Chemical Kinetics

Assertion & Reason Type Questions

consists of two statements, one is Assertion (A) and the other is Reason (R). Give answer:
a. Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
b. Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).
c. Assertion (A) is true but Reason (R) is false.
d. Assertion (A) is false but Reason (R) is true.

Q 1. Assertion (A): Order of the reaction can be zero or fractional.
Reason (R): We cannot determine order from balanced chemical equation.

Answer : (b) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).

Q 2. Assertion (A): Order and molecularity of a reaction are always same.
Reason (R): Complex reactions involve a sequence of elementary reactions and the slowest step is rate determining.

Answer : (d) Order and molecularity are same for an elementary reaction because such reactions proceed in a single step but they are not same for all reactions. So, assertion is false.

Q 3. Assertion (A): Order and molecularity are same.
Reason (R): Order is determined experimentally and molecularity is the sum of the stoichiometric coefficient of rate determining elementary step.

Answer : (d) Order and molecularity may or may not be same as order can be zero and even a fraction but molecularity cannot be zero or a non-integer.

Q 4. Assertion (A): The molecularity of the reaction $H_2 + Br_2 \rightarrow 2HBr$ appears to be 2.
Reason (R): Two molecules of the reactants are involved in the given elementary reaction.

Answer : (a) In the given reaction, two moles of reactants i.e., H_2 and Br_2 are in the elementary step of the reaction and hence, the molecularity appears to be 2. It is clear

that both assertion and reasons are true and reason is the correct explanation of assertion.

Q 5. Assertion (A): The enthalpy of reaction remains constant in the presence of a catalyst.
Reason (R): A catalyst participating in the reaction, forms different activated complex and lowers down the activation energy but the difference in energy of reactants and products remains the same.

Answer : (a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

Q 6. Assertion (A): All collisions of reactant molecules lead to product formation.
Reason (R): Only those collisions in which molecules have correct orientation and sufficient kinetic energy lead to compound formation.

Answer : (d) Only effective collisions lead to the formation of product so assertion is false but reason is true as it defines the correct meaning of effective collision.

Q 7. Assertion (A): Rate constant determined from Arrhenius equation are fairly accurate for simple as well as complex molecules.
Reason (R): Reactant molecules undergo chemical change irrespective of their orientation during collision.

Answer : (c) Assertion (A) is true but Reason (R) is false.

Q8. Assertion (A) : Instantaneous rate is used to predict the rate of a reaction at a particular moment of time.

Reason (R) : Average rate is constant for the time interval for which it is calculated

Q9. Assertion (A) : For the reaction, $CHCl_3 + Cl_2$ $CCl_4 + HCl$, rate = $k[CHCl_3]\ [Cl_2]^{1/2}$

Reason (R) : Rate law for any reaction can be predicted with the help of a balanced chemical equation.

Q10. Assertion (A) : The rate of the reaction is the rate of change of concentration of a reaction or a product.

Reason (R) : Rate of reaction remains constant during the course of reaction.

Q11. Assertion (A) : Order of the reaction can be zero or fractional.

Reason (R) : We cannot determine order from balanced chemical equation.

Q12. Assertion (A) : Order and molecularity are same.

Reason (R) : Order is determined experimentally and molecularity is the sum of the stoichiometric coefficient of rate determining elementary step.

Q13. Assertion (A) : For the reaction

$$2N_2O_5 \longrightarrow 4NO_2 + O_2;$$
$$\text{Rate} = k[N_2O_5].$$

Reason (R) : Rate of decomposition of N2O5 is determined by slow step.

Q14. Assertion (A) : The inversion of cane sugar,

$$C_{12}H_{22}O_{11} + H_2O \xrightarrow{H^+} C_6H_{12}O_6 + C_6H_{12}O_6$$

is a pseudo first order reaction.

Reason (R) : H2O in this reaction is present in very less amount as compared to $C_{12}H_{22}O_{11}$.

Q15. Assertion (A) : For each ten degree rise of temperature the specific rate constant is nearly doubled.

Reason (R) : Energy-wise distribution of molecules in a gas is an experimental function of temperature.

Q16. Assertion (A) : If the activation energy of a reaction is zero, temperature will have no effect on the rate constant.

Reason (R) : Lower the activation energy, faster is the reaction.

Q17. Assertion (A) : Rate constants determined from Arrhenius equation are fairly accurate for simple as well as complex molecules.

Reason (R) : Reactant molecules undergo chemical change irrespective of their orientation during collision.

Q18. Assertion (A) : The enthalpy of reaction remains constant in the presence of a catalyst.

Reason (R) : A catalyst participating in the reaction, forms different activated complex and lowers down the activation energy but the difference in energy of reactant and product remains the same.

Q19. Assertion (A) : All collision of reactant molecules lead to product formation.

Reason (R) : Only those collisions in which molecules have correct orientation and sufficient kinetic energy lead to compound formation.

ANSWER KEY 8 to 19

Q8 : (b)	**Q9 :** (c)	**Q10 :** (c)	**Q11 :** (b)
Q12 : (d)	**Q13 :** (b)	**Q14 :** (c)	**Q15 :** (b)
Q16 : (c)	**Q17 :** (c)	**Q18 :** (a)	**Q19 :** (d)