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CHEMISTRY TEST - CHAPTER 7: CHEMICAL KINETICS

Name:		Roll No.		Section:

Total Time: 2:30 Hour
Time Allowed: 150 Minutes

Total Marks: 150

PAPER OBJECTIVE
SECTION-A (MARKS 150)

NOTE: Section-A is compulsory. All parts of this section are to be answered on these pages and handed over to the center superintendent. Deleting / overwriting is not allowed. Do not use lead pencil.

Q.1 Fill the relevant bubble for each part. All parts carry one mark.

Questions	A	B	C	D	A B C D
1. The study of the rates, mechanisms and factors affecting the rates of chemical reactions is called:	chemical equilibrium	thermochemistry	chemical kinetics	stoichiometry	○○●○
2. The sequence of all chemical steps leading from reactants to products is called the:	rate law	activation energy	reaction mechanism	catalysis	○○●○
3. Rate of reaction is defined as the change in ___ per unit time.	mass of container	concentration	pressure of the atmosphere	temperature of the room	○●○○
4. During a reaction, the concentration of reactants:	decreases with time	remains constant	first increases then decreases	increases with time	●○○○
5. During a reaction, the concentration of products:	increases with time	decreases with time	remains constant	becomes zero at the start	●○○○
6. The unit of reaction rate is:	mol dm^{-3}	dm^3 mol^{-1}	mol dm^{-3} s^{-1}	s mol^{-1}	○○●○
7. The slope of a concentration–time graph is steepest at the:	middle of the reaction	beginning of the reaction	end of the reaction	equilibrium stage	○●○○
8. As a reaction progresses, its rate generally:	remains constant	increases continuously	decreases continuously	becomes infinite	○○●○
9. Rate of reaction between two time intervals gives the:	average rate	initial rate only	instantaneous rate	final rate only	●○○○
10. The instantaneous rate of reaction is the rate at:	the beginning of the reaction only	the end of reaction	any two moments	a particular moment	○○○●
11. For the reaction A → B, the rate may be expressed as:	−d[A]/dt = +d[B]/dt	d[A]/dt = d[B]/dt	+d[A]/dt = −d[B]/dt	−d[B]/dt = −d[A]/dt	●○○○
12. The negative sign in the expression −d[A]/dt shows that the concentration of the reactant:	remains constant	becomes infinite	decreases	increases	○○●○
13. The concentration of C changes from 0 to 0.38 mol dm^{-3} in 20 s. The average rate of reaction is:	0.76 mol dm^{-3} s^{-1}	7.6 mol dm^{-3} s^{-1}	0.019 mol dm^{-3} s^{-1}	0.38 mol dm^{-3} s^{-1}	○○●○
14. A product concentration rises from 0 to 0.60 mol dm^{-3} in 30 s. The average rate is:	18 mol dm^{-3} s^{-1}	0.20 mol dm^{-3} s^{-1}	0.020 mol dm^{-3} s^{-1}	0.60 mol dm^{-3} s^{-1}	○○●○

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Questions	A	B	C	D	A B C D
15. The rate law expresses the rate of reaction in terms of:	temperature only	concentration of reactants raised to powers	volume of the container	colour of reactants	○●○○
16. In the rate equation Rate = $k[A]^x[B]^y$, k is called the:	equilibrium constant	rate constant	Boltzmann constant	Avogadro number	○●○○
17. The rate constant can be defined as the rate of reaction when the concentration of each reactant is:	doubled	unity	halved	zero	○●○○
18. The value of the rate constant changes with:	time	temperature	volume	concentration of reactants	○●○○
19. The overall order of a reaction is:	the sum of exponents in the rate equation	the number of products only	the sum of stoichiometric coefficients	the number of reactants only	●○○○
20. The order of a reaction with respect to a species can be determined:	only by experiment	from the colour change	from the molar mass	from the balanced equation	●○○○
21. For a reaction with rate = $k[NO_2][O_3]$, the order with respect to NO_2 is:	0	2	1	3	○○●○
22. For the reaction $2NO_2 + O_3 \rightarrow N_2O_5 + O_2$, experiments show rate = $k[NO_2][O_3]$. This shows that:	O_3 is a catalyst	the reaction is third order	order always equals the coefficient	order may differ from the stoichiometric coefficient	○○○●
23. The order of a reaction may be:	only a fraction	a whole number, zero or a fraction	only a whole number	only 1 or 2	○●○○
24. A reaction whose rate is independent of the concentration of the reactant is called a:	first-order reaction	second-order reaction	zero-order reaction	third-order reaction	○○●○
25. Which of the following is a zero-order reaction?	Decomposition of N_2O_5	Decomposition of ammonia on hot tungsten	Oxidation of NO by O_2	Decomposition of NO_2	○●○○
26. Enzyme-catalysed reactions often follow:	second-order kinetics only	third-order kinetics	zero-order kinetics	no particular order	○○●○
27. A reaction whose rate is directly proportional to the first power of the concentration of a single reactant is:	a zero-order reaction	a first-order reaction	a second-order reaction	a third-order reaction	○●○○
28. Thermal decomposition of N_2O_5 is an example of a:	second-order reaction	zero-order reaction	third-order reaction	first-order reaction	○○○●
29. A reaction in which the sum of exponents in the rate equation is two is called a:	third-order reaction	first-order reaction	zero-order reaction	second-order reaction	○○○●
30. Decomposition of nitrogen dioxide, $2NO_2 \rightarrow 2NO + O_2$, is a:	second-order reaction	third-order reaction	first-order reaction	zero-order reaction	●○○○
31. The oxidation of NO by O_2 is an example of a:	second-order reaction	third-order reaction	zero-order reaction	first-order reaction	○●○○

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Questions	A	B	C	D	A B C D
32. The reaction between H_2 and Br_2 to give HBr is half order in Br_2 and first order in H_2. Its overall order is:	1.5	1	0.5	2	● ○ ○ ○
33. Reactions with fractional order are called:	first-order reactions	fractional-order reactions	zero-order reactions	pseudo-order reactions only	○ ● ○ ○
34. A bimolecular reaction in which the solvent is in large excess is called a:	pseudo first-order reaction	fractional-order reaction	zero-order reaction	third-order reaction	● ○ ○ ○
35. The method used to find the order of a reaction by changing one reactant concentration at a time is the:	electrolysis method	distillation method	method of initial rates	titration method	○ ○ ● ○
36. In the reaction $NO + O_3 \rightarrow NO_2 + O_2$, doubling [NO] while keeping $[O_3]$ constant doubles the rate. The order with respect to NO is:	0	3	2	1	○ ○ ○ ●
37. In the same reaction, when $[O_3]$ is reduced to one third, the rate falls to one third. The order with respect to O_3 is:	2	1	0	3	○ ● ○ ○
38. The rate law of $NO + O_3 \rightarrow NO_2 + O_2$ from the data is rate = $k[NO][O_3]$, so the overall order is:	2	0	3	1	● ○ ○ ○
39. For a first-order reaction, if the concentration of the reactant is doubled, the rate becomes:	twice	unchanged	half	four times	● ○ ○ ○
40. For a second-order reaction in a single reactant, if the concentration is doubled, the rate becomes:	eight times	unchanged	twice	four times	○ ○ ○ ●
41. For a third-order reaction in a single reactant, doubling the concentration increases the rate:	four times	eight times	six times	two times	○ ● ○ ○
42. For a zero-order reaction, doubling the concentration of the reactant makes the rate:	half	four times	twice	unchanged	○ ○ ○ ●
43. For rate = $k[A]^2[B]$, tripling [B] only makes the rate:	unchanged	three times	six times	nine times	○ ● ○ ○
44. For rate = k[A][B], doubling both [A] and [B] makes the rate:	two times	four times	eight times	unchanged	○ ● ○ ○
45. The unit of the rate constant of a zero-order reaction is:	s^{-1}	$dm^6\ mol^{-2}\ s^{-1}$	$dm^3\ mol^{-1}\ s^{-1}$	$mol\ dm^{-3}\ s^{-1}$	○ ○ ○ ●
46. The unit of the rate constant of a first-order reaction is:	$dm^6\ mol^{-2}\ s^{-1}$	s^{-1}	$dm^3\ mol^{-1}\ s^{-1}$	$mol\ dm^{-3}\ s^{-1}$	○ ● ○ ○
47. The unit of the rate constant of a second-order reaction is:	$dm^6\ mol^{-2}\ s^{-1}$	s^{-1}	$mol\ dm^{-3}\ s^{-1}$	$dm^3\ mol^{-1}\ s^{-1}$	○ ○ ○ ●
48. The unit of the rate constant of a third-order reaction is:	$dm^3\ mol^{-1}\ s^{-1}$	s^{-1}	$dm^6\ mol^{-2}\ s^{-1}$	$mol\ dm^{-3}\ s^{-1}$	○ ○ ● ○

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Questions	A	B	C	D	A B C D
49. The reaction between H_2 and NO has rate = $k[H_2][NO]^2$. The overall order is:	3	4	1	2	●○○○
50. For a reaction that is second order in NO_2 and independent of CO, the rate law is:	rate = $k[NO_2][CO]$	rate = $k[CO]^2$	rate = $k[NO_2]^2$	rate = $k[NO_2][CO]^2$	○○●○
51. For the reaction in which the rate is second order in NO_2 and independent of CO, the overall order is:	0	3	2	1	○○●○
52. The half-life of a reaction is the time required for the concentration of a reactant to:	become zero	become one-tenth	fall to half its initial value	double	○○●○
53. For a first-order reaction, the half-life is:	directly proportional to the initial concentration	inversely proportional to the initial concentration	independent of the initial concentration	equal to the rate	○○●○
54. For a zero-order reaction, the half-life is given by:	$1 / k[A_0]$	$0.693 / k$	$2k / [A_0]$	$[A_0] / 2k$	○○○●
55. For a first-order reaction, the rate constant is related to half-life by:	$k = 0.693 \times t_{½}$	$k = 1 / t_{½}^2$	$k = 0.693 / t_{½}$	$k = t_{½} / 0.693$	○○●○
56. A first-order reaction has a half-life of 30 s. Its rate constant is about:	$0.231\ s^{-1}$	$0.0231\ s^{-1}$	$43.3\ s^{-1}$	$0.0693\ s^{-1}$	○●○○
57. A first-order reaction has a half-life of 10 s. Its rate constant is about:	$0.693\ s^{-1}$	$0.0693\ s^{-1}$	$0.0143\ s^{-1}$	$6.93\ s^{-1}$	○●○○
58. A first-order reaction has a rate constant of $0.0693\ s^{-1}$. Its half-life is:	10 s	69.3 s	1 s	0.1 s	●○○○
59. In a first-order reaction with a half-life of 20 min, a 1.0 M sample is reduced to 0.25 M after:	40 min	80 min	20 min	60 min	●○○○
60. The reaction rate generally ___ with an increase in temperature.	decreases	becomes zero	remains constant	increases	○○○●
61. According to collision theory, the rate of a reaction is proportional to the number of:	electrons in the reactants	molecules in the container	effective collisions between reacting molecules	atoms in the product	○○●○
62. For a collision to be effective, the molecules must have:	activation energy and proper orientation	only high speed	only proper orientation	only low energy	●○○○
63. The minimum energy that colliding particles must possess for an effective collision is called the:	bond energy	lattice energy	activation energy	ionization energy	○○●○
64. At normal temperature, the number of molecules with energy equal to or greater than the activation energy is:	zero	very small	equal to all molecules	very large	○●○○
65. The Maxwell–Boltzmann distribution curve shows the distribution of:	colour among molecules	charge among ions	mass among atoms	kinetic energy among molecules	○○○●

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Questions	A	B	C	D	A B C D
66. The area under the Maxwell–Boltzmann curve beyond E_a represents the number of molecules having energy:	equal to average energy	equal to or greater than the activation energy	less than the activation energy	equal to zero	○●○○
67. When the temperature rises, the fraction of molecules having energy ≥ E_a:	becomes zero	decreases	remains constant	increases	○○○●
68. In general, the rate of reaction increases by about ___ for every 10 K rise in temperature.	one-half	ten times	exactly 100 times	two to three times	○○○●
69. The equation relating the rate constant to temperature was given by:	Boyle	Hess	Arrhenius	Dalton	○○●○
70. Arrhenius studied the effect of temperature on reaction rates in the year:	1889	1905	1840	1766	●○○○
71. In the Arrhenius equation $k = A\,e^{-E_a/RT}$, the symbol R is the:	gas constant	reaction order	Rydberg constant	rate constant	●○○○
72. The value of the gas constant R used in the Arrhenius equation in the book is:	83.14 J K^{-1} mol^{-1}	8.3143 J K^{-1} mol^{-1}	1.987 J K^{-1} mol^{-1}	0.0821 J K^{-1} mol^{-1}	○●○○
73. In the Arrhenius equation, A is related to the:	order of reaction	temperature only	activation energy	frequency of collisions and orientation of molecules	○○○●
74. According to the Arrhenius equation, the rate constant ___ with an increase in temperature.	decreases	remains constant	increases	becomes zero	○○●○
75. According to the Arrhenius equation, a higher activation energy results in a ___ rate constant.	infinite	smaller	larger	constant	○●○○
76. The higher the activation energy, the ___ the rate of reaction.	more constant	doubled	lower	higher	○○●○
77. The path that reactants follow to form products is called the:	mechanism	order	half-life	rate law	●○○○
78. In a multi-step reaction, the overall rate is determined by the:	slowest step	last step always	fastest step	first step always	●○○○
79. The slowest step in a reaction mechanism is called the:	initiation step	termination step	fast step	rate-determining step	○○○●
80. No reaction can proceed more slowly than its:	fastest step	catalyst	final step	rate-determining step	○○○●
81. For $NO_2 + CO \rightarrow NO + CO_2$ with rate = $k[NO_2]^2$, the rate-determining step involves:	two molecules of NO_2	two molecules of CO	one molecule of NO_2 and one of CO	one molecule of CO	●○○○
82. The rate equation rate = $k[NO_2]^2$ for $NO_2 + CO \rightarrow NO + CO_2$ shows that the reaction proceeds in:	more than one step	a single step	exactly three steps	no steps	●○○○

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83. In the mechanism $NO_2 + NO_2 \rightarrow NO_3 + NO$ (slow), $NO_3 + CO \rightarrow NO_2 + CO_2$ (fast), the species NO_3 is a:	reactant	catalyst	reaction intermediate	final product	○○●○
84. A species produced in one step and consumed in a later step of a mechanism is called a:	catalyst	product	inhibitor	reaction intermediate	○○○●
85. A balanced chemical equation:	gives the rate constant	gives the order directly	may not give information about the reaction mechanism	always gives the mechanism	○○●○
86. The decomposition of ClO^- to ClO_3^- and Cl^- is second order in ClO^-. The rate-determining step must involve:	one ClO^- ion	one ClO_2^- ion	three ClO^- ions	two ClO^- ions	○○○●
87. For $2NO_2 + F_2 \rightarrow 2NO_2F$ with rate = $k[NO_2][F_2]$, the rate-determining step involves:	two F_2 molecules	one NO_2 only	one NO_2 and one F_2 molecule	two NO_2 molecules	○○●○
88. A potential energy diagram with two peaks indicates a mechanism with:	two elementary steps	one elementary step	three elementary steps	no elementary step	●○○○
89. In a two-step reaction, the step with the higher activation energy is the:	slow, rate-determining step	catalyst step	intermediate step	fast step	●○○○
90. An unstable high-energy species formed during an effective collision is called the:	activated complex	inhibitor	product	catalyst	●○○○
91. The activated complex is also called the:	ground state	transition state	final state	excited state	○●○○
92. The activated complex is:	stable and isolable	a catalyst	a stable product	short-lived and quickly breaks down into products	○○○●
93. A collision occurs between molecules, but they lack the activation energy. They:	form products	rebound unchanged	form an activated complex	explode	○●○○
94. Proper orientation means that at the moment of collision:	molecules are at rest	atoms that form new bonds collide with each other	all atoms are far apart	the temperature is zero	○●○○
95. In a potential energy diagram of an exothermic reaction, the products are at a:	zero energy	lower energy than the reactants	same energy as the reactants	higher energy than the reactants	○●○○
96. In a potential energy diagram of an endothermic reaction, the products are at a:	same energy as the reactants	negative energy	higher energy than the reactants	lower energy than the reactants	○○●○
97. In a potential energy diagram, the enthalpy change of a reaction equals the energy difference between:	reactants and the activated complex	reactants and products	two activated complexes	products and the activated complex	○●○○
98. In a potential energy diagram, the activation energy is the energy difference between:	reactants and the activated complex	products and the activated complex	two products	reactants and products	●○○○
99. Activation energy appears as a ___ between reactants and products.	hill (energy barrier)	plain	flat region	valley	●○○○

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100. In an effective collision, as colliding molecules approach each other, their kinetic energy:	increases while potential energy decreases	stays constant	becomes zero	decreases while potential energy increases	○○○●
101. A substance that accelerates a reaction but remains chemically unchanged at the end is a:	catalyst	solvent	reactant	product	●○○○
102. The phenomenon of increasing the rate of a reaction by a catalyst is called:	hydrolysis	ionization	electrolysis	catalysis	○○○●
103. A catalyst increases the reaction rate by:	increasing the temperature	raising the activation energy	providing a new mechanism with lower activation energy	changing the enthalpy of reaction	○○●○
104. A catalyst has ___ effect on the enthalpy change of a reaction.	no	a large	an increasing	a negative	●○○○
105. A catalyst cannot bring about a reaction which is:	thermodynamically not feasible	fast	exothermic	reversible	●○○○
106. In homogeneous catalysis, the catalyst and reactants are in:	different phases	solid phase only	the same phase	gas phase only	○○●○
107. In heterogeneous catalysis, the catalyst and reactants are in:	the gas phase only	the liquid phase only	the same phase	different phases	○○○●
108. Enzymes are catalysts found in:	metals only	rocks	nuclear reactors	living organisms	○○○●
109. In the stratosphere, the activation energy of $O_3 + O \rightarrow 2O_2$ is about:	2.1 kJ/mol	17.1 kJ/mol	100 kJ/mol	0.4 kJ/mol	○●○○
110. Chlorine atoms from chlorofluorocarbons catalyse ozone destruction because they provide a path with:	higher enthalpy change	lower activation energy	no activation energy	higher activation energy	○●○○
111. In the stratosphere, Cl atoms catalyse ozone depletion. In the catalysed mechanism, ClO is a:	reaction intermediate	final product	solvent	reactant	●○○○
112. Chlorofluorocarbons release Cl atoms in the stratosphere by absorbing:	infrared light	short wavelength ultraviolet light	radio waves	visible light only	○●○○
113. If ΔG° is negative or zero, a reaction is:	feasible	always very fast	always slow	not feasible	●○○○
114. If ΔG° is positive, a reaction is:	exothermic	feasible	not feasible	at equilibrium	○○●○
115. Fermentation is an example of a:	explosive reaction	very fast reaction	instantaneous reaction	slow reaction	○○○●
116. Acid-base neutralization reactions are generally completed in:	microseconds	several years	several months	several weeks	●○○○

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117. The most important information used to infer the mechanism of a reaction is:	boiling points	rate information	colour of reactants	density of products	○●○○
118. The reaction rate decreases continuously during a reaction because the:	temperature falls	volume increases	concentration of reactants decreases	catalyst is used up	○○●○
119. For rate = $k[A]^2$, if [A] is halved, the rate becomes:	double	one-half	unchanged	one-fourth	○○○●
120. For rate = k[A], if [A] is tripled, the rate becomes:	six times	unchanged	three times	nine times	○○●○
121. For rate = $k[A][B]^2$, doubling [B] only makes the rate:	unchanged	eight times	two times	four times	○○○●
122. For rate = $k[A]^2[B]$, doubling both [A] and [B] makes the rate:	six times	two times	eight times	four times	○○●○
123. For a reaction that is first order in H_2 and half order in Br_2, the rate law is:	rate = $k[H_2]^2[Br_2]$	rate = $k[H_2]^{1/2}[Br_2]$	rate = $k[H_2][Br_2]$	rate = $k[H_2][Br_2]^{1/2}$	○○○●
124. Phosgene, a toxic gas, is prepared by the reaction of:	ammonia with chlorine	carbon dioxide with hydrogen	methane with oxygen	carbon monoxide with chlorine	○○○●
125. In an experiment, doubling [A] quadruples the rate while [B] is constant. The order with respect to A is:	2	1	4	0	●○○○
126. In an experiment, tripling [B] triples the rate while [A] is constant. The order with respect to B is:	0	1	2	3	○●○○
127. In an experiment, doubling [C] does not change the rate. The order with respect to C is:	2	½	1	0	○○○●
128. A zero-order reaction has $[A_0] = 0.1$ mol dm^{-3} and $k = 0.01$ mol $dm^{-3}s^{-1}$. Its half-life is:	10 s	5 s	0.5 s	20 s	○●○○
129. For a first-order reaction, the fraction of reactant remaining after two half-lives is:	50%	75%	12.5%	25%	○○○●
130. For a first-order reaction, the fraction of reactant remaining after three half-lives is:	12.5%	37.5%	6.25%	25%	●○○○
131. A first-order reaction has a half-life of 69.3 s. Its rate constant is:	1.0 s^{-1}	0.01 s^{-1}	0.1 s^{-1}	0.001 s^{-1}	○●○○
132. A catalyst increases the rate of a reaction by:	decreasing the temperature	increasing the enthalpy change	raising the activation energy	lowering the activation energy	○○○●
133. A spark from a light switch can start a gas explosion in a home because it provides the:	product	catalyst	activation energy	enthalpy of fusion	○○●○

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134. Industrial reactions at very high temperatures create problems of:	lower activation energy	safety and instability of chemical species	decreased reaction rate	absence of products	○●○○
135. Endothermic reactions require:	release of energy only	no energy	a negative activation energy	a constant source of energy	○○○●
136. In the mechanism $NO_2 + F_2 \rightarrow NO_2F + F$ (slow), $NO_2 + F \rightarrow NO_2F$ (fast), the species F is:	a reaction intermediate	a final product	a reactant	a catalyst	●○○○
137. The sum of the elementary steps of a mechanism must equal the:	activation energy	half-life	rate constant	overall balanced equation	○○○●
138. In a potential energy diagram, the rate-determining step is the step with the:	lowest activation energy	zero activation energy	negative activation energy	highest activation energy	○○○●
139. The rate law includes the concentration of each reactant raised to the power of its coefficient in the:	last step only	rate-determining elementary step	fastest step	overall balanced equation	○●○○
140. If a reactant does not appear in the rate law, the order of reaction with respect to it is:	negative	one	two	zero	○○○●
141. The reaction rate is never constant during a reaction because the:	catalyst is present	temperature is constant	container is closed	concentrations of reactants change continuously	○○○●
142. The order of reaction with respect to a species:	cannot be predicted from the balanced equation	is always one	equals its stoichiometric coefficient	is always zero	●○○○
143. The value of the rate constant at a given temperature is independent of:	temperature	nature of the reaction	concentration of reactants and time	activation energy	○○●○
144. At a higher temperature, the Maxwell–Boltzmann curve shifts toward:	the same position	zero energy	higher energy with a lower, broader peak	lower energy with a taller peak	○○●○
145. The slope of the concentration–time curve of a reactant is:	zero always	negative	infinite	positive	○●○○
146. A reaction has a negative ΔG° but proceeds very slowly at room temperature. This is because it has a:	high activation energy	zero rate constant	positive enthalpy of formation	low molar mass	●○○○
147. Unlike a reaction intermediate, a catalyst is:	consumed completely	formed and consumed in different steps	regenerated at the end of the reaction	present only in the products	○○●○
148. The rate of reaction can be expressed as the rate of disappearance of a reactant or the rate of:	decrease of temperature	increase of volume	appearance of a product	increase of mass of container	○○●○
149. In the reaction $NO_2 + CO \rightarrow NO + CO_2$ (rate = $k[NO_2]^2$), CO reacts in a:	step that is not required	slow step	step before the rate-determining step	fast step after the rate-determining step	○○○●
150. Increasing the temperature of a reaction mixture increases the number of effective collisions because the:	average kinetic energy of molecules increases	number of molecules increases	activation energy decreases	enthalpy of reaction changes	●○○○

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