## Exercise - I (Conceptual Questions) Build Up Your Understanding

### RATE OF REACTION

**1.** 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 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 = $-\frac{d[N_2]}{dt} = -\frac{d[H_2]}{dt} = \frac{d[NH_3]}{dt}$

**CCK001**

**2.** In the formation of sulphur trioxide by the contact process $2SO_2(g) + O_2(g) \rightarrow 2SO_3(g)$; the rate of reaction is expressed as $-\frac{d[O_2]}{dt} = 2.5 \times 10^{-4}$ mol $L^{-1}$ $s^{-1}$

The rate of disappearance of ($SO_2$) will be

(1) $5 \times 10^{-4}$ mol $L^{-1}$ $s^{-1}$

(2) $-2.25 \times 10^{-4}$ mol $L^{-1}$ $s^{-1}$

(3) $3.75 \times 10^{-4}$ mol $L^{-1}$ $s^{-1}$

(4) $50.0 \times 10^{-4}$ mol $L^{-1}$ $s^{-1}$

**CCK002**

**3.** In a catalytic reaction involving the formation of ammonia by Haber's process $N_2 + 3H_2 \rightarrow 2NH_3$ the rate of appearance of $NH_3$ was measured as $2.5 \times 10^{-4}$ mole $L^{-1}$ $s^{-1}$ The rate of disappearance of $H_2$ will be –

(1) $2.5 \times 10^{-4}$ mol $L^{-1}$ $s^{-1}$

(2) $1.25 \times 10^{-4}$ mol $L^{-1}$ $s^{-1}$

(3) $3.75 \times 10^{-4}$ mol $L^{-1}$ $s^{-1}$

(4) $5 \times 10^{-4}$ mol $L^{-1}$ $s^{-1}$

**CCK003**

**4.** Which of the following statement is correct for a reaction X + 2Y $\rightarrow$ Product (p)

(1) The rate of disappearance of X = twice the rate of disappearance of Y.

(2) The rate of disappearance of X = $\frac{1}{2}$ rate of appearance of product (p)

(3) The rate of appearance of product (p) = $\frac{1}{2}$ the rate of disappearance of Y

(4) The rate of appearance of product (p) = $\frac{1}{2}$ the rate of disappearance of X

**CCK004**

**5.** For the reaction, $N_2O_5 \longrightarrow 2NO_2 + \frac{1}{2} O_2$

Given $-\frac{d[N_2O_5]}{dt} = K_1[N_2O_5]$,

$\frac{d[NO_2]}{dt} = K_2[N_2O_5]$, $\frac{d[O_2]}{dt} = K_3[N_2O_5]$

The relation between $K_1$, $K_2$ and $K_3$ is –

(1) $2K_1 = K_2 = 4K_3$

(2) $K_1 = K_2 = K_3$

(3) $2K_1 = 4K_2 = K_3$

(4) None

**CCK005**

**6.** Rate of formation of $SO_3$ according to the reaction $2SO_2+O_2 \rightarrow 2SO_3$ is $1.6 \times 10^{-3}$ kg $L^{-1}$ $min^{-1}$ Hence rate of decomposition of $SO_2$ is :-

(1) $1.6 \times 10^{-3}$ kg $L^{-1}$ $min^{-1}$

(2) $8.0 \times 10^{-4}$ kg $L^{-1}$ $min^{-1}$

(3) $3.2 \times 10^{-3}$ kg $L^{-1}$ $min^{-1}$

(4) $1.28 \times 10^{-3}$ kg $L^{-1}$ $min^{-1}$

**CCK006**

**7.** For a general chemical change 2A + 3B $\rightarrow$ products, the rate of disappearance of A is $r_1$ and of B is $r_2$. The rates $r_1$ and $r_2$ are related as :–

(1) $3r_1 = 2r_2$ (2) $r_1 = r_2$

(3) $2r_1 = 3r_2$ (4) $r_1^2 = 2r_2^2$

**CCK007**

**8.** For the reaction 2A + B $\rightarrow$ 3C + D, Which of the following does not express the reaction rate ?

(1) $-\frac{1}{3}\frac{d[C]}{dt}$ (2) $-\frac{d[B]}{dt}$

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

**CCK008**

**9.** Consider the reaction

$N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$

The correct equality relationship between $\frac{d[NH_3]}{dt}$ and $-\frac{d[H_2]}{dt}$ is :

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

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

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

(4) $\frac{d[NH_3]}{dt} = -\frac{d[H_2]}{dt}$

**CCK009**

## RATE LAW / ORDER / MOLECULARITY

**10.** For gaseous reaction, rate = k [A] [B]. If volume of container is reduced to $\frac{1}{4}$ of initial, then the rate of the reaction will be....... times of initial:-

(1) $\frac{1}{8}$ (2) 8 (3) $\frac{1}{16}$ (4) 16

**CCK010**

**11.** 2A(g) + B(g) $\longrightarrow$ Product is an elementary reaction, If pressure of both A and B is increased three times of the initial pressure, the rate of forward reaction will be ------ of the previous rate :-

(1) 9 times (2) 27 times

(3) $\frac{1}{9}$ times (4) $\frac{1}{27}$ times

**CCK011**

**12.** 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) $\frac{13}{12}$

**CCK012**

**13.** Which of the following rate law has an overall order of 0.5 for reaction involving substances x,y and z ?

(1) Rate = K $(C_x)$ $(C_y)$ $(C_z)$

(2) Rate = K $(C_x)^{0.5}(C_y)^{0.5}(C_z)^{0.5}$

(3) Rate = K $(C_x)^{1.5}$ $(C_y)^{-1}(C_z)^0$

(4) Rate = $K(C_x)(C_z)^0 / (C_y)^2$

**CCK013**

**14.** A chemical reaction involves two reacting species. The rate of reaction is directly proportional to square of the concentration of one of them and inversely proportional to the concentration of the other. The order of reaction is –

(1) 1 (2) 2

(3) Zero (4) Unpredictable

**CCK014**

**15.** For the reaction $H_2(g) + Br_2(g) \rightarrow 2HBr(g)$, the experimental data suggests, Rate = K $[H_2]$ $[Br_2]^{1/2}$. The order for this reaction is –

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

**CCK015**

**16.** Select the rate law that corresponds to the data shown for the following reaction A + B $\rightarrow$ C

| Exp. | [A] | [B] | Initial rate |
|---|---|---|---|
| 1. | 0.012 | 0.035 | 0.10 |
| 2. | 0.024 | 0.070 | 1.6 |
| 3. | 0.024 | 0.035 | 0.20 |
| 4. | 0.012 | 0.070 | 0.80 |

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

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

**CCK016**

**17.** Select the rate law that corresponds to data 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 | $6 \times 10^{-3}$ |
| 2. | 0.3 | 0.2 | $9 \times 10^{-2}$ |
| 3. | 0.3 | 0.4 | $3.6 \times 10^{-1}$ |
| 4. | 0.5 | 0.1 | $3 \times 10^{-2}$ |

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

**CCK017**

**18.** For a hypothetical reaction ; $A + B \rightarrow C$ the following data were obtained in three different experiments :–

| [A] (mol $L^{-1}$) | [B] (mol $L^{-1}$) | Rate of reaction (Mol $L^{-1}$ $min^{-1}$) |
|---|---|---|
| 0.01 | 0.01 | 1.0   $10^{-4}$ |
| 0.01 | 0.03 | 9.0   $10^{-4}$ |
| 0.03 | 0.03 | 2.70   $10^{-3}$ |

The rate law will be :–
(1) $r = K[A]^2[B]$ (2) $r = K[A][B]^2$
(3) r = K[A][B] (4) None of these

**CCK018**

**19.** Calculate the order of the reaction w.r.t. A and B:

| [A] (mol $L^{-1}$) | [B] (mol $L^{-1}$) | Rate (mol $L^{-1}$ $s^{-1}$) |
|---|---|---|
| 0.05 | 0.05 | $1.2 \times 10^{-3}$ |
| 0.10 | 0.05 | $2.4 \times 10^{-3}$ |
| 0.05 | 0.10 | $1.2 \times 10^{-3}$ |

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

**CCK019**

**20.** For a chemical reaction $A + B \rightarrow$ product, the order is one with respect to each A and B. Value of x and y from the given data is :–

| Rate (mol $L^{-1}$ $s^{-1}$) | [A] | [B] |
|---|---|---|
| 0.10 | 0.20 M | 0.05 M |
| 0.40 | x | 0.05 M |
| 0.80 | 0.40 M | y |

(1) 0.20, 0.80 (2) 0.80, 0.40
(3) 0.80, 0.20 (4) 0.40, 0.20

**CCK020**

**21.** 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 = $K[A]^2[B]^0$

**CCK021**

**22.** For a reaction of the type $A + B \rightarrow$ products, it is observed that doubling the concentration of A causes the reaction rate to increase four times but doubling the amount of B does not effect the rate. The rate equation is –
(1) Rate = K [A][B] (2) Rate = K $[A]^2$
(3) Rate = $K[A]^2[B]$ (4) Rate = $K[A]^2[B]^2$

**CCK022**

**23.** Point out incorrect statement.
(1) Rate law is an experimental value
(2) Law of mass action is a theoretical proposal
(3) Rate law is more informative than law of mass action for developing mechanism
(4) Rate law is always different from the expression of law of mass action.

**CCK023**

**24.** For an elementary process $2X + Y \rightarrow Z + W$, the molecularity is –
(1) 2 (2) 1
(3) 3 (4) Unpredictable

**CCK024**

**25.** For a reaction $A + B \rightarrow$ products, the rate of the reaction was doubled when the concentration of A was doubled, the rate was again doubled when the concentration of both A & B were doubled the order of the reaction with respect to A & B are:–
(1) 1, 1 (2) 2, 0 (3) 1, 0 (4) 0, 1

**CCK025**

**26.** For the reaction $A + B \rightarrow$ products, it is found that the order w.r.t. A is 1 and the order w.r.t. B is $\frac{1}{2}$. When the concentration of both A and B are increased four times, the rate will increase by a factor of :–
(1) 16 (2) 8 (3) 6 (4) 4

**CCK026**

**27.** The rate law for a reaction A + B $\rightarrow$ product is rate = $K[A]^1[B]^2$. Then which one of the following statement is false :–

(1) If [B] is kept constant while [A] is doubled, the reaction will proceed twice as fast

(2) If [A] is kept constant while [B] is reduced to one quarter, the rate will be halved

(3) If [A] and [B] are both doubled, the reaction will proceed 8 times as fast

(4) This is a third order reaction

**CCK027**

**28.** For a chemical reaction A $\rightarrow$ B, the rate of reaction doubles when the concentration of A is increased 8 times. The order of reaction w.r.t. A is :–

(1) 3 (2) $\frac{1}{2}$

(3) $\frac{1}{3}$ (4) Zero

**CCK028**

**29.** The rate constant of a first order reaction depends on the :–

(1) Concentration of the reactant

(2) Concentration of the product

(3) Time

(4) Temperature

**CCK029**

**30.** Consider the following reaction,

$KClO_3 + 6FeSO_4 + 3H_2SO_4 \longrightarrow KCl + 3Fe_2(SO_4)_3 + 3H_2O$

Which of the statements regarding this reaction is incorrect?

(1) It is a complex reaction

(2) It is a tenth order reaction

(3) It is completed in several steps

(4) Order of this reaction can be determined experimentally

**CCK030**

## PSEUDO FIRST ORDER REACTION / MECHANISM OF REACTION

**31.** Following mechanism has been proposed for a reaction 2A + B $\rightarrow$ D + E

A + B $\rightarrow$ C + D .........(slow)

A + C $\rightarrow$ E .........(fast)

The rate law expression for the reaction is –

(1) r = $K[A]^2[B]$ (2) r = K[A][B]

(3) r = $K[A]^2$ (4) r = K[A][C]

**CCK031**

**32.** The chemical reaction $2O_3 \rightarrow 3O_2$ proceeds as follows

$O_3 \rightleftharpoons O_2 + O$ ............ (fast)

$O + O_3 \rightarrow 2O_2$ ............ (slow)

The rate law expression should be –

(1) r = $K[O_3]^2$ (2) r = $K[O_3]^2[O_2]^{-1}$

(3) r = $K[O_3][O_2]$ (4) Unpredictable

**CCK032**

**33.** The hypothetical reaction $A_2 + B_2 \rightarrow 2AB$ follows the mechanism as given below –

$A_2 \rightleftharpoons A + A$ ............ (fast)

$A + B_2 \rightarrow AB + B$ ............ (slow)

A + B $\rightarrow$ AB ............ (fast)

The order of the over all reaction is –

(1) 2 (2) 1 (3) 1½ (4) Zero

**CCK033**

**34.** The rate for the reaction

RCl + NaOH (aq) $\rightarrow$ ROH + NaCl is given by rate = $k_1$[RCl]. The rate of the reaction is –

(1) Doubled on doubling the concentration of NaOH

(2) Halved on reducing the concentration of RCl to half

(3) Decreased on increasing the temperature of reaction

(4) Unaffected by increasing the temperature of the reaction

**CCK034**

**35.** For reaction $NO_2 + CO \rightarrow CO_2 + NO$, the rate expression is, Rate = $k[NO_2]^2$

The number of molecules of CO involved in the slowest step will be –

(1) 0 (2) 1 (3) 2 (4) 3

**CCK035**

**36.** The rate law of the reaction $A + 2B \rightarrow$ product is given by $\frac{d[P]}{dt} = K[A]^2[B]$. If A is taken in large excess, the order of the reaction will be –
(1) Zero (2) 1 (3) 2 (4) 3
**CCK036**

**37.** The acidic hydrolysis of ester is –
(1) Psuedo I$^{st}$ order reaction
(2) II$^{nd}$ order reaction
(3) Trimolecular reaction
(4) All of the above
**CCK037**

**38.** The reaction $2A + B \rightarrow P$, follows the mechanism
$2A \rightleftharpoons A_2$ (fast)
$A_2 + B \rightarrow P$ (slow)
The order of the reaction is :–
(1) 1.5 (2) 3 (3) 1 (4) 2
**CCK038**

**39.** For the reaction $2NO + Cl_2 \rightarrow 2NOCl$ the following mechanism has been proposed
$NO + Cl_2 \rightleftharpoons NOCl_2$ (fast)
$NOCl_2 + NO \rightarrow 2NOCl$ (slow) the rate law for the reaction is :-
(1) Rate = $K[NO]^2[Cl_2]$ (2) Rate = $K[NO][Cl_2]^2$
(3) Rate = $K[NOCl_2]$ (4) Rate = $K[NOCl]^2$
**CCK039**

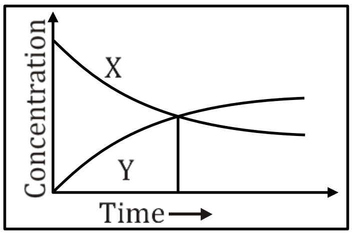
## ZERO / FIRST / N$^{TH}$ ORDER REACTIONS

**40.** The rate constant is numerically the same for three reactions of first, second and third order respectively. Which one is true at a moment for rate of all three reactions if concentration of reactants is same and greater than 1 M.
(1) $r_1 = r_2 = r_3$ (2) $r_1 > r_2 > r_3$
(3) $r_1 < r_2 < r_3$ (4) All
**CCK040**

**41.** K for a zero order reaction is $2 \times 10^{-2}$ mol L$^{-1}$ s$^{-1}$. If the concentration of the reactant after 25s is 0.5M, the initial concentration must have been.
(1) 0.5 M (2) 1.25 M
(3) 12.5 M (4) 1.0 M
**CCK041**

**42.** The decomposition of $N_2O_5$ occurs as, $2N_2O_5 \rightarrow 4NO_2 + O_2$, and follows first order kinetics; hence
(1) The reaction is bimolecular
(2) The reaction is unimolecular
(3) $t_{1/2} \propto a^0$
(4) $t_{1/2} \propto a^2$
**CCK042**

**43.** The accompanying figure depicts the change in concentration of species X and Y for the reaction $X \rightarrow Y$ as a function of time. The point of intersection of the two curves represents.




(1) $t_{1/2}$
(2) $t_{3/4}$
(3) $t_{2/3}$
(4) Data is insufficient to predict
**CCK043**

**44.** If the first order reaction involves gaseous reactants and gaseous products the unit of its rate is -
(1) atm (2) atm s (3) atm s$^{-1}$ (4) atm$^2$ s$^2$
**CCK044**

**45.** 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
**CCK045**

**46.** The rate constant of a first order reaction is $4 \times 10^{-3}$ s$^{-1}$. At a reactant concentration of 0.02 M, the rate of reaction would be–
(1) $8 \times 10^{-5}$ M s$^{-1}$ (2) $4 \times 10^{-3}$ M s$^{-1}$
(3) $2 \times 10^{-1}$ M s$^{-1}$ (4) $4 \times 10^{-1}$ M s$^{-1}$
**CCK046**

**47.** In a first order reaction, the concentration of the reactant is decreased from 1.0 M to 0.25 M in 20 min. The rate constant of the reaction would be–
(1) 10 min$^{-1}$ (2) 6.931 min$^{-1}$
(3) 0.6931 min$^{-1}$ (4) 0.06931 min$^{-1}$
**CCK047**

**48.** In a first order reaction, the value of a/(a – x) was found to be 8 after 10 minute. The rate constant is

(1) $\frac{(2.303\times3\log2)}{10}$ (2) $\frac{(2.303\times2\log3)}{10}$

(3) 10 × 2.303 × 2log3 (4) 10 × 2.303 × 3log2

**CCK048**

**49.** 75 % of a first order reaction was found to complete in 32 min. When will 50 % of the same reaction complete –

(1) 24 min (2) 16 min

(3) 8 min (4) 4 min

**CCK049**

**50.** A first order reaction has a half life period of 69.3 s. At 0.10 mol $L^{-1}$ reactant concentration, the rate will be –

(1) $10^{-4}$ M $s^{-1}$ (2) $10^{-3}$ M $s^{-1}$

(3) $10^{-1}$ M $s^{-1}$ (4) $6.93 \times 10^{-1}$ M $s^{-1}$

**CCK050**

**51.** For a first order reaction A $\rightarrow$ products, the rate of reaction at [A] = 0.2 M is $1\times 10^{-2}$ mol $L^{-1}min^{-1}$. The half life period for the reaction is -

(1) 832 min. (2) 440 s

(3) 416 min. (4) 14 min.

**CCK051**

**52.** 99 % of a first order reaction was completed in 32 min. when will 99.9 % of the reaction complete ?

(1) 50 min. (2) 46 min.

(3) 49 min. (4) 48 min.

**CCK052**

**53.** What is the half life of a radioactive substance if 87.5% of any given amount of the substance disintegrate in 40 minutes ?

(1) 160 min (2) 10 min

(3) 20 min (4) 13 min 20 sec.

**CCK053**

**54.** For a given reaction of first order, it takes 20 min for the concentration to drop from 1 M to 0.6 M. The time required for the concentration to drop from 0.6 M to 0.36 M will be :

(1) More than 20 min

(2) Less than 20 min

(3) Equal to 20 min

(4) Infinity

**CCK054**

**55.** A first order reaction is carried out with an initial concentration of 10 mol per litre and 80% of the reactant changes into the product. Now if the same reaction is carried out with an initial concentration of 5 mol per litre for the same period, the percentage of the reactant changing to the product is.

(1) 40

(2) 80

(3) 160

(4) Cannot be calculated

**CCK055**

**56.** The reaction L $\rightarrow$ M is started with 10 g/L. After 30 minute and 90minute, 5 g/L and 1.25 g/L are left respectively. The order of reaction is

(1) 0 (2) 2 (3) 1 (4) 3

**CCK056**

**57.** Doubling the initial concentration of a reactant doubles $t_{½}$ of the reaction, then order of the reaction is–

(1) 3 (2) 2 (3) 1 (4) 0

**CCK057**

**58.** The half life period for catalytic decomposition of $AB_3$ at 50 mm is found to be 4 hrs and at 100 mm it is 2 hrs. The order of reaction is –

(1) 3 (2) 1 (3) 2 (4) 0

**CCK058**

**59.** The rate constant for a reaction is $10.8 \times 10^{-5}$ mol $L^{-1}$ $s^{-1}$ The reaction obeys –

(1) First order (2) Zero order

(3) Second order (4) All are wrong

**CCK059**

**60.** A substance 'A' decomposes in solution following the first order kinetics flask I contains 1L of 1M. solution of A and flask II contains. 100 ml of 0.6 M solution. After 8 hr. the concentration of A in flask I become 0.25 M, what will be the time for concentration of A in flask II to become 0.3 M.

(1) 0.4 hr.

(2) 2.4 hr.

(3) 4.0 hr.

(4) Unpredictable as rate constant is not given

**CCK060**

**61.** The rate constant (K) for the reaction $2A + B \rightarrow$ product, was found to be $2.57 \times 10^{-5}$ L $mol^{-1}$ $s^{-1}$ after 15 s, $2.60 \times 10^{-5}$ L $mol^{-1}$ $s^{-1}$ after 30 s and $2.55 \times 10^{-5}$ L $mol^{-1}$ $s^{-1}$ after 50 s. The order of reaction is

(1) 2 (2) 3

(3) Zero (4) 1

**CCK061**

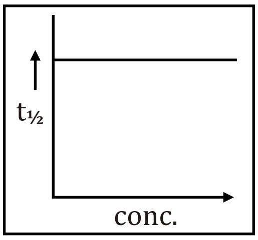
**62.** The rate constant for a second order reaction is $8 \times 10^{-5}$ $M^{-1}$ $min^{-1}$ : How long will it take a 1M solution to be reduced to 0.5 M.

(1) $8.665 \times 10^{3}$ min (2) $8 \times 10^{-3}$ min

(3) $1.25 \times 10^{4}$ min (4) $4 \times 10^{-5}$ min

**CCK062**

**63.** A graph between $t_{1/2}$ and concentration for $n^{th}$ order reaction is a straight line. Reaction of this nature is completed 50% in 10 minutes when concentration is 2 mol $L^{-1}$. This is decomposed 50% in t minutes at 4 mol $L^{-1}$, n and t are respectively




(1) 0, 20 min. (2) 1, 10 min.

(3) 1, 20 min. (4) 0, 5 min.

**CCK063**

**64.** In the case of first order reaction, the ratio of time required for 99.9 % completion to 50 % completion is :–

(1) 2 (2) 5

(3) 10 (4) None

**CCK064**

**65.** From different sets of data of $t_{1/2}$ at different initial concentrations say 'a' for a given reaction, the $[t_{1/2} \times a]$ is found to be constant. The order of reaction is :–

(1) 0 (2) 1

(3) 2 (4) 3

**CCK065**

**66.** Which of the following statement is not correct for the reaction whose rate is r = k (rate constant)

(1) Rate of reaction is independent of concentration of reactant

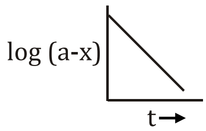
(2) $t_{1/2}$ of reaction does not depend upon concentration of reactant

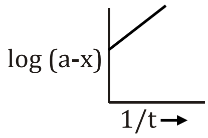
(3) Rate constant is independent of concentration of reactant

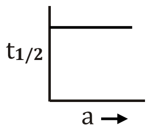
(4) This is zero order reaction

**CCK066**

**67.** Which of the following curves represents a $I^{st}$ order reaction :–

(1) 


(2) 


(3) 


(4) 1 & 3 both

**CCK067**

**68.** The following data were obtained at a certain temperature for the decomposition of ammonia

| | | | |
|---|---|---|---|
| p (mm) | 50 | 100 | 200 |
| $t_{1/2}$ | 3.64 | 1.82 | 0.91 |

The order of the reaction is :–

(1) 0 (2) 1 (3) 2 (4) 3

**CCK068**

**69.** A reaction is found to have the rate constant x $s^{-1}$ , by what factor the rate is increased if initial concentration of reactant is tripled

(1) 3 (2) 9

(3) x (4) Remains same

**CCK069**

**70.** Which is incorrect :–

(1) Half life of a first order reaction is independent of initial concentration

(2) Rate of reaction is constant for first order reaction

(3) Unit of K for second order reaction is $mol^{-1}$ L $s^{-1}$

(4) Half life of zero order is proportional to initial concentration

**CCK070**

**71.** Hydrolysis of ester in alkaline medium is :–
(1) First order reaction
(2) Second order reaction
(3) Zero order reaction
(4) Third order reaction

**CCK071**

**72.** The expression which gives $\frac{1}{4}$th life of I$^{st}$ order reaction is :–

(1) $\frac{k}{2.303}\log\frac{4}{3}$ (2) $\frac{2.303}{k}\log 3$
(3) $\frac{2.303}{k}\log\frac{3}{4}$ (4) $\frac{2.303}{k}\log\frac{4}{3}$

**CCK072**

**73.** The rate constant of a zero order reaction is 0.2 mol dm$^{-3}$h$^{-1}$. If the concentration of the reactant after 30 minutes is 0.05 mol dm$^{-3}$. Then its initial concentration would be :-
(1) 6.05 mol dm$^{-3}$ (2) 0.15 mol dm$^{-3}$
(3) 0.25 mol dm$^{-3}$ (4) 4.00 mol dm$^{-3}$

**CCK073**

**74.** A reaction is of first order. After 100 minutes, 75 gm of the reactant A are decomposed when 100 gm are taken initially, calculate the time required when 150 gm of the reactant A are decomposed, the initial weight taken is 200 gm :-
(1) 100 minutes (2) 200 minutes
(3) 150 minutes (4) 175 minutes

**CCK074**

**75.** 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

**CCK075**

**76.** A $\rightarrow$ Product, follows the first order kinetics. If the half life period of the reaction at $[A]_{Initial}$ = 0.2 mol L$^{-1}$ is 20 min. then the value of rate constant would be:-
(1) 4 s$^{-1}$ (2) 20 s$^{-1}$
(3) 4 L mol$^{-1}$ min.$^{-1}$ (4) 0.034 min$^{-1}$

**CCK076**

**77.** Correct statement about first order reaction is:-
(1) $t_{completion}$ = finite
(2) $t_{1/2} \propto \frac{1}{a}$
(3) Unit of k is mole L$^{-1}$ s$^{-1}$
(4) $t_{1/2} \times k$ = constant (at given temperature)

**CCK077**

## COLLISION THEORY AND FACTORS AFFECTING RATE OF REACTION

**78.** Activation energy of a reaction is –
(1) The energy released during the reaction
(2) The energy evolved when activated complex is formed
(3) Minimum extra amount of energy needed to overcome the potential barrier of reaction
(4) The energy needed to form one mole of the product

**CCK078**

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

**CCK079**

**80.** The rate constant $k_1$ of a reaction is found to be double that of rate constant $k_2$ of another reaction. The relationship between corresponding activation energies of the two reactions at same temperature ($E_1$ & $E_2$) can be represented as
(1) $E_1 > E_2$ (2) $E_1 < E_2$
(3) $E_1 = E_2$ (4) $E_1 = 4E_2$

**CCK080**

**81.** At room temperature, the reaction between NO and $O_2$ to give $NO_2$ is fast while that between CO and $O_2$ is slow it is due to –
(1) CO is smaller in size than that of NO
(2) CO is poisonous
(3) The activation energy for the reaction $2NO + O_2 \rightarrow 2NO_2$ is less than $2CO + O_2 \rightarrow 2CO_2$
(4) $NO_2$ is poisonous

**CCK081**

**82.** Chemical reaction occurs as a result of collisions between reacting molecules. Therefore the reaction rate is given by
(1) Total number of collisions occurring in a unit volume per second
(2) Fraction of molecules which possess energy less than the threshold energy.
(3) Total number of effective collisions
(4) Temperature

**CCK082**

**83.** An endothermic reaction $A \rightarrow B$ has an activation energy 15 kcal/mol and the heat of the reaction is 5 kcal/mol. The activation energy of the reaction $B \rightarrow A$ is –
(1) 20 kcal/mol (2) 15 kcal/mol
(3) 10 kcal/mol (4) Zero

**CCK083**

**84.** A large increase in the rate of a reaction for a rise in temperature is due to –
(1) Increase in the number of collisions
(2) Increase in the number of activated molecules
(3) Lowering of activation energy
(4) Shortening of the mean free path

**CCK084**

**85.** Rate of which reactions increases with temperature
(1) Of all reactions
(2) Of exothermic reactions
(3) Of endothermic reactions
(4) Can't be predicted

**CCK085**

**86.** The rate of a chemical reaction doubles for every $10^0C$ rise in temperature. If the temperature is increased by $60^0C$ the rate of reaction increases by :
(1) 20 times (2) 32 times
(3) 64 times (4) 128 times

**CCK086**

**87.** According to the Arrhenius equation, a straight line is to be obtained by plotting the logarithm of the rate constant of chemical reaction (log k) against.
(1) T (2) log T
(3) $1/T$ (4) log $1/T$

**CCK087**

**88.** Which plot will give the value of activation energy.
(1) k v/s T (2) $1/k$ v/s T
(3) lnk v/s T (4) lnk v/s $1/T$

**CCK088**

**89.** Given that k is the rate constant of any reaction at temperature T then the value of $\lim_{T\to\infty} \log k$ is :
(1) $A \cong 2.303$ (2) A
(3) 2.303 A (4) log A

**CCK089**

**90.** The rate constant, the activation energy and the frequency factor of a chemical reaction at $25^0C$ are $3 \times 10^{-4}\ s^{-1}$; 104.4 kJ $mol^{-1}$ and $6.0 \times 10^{14}\ s^{-1}$ respectively, the value of the rate constant as $T \rightarrow \infty$ is.
(1) $2 \times 10^8\ s^{-1}$ (2) $6 \times 10^{14}\ s^{-1}$
(3) Infinity (4) $3.6 \times 10^{30}\ s^{-1}$

**CCK090**

**91.** For an endothermic reaction where $\Delta H$ represents the enthalpy of the reaction in kJ/mol ; the minimum value for the energy of activation will be
(1) Less than $\Delta H$ (2) Zero
(3) More than $\Delta H$ (4) Equal to $\Delta H$

**CCK091**

**92.** The rate of reaction increases 2.3 times when the temperature is raised from 300 K to 310 K. If k is the rate constant at 300 K then the rate constant at 310 K will be equal to –
(1) 2 k (2) k (3) 2.3 k (4) 3 $k^2$

**CCK092**

**93.** If the concentration units are reduced by n times then the value of rate constant of first order will
(1) Increases by n times
(2) Decreases by factor of n
(3) Remain constant
(4) Decrease 1/n times

**CCK093**

**94.** Which is used in the determination of reaction rates.
(1) Reaction Temperature
(2) Reaction Concentration
(3) Specific rate constant
(4) All of these

**CCK094**

**95.** The rate constant of a first order reaction depends on the :–
(1) Concentration of the reactant
(2) Concentration of the product
(3) Volume of the reaction container
(4) Temperature

**CCK095**

**96.** For the decomposition of $N_2O_5(g)$ it is given that $2N_2O_5(g) \rightarrow 4NO_2(g) + O_2(g)$ activation energy = $E_a$, $N_2O_5(g) \rightarrow 2NO_2(g) + \frac{1}{2}O_2(g)$ activation energy = $E_a'$ then
(1) $E_a = 2E'_a$ (2) $E_a > E'_a$
(3) $E_a < E'_a$ (4) $E_a = E'_a$

**CCK096**

**97.** For a reaction in which case the activation energies of forward and reverse reactions are equal :–
(1) $\Delta H = 0$
(2) $\Delta S = 0$
(3) The order is zero
(4) There is no catalyst

**CCK097**

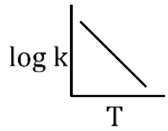
**98.** The energy of activation of a forward reaction is 50 kcal. The energy of activation of its backward reaction is:–
(1) Equal to 50 kcal.
(2) Greater than 50 kcal.
(3) Less than 50 kcal.
(4) Either greater or less than 50 kcal.

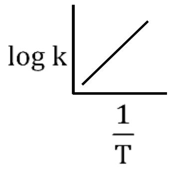
**CCK098**

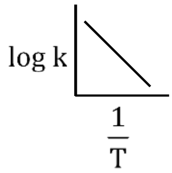
**99.** An exothermic reaction $X \rightarrow Y$ has an activation energy 30 kJ $mol^{-1}$. If energy change ($\Delta H$) during the reaction is – 20 kJ, then the activation energy for the reverse reaction is :–
(1) 10 kJ (2) 20 kJ
(3) 50 kJ (4) – 30 kJ

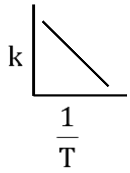
**CCK099**

**100.** Which of the following plot is in accordance with the Arrhenius equation :–

(1) 


(2) 


(3) 


(4) 


**CCK100**

**101.** The rate of reaction increases with increase in temperature because :–
(1) Collision is increased
(2) Energy of products decreases
(3) Fraction of molecules possessing energy $\geq E_T$ (Threshold energy) increases
(4) Mechanism of a reaction is changed

**CCK101**

**102.** For a certain gaseous reaction, rise of temperature from 25° C to 35° C doubles the rate of reaction. What is the value of activation energy :–

(1) $\frac{10}{2.303R \times 298 \times 308}$

(2) $\frac{2.303 \times 10}{298 \times 308R}$

(3) $\frac{0.693R \times 10}{290 \times 308}$

(4) $\frac{0.693R \times 298 \times 308}{10}$

**CCK102**

**103.** For producing the effective collisions, the colliding molecules must possess :-
(1) A certain minimum amount of energy
(2) Energy equal to or greater than threshold energy
(3) Proper orientation
(4) Threshold energy as well as proper orientation of collision

**CCK103**

**104.** The half life for a reaction ............. of temperature :-
(1) Independent
(2) Increases with increase
(3) Decreases with increase
(4) Increases or decreases with increase
**CCK104**

**105.** The activation energy for a chemical reaction depends upon :-
(1) Temperature
(2) Nature of reacting species
(3) Concentration of the reacting species
(4) Collision frequency
**CCK105**

**106.** During decomposition of an activated complex
(1) Some energy is absorbed
(2) Some energy is released
(3) No energy change
(4) Both (1) & (2)
**CCK106**

## EXERCISE-I (Conceptual Questions) ANSWER KEY

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Question** | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| **Answer** | 1 | 1 | 3 | 3 | 1 | 4 | 1 | 1 | 2 | 4 | 2 | 4 | 3 | 1 | 2 |
| **Question** | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| **Answer** | 3 | 2 | 2 | 1 | 3 | 2 | 2 | 4 | 3 | 3 | 2 | 2 | 3 | 4 | 2 |
| **Question** | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 |
| **Answer** | 2 | 2 | 3 | 2 | 1 | 2 | 1 | 2 | 1 | 3 | 4 | 3 | 1 | 3 | 2 |
| **Question** | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 |
| **Answer** | 1 | 4 | 1 | 2 | 2 | 4 | 4 | 4 | 3 | 2 | 3 | 4 | 3 | 2 | 3 |
| **Question** | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 | 73 | 74 | 75 |
| **Answer** | 1 | 3 | 2 | 3 | 3 | 2 | 4 | 3 | 1 | 2 | 2 | 4 | 2 | 1 | 2 |
| **Question** | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 |
| **Answer** | 4 | 4 | 3 | 3 | 2 | 3 | 3 | 3 | 2 | 1 | 3 | 3 | 4 | 4 | 2 |
| **Question** | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 100 | 101 | 102 | 103 | 104 | 105 |
| **Answer** | 3 | 3 | 3 | 4 | 4 | 4 | 1 | 4 | 3 | 3 | 3 | 4 | 4 | 3 | 2 |
| **Question** | 106 | | | | | | | | | | | | | | |
| **Answer** | 2 | | | | | | | | | | | | | | |

## Exercise - II (Previous Year Questions) AIPMT/NEET

### AIPMT 2015

**1.** The activation energy of a reaction can be determined from the slope of which of the following graphs ?

(1) $\frac{\ln k}{T}$ v/s.T (2) ln k v/s. $\frac{1}{T}$

(3) $\frac{T}{\ln k}$ v/s. $\frac{1}{T}$ (4) ln k v/s. T

**CCK124**

**2.** When initial concentration of a reactant is doubled in a reaction, its half-life period is not affected. The order of the reaction is :-

(1) First

(2) Second

(3) More than zero but less than first

(4) Zero

**CCK125**

### Re-AIPMT 2015

**3.** The rate constant of the reaction $A \rightarrow B$ is $0.6 \times 10^{-3}$ M $sec^{-1}$. If the concentration of A is 5 M, then concentration of B after 20 min is :-

(1) 0.36 M (2) 0.72 M

(3) 1.08 M (4) 3.60 M

**CCK126**

### NEET-I 2016

**4.** The rate of a first-order reaction is 0.04 mol $L^{-1}s^{-1}$ at 10 s and 0.03 mol $L^{-1}$ $s^{-1}$ at 20 s after initiation of the reaction. The half-life period of the reaction is :

(1) 24.1 s (2) 34.1 s

(3) 44.1 s (4) 54.1 s

**CCK127**

**5.** The addition of a catalyst during a chemical reaction alters which of the following quantities ?

(1) Entropy (2) Internal energy

(3) Enthalpy (4) Activation energy

**CCK128**

### NEET-II 2016

**6.** The decomposition of phosphine ($PH_3$) on tungsten at low pressure is a first-order reaction. It is because the

(1) Rate is independent of the surface coverage

(2) Rate of decomposition is very slow

(3) Rate is proportional to the surface coverage

(4) Rate is inversely proportional to the surface coverage

**CCK129**

### NEET(UG) 2017

**7.** Mechanism of a hypothetical reaction

$X_2 + Y_2 \rightarrow 2XY$ is given below :

(i) $X_2 \rightleftharpoons X + X$(fast)

(ii) $X + Y_2 \rightarrow XY + Y$ (slow)

(iii) $X + Y \rightarrow XY$ (fast)

The overall order of the reaction will be :

(1) 2 (2) 0 (3) 1.5 (4) 1

**CCK130**

**8.** A first order reaction has a specific reaction rate of $10^{-2}$ $s^{-1}$. How much time will it take for 20 g of the reactant to reduce to 5 g ?

(1) 138.6 s (2) 346.5 s

(3) 693.0 s (4) 238.6 s

**CCK131**

### NEET(UG) 2018

**9.** The correct difference between first- and second-order reaction is that

(1) The rate of a first-order reaction does not depend on reactant concentration; the rate of a second-order reaction does depend on reactant concentrations.

(2) The half-life of a first-order reaction does not depend on $[A]_0$; the half-life of a second-order reaction does depend on $[A]_0$

(3) A first-order reaction can be catalyzed; a second-order reaction cannot be catalyzed.

(4) The rate of a first-order reaction does depend on reactant concentrations; the rate of a second-order reaction does not depend on reactant concentrations

**CCK132**

**10.** When initial concentration of the reactant is doubled, the half-life period of a zero order reaction
(1) Is halved
(2) Is doubled
(3) Is tripled
(4) Remains unchanged

**CCK133**

## NEET(UG) 2019

**11.** If the rate constant for a first order reaction is k, then the time (t) required for the completion of 99% of the reaction is given by:-
(1) t = 0.693/k (2) t = 6.909/k
(3) t = 4.606/k (4) t = 2.303/k

**CCK134**

**12.** For the chemical reaction
$N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$
the **correct** option is :
(1) $-\frac{1}{3}\frac{d[H_2]}{dt} = -\frac{1}{2}\frac{d[NH_3]}{dt}$
(2) $-\frac{d[N_2]}{dt} = 2\frac{d[NH_3]}{dt}$
(3) $-\frac{d[N_2]}{dt} = \frac{1}{2}\frac{d[NH_3]}{dt}$
(4) $3\frac{d[H_2]}{dt} = 2\frac{d[NH_3]}{dt}$

**CCK135**

## NEET(UG) 2019 (Odisha)

**13.** A first order reaction has a rate constant of $2.303\times10^{-3}$ s$^{-1}$. The time required for 40g of this reactant to reduce to 10 g will be-
[Given that $\log_{10} 2=0.3010$]
(1) 230.3 s (2) 301 s
(3) 2000 s (4) 602 s

**CCK136**

**14.** For a reaction, activation energy $E_a=0$ and the rate constant at 200K is $1.6\times10^6 s^{-1}$. The rate constant at 400K will be-
[Given : gas constant R= 8.314 J $K^{-1}$ $mol^{-1}$]
(1) $3.2 \times10^4$ $s^{-1}$ (2) $1.6 \times 10^6$ $s^{-1}$
(3) $1.6 \times 10^3$ $s^{-1}$ (4) $3.2 \times 10^6$ $s^{-1}$

**CCK137**

## NEET (UG) 2020

**15.** The rate constant for a first order reaction is $4.606 \times 10^{-3}$ $s^{-1}$. The time required to reduce 2.0 g of the reactant to 0.2 g is :
(1) 1000 s (2) 100 s
(3) 200 s (4) 500 s

**CCK138**

**16.** An increase in the concentration of the reactants of a reaction leads to change in :
(1) Collision frequency (2) Activation energy
(3) Heat of reaction (4) Threshold energy

**CCK139**

## NEET (UG) 2020 (COVID-19)

**17.** The half-life for a zero order reaction having 0.02 M initial concentration of reactant is 100 s. The rate constant (in mol $L^{-1}$ $s^{-1}$) for the reaction is
(1) $1.0 \times 10^{-4}$ (2) $2.0 \times 10^{-4}$
(3) $2.0 \times 10^{-3}$ (4) $1.0 \times 10^{-2}$

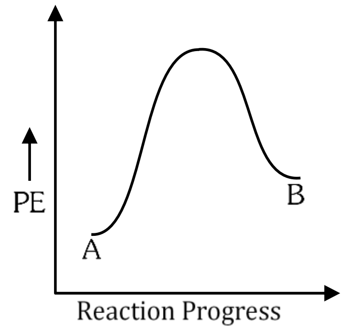
**CCK140**

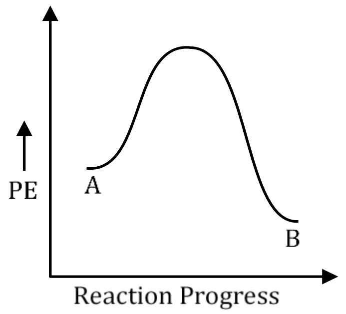
**18.** In collision theory of chemical reaction, $Z_{AB}$ represents
(1) The fraction of molecules with energies greater than $E_a$
(2) The collision frequency of reactants, A and B
(3) Steric factor
(4) The fraction of molecules with energies equal to $E_a$

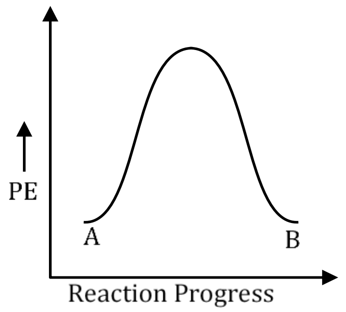
**CCK141**

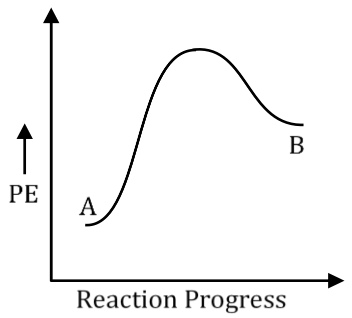
## NEET (UG) 2021

**19.** For a reaction A → B, enthalpy of reaction is $-4.2$ kJ $mol^{-1}$ and enthalpy of activation is 9.6 kJ $mol^{-1}$. The correct potential energy profile for the reaction is shown in option.

(1) 

(2) 


(3) 


(4) 


**CCK142**

**20.** The slope of Arrhenius Plot $\left(\ln k \text{ v/s } \frac{1}{T}\right)$ of first order reaction is $-5 \times 10^3$ K. The value of $E_a$ of the reaction is. Choose the correct option for your answer.

[Given R=8.314 $JK^{-1}$ $mol^{-1}$]

(1) 41.5 kJ $mol^{-1}$

(2) 83.0 kJ $mol^{-1}$

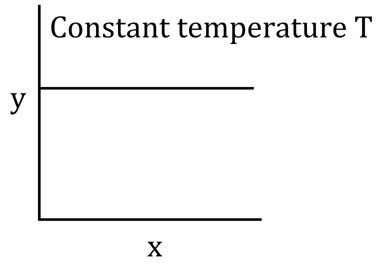
(3) 166 kJ $mol^{-1}$

(4) $-83$ kJ $mol^{-1}$

**CCK143**

**NEET (UG) 2022**

**21.** The given graph is a representation of kinetics of a reaction.




The y and x axes for zero and first order reactions, respectively are

(1) Zero order (y = concentration and x = time), first order (y = rate constant and x = concentration)

(2) Zero order (y = rate and x = concentration), first order ($y = t_{1/2}$ and x = concentration)

(3) Zero order (y = rate and x = concentration), first order (y = rate and $x = t_{1/2}$)

(4) Zero order (y = concentration and x = time), first order ($y = t_{1/2}$ and x = concentration)

**CCK144**

**22.** For a first order reaction A $\rightarrow$ Products, initial concentration of A is 0.1 M, which becomes 0.001 M after 5 minutes. Rate constant for the reaction in $min^{-1}$ is

(1) 0.9212 (2) 0.4606

(3) 0.2303 (4) 1.3818

**CCK145**

**23.** The half life of a first order reaction is 2000 years. If the concentration after 8000 years is 0.02 M, then the initial concentration was :

(1) 0.16 M (2) 0.32 M

(3) 0.08 M (4) 0.04 M

**CCK146**

**24.** For a chemical reaction $4A + 3B \rightarrow 6C + 9D$ rate of formation of C is $6 \times 10^{-2}$ mol $L^{-1}$ $s^{-1}$ and rate of disappearance of A is $4 \times 10^{-2}$ mol $L^{-1}$ $s^{-1}$. The rate of reaction and amount of B consumed in interval of 10 seconds, respectively will be :

(1) $1 \times 10^{-2}$ mol $L^{-1}$ $s^{-1}$ and $30 \times 10^{-2}$ mol $L^{-1}$

(2) $10 \times 10^{-2}$ mol $L^{-1}$ $s^{-1}$ and $10 \times 10^{-2}$ mol $L^{-1}$

(3) $1 \times 10^{-2}$ mol $L^{-1}$ $s^{-1}$ and $10 \times 10^{-2}$ mol $L^{-1}$

(4) $10 \times 10^{-2}$ mol $L^{-1}$ $s^{-1}$ and $30 \times 10^{-2}$ mol $L^{-1}$

**CCK147**

## NEET (UG) 2023

**25.** Given below are two statements : one is labelled as **Assertion A** and the other is labelled as **Reason R**.

**Assertion A :** A reaction can have zero activation energy.

**Reasons R :** The minimum extra amount of energy absorbed by reactant molecules so that their energy becomes equal to threshold value, is called activation energy.

In the light of the above statements, choose the **correct** answer from the options given below :

(1) Both **A** and **R** are true but **R** is **NOT** the correct explanation of **A**.

(2) **A** is true but **R** is false

(3) **A** is false but **R** is true

(4) Both **A** and **R** are true and **R** is the correct explanation of **A**.

**CCK163**

## NEET (UG) 2024

**26.** Activation energy of any chemical reaction can be calculated if one knows the value of

(1) rate constant at standard temperature.

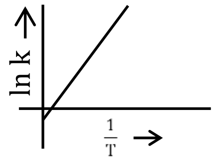
(2) probability of collision.

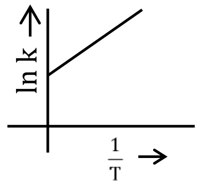
(3) orientation of reactant molecules during collision.

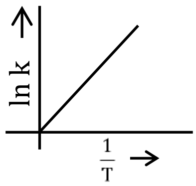
(4) rate constant at two different temperatures.

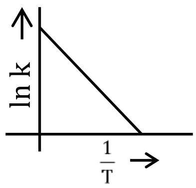
**CCK179**

**27.** Which plot of ln k vs $\frac{1}{T}$ is consistent with Arrhenius equation?

(1) 


(2) 


(3) 


(4) 


**CCK180**

**28.** The rate of a reaction quadruples when temperature changes from 27°C to 57°C. Calculate the energy of activation.

Given R = 8.314 J $K^{-1}$ $mol^{-1}$, log 4 = 0.6021

(1) 38.04 kJ/mol (2) 380.4 kJ/mol

(3) 3.80 kJ/mol (4) 3804 kJ/mol

**CCK181**

## NEET (UG) 2024 (Re-examination)

**29.** Following data is for a reaction between reactants A and B :

| Rate mol $L^{-1}$ $s^{-1}$ | [A] | [B] |
|---|---|---|
| $2 \times 10^{-3}$ | 0.1 M | 0.1 M |
| $4 \times 10^{-3}$ | 0.2 M | 0.1 M |
| $1.6 \times 10^{-2}$ | 0.2 M | 0.2 M |

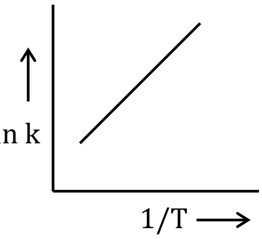
The order of the reaction with respect to A and B, respectively are :

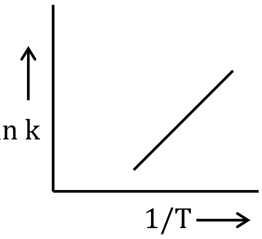
(1) 1, 0 (2) 0, 1

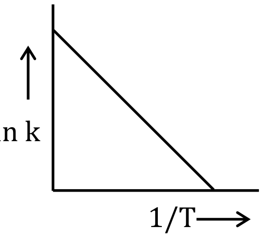
(3) 1, 2 (4) 2, 1

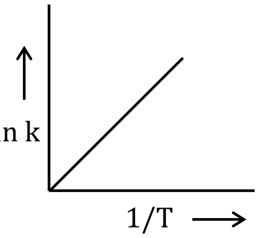
**CCK182**

**30.** Which of the following plot represents the variation of ln k versus $\frac{1}{T}$ in accordance with Arrhenius equation ?

(1)



(2)



(3)



(4)



**CCK183**

**31.** Rate constants of a reaction at 500 K and 700 K are $0.04 s^{-1}$ and $0.14 s^{-1}$, respectively, then, activation energy of the reaction is :
(Given : log 3.5 = 0.5441, R = 8.31 J $K^{-1}mol^{-1}$)

(1) 182310 J (2) 18500 J
(3) 18219 J (4) 18030 J

**CCK184**

## EXERCISE-II (Previous Year Questions) ANSWER KEY

| Question | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Answer | 2 | 1 | 2 | 1 | 4 | 3 | 3 | 1 | 2 | 2 | 3 | 3 | 4 | 2 | 4 |
| Question | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| Answer | 1 | 1 | 2 | 2 | 1 | 2 | 1 | 2 | 1 | 3 | 4 | 4 | 1 | 3 | 3 |
| Question | 31 | | | | | | | | | | | | | | |
| Answer | 3 | | | | | | | | | | | | | | |

## Exercise – III (Analytical Questions) Master Your Understanding

**1.** Given below are two statements:

**Statement-I :** Rate of zero order reactions is independent of temperature.

**Statement-II :** Half-life of zero order reactions is independent of concentration.

In the light of the above statements, choose the most appropriate answer from the options given below:

(1) Both Statement-I & Statement-II are correct and the Statement-II is a correct explanation of Statement-I.

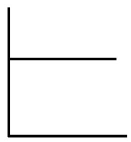
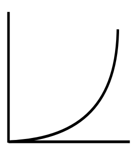
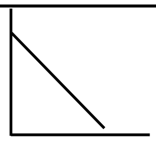
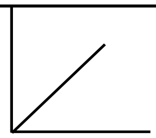
(2) Both Statement-I & Statement-II are correct but Statement-II is not a correct explanation of Statement-I.

(3) Statement-I is correct and Statement-II is incorrect.

(4) Both Statement-I and Statement-II are incorrect.

**CCK148**

**2.** Match the following

| | | | |
|---|---|---|---|
| (a) | $[A]_t$ Vs time for zero order | (p) |  |
| (b) | Half -life Vs Initial concentration for zero order | (q) |  |
| (c) | Rate Vs time for zero order | (r) |  |
| (d) | Rate constant Vs Temperature | (s) |  |

(1) (a) $\rightarrow$ (r), (b) $\rightarrow$ (s), (c) $\rightarrow$ (p), (d) $\rightarrow$ (q)

(2) (a) $\rightarrow$ (s), (b) $\rightarrow$ (r), (c) $\rightarrow$ (p), (d) $\rightarrow$ (q)

(3) (a) $\rightarrow$ (r), (b) $\rightarrow$ (s), (c) $\rightarrow$ (q), (d) $\rightarrow$ (p)

(4) (a) $\rightarrow$ (s), (b) $\rightarrow$ (r), (c) $\rightarrow$ (q), (d) $\rightarrow$ (p)

**CCK149**

**3.** Given below are two statements; one is labelled as **Assertion (A)** and the other is labelled as **Reason(R)**.

**Assertion (A) :** For a reaction $A \rightarrow P$, Rate and Rate constant are numerically equal when $[A] = 1M$.

**Reason (R) :** Rate and rate constant are equal for zero order reaction involving single reactant.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

(1) Both Assertion & Reason are correct and the Reason is a correct explanation of Assertion.

(2) Both Assertion & Reason are correct but Reason is not a correct explanation of Assertion.

(3) Assertion is correct and Reason is incorrect.

(4) Both Assertion and Reason are incorrect.

**CCK151**

**4.** Given below are two statements:

**Statement-I :** Catalyst does not change equilibrium constant of a reaction.

**Statement-II :** Catalyst decreases the time required to attain equilibrium.

In the light of the above statements, choose the most appropriate answer from the options given below:

(1) Both Statement-I & Statement-II are correct and the Statement-II is a correct explanation of Statement-I.

(2) Both Statement-I & Statement-II are correct but Statement-II is not a correct explanation of Statement-I.

(3) Statement-I is correct and Statement-II is incorrect.

(4) Both Statement-I and Statement-II is incorrect.

**CCK152**

**5.** Consider the following statements :

(a) Order of a reaction is an experimental quantity.

(b) Order is applicable only for elementary reactions.

(c) Rate constant for a first order gaseous reaction will have the unit of atm. $s^{-1}$.

(d) Half-life period of a reaction decreases with increases in temperature.

Which statements are correct ?

(1) b, c

(2) a, b, d

(3) a, d

(4) c, d

**CCK154**

**6.** Which of the following statements are correct according to Arrhenius equation ?

(a) Rate of a reaction increases with increase in temperature.

(b) Rate of a reaction increases with decreases in activation energy.

(c) Rate constant decreases exponentially with increase in temperature.

(d) Rate of reaction decreases with decrease in activation energy.

(1) a, b

(2) b, d

(3) a, b and c

(4) a, d

**CCK157**

**7.** According to Maxwell Boltzmann distribution of energy.

(a) The fraction of molecules with most probable kinetic energy decreases at higher temperature.

(b) The fraction of molecules with most probable kinetic energy increases at higher temperature

(c) Most probable kinetic energy increases at higher temperature.

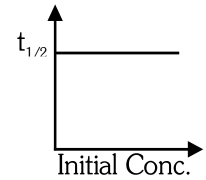
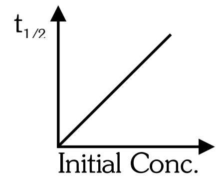
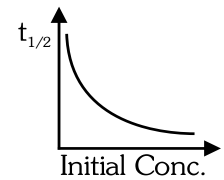
(d) Most probable kinetic energy decreases at higher temperature.

(1) a, b are correct (2) a, c are correct

(3) b, c are correct (4) b, d are correct

**CCK161**

**8.** Match the group given in column I with the order of reaction given in column II.

| | **Column-I** | | **Column-II** |
|---|---|---|---|
| (i) |   | (a) | First order |
| (ii) |   | (b) | Zero order |
| (iii) |   | (c) | Second order |

| | (i) | (ii) | (iii) |
|---|---|---|---|
| (1) | a | b | c |
| (2) | b | c | a |
| (3) | b | a | c |
| (4) | c | a | b |

**CCK162**

## EXERCISE-III (Analytical Questions) ANSWER KEY

| **Question** | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| **Answer** | 4 | 1 | 2 | 2 | 3 | 1 | 2 | 1 |