PHYSICAL CHEMISTRY

NEET

CRASH COURSE

CHEMICAL KINETICS

SMART ACHIEVERS

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CHEMICAL KINETICS

Q.1 $3A \rightarrow 2B$, rate of reaction $\frac{+d[B]}{dt}$ is equal to :

(1) $-\frac{3}{2}\frac{d[A]}{dt}$ (2) $-\frac{2}{3}\frac{d[A]}{dt}$ (3) $-\frac{1}{3}\frac{d[A]}{dt}$ (4) $+2\frac{d[A]}{dt}$

Q.2 In the following reaction : $xA \longrightarrow yB$

$$\log\left[-\frac{d[A]}{dt}\right] = \log\left[\frac{d[B]}{dt}\right] + \log 2$$

where –ve sign indicates rate of disappearance of the reactant. Thus, x : y is :

(1) 1 : 2 (2) 2 : 1 (3) 3 : 1 (4) 3 : 10

Q.3 If a reaction gets completed in finite time then its order can be :

(1) 3 (2) 2 (3) 1 (4) Zero

Q.4 For a first order reaction, the plot of 't' against log C gives a straight line with slope equal to :

(1) (k / 2.303) (2) (– k / 2.303) (3) (ln k / 2.303) (4) – k.

Q.5 Plot of log(a–x) vs time t is straight line. This indicates that the reaction is of

(1) Second order (2) First order (3) Zero order (4) Third order

Q.6 If a first order reaction is completed to the extent of 75% and 50% in time intervals, t_1 and t_2, what is the ratio, $t_1 : t_2$?

(1) ln 2 (2) $\frac{\ln(3/4)}{\ln 2}$ (3) 2 (4) 1/2

Q.7 In the first order reaction 75% of the reactant disappeared in 1.388 hrs. Calculate the rate constant of the reaction :

(1) 1 s^{-1} (2) 2.8×10^{-4} s^{-1} (3) 17.2×10^{-3} s^{-1} (4) 1.8×10^{-3} s^{-1}

Q.8 The data for the reaction $A + B \rightarrow C$ is

Exp.	$[A]_0$	$[B]_0$	initial rate
1	0.012	0.035	0.10
2	0.024	0.035	0.80
3	0.012	0.070	0.10
4	0.024	0.070	0.80

(1) $r = k[B]^3$ (2) $r = k[A]^3$ (3) $r = k[A][B]^4$ (4) $r = k[A]^2[B]^2$.

Q.9 The first order rate constant k is related to temp. as $\log k = 15.0 - (10^6/T)$ Which of the following pair of value is correct ?

(1) $A = 10^{15}$ and $E = 1.9 \times 10^4$ KJ (2) $A = 10^{-15}$ and E = 40 KJ

(3) $A = 10^{15}$ and E = 40 KJ (4) $A = 10^{-15}$ and $E = 1.9 \times 10^4$ KJ.

Q.10 For an elementary process $2X + Y \rightarrow Z + W$, the molecularity is :

(1) 2 (2) 1 (3) 3 (4) Unpredictable

Q.11 For a reaction following n^{th} order kinetics, the half life ($t_{1/2}$) would depend upon the initial concentration (s) as:

(1) $t_{1/2} \propto a^{1-n}$ (2) $t_{1/2} \propto a^{n-1}$ (3) $t_{1/2} \propto a^n$ (4) $t_{1/2} \propto a^{-n}$

Q.12 Consider the chemical reaction : $N_2(g) + 3H_2(g) \longrightarrow 2NH_3(g)$
The rate of this reaction can be expressed in terms of time of concentration of $N_2(g)$, $H_2(g)$ or $NH_3(g)$. Identify the correct relationship amongst the rate expressions.

(1) Rate $= -\frac{d[N_2]}{dt} = -\frac{1}{3}\frac{d[H_2]}{dt} = \frac{1}{2}\frac{d[NH_3]}{dt}$ (2) Rate $= -\frac{d[N_2]}{dt} = -\frac{3d[H_2]}{dt} = \frac{2d[NH_3]}{dt}$

(3) Rate $= \frac{d[N_2]}{dt} = \frac{1}{3}\frac{d[H_2]}{dt} = \frac{1}{2}\frac{d[NH_3]}{dt}$ (4) Rate $= -\frac{d[N_2]}{dt} = -\frac{d[H_2]}{dt} = \frac{d[NH_3]}{dt}$

Q.13 According to collision theory of reaction rates –
(1) Every collision between reactant leads to chemical reaction
(2) Rate of reaction is proportional to velocity of molecules
(3) All reactions which occur in gaseous phase are zero order reaction
(4) Rate of reaction is directly proportional to collision frequency.

Q.14 The minimum energy for molecules to enter into chemical reaction is called.
(1) Kinetic energy (2) Potential energy (3) Threshold energy (4) Activation energy

Q.15 The rate of certain hypothetical reaction : $A + B + C \rightarrow$ products is given by
$r = \frac{-d[A]}{dt} = K[A]^{1/2}[B]^{1/3}[C]^{1/4}$ The order of the reaction –

(1) 1 (2) $\frac{1}{2}$ (3) 2 (4) $\frac{13}{12}$

Q.16 Select the law that corresponds to date shown for the following reaction $2A + B \rightarrow C + D$ –

Exp.	[A]	[B]	Initial rate (mol L^{-1} min^{-1})
1.	0.1	0.1	7.5×10^{-3}
2.	0.3	0.2	9.0×10^{-2}
3.	0.3	0.4	3.6×10^{-1}
4.	0.4	0.1	3.0×10^{-2}

(1) Rate = $K[A]^2[B]$ (2) Rate = $K[A][B]^2$ (3) Rate = $K[A][B]^3$ (4) Rate = $K[A][B]$

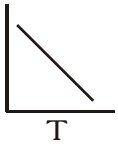
Q.17 Calculate the order of the reaction in A and B :

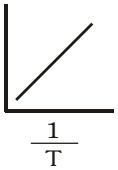
[A] (mol l^{-1})	[B] (mol^{-1})	Rate
0.05	0.05	1.2×10^{-3}
0.10	0.05	2.4×10^{-3}
0.05	0.10	1.2×10^{-3}

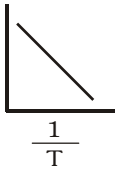
(1) 1 and 0 (2) 1 and 1 (3) 0 and 1 (4) None

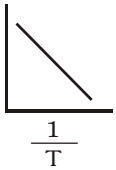
Q.18 If a reaction with $t_{1/2} = 69.3$ second; has a rate constant 10^{-2} per second the order is :
(1) Zero (2) 1 (3) 2 (4) None

Q.19 Which of the following plot is in accordance with the arrhenius equation :–

(1) 

(2) 

(3) 

(4) 

Q.20 The activation energy for the forward reaction $X \rightarrow Y$ is 60 KJ mol^{-1} and ΔH is - 20 KJ mol^{-1}. The activation energy for the backward reaction $Y \rightarrow X$ is:-
(1) 80 KJ mol^{-1} (2) 40 KJ mol^{-1} (3) 60 KJ mol^{-1} (4) 20 KJ mol^{-1}

Q.21 Which plot can give us the value of activation energy
(1) K versus T (2) $\frac{1}{K}$ versues T (3) Log K versus 1/T (4) C versus T

Q.22 For which of the following, the unit of rate and rate constant of the reaction are identical :-
(1) First order reaction (2) Zero order reaction
(3) Second order reaction (4) Fractional order of reaction

Q.23 Correct statement about first order reaction is:-
(1) $t_{complition\ =\ finite}$ (2) $t_{1/2} \propto \frac{1}{a}$
(3) Unit of K is mole lit^{-1} sec^{-1} (4) $t_{1/2} \times K$ = const. at const. temp.

Q.24 In a first order reaction, the concentration of the reactant, decreases from 0.8 M to 0.4 M in 15 minutes. The time taken for the concentration to change from 0.1 M to 0.025 M is
(1) 7.5 min (2) 15 min (3) 30 min (4) 60 min

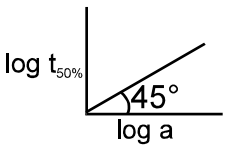
Q.25 The rate equation for the reaction $2A + B \rightarrow C$ is found to be : rate= k[A][B]. The correct statement in relation to this reaction is that the
(1) rate of formation of C is twice the rate of disappearance of A.
(2) Half life is a constant
(3) unit of k must be s^{-1}
(4) value of k is independent of the initial concentrations of A and B

Q.26 The half-life of a radio isotope is four hours. If the initial mass of the isotope was 200 g, the mass remaining after 24 hours undecayed is :
(1) 3.125 g (2) 2.084 g (3) 1.042 g (4) 4.167 g

Q.27 The following mechanism has been proposed for the reaction of NO with Br_2 to form NOBr :
$NO(g) + Br_2(g) \rightarrow NOBr_2(g)$
$NOBr_2(g) + NO(g) \rightarrow 2NOBr(g)$
If the second step is the rate determining step, the order of the reaction with respect to NO(g) is :
(1) 2 (2) 1 (3) 0 (4) 3

Q.28 The rate law for the single step reaction $2A + B \rightarrow 2C$, is given by
(1) Rate = K [A][B] (2) Rate = K $[A]^2[B]$
(3) Rate = K [2A][B] (4) Rate = K $[A]^2[B]^0$

Q.29 What will be the order of reaction and rate constant for a chemical change having log $t_{50\%}$ vs log concentration of (A) curves as :



(1) 0, 1/2 (2) 1, 1 (3) 2, 2 (4) 3, 1

ASSERTION & REASON

Directions : Each of these questions contains an Assertion followed by reason. Read them carefully and answer the question on the basis of following options. You have to select the one that best describes the two statements.

(1) If both assertion and reason are true and reason is the correct explanation of assertion.
(2) If both assertion and reason are true but reason is not the correct explanation of assertion.
(3) If Assertion is true but reason is false.
(4) If both assertion and reason are false.

Q.30 **Assertion :** Order of reaction can never be fractional for an elementary reaction.
Reason : An elementary reaction takes place by one step mechanism.

Q.31 **Assertion** : The rate of the reaction is the rate of change of concentration of a reactant or a product.
Reason : Rate of reaction remains constant during the complete reaction.

Q.32 **Assertion** : The reaction having low value of activation energy are generally fast.
Reason : Temperature coefficient for reaction having low activation energy is large.

Q.33 **Assertion :-** In a first order reaction the rate constant double on doubling the initial concentration of the reaction. **[AIIMS 2010]**
Reason :- The rate constant varies directly with the concentration of the reactants in a first order reaction.

Q.34 **Assertion :-** Two different reaction can never have same rate of reaction **[AIIMS 2011]**
Reason :- Rate of reaction always depends only on frequency of collision and Arrhenious factor

Q.35 **Assertion :-** Rate of reaction double when concentration of reactant is double if it is a first order reaction. **[AIIMS 2012]**
Reason :- Rate constant also double.

ANSWER KEY

Q.1	2	Q.2	2	Q.3	4	Q.4	2	Q.5	2	Q.6	3	Q.7	2
Q.8	2	Q.9	1	Q.10	3	Q.11	1	Q.12	1	Q.13	4	Q.14	3
Q.15	4	Q.16	2	Q.17	1	Q.18	2	Q.19	3	Q.20	1	Q.21	3
Q.22	2	Q.23	4	Q.24	3	Q.25	4	Q.26	1	Q.27	1	Q.28	2
Q.29	1	Q.30	1	Q.31	3	Q.32	3	Q.33	4	Q.34	4	Q.35	3