Chemical Kinetic Assignment

1. A catalyst is a substance which
(a) Increases the equilibrium concentration of the product (b) Changes the equilibrium constant of the reaction
(c) Shortens the time to reach equilibrium (d) Supplies energy to the reaction.

2. A catalyst increases the rate of a chemical reaction by
(a) Increasing the activation energy (b) Decreasing the activation energy
(c) Reacting with reactants (d) Reacting with products

3. The rate of a reaction
(a) Increases with increase in temperature (b) Decreases with increase in temperature
(c) Does not depend on temperature (d) Does not depend on concentration

4. If the concentration of the reactants is increased, the rate of reaction
(a) Remains unaffected (b) Increases (c) Decreases (d)May increase or decrease

5. A catalyst increases the rate of reaction because it
(a) Increases the activation energy (b) Decreases the energy barrier for reaction
(c) Decreases the collision diameter (d) Increases the temperature coefficient

6. For the reaction $CH_3COOCH_3 + H_2O \xrightarrow{H^+} CH_3COOH + CH_3OH$ The progress of the process of reaction is followed by
(a) Finding the amount of methanol formed at different intervals
(b) Finding the amount of acetic acid formed at different intervals
(c) Using a voltmeter
(d) Using a polarimeter

7. The concentration of a reactant decreases from 0.2 *M* to 0.1 *M* in 10 *minutes*. The rate of the reaction is
(a) 1.01 *M* (b) 10^{-2} (c) $0.01\, mol\ dm^{-3}\ \min^{-1}$ (d) $1\, mol\ dm^{-3}\ \min^{-1}$

8. If doubling the concentration of a reactant 'A' increases the rate 4 times and tripling the concentration of 'A' increases the rate 9 times the rate is proportional to
(a) Concentration of 'A' (b) Square of concentration of 'A'
(c) Under root of the concentration of 'A' (d) Cube of concentration of 'A'

9. A catalyst
(a) Increases the average kinetic energy of reacting molecules (b)Decrease the activation energy
(c) Alters the reaction mechanism (d)Increases the frequency of collision of reaction species

10. In a catalytic conversion of N_2 to NH_3 by Haber's process, the rate of reaction was expressed as change in the concentration of ammonia per time is $40 \times 10^{-3}\ mol\ litre^{-1}\ s^{-1}$. If there are no side reaction , the rate of the reaction as expressed in terms of hydrogen is (in $mol\ litre^{-1}\ s^{-1}$)
(a) 60×10^{-3} (b) 20×10^{-3} (c) 1.200 (d) 10.3×10^{-3}

11. For the reaction $N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$ under certain conditions of temperature and partial pressure of the reactants, the rate of formation of NH_3 is $0.001\ kg\ h^{-1}$. The rate of conversion of H_2 under the same conditions is
(a) $1.82 \times 10^{-4}\ kg/hr$ (b) $0.0015\ kg/hr$ (c) $1.52 \times 10^{4}\ kg/hr$ (d) $1.82 \times 10^{-14}\ kg/hr$

12. In the reaction $2A + B \rightarrow A_2B$, if the concentration of *A* is doubled and of *B* is halved, then the rate of the reaction will
(a) Increase by four times (b) Decrease by two times (c) Increase by two times (d) Remain the same

13. The term $\left(\frac{dc}{dt}\right)$ in a rate equation refers to the
(a) Concentration of the reactant (b) Decrease in concentration of the reactant with time
(c) Increase in concentration of the reactant with time (d) Velocity constant of the reaction

14. When the concentration of *A* in the reaction $A + B$ *AB* is doubled, the rate of reaction will be
(a) Doubled (b) Decreased by half (c) Unchanged (d)Increased by four times

15. The rate law for the reaction $RCl + NaOH(aq) \rightarrow ROH + NaCl$ is given by Rate=K_1[*RCl*]. The rate of the reaction will be
(a) Doubled on doubling the concentration of sodium hydroxide
(b) Halved on reducing the concentration of alkyl halide to one half
(c) Decreased on increasing the temperature of the reaction
(d) Unaffected by increasing the temperature of the reaction

16. In the following reactions, how is the rate of appearance of the bold product related to the rate of disappearance of the bold reactant

$BrO_3^-(aq) + 5Br^-(aq) + 6H^+ \rightarrow 3Br_2(l) + 3H_2O(l)$

(a) $\frac{d[Br_2]}{dt} = -\frac{5}{3}\frac{d[Br^-]}{dt}$ (b) $\frac{d[Br_2]}{dt} = -\frac{d[Br^-]}{dt}$ (c) $\frac{d[Br_2]}{dt} = \frac{3}{5}\frac{d[Br^-]}{dt}$ (d) $\frac{d[Br_2]}{dt} = -\frac{3}{5}\frac{d[Br^-]}{dt}$

17. For the reaction system $2NO(g)+O_2(g)\rightarrow 2NO_2(g)$ volume is suddenly produced to half its value by increasing the pressure on it. If the reaction is of first order with respect to O_2 and second order with respect to *NO,* the rate of reaction will

(a) Diminish to one fourth of its initial value (b) Diminish to one eighth of its initial value
(c) Increase to eight times of its initial value (d) Increase to four times of its initial value

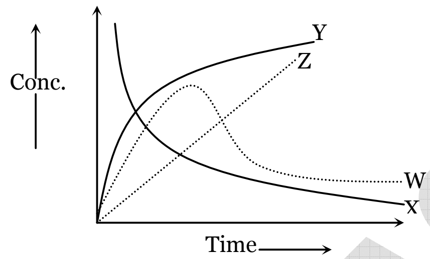
18. The conversion of $A\rightarrow B$ follows second order kinetics. Doubling the concentration of *A* will increase the rate of formation of *B* by a factor

(a) $\frac{1}{4}$ (b) 2 (c) $\frac{1}{2}$ (d) 4

19. For a reaction $A\rightarrow B,$ the rate of reaction quadrupled when the concentration of *A* is doubled. The rate expression of the reaction is $r=K(A)^n$. when the value of *n* is

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

20. For the reaction $A+B\rightarrow C+D.$ The variation of the concentration of the products is given by the curve



(a) X (b) Y (c) W (d) Z

21. In the formation of sulphur trioxide by the Contact Process, $2SO_2(g)+O_2(g)\quad 2SO_3(g)$ The rate of reaction is expressed as $-\frac{d(O_2)}{dt}=2.5\times10^{-4}$ *mol* L^{-1} $\sec^{-1}$. The rate of disappearance of (SO_2) will be

(a) $5.0\times10^{-4}\ mol\ L^{-1}\ s^{-1}$ (b) $-2.25\times10^{-4}\ mol\ L^{-1}\ s^{-1}$ (c) $3.75\times10^{-4}\ mol\ L^{-1}\ s^{-1}$ (d) $50.0\times10^{-4}\ mol\ L^{-1}\ s^{-1}$

22. Which of the following statement is correct?

(a) For reaction *x* $X\rightarrow y\,Y$, Rate = $\frac{1}{x}\frac{d[X]}{dt}=\frac{d[Y]}{dt}$
(b) The parameter, rate constant and specific reaction rate have different meaning
(c) For any reaction the value of specific reaction rate is independent of the initial concentrations of reactants
(d) $E_a=E_R+E_{Threshold}$

23. For a chemical reaction $2X+Y\rightarrow Z$ the rate of appearance of *Z* is 0.05 mol L^{-1} *per min.* The rate of disappearance of *X* will be

(a) 0.05 *mol* L^{-1} *per hour* (b) 0.05 *mol* L^{-1} *per min* (c) 0.1 *mol* L^{-1} $\min^{-1}$ (d) 0.25 *mol* L^{-1} *per min.*

24. The rate equation for the decomposition of N_2O_5 in CCl_4 is rate= $k[N_2O_5]$ where $k=6.3\times10^{-4}\ s^{-1}$ at 320 K. What would be the initial rate of decomposition of N_2O_5 in a 0.10-M solution of N_2O_5

(a) $6.3\times10^{-6}\ mol\ L^{-1}\ s^{-1}$ (b) $0.63\times10^{-6}\ mol\ L^{-1}\ s^{-1}$ (c) $6.3\times10^{-5}\ mol\ L^{-1}\ s^{-1}$ (d) $0.63\times10^{-4}\ mol\ L^{-1}\ s^{-1}$

25. The rate equation for a gaseous reaction is rate $=k[A][B].$ If the volume of the reaction vessel containing these gases is reduced to half the initial volume, the rate of the reaction would be

(a) One-fourth the original rate (b) Four times the original rate
(c) Double the original rate (d) Half the original rate

26. For the reaction $A+2B\rightarrow C+D,$ rate $=-\frac{d[A]}{dt}=k[A]^2[B].$ The expression for the rate of the reaction in terms of change in the concentration of *B,* $-\frac{d[B]}{dt}$, would be

(a) $k[A]^2[B]$ (b) $k[A]^2[2B]$ (c) $2k[A]^2[B]$ (d) $\frac{1}{2}k[A]^2[B]$

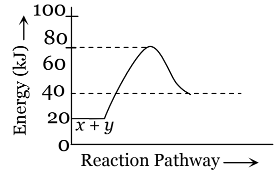
27. In the reaction $A+2B\rightarrow C+D$ the concentration of *A* is kept constant and that of *B* is tripled. The rate of the reaction will

(a) Become threefold (b) Become sixfold (c) Become ninefold (d) Not change

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

(a) The decrease in the number of collisions (b) The increase in the number of activated molecules
(c) The shortening of the mean free path (d) The lowering of the activation energy

29. Consider the following energy profile for the reaction. $X + Y = R + S$. Which of the following deductions about the reaction is not correct



(a) The energy of activation for the backward reaction is 80 *kJ*
(b) The forward reaction is endothermic
(c) ΔH for the forward reaction is 20 *kJ*
(d) The energy of activation for the forward reaction is 60 *kJ*

30. On increasing the temperature, the rate of the reaction increases because of
(a) Decrease in the number of collisions
(b) Decrease in the energy of activation
(c) Decrease in the number of activated molecules
(d) Increase in the number of effective collisions

31. The rate of a reaction is doubled for every 10^0 rise in temperature. The increase in reaction rate as a result of temperature rise from 10^0 *C* to 100^0 *C* is
(a) 112 (b) 512 (c) 400 (d) 614

32. The minimum energy a molecule should possess in order to enter into a fruitful collision is known as
(a) Reaction energy (b) Collision energy (c) Activation energy (d) Threshold energy

33. Which of the following statements is not true according to collision theory of reaction rates
(a) Collision of molecules is a precondition for any reaction to occur
(b) All collisions result in the formation of the products
(c) Only activated collision result in the formation of the products
(d) Molecules which have acquired the energy of activation can collide effectively

34. The activation energy for a simple chemical reaction $A \rightarrow B$ 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 then E_a
(d) Can be less than or more than E_a

35. A reaction rate constant is given by $k = 1.2 \times 10^{14}\, e^{-(25000/RT)}\, \sec^{-1}$ It means
(a) log *k* versus *log T* will give a straight line with slope as – 25000
(b) log *k* versus *T* will give a straight line with slope as – 25000
(c) log *k* versus 1/*T* will give a straight line with slope as – 25000
(d) log *k* versus 1/*T* will give a straight line

36. If we plot a graph between log *k* and $\frac{1}{T}$ by Arrhenius equation, the slope is
(a) $-\frac{E_a}{R}$ (b) $+\frac{E_a}{R}$ (c) $-\frac{E_a}{2.303\,R}$ (d) $+\frac{E_a}{2.303\,R}$

37. The activation energy for a reaction is $9\,kcal\,mol^{-1}$. The increase in the rate constant when its temperature is raised from 295 to 305 *K is*
(a) 10% (b) 50% (c) 100% (d) 20%

38. An endothermic reaction $A \rightarrow B$ has an activation energy $15 kcal/mole$ and energy of reaction $5 kcal/mole$. The activation energy of the reaction $B \rightarrow A$ is
(a) $20 kcal/mole$ (b) $15 kcal/mole$ (c) $10 kcal/mole$ (d) None of these

39. 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
(a) Less than ΔH (b) Zero (c) More than ΔH (d) Equal to ΔH

40. The rate constant (K') of one reaction is double of the rate constant (K'') of another reaction. Then the relationship between the corresponding activation energies of the two reactions ($E_a^{'}$ and $E_a^{''}$) will be
(a) $E_a^{'} > E_a^{''}$ (b) $E_a^{'} = E_a^{''}$ (c) $E_a^{'} < E_a^{''}$ (d) $E_a^{'} = 4E_a^{''}$

41. The following statement (*s*) is (are) correct
(a) A plot of log K_P *versus* $1/T$ is linear
(b) A plot of log [*X*] *versus* time is linear for a first order reaction $X \rightarrow P$
(c) A plot of log *P versus* 1/*T* is linear at constant volume
(d) A plot of *P* versus $1/V$ is linear at constant temperature

42. The ΔH value of the reaction $H_2 + Cl_2 \rightleftharpoons 2HCl$ is $-44.12 kcal$. If E_1 is the activation energy of the products, then for the above reaction
(a) $E_1 > E_2$
(b) $E_1 < E_2$
(c) $E_1 = E_2$
(d) ΔH is not related to E_1 and E_2

43. The temperature dependence of rate constant (k) of a chemical reaction is written in terms of Arrhenius equation, $k = A.e^{-E^*/RT}$. Activation energy (E^*) of the reaction can be calculated by plotting

(a) $\log k \; vs \; \frac{1}{\log T}$ (b) $k \; vs \; T$ (c) $k \; vs \; \frac{1}{\log T}$ (d) $\log k \; vs \; \frac{1}{T}$

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

(a) Changing concentration of reactants
(b) Evaluating rate constant at standard temperatures
(c) Evaluating rate constants at two different temperatures
(d) Evaluating velocities of reaction at two different temperatures

45. Activation energy is given by the formula

(a) $\log \frac{K_2}{K_1} = \frac{E_a}{2.303\,R}\left[\frac{T_2 - T_1}{T_1 T_2}\right]$ (b) $\log \frac{K_1}{K_2} = -\frac{E_a}{2.303\,R}\left[\frac{T_2 - T_1}{T_1 T_2}\right]$

(c) $\log \frac{K_1}{K_2} = -\frac{E_a}{2.303\,R}\left[\frac{T_1 - T_2}{T_1 T_2}\right]$ (d) None of these

46. A reaction having equal activation energies for forward and reverse reaction has

(a) $\Delta H = 0$ (b) $\Delta S = 0$ (c) Zero order (d) None of these

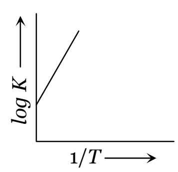
47. Collision theory is applicable to

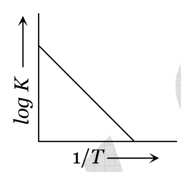
(a) First order reactions (b) Zero order reactions (c) Bimolecular reactions (d) Intra molecular reactions

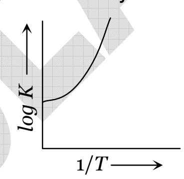
48. In respect of the equation $k = Ae^{-E_a/RT}$ in chemical kinetics, which one of the following statement is correct

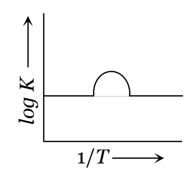
(a) k is equilibrium constant (b) A is adsorption factor (c) E_a is energy of activation (d) R is Rydberg's constant

49. A graph plotted between log *K* *vs* 1/*T* for calculating activation energy is shown by

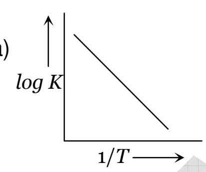
(a) 

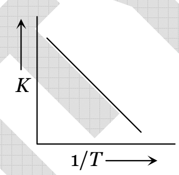
(b) 

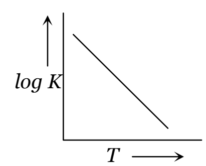
(c) 

(d) 

50. Which of the following plots is in accordance with the Arrhenius equation

(a) 

(b) 

(c) 

(d)