NEET CHEMISTRY PRACITCE PAPER

Time : 60 Mins **7 CHEMICAL KINETICS 1** **Marks : 200**

1. For a reaction between A and B the order with respect to A is 2 and the order with respect to B is 3. The concentrations of both A and B are doubled, the rate will increase by a factor of :
   a) 10 b) 12 c) 16 d) 32
2. For the reaction 2A $+\mathrm{B} \rightarrow 3\mathrm{C} + \mathrm{D}$
   which of the following does not express the reaction rate?
   a) $-\frac{d[\mathrm{B}]}{dt}$ b) $\frac{d[\mathrm{D}]}{dt}$ c) $-\frac{1}{2}\frac{d[\mathrm{A}]}{dt}$ d) $-\frac{1}{3}\frac{d[\mathrm{C}]}{dt}$
3. Consider the reaction, $N_{2(g)}$+ $3H_{2(g)} \longrightarrow 2NH_{3(g)}$ The equality relationship between $\frac{d[NH_3]}{dt}$ and $-\frac{d[NH_2]}{dt}$ is :
   a) $\frac{d[NH_3]}{dt} = -\frac{1}{3}\frac{d[H_2]}{dt}$ b) $+\frac{d[NH_3]}{dt} = -\frac{2}{3}\frac{d[H_2]}{dt}$ c) $+\frac{d[NH_3]}{dt} = -\frac{3}{2}\frac{d[H_2]}{dt}$ d) $\frac{d[NH_3]}{dt} = -\frac{d[H_2]}{dt}$
4. In a first order reaction, the concentration of reactant decreases from 400 mol L^{-1} to 25 mol L^{-1} in 200 seconds. The rate constant for the reaction is
   a) 1.01386 s^{-1} b) 2 x 10^{-4} s^{-1} c) 1.386 x 10^{-2} s^{-1} d) 3.4 x 10^{-4} s^{-1}
5. For a reaction, $2NO + 2H_2 \longrightarrow N_2 + 2H_2O$, the possible mechanism is
   $2NO \rightleftharpoons N_2O_2$
   $N_2O_2 + H_2 \xrightarrow{slow} N_2O + H_2O$
   $N_2O + H_2O \xrightarrow{fast} N_2 + H_2O$
   What is the rate law and order of the reaction?
   a) Rate = $[N_2O_2]$, order = 1 b) Rate = $[N_2O_2][H_2]$, order = 2 c) Rate = $[N_2O_2]^2$, order = 2
   d) Rate = $[N_2O_2]^2$ $[H_2]$, order = 3
6. The rate of first order reaction is 1.5 X 10^{-2} mol L^{-1} min^{-1} at 0.5 M concentration of the reactant. The half-life of the reaction is :
   a) 0.383 min b) 23.1 min c) 8.73 min d) 7.53 min
7. For a first reaction A - B the reaction rate at reactant concentration of 0.01 M is found to be 2.0 x 10^{-5} mol L^{-1} s^{-l}. The half-life period of the reaction is:
   a) 30 s b) 220 s c) 300 s d) 347 s
8. The order of reaction is decided by
   a) temperature b) mechanism of reaction as well as relative concentration of reactants c) molecularity
   d) pressure
9. Half-life of a first order reaction is 4 s and the initial concentration of the reactants is 0.12 M. The concentration of the reactant left after 16 s is:
   a) 0.0075 M b) 0.06 M c) 0.03 M d) 0.015 M
10. Which of the following factors are responsible for the increase in the rate of a surface catalysed reaction?
    (i) A catalyst provides proper orientation for the reactant molecules to react.
    (ii) Heat of adsorption of reactants on a catalyst helps reactant molecules to overcome activation energy.
    (iii) The catalyst increases the activation energy of the reaction.
    a) (i) and (iii) b) (i) and (ii) c) (ii) and (iii) d) (i), (ii) and (iii)

11. The experimental data for the reaction 2A + B_2 + 2AB is

Exp.	[A]	$[B_2]$	Rate (Ms^{-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) $\text{rate} = k[B_2]$ b) $\text{rate} = k[B_2]^2$ c) $\text{rate} = k[A]^2[B]^2$ d) $\text{rate} = k[A]^2[B]$

12. The activation energy for a simple chemical reaction A + B is E_a in forward direction. The activation energy for reverse reaction

a) Is always double of E_a b) Is negative of E_a c) Is always less than E_a

d) Canbe less than or more than E_a

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

a) A first-order reaction can catalyzed; a second-order reaction cannot be catalyzed.

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)

The rate of a first-order reaction does not depend on reactant concentrations; the rate of a second-order reaction does depend on reactant concentrations.

d)

The rate of a first-order reaction does depend on reactant concentrations; the rate of a secondorder reaction does not depend on reactant concentrations.

14. For the reaction $2NH_3 \longrightarrow N_2+3H_2$

$-\frac{d[NH_3]}{dt} = k_1[NH_3], \frac{d[N_2]}{dt} = K_2[NH_3], \frac{d[H_2]}{dt} = k_3[NH_3]$then the relation between k_1, k_2 and k_3 is

a) $k_1=k_2=k_3$ b) $k_1=3k_2=2k_3$ c) $1.5k_1=3k_2=k_3$ d) $2k_1=k_2=3k_3$

15. Assertion: E_a of the forward reaction is higher than that of backward reaction in a reversible endothermic reaction.
Reason: Increasing the temperature of the substance increases the fraction of molecules which collide with energies greater than E_a.

a) If both assertion and reason are true and reason is the correct explanation of assertion

b) If both assertion and reason are true but reason is not the correct explanation of assertion

c) If assertion is true but reason is false d) If both assertion and reason are false

16. Fill up the following with suitable terms.

(i) Activation energy = Threshold energy __

(ii) Half-life period of zero order reaction = __

(iii) Average rate of reaction = ____

(iv) Instantaneous rate of reaction = _____

a)

(i)	(ii)	(iii)	(iv)
Potential energy	$\frac{0.693}{k}$	$\frac{dx}{dt}$	$\frac{\triangle[A]}{\triangle t}$

b)

(i)	(ii)	(iii)	(iv)
Energy of reactants	$\frac{1}{k}$	$\frac{\triangle[A]}{\triangle t}$	$\frac{dx}{dt}$

c)

(i)	(ii)	(iii)	(iv)
Energy of reaction	$\frac{logk}{t}$	$\frac{\triangle[A]}{\triangle t}$	$\frac{dx}{dt}$

d)

(i)	(ii)	(iii)	(iv)
Average kinetic energy of reactants	$\frac{a}{2k}$	$\frac{\triangle[A]}{\triangle t}$	$\frac{dx}{dt}$

17. For the reaction, 2A + B $\longrightarrow$ 3C + D which of the following does not express the reaction rate?

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

18. A chemical reaction is catalysed by a catalyst X. Hence, X :

a) reduces enthalpy of the reaction b) decreases rate constant of the reaction
c) increases activation energy of the reaction d) does not affect equilibrium constant of the reaction

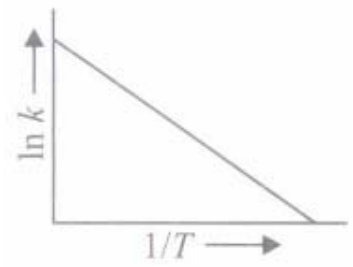
19. Assertion: All molecular collisions lead to the formation of products.
Reason: Reactant molecules undergo chemical change irrespective of their collision
a) If both assertion and reason are true and reason is the correct explanation of assertion
b) If both assertion and reason are true but reason is not the correct explanation of assertion
c) If assertion is true but reason is false d) If both assertion and reason are false

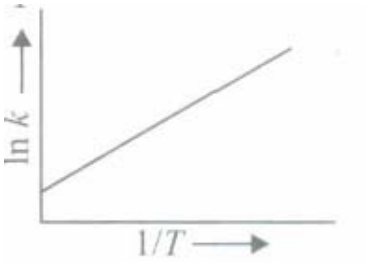
20. A hypothetical reaction, A2 + B2 ⟶ 2AB follows the mechanism as given below:
A2 ⇌ A + A ....(fast)
A + B2 ⟶ AB + B .....(slow)
A + B ⟶ AB ..... (fast)
The order of the overall reaction is
a) 2 b) 1 c) 3/2 d) zero

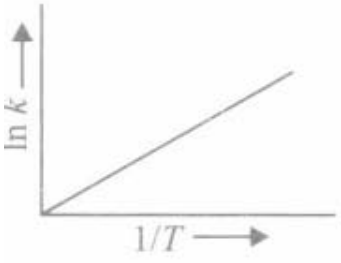
21. The rate of reaction between two reactants A and B decreases by a factor of 4 if the concentration of reactant B is doubled. The order of this reaction with respect to reactant B is
a) 2 b) -2 c) 1 d) -1

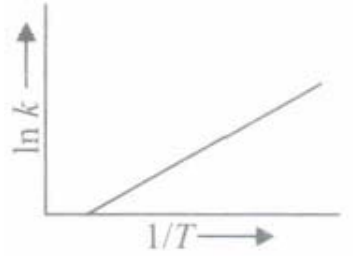
22. The rate of first-order reaction is 0.04 mol L^{-1} s^{-1} at 10 seconds and 0.03 mol L^{-1} s^{-1} at 20 seconds after initiation of the reaction. The half-life period of the reaction is :
a) 44.1 s b) 54.1 s c) 24.1 s d) 34.1 s

23. According to Arrhenius equation rate constant k is equal to Ae-EaIRT. Which of the following options represents the graph of In k vs 1/T?

a) 

b) 

c) 

d) 

24. The rate constants 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) 1000 K b) $\frac{2000}{2.303}K$ c) 2000 K d) $\frac{1000}{2.303}K$

25. A substance I decomposes by a first order reaction starting initially with [A] = 2.00 m and after 200 min, [A] becomes 0.15 m. For this reaction t1/2 is:
a) 53.49 min b) 50.49 min c) 48.45 min d) 46.45 min

26. Which of the following statements is correct?
a) The rate of a reaction decreases with passage of time as the concentration of reactants decreases
b) The rate of a reaction is same at any time during the reaction
c) The rate of a reaction is independent of temperature change
d) The rate of a reaction decreases with increase in concentration of reactant(s)

27. In a pseudo first order hydrolysis of ester in water, the following results were obtained.

t/s	0	30	60	90
Ester/mol L^{-1}	0.55	0.31	0.17	0.085

What will be the average rate of reaction between the time interval 30 to 60 seconds?

a) 1.91 x 10^{-2} s^{-1} b) 4.67 x 10^{-3} mol L^{-1} s^{-1} c) 1.98 x 10^{-3} s^{-1} d) 2.07 x 10^{-2} s^{-1}

28. Rate law for the reaction, A + 2B ⟶ C is found to be Rate =k[A][B]
Concentration of reactant 'B' is doubled, keeping the concentration of 'A' constant, the value of rate constant will be _____

a) the same b) doubled c) quadrupled d) halved

29. Consider the reaction: $2N_2O_4 \rightleftharpoons 4NO_2$ if $-\frac{d[N_2O_4]}{dt}$=k and $\frac{d[NO_2]}{dt}$=k' then

a) 2k'=k b) k'=2k c) k'=k d) k=$\frac{1}{4}$k'

30. The reaction 2X ⟶ Y + Z would be zero order reaction when

a) rate remains unchanged at any concentration of Y and Z
b) rate of reaction doubles if concentration of Y is doubled
c) rate of reaction remains same at any concentration of X
d) rate of reaction is directly proportional to square of concentration of X

31. For the reaction, $N_2O_{5(g)} \longrightarrow 2NO_{2(g)} + \frac{1}{2}O_{2(g)}$. The value of rate of disappearance of N_2O_5 is given as 6.25 x 10^{-3} mol $L^{-1}s^{-1}$. The rate of formation of NO_2 and O_2 is given respectively as :

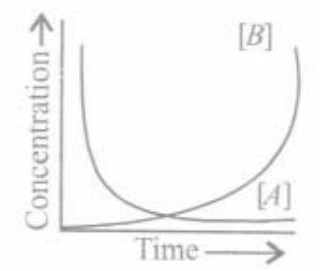
a) 6.25 x 10^{-3} mol L^{-1} s^{-1} and 6.25 x 10^{-3} mol L^{-1} s^{-1} b) 1.25 x 10^{-2} mol $L^{-1}s^{-1}$ and 3.125 x 10^{-3} mol $L^{-1}s^{-1}$
c) 6.25 x 10^{-3} mol $L^{-1}s^{-1}$ and 3.125 x 10^{-3} mol L^{-1} s^{-1} d) 1.25 x 10^{-2} mol $L^{-1}s^{-1}$ and 6.25 x 10^{-3} mol $L^{-1}s^{-1}$

32. Which of the following statements is not correct?

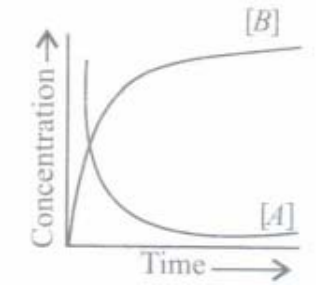
a) For a zero order reaction, $t_{1/2}$ is proportional to initial concentration
b) The relationship of variation of rate constant with temperature is given by $\frac{k_2}{k_1} = \frac{E_a}{2.303R}\left[\frac{T_2 - T_1}{T_1 T_2}\right]$.
c) The unit of rate constant for a reaction is $mol^{1-n}L^{n-1}s^{-1}$ where n is order of the reaction
d) The unit of rate of reaction changes with order of reaction

33. Consider the reaction A ⟶ B. The concentration of both the reactants and the products varies exponentially with time. Which of the following figures correctly describes the change in concentration of reactants and products with time?

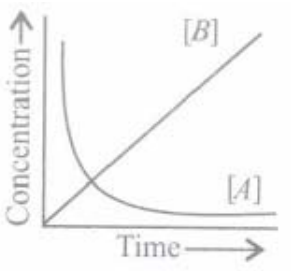
a)



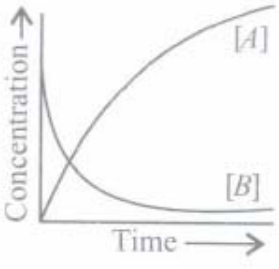
b)



c)



d)



34. For the reaction, $H_{2(g)}$ + $Br_{2(g)}$ ⟶ $2HBr_{(g)}$, the reaction rate =$k[H_2][Br_2]^{1/2}$. Which statement is true about this reaction?

a) The reaction is of second order b) Molecularity of the reaction is 3/2. c) The unit of k is sec^{-1}
d) Molecularity of the reaction is 2

35. For a reaction R ⟶ P, the concentration of a reactant changes from 0.05 M to 0.04 M in 30 minutes. What will be the average rate of reaction in minutes?
a) 4 x 10^{-4} M min^{-1} b) 8 x 10^{-4} M min^{-1} c) 3.3 x 10^{-4} M min^{-1} d) 2.2 x 10^{-4} M min^{-1}

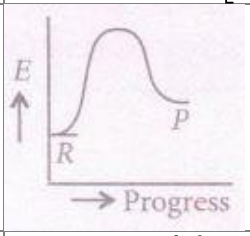
36. An increase in the concentration of the reactants of a reaction leads to change in:
a) collision frequency b) activation energy c) heat of reaction d) threshold energy

37. Radioactive disintegration is an example of
a) zero order reaction b) first order reaction c) second order reaction d) third order reaction

38. Which of the following statements is incorrect about the collison theory of chemical reaction?
a) It considers reacting molecules or atoms to be hard spheres and ignores their structural features
b) Number of effective collisions determines the rate of reaction
c) Collision of atoms or molecules possessing sufficient threshold energy results into the product formation
d)
Molecules should collide with sufficient threshold energy and proper orientation for the collision to be effective

39. The decomposition of a hydrocarbon follows the equation k = (4.5 x 10^{11} s^{-1})$e^{-28000K/T}$. What will be the value of activation energy?
a) 669 kJ mol^{-1} b) 669 kJ mol^{-1} c) 4.5 x 10^{11} kJ mol^{-1} d) 28000 kJ mol^{-1}

40. Match the column I with column II and mark the appropriate choice.

Column I		Column II	
(A)	Zero-order	(i)	$\log\frac{k_2}{k_1} = \frac{E_a}{2.303R}\left[\frac{T_2-T_1}{T_1T_2}\right]$
(B)	First-order	(ii)	
(C)	Endothermic reaction	(iii)	$k = \frac{2.303}{t} log\frac{[A]_0}{[A]}$
(D)	Activation energy	(iv)	$k = \frac{1}{t}$ ($[A]_0$-[A]

a) (A) ⟶ (iv), (B) ⟶ (iii), (C) ⟶ (ii), (D) ⟶ (i) b) (A) ⟶ (i), (B) ⟶ (ii), (C) ⟶ (iii), (D) ⟶ (iv)
c) (A) ⟶ (ii), (B) ⟶ (iii), (C) ⟶ (iv), (D) ⟶ (i) d) (A) ⟶ (iii), (B) ⟶ (iv), (C) ⟶ (i), (D) ⟶ (ii)

41. Compounds 'A' and 'B' react according to the following chemical equation.
$A_{(g)} + 2B_{(g)} \longrightarrow 2C_{(g)}$
Concentration of either 'A' or 'B' were changed keeping the concentrations of one of the reactants constant and rates were measured as a function of initial concentration. Following results were obtained. Choose the correct option for the rate equations for this reaction.

Experiment	Initial concentration of [A]mol L^{-1}	Initial concentration of [B] /mol L^{-1}	Initial rate of formation of [C]/mol $L^{-1}s^{-1}$
1.	0.30	0.30	0.10
2.	0.30	0.60	0.40
3.	0.60	0.30	0.20

a) Rate = k $[A]^2$ [B] b) Rate = k [A] $[B]^2$ c) Rate = k [A] [B] d) Rate = k [A] $[B]^0$

42. Assertion: Order of a reaction with respect to any reactant can be zero, positive, negative or fractional.
Reason: Rate of a reaction cannot decrease with increase in concentration of a reactant or a product.

a) If assertion is true but reason is false b) If both assertion and reason are false
c) If both assertion and reason are true and reason is the correct explanation of assertion
d) If both assertion and reason are true but reason is not the correct explanation of assertion

43. The temperature dependence of the rate of a chemical reaction is given by Arrhenius equation, $k = Ae^{-E_a/RT}$.
Which of the following graphs will be a straight line?
a) ln A vs 1/T b) ln A vs E_a c) ln k vs 1/T d) ln k vs $-E_a/R$

44. For the reaction A + B ⟶ products, what will be the order of reaction with respect to A and B?

Exp,	[A](mol L^{-1})	[A](mol L^{-1})	initial rate (mol L^{-1} s^{-1})
1.	2.5×10^{-4}	3×10^{-5}	5×10^{-4}
2.	5×10^{-4}	6×10^{-5}	4×10^{-3}
3.	1×10^{-3}	6×10^{-5}	1.6×10^{-2}

a) 1 with respect to A and 2 with respect to B b) 2 with respect to A and 1 with respect to B
c) 1 with respect to A and 1 with respect to B d) 2 with respect to A and 2 with respect to B

45. The rate constant for a first order reaction is $4.606 \times 10^{-3} s^{-1}$. The time required to reduce 2.0 g of the reactant to 0.2 g is:
a) 1000 s b) 100 s c) 200 s d) 500 s

46. 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.

47. 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 concentration of NO b) increasing the temperature
c) increasing the concentration of the Cl_2 d) doing all of these

48. Rate of a general reaction A + B ⟶ products can be expressed as follows on the basis of collision theory Rate = $ZAB^{e-E_a/RT}$.
Which of the following statements is not correct for the above expression?
a)
Z is collision frequency and is equal to number of collisions per second per unit volume of the reaction mixture
b) $e^{-E_a/RT}$ is the fraction of molecules with kinetic energy equal to or greater than E_a
c) E_a is activation energy of the reaction
d) All the molecules which collide with one other are effective collisions

49. Which of the following statements is not correct for the catalyst?
a) It catalyses the forward and backward reaction to the same extent b) It alters ΔG of the reaction
c) It is a substance that does not change the equilibrium constant of a reaction
d) It provides an alternate mechanism by reducing activation energy between reactants and products

50. If the rate constant for a first order reaction is k, the time (l) required for the cornpletion of 99% of the reaction is given by
a) t = 6.909/k b) t = 4.606/k c) t = 2.303/k d) t = 0.693/k