) two (2)
 c) two and a half (2.5)
 d) between 1 and 2

200. For a first order reaction $A \longrightarrow P$, the temperature (T) dependent rate constant (k) was found to follow the equation:

$$\log k = -(2000) / T + 6.0$$

The pre exponential factor A and the activation energy E_a respectively, are:

- a) $1 \times 10^6 \text{ s}^{-1}$ and 9.2 KJ mol^{-1}
 b) 6 s^{-1} and 16.6 KJ mol^{-1}
 c) $1 \times 10^6 \text{ s}^{-1}$ and 16.6 KJ mol^{-1}
 d) $1 \times 10^6 \text{ s}^{-1}$ and 38.3 KJ mol^{-1}

1.(c)	26.(d)	51.(c)	76.(c)	101.(d)	126.(a)	151.(b)	176.(d)
2.(d)	27.(a)	52.(d)	77.(b)	102.(d)	127.(c)	152.(c)	177.(a)
3.(b)	28.(b)	53.(a)	78.(b)	103.(c)	128.(b)	153.(c)	178.(c)
4.(b)	29.(d)	54.(b)	79.(d)	104.(b)	129.(a)	154.(b)	179.(c)
5.(a)	30.(d)	55.(d)	80.(a)	105.(b)	130.(a)	155.(a)	180.(b)
6.(a)	31.(d)	56.(c)	81.(d)	106.(c)	131.(a)	156.(c)	181.(b)
7.(c)	32.(b)	57.(b)	82.(c)	107.(a)	132.(a)	157.(c)	182.(a)
8.(d)	33.(a)	58.(a)	83.(b)	108.(d)	133.(c)	158.(c)	183.(a)
9.(b)	34.(a)	59.(c)	84.(a)	109.(b)	134.(b)	159.(c)	184.(d)
10.(c)	35.(b)	60.(d)	85.(c)	110.(b)	135.(b)	160.(b)	185.(b)
11.(a)	36.(c)	61.(b)	86.(a)	111.(d)	136.(b)	161.(b)	186.(b)
12.(d)	37.(d)	62.(c)	87.(a)	112.(a)	137.(b)	162.(a)	187.(c)
13.9d	38.(d)	63.(d)	88.(c)	113.(c)	138.(c)	163.(a)	188.(c)
14.(d)	39.(a)	64.(c)	89.(c)	114.(a)	139.(a)	164.(c)	189.(b)
15.(b)	40.(c)	65.(a)	90.(c)	115.(a)	140.(e)	165.(c)	190.(a)
16.(a)	41.(b)	66.(d)	91.(b)	116.(c)	141.(c)	166.(a)	191.(b)
17.(c)	42.(b)	67.(c)	92.(d)	117.(a)	142.(d)	167.(b)	192.(a)
18.(c)	43.(d)	68.(b)	93.(a)	118.(a,c)	143.(b)	168.(a)	193.(b)
19.(b)	44.(c)	69.(c)	94.(d)	119.(b)	144.(b)	169.(c)	194.(d)
20.(b)	45.(a)	70.(c)	95.(d)	120.(b)	145.(c)	170.(a)	195.(b)
21.(c)	46.(b)	71.(a)	96.(b)	121.(b)	146.(c)	171.(b)	196.(c)
22.(a)	47.(c)	72.(d)	97.(b)	122.(a)	147.(c)	172.(c)	197.(b)
23.(a)	48.(a)	73.(a)	98.(a)	123.(c)	148.(c)	173.(b)	198.(c)
24.(d)	49.(d)	74.(b)	99.(a)	124.(a)	149.(b)	174.(b)	199.(d)
25.(c)	50.(b)	75.(d)	100.(a)	125.(a)	150.(c)	175.(a)	200.(d)