Q1. Express the rate of the following reaction in terms of the formation of ammonia.

$$N_{2\,(g)} + 3\,H_{2\,(g)} \xrightarrow{Pt} 2NH_{3\,(g)}$$

Q2. Define elementary step in a reaction.

Q3. Why does the rate of a reaction not remain constant throughout the reaction process?

Q4. What is meant by rate of reaction? Differentiate between average rate and instantaneous rate of reaction.

Q5. Explain the difference between the average rate and instantaneous rate of chemical reaction.

Q6. Define the rate constant.

Q7. Define the specific rate of reaction.

Q8. For a reaction A + B → P, the rate law is given by, $r = k[A]^{1/2}[B]^2$ What is the order of this reaction?

Q9. If the rate constant of reaction is $k = 3 \times 10^{-4}\ s^{-1}$, then identify the order of the reaction.

Q10. Identify the reaction order from the following rate constant: $K = 2.3 \times 10^{-5}\ L\ mol^{-1}\ s^{-1}$

Q11. Distinguish between molecularity and order of reaction

Q12. Define the term 'order of reaction' for chemical reactions.

Q13. For the reaction, $Cl_{2\,(g)} + 2NO_{(g)} \rightarrow 2NOCl_{(g)}$ the rate law is expressed as Rate $= k[Cl_2][NO]^2$ What is the overall order of this reaction?

Q14. Express the rate of the following reaction in terms of disappearance of hydrogen in the reaction :

$$N_{2\,(g)} + 3\,H_{2\,(g)} \xrightarrow{Pt} 2NH_{3\,(g)}$$

Q15. For a reaction: $2\,NH_{3\,(g)} \rightarrow N_{2\,(g)} + 3H_{2\,(g)}$ Rate = k

a) Write the order and molecularity of this reaction.
b) Write the unit of k.

Q16. For a reaction: $H_2 + Cl_2 \rightarrow 2HCl$ Rate = k

a) Write the order and molecularity of this reaction
b) Write the unit of k.

Q17. For a reaction A + B → P, the rate is given by Rate $= k[A][B]^2$

a) How is the rate of reaction affected if the concentration of B is doubled?
b) What is the overall order of reaction if A is present in large excess?

Q18. Define rate of reaction? Write two factors that affect the rate of reaction.

Q19. Write units of rate constants for zero order and for the second order reactions if the concentration is expressed in mol L^{-1} and time in second.

Q20. Write two differences between 'order of reaction' and 'molecularity of reaction'.

Q21. For a reaction, A + B → Product, the rate law is given by, Rate $= k[A]^1[B]^2$.

a) What is the order of the reaction?
b) Write the unit of rate constant 'k' for the first order reaction.

Q22. A reaction is of second order with respect to its reactant. How will its reaction rate be affected if the concentration of the reactant is

a) Doubled
b) Reduced to half?

Q23. What do you understand by the 'order of a reaction'? Identify the reaction order from each of the following units of reaction rate constant.

a) $L^{-1}\ mol\ s^{-1}$
b) $L\ mol^{-1}\ s^{-1}$

Q24. Distinguish between 'rate expression' and 'rate constant' of a reaction.
Q25. Express clearly what do you understand by 'rate expression' and 'rate constant' of a reaction
Q26. Explain the term 'order of reaction'. Derive the unit for first order rate constant.
Q27. What is meant by the 'rate constant, k' of a reaction? If the concentration be expressed in mol L^{-1} units and time in seconds. What would be the units for *k*
   a) For a zero order reaction?
   b) For a first order reaction?
Q28. List the factors on which the rate of a chemical reaction depends.
Q29. Distinguish between order and molecularity of a reaction. When could order and molecularity of a reaction be the same?
Q30. Reaction is second order in *A* and first order in *B*.
   a) Write the differential rate equation.
   b) How is the rate affected on increasing the concentration of A three times?
   c) How is the rate affected when the concentration of both A and B are doubled?
Q31. A reaction is first order in A and second order in B.
   a) Write differential rate equation.
   b) How is rate affected when concentration of B is tripled?
   c) How is rate affected when concentration of both A and B is doubled?
   d) What is molecularity of a reaction?
Q32. A + 2B → 3C + 2D. The rate of disappearance of B is 1×10^{-2} mol/L/s. What will be
   a) Rate of the reaction
   b) Rate of change in concentration of A and C?
Q33. The decomposition of NH_3 on platinum surface :
$N_{2\,(g)} + 3\,H_{2\,(g)} \xrightarrow{Pt} 2NH_{3\,(g)}$ is a zero order reaction with k = 2.5×10^{-4} mol L^{-1} s^{-1} What are the rates of production of N_2 and H_2?
Q34. Define the half-life period of reaction ($t_{½}$).
Q35. If half-life period of a first order reaction is *x* and 3/4th life period of the same reaction is *y*, how are *x* and *y* related to each other?
Q36. Define Energy of activation of reaction
Q37. How does a change in temperature affect the rate of a reaction? How can this effect on the rate constant of reaction be represented quantitatively?
Q38. With the help of diagram, explain the physical significance of energy of activation (E_a) in chemical reactions.
Q39. In some cases it is found that a large number of colliding molecules have energy more than threshold energy, yet the reaction is slow, what role of activated complex in a reaction.
Q40. State a condition under which a bimolecular reaction is kinetically first order reaction.
Q41. Write the rate equation for the reaction 2A + B⟶ C if the order of the reaction is zero.
Q42. How can you determine the rate law of the following reaction?
2NO (g) + O2 (g) ⟶ 2NO2 (g)
Q43. For which type of reactions, order and molecularity have the same value?
Q44. In a reaction if the concentration of reactant A is tripled, the rate of reaction becomes twenty seven times. What is the order of the reaction?
Q45. Derive an expression to calculate time required for completion of zero order reaction.

Q46. For a reaction A + B → Products, the rate law is rate = k [A][B]$^{3/2}$ Can the reaction be an elementary reaction? Explain.

Q47. For a certain reaction large fraction of molecules has energy more than the threshold energy, yet the rate of reaction is very slow. Why?

Q48. For a zero order reaction will the molecularity be equal to zero? Explain.

Q49. The reaction between $H_{2\,(g)}$ and $O_{2\,(g)}$ is highly feasible yet allowing the gases to stand at room temperature in the same vessel does not lead to the formation of water. Explain.

Q50. Why does the rate of a reaction increase with rise in temperature?

Q51. Oxygen is available in plenty in air yet fuels do not burn by themselves at room temperature. Explain.

Q52. Why is the probability of reaction with molecularity higher than three very rare?

Q53. Why does the rate of any reaction generally decreases during the course of the reaction?

Q54. Thermodynamic feasibility of the reaction alone cannot decide the rate of the reaction. Explain with the help of one example.

Q55. Why in the redox titration of $KMnO_4$ vs oxalic acid, we heat oxalic acid solution before starting the titration?

Q56. Why can't molecularity of any reaction be equal to zero?

Q57. Why molecularity is applicable only for elementary reactions and order is applicable for elementary as well as complex reactions?

Q58. Why can we not determine the order of a reaction by taking into consideration the balanced chemical equation?