CHEMICAL KINETICS

SINGLE CORRECT OPTION TYPE

1. The half time of first order decomposition of nitramide is 2.1 hour at $15^\circ C$ $NH_2NO_2 \rightarrow N_2O + H_2O$. If 6.2g of NH_2NO_2 is allowed to decompose, what is the
(a) time taken for NH_2NO_2 to decompose 99%
(b) volume of dry N_2O produced at this point measured at STP
(A) 13.95 hour, 2.217 L (B) 19.85 hour, 16.17 L (C) 31.25 hour, 18.62 L (D) 15.62 hour, 3.17 L

2. A first order reaction: $A \rightarrow B$ requires activation energy of 89 KJ/mol. When 20% solution of A was kept at $27^\circ C$ for 40 minutes, 25% decomposition took place. What will be the percent decomposition in the same time in a 30% solution maintained at $37^\circ C$?
(The activation energy remains constant in this range of temperature)
(A) 50.0% (B) 60.0% (C) 70.0% (D) 80.0%

3. The activation energy of reaction:
$A + B \rightarrow$ is 105.73 KJ/mol
At $40^\circ C$, the products are formed at the rate of $0.133 mol\, L^{-1} min^{-1}$. What will be rate of formation of products at $80^\circ C$?
(A) 15.0 mol/L/min (B) 13.3 mol/L/min (C) 14.0 mol/L/min (D) 14.3 mol/L/min

4. The data for the reaction: $A + B \rightarrow$ Product

Experiment	$[A]_0$	$[B]_0$	Rate
1	0.012	0.035	0.10
2	0.024	0.070	0.80
3	0.024	0.375	0.10
4	0.012	0.070	0.80

The rate law corresponding to the above data is
(A) $\text{rate} = K[B]^3$ (B) $\text{rate} = K[B]^4$ (C) $\text{rate} = K[A][B]^3$ (D) $\text{rate} = K[A]^2[B]^2$

5. The rate of a reaction is expressed in different ways as follows
$$+\frac{1}{2}\frac{d[C]}{dt} = -\frac{1}{3}\frac{d[D]}{dt} = +\frac{1}{4}\frac{d[A]}{dt} = -\frac{d[B]}{dt}$$
The reaction is
(A) $4A + B \rightarrow 2C + 3D$ (B) $B + 3D \rightarrow 4A + 2C$ (C) $A + B \rightarrow C + D$ (D) $B + D \rightarrow A + C$

6. For the reversible reaction is equilibrium: The values of K_1 and K_2 are $2 \times 10^{-3} mol L^{-1} sec^{-1}$ and $3 \times 10^{-3} sec^{-1}$ respectively/ If 0.2 moles of B are added to the equilibrium mixture, initially having 2 moles of A, what will be the time taken for concentration of B to become $\frac{3}{4}$ of the concentration of A at initial equilibrium?
(A) 89.24 sec (B) 83.44 sec (C) 94.18 sec (D) 98.14 sec

7. For a reversible first order reaction, $K_f = 10^2 sec^{-1}$ and $\frac{B_{eq}}{A_{eq}} = 4$, if $A_o = 0.01 ML^{-1}$ and $B_o = 0$, what will be concentration of B after 30 sec?
(A) 2.50×10^{-5} (B) 2.50×10^{-15} (C) 2.50×10^{-3} (D) 2.50×10^{-30}

8. A certain reaction $A+B \rightarrow$ Products; is first order w.r.t. each reactant with $k=5\times10^{-3}M^{-1}S^{-1}$. What is the concentration of A remaining after 100 s if the initial concentration of A 0.1 M and that of B was 6.0 M?

(A) $5\times10^{-3}M$ (B) $6\times10^{-3}M$ (C) $7\times10^{-3}M$ (D) $8\times10^{-3}M$

9. In an ore containing Uranium, the ratio of U^{238} to Pb^{206} nuclei is 3. Calculate the age of the ore. Assuming that all the lead present in the ore is the final stable product is U^{238}.

(A) 0.85×10^{10} years (B) 2×10^{5} years (C) 1.85×10^{9} years (D) 3.45×10^{9} years

10. The nucleonic ratio of $_1H^3$ to $_1H^1$ in a sample of water is $8.0\times10^{-8}:1$. Tritium undergoes decay with a half life period is 12.0 years. How many tritium atoms would a 10.0 gm of such sample contain 36 years after the original sample is collected?

(A) 3.66×10^{5} atoms (B) 5.66×10^{5} atoms (C) 6.68×10^{8} atoms (D) 6.66×10^{5} atoms

11. The decomposition of N_2O_5 according to following reactions is first order reactions:

$2N_2O_5(g) \rightarrow 4NO_2(g)+O_2(g)$

After 30 minutes from start of the decomposition in a closed vessel, the total pressure developed is found to be 250 mm of Hg and on complete decomposition, the total pressure is 500 mm of Hg. What is rate constant of the reaction?

(A) $3.08\times10^{-5}\,min^{-1}$ (B) $6.08\times10^{-3}\,min^{-1}$ (C) $6.01\times10^{-7}\,min^{-1}$ (D) $7.02\times10^{-8}\,min^{-1}$

12. The activation energy of a non-catalysed reaction at $37°C$ is 200 Kcal/mol and the activation energy of the same reaction when catalysed decreases to only 60.0 Kcal/mol. What is the ratio of rate constants of the two reactions?

(A) 10^{90} (B) 10^{80} (C) 10^{98} (D) 10^{28}

13. The rate constant for the forward reaction $A(g) \rightleftharpoons 2B(g)$ is $1.5\times10^{-3}s^{-1}$ at 100 K. If 10^{-5} moles of A and 100 moles of B are present in a 10 litre vessel at equilibrium then rate constant for the backward reaction at this temperature is

(A) $1.50\times10^{4}L\ mol^{-1}s^{-1}$ (B) $1.5\times10^{11}L\ mol^{-1}s^{-1}$

(C) $1.5\times10^{10}L\ mol^{-1}s^{-1}$ (D) 1.5×10^{11}

14. The rate constant, the energy of activation and the Arrhenius parameter of a chemical reactions at $25°C$ are $3.0\times10^{-4}\,sec^{-1}$, $104.47KJ\,mol^{-1}$ and $6.0\times10^{14}\,sec^{-1}$ respectively. The value of rate constant as T_∞ is

(A) $2.0\times10^{18}\,sec^{-1}$ (B) $6.0\times10^{14}\,sec^{-1}$ (C) infinity (D) $3.6\times10^{30}\,sec^{-1}$

15. For a reaction, the rate of reaction was found to increase about 1.8 times when the temperature was increased by $10°C$. The increase in rate is due to

(A) increase in number of active molecules
(B) increase in activation energy of reactants
(C) decrease in activation energy of reactants
(D) increase in the number of collisions between reacting molecules

16. The rate of production of NH_3 in $N_2+3H_2 \rightarrow 2NH_3$ is 3.4 kg min^{-1}. The rate of consumption of H_2 is

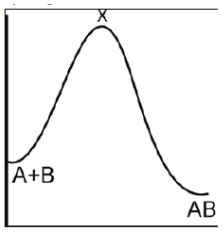
(A) $5.1\,kg\,min^{-1}$ (B) $0.01\,kg\,sec^{-1}$ (C) 0.6 kg hr^{-1} (D) None of these

17. For an exothermic chemical process occurring in two steps as,

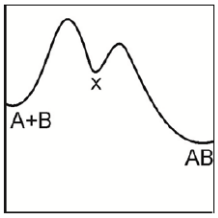
(i) $A+B \rightarrow X(slow)$

(ii) $X \rightarrow AB(Fast)$

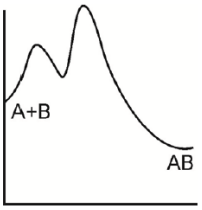
The progress of the reaction can be best described by:



(A)



(B)



(C)

All are correct

(D)

18. The decomposition of Cl_2O_7 at 400 K in the gas phase to Cl_2 and O_2 is of I order. After 55 sec. at 400 K, the pressure of $Cl_2O \rightarrow$ falls from 0.062 atm to 0.044 atm. What is the value of (a) the rate constant (b) pressure of Cl_2O_7, after 100 sec?

(A) $K = 6.023 \times 10^{-3}\ sec^{-1}, p = 0.033 atm$ (B) $K = 6.044 \times 10^{-30}\ sec^{-1}, p = 0.044 atm$

(C) $K = 3.044 \times 10^{-20}\ sec^{-1}, p = 0.144 atm$ (D) $K = 1.66 \times 10^{-20}\ sec^{-1}, p = 0.144 atm$

19. If the activation energy for the forward reaction is 150 kJ mol^{-} and that of the reverse reaction is 260kJ mol^{-}, what is the enthalpy change for the reaction?

(A) 410 kJ mol^{-} (B) –110 kJ mol^{-} (C) 110 kJ mol^{-} (D) –410 kJ mol^{-}

20. The first order reaction is 50% complete in 69.3 minutes. The time required for 90% completion for this reaction is

(A) 100 minutes (B) 230 minutes (C) 2303 minutes (D) 125 minutes

INTEGER TYPE

21. A catalyst lowers the activation energy of a reaction from 30 kJ mol^{-} to 20 kJ mol^{-}. The temperature at which the uncatalysed reaction will have the same rate as that of the catalysed at 25°C is

22. The half life period of a first order reaction is 50 min. In what time will it go to 90% completion? (in min)

23. A flask contains a mixture of compounds A and B. Both compounds decompose by first-order kinetics. The half-lives are 54.0 min for A and 18.0 min. for B. If the concentrations of A and B are equal initially, how long will it take for the concentration of A to be four times that of B ? (in min)

24. Two substances A ($t_{1/2}$ = 5 mins) and B ($t_{1/2}$ = 15 mins) follow first order kinetics are taken in such a way that initially [A] = 4[B]. Calculate the time after which the concentration of both the substance will be equal. (in min)

25. The rate of first order reaction is 0.04 mole $litre^{-1}$ s^{-1} at 10 minutes and 0.03 mol $litre^{-1}$ s^{-1} at 20 minutes after initiation. Find the half life of the reaction.

KEY

1.	A	**2.**	B	**3.**	B	**4.**	A	**5.**	B
6.	A	**7.**	C	**8.**	A	**9.**	C	**10.**	D
11.	C	**12.**	C	**13.**	D	**14.**	B	**15.**	A
16.	B	**17.**	A	**18.**	A	**19.**	B	**20.**	B
21.	447	**22.**	166.6	**23.**	54	**24.**	15	**25.**	24.14

✻ *Wish You all the Best* ✻