VIKASANA – 2012

KEY ANSWERS

CHEMICAL KINETICS & THIRMODYNAMICS-2

1. **The rate of a chemical reaction at constant temperature is proportional to :**
   1) The amount of products formed
   2) The product of the masses of the reactants
   3) The product of the molar concentrations of the reactants
   4) The mean free path of the reactions

2. **The reaction becomes faster if**
   1) Lower the energy of reactants
   2) Higher the energy of products
   3) Lower the activation energy
   4) Higher the activation energy

3. **For the reaction, A + 2B → C, the rate of reaction at a given instant can be represented by**
   1) + d[A] / dt = - 1/2 d[B] / dt = + d[C] / dt
   2) + d [A]/dt = + 1/2 d[B] / dt = + d[C]/dt
   3) – d[A] / dt = + 1/2 d[B] / dt = - d[C] / dt
   4) – d[A] / dt = - 1/2 d[B] / dt = + d[C] / dt

4. **For a reaction of the type aA + b[B] ⟶ Products : - d [A] / dt is equal to :**
   1) – d [B] / dt
   2) – a/ b d[B] / dt
   3) – b/a d [B] / dt
   4) – b/a d[B] / dt

5. **Radio – active decay follows**
   1) First order
   2) Second order
   3) Third order
   4) Zero order

6. **Concentration of a reactant is changed from 1 mole to 0.75 mole in 25 minutes in a litre vessel. The rate of reaction is**
   1) 10^{-2}
   2) 10^{-3}
   3) 3×10^{-2}
   4) 3×10^{4}

7. **For the reaction 4A + B ⟶ 2C + 2D. Which of the following statement is incorrect ?**
   1) The rate of formation of C is one half of the rate of consumption of A
   2) The rate of appearance of D is the half of the rate of disappearance of B
   3) The rate of disappearance of B is one fourth of the rate of disappearance of A
   4) The rate of formation of C and D are equal

8. **In a first order of reaction the concentration of the reactant decreases from 0.8M to 0.4M in 15 minutes. The time taken for the concentration to change from 0.1M to 0.025M is**
   1) 7.5 minutes
   2) 15 minutes
   3) 30 minutes
   4) 60 minutes

9. **Decomposition of nitrogen pentoxide is known to be a first order reaction. 75 percent of the oxide had decomposed in the first 24 minutes. At the end of an hour after the start of the reaction the amount of oxide left over will be**
   1) Zero
   2) about 1%
   3) about 2%
   4) about 3%

10. **The rate constant for the reaction $2N_2O_5 \longrightarrow 4NO_2+O_2$ is $3 \times 10^{-5} S^{-1}$. If the rate is 2.4×10^{-5} mol L^{-1} S^{-1} the concentration of N_2O_5 in mol L^{-1} is**
    1) 1.4
    2) 1.2
    3) 0.04
    4) 0.8

11. **In case of – endothermic reaction threshold energy is equal to**
    1) Heat of reaction + activation energy of the reverse reaction
    2) Heat of reaction + activation energy of the forward reaction
    3) Heat of reaction + energy of reactants
    4) Energy of reactants + Heat of reaction + activation energy of the reverse reaction

12. **A reaction involving two different reactants**
    1) can never be a first order reaction
    2) can never be a second order reaction
    3) can never be a unimolecular reaction
    4) can never be a bimolecular reaction

13. **By the n order of reactions, n we mean**
    1) The number of reactants which take part in the reaction
    2) The least number of molecules of the reactants needed for the reaction
    3) The number of concentration terms in the velocity equation of the reaction
    4) The sum of power to which the concentration terms are raised in the velocity equation

14. **Which of the following is incorrect about order of a reaction ?**
1) It is calculated experimentally
2) It is the sum of powers of concentrations in rate law expression
3) The order of a reaction cannot be a fraction
4) There is not necessarily a connection between order and stoichiometry of a reaction

15. **The rate constant of a reaction is 2.3×10^{-2} mol^{-1} L^1 m^{-1}. The order of reaction is**
1) Zero 2) 1 3) 2 4) 3

16. **75% of a first order reaction is completed in 30 minutes. What is the time required for 93.75% completion of the reaction in minutes ?**
1) 120 2) 45 4) 60 4) 90

17. **Order of a reaction is decided by**
1) mechanism of a reaction as well as relative concentration of reactants
2) temperature
3) pressure
4) molecularity

18. **Which of these does not influence the rate of a reaction ?**
1) molecularity of the reaction 2) temperature of the reaction
3) concentration of the reactants 4) Nature of reactants

19. **For a reaction $A + B \longrightarrow C + D$ if concentration of A is doubled without altering that of B rate doubles. If concentration of B is increased 9 times without altering that of A rate tripples. Order of the reaction is**
1) 2 2) 1 3) 3/2 4) 4/3

20. **Inversion of cane – sugar in dilute acid is**
1) unimoleular reaction 2) bimoleular reaction
3) Trimoleular reaction 4) pseudo – unimoleular reaction

21. **For the reaction $2NO + O_2 \longrightarrow 2NO_2$. By how much the rate of reaction will alter if the volume of the vessel is reduce to 1/3 of its original volume ?**
1) 27 times increase 2) 27 times decrease
3) 9 times increase 4) 4 times decrease

22. **The velocity constant of a reaction at 290k was found to be 3.2×10^{-3} S^1 when the temperature is raised to 310K it will be about**
1) 6.4×10^{-3} 2) 3.2×10^{-4}
3) 9.6×10^{-3} 4) 1.28×10^{-2}

23. **Which of the following is wrongly matched**
1) Saponification of CH_3COOCH_3 – second order reaction
2) Acid Hydrolysis of CH_3COOCH_3 – pseudo – unimolecular reaction
3) Decomposition of H_2O_2 – first order reaction
4) Combination of H_2 and Br_2 to give HBr – zero order reaction

24. **The reaction $2SO_2(g) + O_2(g) \longrightarrow 2SO_3(g)$, is carried out in a 1 dm^3 vessel and 2 dm^3 vessel separately. The ratio of the reaction velocities will be**
1) 1 : 8 2) 8 : 1 3) 4 : 1 4) 1 : 4

25. **Temperature co–efficient of a reaction is 2. When temperature is increased from 30°C to 100°C rate of the reaction increases by**
1) 250 times 2) 500 times
3) 128 times 4) 100 times

26. **A rise in temperature increases the velocity of a reaction it is because it results in**
1) an increased number of effective collisions
2) an increased momentum of colliding molecules
3) an increase in the threshold energy
4) a decrease in the threshould energy

27. **A large increase in the rate of a reaction for a rise in the temperature is due to**
1) the increase in the number of collisions
2) the increase in the number of activated molecules
3) the shortening of the mean free path
4) the lowering the activation energy

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28. **According to Arrhenius theory, the activation energy is**
1) the energy gained by the molecule on colliding with another reaction
2) the energy the molecule should possess in order to undergo reaction
3) the energy it should possess so that is can enter in to an effective collision
4) the energy it has to further acquire so that it can enter in to an effective collision

29. **The rate of a first order reaction is 1.5×10^{-2} mol L^{-1} m^{-1} at 0.5M concentration of reactant. The half life of the reaction is**
1) 0.83m 2) 23.1m 3) 90m 4) 120m

30. **In a first order reaction the concentration of reactant decreases from 800 mol dm^{-3} to 50 mol dm^{-3} in 2×10^4s. The rate constant of reaction in S^{-1} is**
1) 2×10^4 2) 3.45×10^{-5} 3) 1.386×10^{-4} 4) 2×10^{-4}

31. **The minimum energy a molecule should possess in order to enter in to a fruitful collision is known as**
1) Reaction energy 2) Collision energy 3) Activation energy 4) threshold energy

32. **The equation for the rate constant is** $k = Ae^{-\frac{Ea}{RT}}$ **A chemical reaction will proceed more rapidly if there is a decrease in**
1) k 2) A 3) Ea 4) T

33. **Consider an endothermic reaction $x \rightarrow y$ with the activation energies E_b and E_f for the backward and forward reactions respectively. In general**
1) $E_b < E_f$ 2) $E_b > E_f$
3) there is no definite relation between E_b & E_f 4) $E_b = E_f$

34. **If a is the initial concentration of reaction, then the half – life period of a reaction of nth order is proportional to**
1) a^n 2) a^{n-1} 3) a^{1-n} 4) a^{n+1}

35. **The energy of activation of a reactant is reduced by**
1) Increased temperature 2) Reduced temperature
3) Reduced pressure 4) Increased pressure

36. **For a given reaction $t_{1/2} = 1 / ka$ the order of a reaction is**
1) 0 2) 1 3) 2 4) 3

37. **For a certain reaction the activation energy is zero. What is the value of rate constant at 300K if $k = 1.6 \times 10^6$ S^{-1} at 280K**
1) 1.6×10^6 S^{-1} 2) Zero 3) ∞ 4) 32×10^{12} S^{-1}

38. **Arrhenius equation, $k = A.e^{-Ea/RT}$ gives the relationship between**
1) Rate constant and temperature 2) Equation constant and temperature
3) Rate constant and gas constant 4) Rate constant and Arrhenius factor

39. **If a substance with half life of 3 days is taken to other place in 12 days, what amount of substance is left now ?**
1) 1/4 2) 1/8 3) 1/16 4) 1/32

40. **The activation energy for the forward reaction X → Y is 60 kJ mol^{-1} and ΔH is – 20kJmol^{-1}. The activation energy for the reverse reaction is**
1) 40 kJ mol^{-1} 2) 60 kJ mol^{-1} 3) 80 kJ mol^{-1} 4) 20 kJ mol^{-1}

41. **On which of the following factors, the rate constant does not depends ?**
1) Temperature 2) concentration 3) Presence of catalyst 4) Nature of reactants

42. **Consider the reaction, $N_2 + 3H_2 \rightarrow 2NH_3$. If the rate of increase in concentration of ammonia is x mol L^{-1} s^{-1}, the rate of decrease of concentration of hydrogen would be**
1) x mol L^{-1} s^{-1} 2) 2x mol L^{-1} s^{-1} 3) 3x mol L^{-1} s^{-1} 4) 1.5 x mol L^{-1} s^{-1}

43. **For a zero order reaction involving gaseous ~~prices~~ species, the rate ~~the rate~~ of the reaction changes with change ~~is~~ in**
1) concentration 2) pressure 3) volume 4) temperature

44. **Which of the following represents the expression for $3/4^{th}$ life of a first order reaction ?**
1) $\frac{k}{2.303}.\log\frac{4}{3}$ 2) $\frac{2.303}{k}.\log\frac{3}{4}$ 3) $\frac{2.303}{k}.\log 4$ 4) $\frac{2.303}{k}.\log 3$

45. **For the reaction, 2A → B + C, a plot of log [A] versus time is found to be a straight line. The order of the reaction must be**
1) one 2) zero 3) two 4) three

46. For a first order reaction, A → B, $t_{1/2} = 1$ hr. What fraction of the initial concentration of A reacts in 4 hours ?
1) 15 / 16 2) 1 / 16 3) 7 / 8 4) 1/ 8

47. The plot of log k vs $\frac{1}{T}$ helps to calculate
1) Energy of activation 2) Rate constant of the reaction
3) Order of the reaction 4) Energy of activation as well as the frequency factor

48. The rate of a certain reaction increases by 2.3 times when the temperature is raised from 300K to 310K. If k is the rate constant at 300K, then the rate constant at 310K will be equal to
1) 2k 2) k 3) 2.3k 4) $3k^2$

49. For a reaction, aA → bB, the rate law is rate = k $[A]^{3/2}$. If the concentration of A is doubled, the rate of reaction would become
1) Twice 2) Thrice 3) 1.5 times 4) 2.8 times

50. When the conc. of the reactant is increased 16 times, the rate becomes 2 times. The order of the reaction is
1) 1/4 2) 1/8 3) 3 4) 4

51. The rate of a gaseous reaction is given by the expression K. [A] [B]. If the volume of the reaction vessel is suddenly reduced to $1/4^{th}$ of the initial volume, the reaction rate relating to original rate will be
1) 1/10 2) 1/8 3) 8 4) 16

52. The unit of rate constant for a zero order reaction is
1) litre sec^{-1} 2) litre mol^{-1} sec^{-1} 3) mol $litre^{-1}$ sec^{-1} 4) mol sec^{-1}

53. A reaction A + B → C + D is found to be of second order, its rate constant being 0.05 dm^3 mol^{-1} S^{-1}. If the concentrations of A and B are 0.05 mol dm^{-1} each, rate of the reaction is
1) 1.25×10^{-4} 2) 2.5×10^{-3} 3) 0.05 4) 6.25×10^{-4}

54. For the reaction A → B, the rate increases by a factor of 2.25 when the conc. of A is increased by 1.5. What is the order of the reaction ?
1) 0 2) 2 3) 1 4) 2

55. Rate constant of C + D → A + B is 0.006 sec^{-1}. Equilibrium constant for A+B⇔C+D is 0.25. Rate constant for A + B → C + D is
1) 0.015 S^{-1} 2) 41.7 S^{-1} 3) $1.5 \times 10^{-3} S^{-1}$ 4) 0.024 S^{-1}

56. For the reaction A + B → C, it is found that doubling the conc. of A increases the rate by 4 times and doubling the conc. of B doubles the reaction rate. What is the overall order of the reaction ?
1) 3/2 2) 4 3) 1 4) 3

57. For a reaction A + B ⇔ C + D if conc. of A is doubled without altering that of B, rate doubles. If the conc. of B is increased nine times without altering that of A, rate triples. Order of the reaction is
1) 1 2) 3/2 3) 2 4) 4/3

58. In the reaction, A + 2B → C + 2D, the initial rate – d[A]/dt at t = 0 was found to be 2.6×10^{-2}M sec^{-1}. What is the value of – d[B] / dt at t = 0 ?
1) 2.6×10^{-2} 2) 5.2×10^{-2} 3) 1.0×10^{-1} 4) 6.5×10^{-3}

59. The rate of the reaction $2A_2 + B_2 \rightarrow 2A_2B$ is found to be X at a particular conc. of A and B. The rate will be 2X when the conc. of A alone is doubled. The rate will be $\sqrt{2}$ X when conc. of B alone is doubled. Then order of the reaction is
1) 1.5 2) 2 3) 3 4) 2.5

60. Half – life of a certain I order reaction is 10 minutes. The time that the reaction takes for its 100% completion is
1) 20 minutes 2) 15 minutes 3) 40 minutes 4) infinite