10. CHEMICAL KINETICS

SOLUTIONS

TEACHING TASK
WORKSHEET-10

1. When a reaction is progressing

(a)The rate of the reaction goes on increasing

(b)The concentration of the products goes on decreasing

(c) The concentration of the reactants goes on decreasing

(d) The reaction rate always remains constant

Answer:C

Solution:The concentration of the reactants goes on decreasing → True (reactants are consumed).

2. The velocity of a chemical reaction with the progress of reaction

(a)Increases **(b)Decreases**

(c) First increases and then decreases **(d) Remain constant**

Answer:B

Solution:For most reactions, as reactants are consumed, their concentration decreases, leading to a decrease in the reaction rate

3. For the reaction $H_2(g) + l_2(g) \rightarrow 2HI(g),$ **the rate of reaction is expressed as**

(a) $-\frac{\Delta[l_2]}{\Delta t} = -\frac{\Delta[H_2]}{\Delta t} = \frac{1}{2}\frac{\Delta[HI]}{\Delta t}$ **(b)** $\frac{\Delta[l_2]}{\Delta t} = \frac{\Delta[H_2]}{\Delta t} = \frac{\Delta[HI]}{2\Delta t}$

(c) $\frac{\Delta[H_2]}{\Delta t} = \frac{1}{2}\frac{\Delta[l_2]}{\Delta t} = -\frac{\Delta[HI]}{\Delta t}$ **(d) None of these**

Answer:A

Solution:For this reaction:

H_2 disappears with coefficient 1.

I_2 disappears with coefficient 1.

HI appears with coefficient 2.

Rate=$-\frac{\Delta[l_2]}{\Delta t} = -\frac{\Delta[H_2]}{\Delta t} = \frac{1}{2}\frac{\Delta[HI]}{\Delta t}$

4. For a hypothetical reaction; $A \rightarrow L,$ **the rate expression is,** $rate = -\frac{dC_A}{dt}$

(a) Negative sign represents that rate is negative

(b) Negative sign indicates the decrease in the concentrations of reactants

(c) Negative sign indicates the attractive forces between reactants

(d) None of the above is correct

Answer:B

Solution:The negative sign indicates the decrease in the concentration of the reactant (A) over time.

5. For the reaction; $2HI \rightarrow H_2 + I_2,$ **the expression** $-\frac{1}{2}\frac{d[HI]}{dt}$ **represents**

(a)The rate of formation of HI
(b) The rate of disappearance of HI
(c) The instantaneous rate of the reaction
(d) The average rate of reaction

Answer:C

Solution:For the reaction: $2HI \rightarrow H_2 + I_2,$

The expression $-\frac{1}{2}\frac{d[HI]}{dt}$ represents the instantaneous rate of the reaction.

The instantaneous rate of the reaction $\frac{-\mathrm{d(HI)}}{2\mathrm{dt}} = \frac{\mathrm{dH_2}}{\mathrm{dt}} = \frac{\mathrm{dI_2}}{\mathrm{dt}}$

6. Which of the following expressions can be used to describe the instantaneous rate of the reaction $2A + B \rightarrow A_2B$

(a) $-\frac{1}{2}\frac{d[A]}{dt}$ **(b)** $-\frac{d[A]}{dt}$ **(c)** $\frac{1}{2}\frac{d[A_2B]}{dt}$ **(d)** $-\frac{1}{2}\frac{d[A]}{dt}\cdot\frac{d[B]}{dt}$

Answer:A

Solution: $Rate = -\frac{1}{2}\frac{\mathrm{d[A]}}{\mathrm{dt}} = -\frac{\mathrm{d[B]}}{\mathrm{dt}} = +\frac{\mathrm{d[A_2}B]}{\mathrm{dt}}$

7. In a reaction $2A + B \rightarrow A_2B,$ **the reactant A will disappear at**

(a) Half the rate that B will decrease
(b)The same rate that B will decrease
(c) Twice the rate of that B will decrease
(d) The same rate that A_2B will form

Answer:C

Solution:

$$Rate = -\frac{1}{2}\frac{\mathrm{d[A]}}{\mathrm{dt}} = -\frac{\mathrm{d[B]}}{\mathrm{dt}} = +\frac{\mathrm{d[A_2}B]}{\mathrm{dt}}$$

$$-\frac{1}{2}\frac{\mathrm{d[A]}}{\mathrm{dt}} = -\frac{\mathrm{d[B]}}{\mathrm{dt}}$$

$$\frac{\mathrm{d[A]}}{\mathrm{dt}} = 2\frac{\mathrm{d[B]}}{\mathrm{dt}}$$

Thus, A disappears at twice the rate that B decreases.

8. The concentration of a reactant decreases from 0.2 M to 0.1 M in 10 minutes. The rate of the reaction is

(a) 1.01 M **(b)** 10^{-2} **--** **(c)** $0.01\,mol\ dm^{-3}\ \mathrm{min}^{-1}$ **(d)** $1\,mol\ dm^{-3}\ \mathrm{min}^{-1}$

Answer:C

Solution:Given: Concentration decreases from 0.2 M to 0.1 M in 10 minutes.

The average rate of reaction (based on reactant disappearance) is:

$$Rate = -\frac{\Delta[reac\tan t]}{\Delta t} = -\frac{(0.1-0.2)}{10} = \frac{0.1}{10} = 0.01 moldm^{-3}\,\min^{-1}$$

9.. In the following reactions, how is the rate of appearance of the bold product related to the rate of disappearance of the bold reactant

$$BrO_3^-(aq) + 5Br^-(aq) + 6H^+ \rightarrow 3\mathbf{Br_2}(l) + 3H_2O(l)$$ **[CBSE 2000]**

(a) $\frac{d[Br_2]}{dt} = -\frac{5}{3}\frac{d[Br^-]}{dt}$ **(b)** $\frac{d[Br_2]}{dt} = -\frac{d[Br^-]}{dt}$ **(c)** $\frac{d[Br_2]}{dt} = \frac{3}{5}\frac{d[Br^-]}{dt}$ **(d)** $\frac{d[Br_2]}{dt} = -\frac{3}{5}\frac{d[Br^-]}{dt}$

Answer:D

Solution: $BrO_3^-(aq) + 5Br^-(aq) + 6H^+ \rightarrow 3\mathbf{Br_2}(l) + 3H_2O(l)$

$$-\frac{1}{5}\frac{dt[Br^-]}{dt} = +\frac{1}{3}\frac{dt[Br_2]}{dt}$$
$$-\frac{3}{5}\frac{dt[Br^-]}{dt} = \frac{dt[Br_2]}{dt}$$

10. In the formation of sulphur trioxide by the Contact Process, $2SO_2(g) + O_2(g) \quad 2SO_3(g)$

The rate of reaction is expressed as $-\frac{d(O_2)}{dt} = 2.5\times10^{-4}$ **mol** $L^{-1}\ \sec^{-1}$ **. The rate of disappearance of (SO_2) will be**

(a) $5.0\times10^{-4}\ mol\ L^{-1}\ s^{-1}$ **(b)** $-2.25\times10^{-4}\ mol\ L^{-1}\ s^{-1}$

(c) $3.75\times10^{-4}\ mol\ L^{-1}\ s^{-1}$ **(d)** $50.0\times10^{-4}\ mol\ L^{-1}\ s^{-1}$

Answer:A

Solution: $2SO_2(g) + O_2(g) \rightarrow 2SO_3(g)$

$$-\frac{1}{2}\frac{d[SO_2]}{dt} = -\frac{d[O_2]}{dt} = +\frac{1}{2}\frac{d[SO_3]}{dt}$$
$$-\frac{1}{2}\frac{d[SO_2]}{dt} = -\frac{d[O_2]}{dt}$$
$$-\frac{d[SO_2]}{dt} = -2\frac{d[O_2]}{dt}$$
$$-\frac{d[SO_2]}{dt} = 2\times2.5\times10^{-4} = 5\times10^{-4}\,\mathrm{mol\,L^{-1}s^{-1}}$$

MORE THAN ONE CORRECT ANSWER TYPE :

11. Rate is

a) $\frac{dr}{dt}$ **b)** $\frac{d}{dt}\left(\frac{n}{V}\right)$ **c)** $\frac{1}{RT}\left(\frac{dp}{dt}\right)$ **d)** $\frac{1}{v}\frac{d}{dt}\left(\frac{w}{Mwt}\right)$

Answer:A,B,C,D

Solution:In terms of Extent of reaction Rate=$\frac{dr}{dt}$

In terms of Concentration Rate=$\frac{d}{dt}\left(\frac{n}{V}\right)$

For an ideal gas,

$$pV = nRT \Rightarrow \frac{n}{V} = \frac{p}{RT}$$

$$Rate = \frac{d}{dt}\frac{p}{RT} = \frac{1}{RT}\frac{dp}{dt}$$

In terms of mass of substance:Number of moles $n = \frac{w}{M_{wt}}$

For stoichiometry, $Rate = \frac{1}{v}\frac{d}{dt}\frac{w}{M_{wt}}$

12. Which of the following is correct for the following reaction $N_{2(g)} + O_{2(g)} \rightarrow 2NO_{(g)}$

a) $-\frac{d[N_2]}{dt}$ **b)** $-\frac{d[O_2]}{dt}$ **c)** $\frac{d[NO]}{dt}$ **d)** $\frac{1}{2}\frac{d[NO]}{dt}$

Answer:A,B,D

Solution: $N_{2(g)} + O_{2(g)} \rightarrow 2NO_{(g)}$

$$-\frac{d[N_2]}{dt} = -\frac{d[O_2]}{dt} = +\frac{1}{2}\frac{d[NO]}{dt}$$

STATEMENT TYPE

A) Both **Statement** – I and **Statement** – II are true and **Statement** – II is the correct explanation of **Statement** – I

B) Both **Statement** – I and **Statement** – II are true and **Statement** – II is not the correct explanation of **Statement** – I

C) **Statement** – I is true but **Statement** – II is false

D) **Statement** – I is false but **Statement** – II is true

13. Statement – I: The change in concentration of reactant (dc) decreases with time

Statement – II:Rate with respect to reactant = $-\frac{dc}{dt}$

Answer:A

Solution:The term $-\frac{dc}{dt}$ specifically refers to the change in concentration of a substance C over time. The negative sign indicates that the concentration of C is decreasing

if C is a reactant.

14. Statement -I: Formation of water is a slow reaction at room temperature
Statement II: for the completion of slow reaction a very long time period is required.

Answer:A

Solution:Statement I: Formation of water is a slow reaction at room temperature. — Interpreting this as the direct combination of H_2 and O_2 to make H_2O: True in practice — the reaction has a high activation energy and does not proceed rapidly at room temperature without an ignition/catalyst.

Statement II: For the completion of a slow reaction a very long time period is required. — True (that is the definitionally correct consequence of a reaction being slow

COMPREHENSION TYPE

Comprehension - I

The average rate is defined as the change in the concentration (active mass) of ractants or products over a long time interval.

15 The concentration of a reactant decreases from 0.2 M to 0.05 M in 5 minutes. The rate of the reaction is

a) 1.01 M **b) 10^{-2}**

c)0.01 mol $dm^{-3}min^{-1}$ **d)0.03mol dm^{-3} min^{-1}**

Answer:D

Solution: $\text{Rate} = -\frac{\Delta[A]}{\Delta t} = -\frac{(0.05-0.2)}{5} = \frac{0.15}{5} = 0.03\text{mol}\,\text{dm}^{-3}\text{min}^{-1}$

16. The rate of reaction between two specific time intervals is called

a)average rate **b) Ordinary rate**

c)Instantaneous rate **d)Specific rate**

Answer:A

Solution:The rate measured over a finite time interval is the average rate

INTEGER TYPE QUESTIONS:

17. 1 lit = _____dm^3

Answer:1

Solution:

1 liter (L) is equal to 1 cubic decimeter (dm^3).

This is a standard conversion in the metric system.

$1L = 1dm^3$

18. For a reaction $2A + B \rightarrow C$ $\frac{dx}{dt} =$ _____ $\left[\frac{-d[A]}{dt}\right]$

Answer:1/2

Solution:

$$\frac{dx}{dt} = -\frac{1}{2}\frac{d[A]}{dt} = -\frac{d[B]}{dt} = \frac{d[C]}{dt}$$

$$\frac{dx}{dt} = \frac{1}{2}(-\frac{d[A]}{dt})$$

Thus the factor is $\frac{1}{2}$

Match the following

19.

Column-I	**Column – II**
A) $A \rightarrow B$	**p) Rate =** $-\frac{d[C]}{dt} = -\frac{d[D]}{dt}$
B) $C \rightarrow D$	**q) Rate =** $-\frac{d[A]}{dt} = +\frac{d[B]}{dt}$
C) $\mathbf{2HI_{(g)}} \rightarrow H_{2_{(g)}} + I_{2_{(g)}}$	**r) Rate =** $-\frac{1}{2}\frac{d[HI]}{dt}$
D) $\mathbf{Hg_{(1)} + cl_{2(g)} \rightarrow Hgcl_{2(g)}}$	**s) Rate =** $-\frac{d[Hg]}{dt} = -\frac{d[cl_2]}{dt} = +\frac{d[Hgcl_2]}{dt}$

Answer:A-q,B-p,C-r,D-s

Solution:

A) $A \rightarrow B$	q) Rate = $-\frac{d[A]}{dt} = +\frac{d[B]}{dt}$
B) $C \rightarrow D$	p) Rate = $-\frac{d[C]}{dt} = -\frac{d[D]}{dt}$
C) $2HI_{(g)} \rightarrow H_{2_{(g)}} + I_{2_{(g)}}$	r) Rate = $-\frac{1}{2}\frac{d[HI]}{dt}$
D) $Hg_{(1)} + cl_{2(g)} \rightarrow Hgcl_{2(g)}$	s) Rate = $-\frac{d[Hg]}{dt} = -\frac{d[cl_2]}{dt} = +\frac{d[Hgcl_2]}{dt}$

LEARNER'S TASK

Conceptual Under Standing Question (CUQ;s)

1. Chemical reactions are classified into

A) 1 B)2 C) 3 D)4

Answer:C

Solution:Chemical reactions are classified into based on rate: slow, fast, and moderate.

2. Electron transfer reactions are

A) fast reactions B) slow reactions

C) moderate reactions D) none

Answer:A

Solution:Electron transfer reactions (e.g., in redox reactions) are often fast.

3. Rusting of iron is a

A) slow reactions **B) fast reactions**

C) moderate reactions **D) none**

Answer:A

Solution:Rusting is a slow process.

4. Ionic reactions are

A)moderate reactions **B) slow reactions**

C)fast reactions **D) none**

Answer:C

Solution:Ionic reactions (e.g., precipitation) are very fast.

5. Salt formation is a

A)slow reactions **B) moderate reactions**

C)fast reactions **D) none**

Answer:C

Solution:Salt formation (e.g., acid-base neutralization) is fast.

6. Unit of Rate of reaction

A) conc. time^{-1} **B) conc. time** **C) M^{-1} time^{-1}** **D) mol.dm.time^{-1}**

Answer:A

Solution:Rate = change in concentration per time $\rightarrow$ conc. time^{-1} (e.g., mol L^{-1} s^{-1})

7. Inversion of care sugar is a

A) fast reactions **B) slow reactions**

C) moderate reactions **D) none**

Answer:C

Solution:Inversion of a cane sugar occurs at a moderate rate.

8. 1Lit

A) 10^{3}ml **B) 10^{3}CC** **C) 10^{3}cm^3** **D)All**

Answer:D

Solution:1 L = 1000 mL = 1000 cc = 1000 cm^3

9. For a reaction $2A + B \rightarrow C$ rate of formation of C 0.5M sec^{-1} calculate rate of consumption of A

A)1 M sec^{-1} **B)0.5M sec^{1-}** **C)0.6Msec$^{\backslash 1}$** **D)0.1Msec^{-1}**

Answer:A

Solution:

$$-\frac{1}{2}\frac{d[A]}{dt}=-\frac{d[B]}{dt}=\frac{d[C]}{dt}$$

$$-\frac{1}{2}\frac{d[A]}{dt}=\frac{d[C]}{dt}$$

$$-\frac{d[A]}{dt}=2\frac{d[C]}{dt}$$

$$-\frac{d[A]}{dt}=2(0.5)=1\mathrm{M\,sec^{-1}}$$

10. For a reaction $A+B\rightarrow products$ **rate is**

A)K[A]^m [B]^n B)K[A]^m C)K[B]^n D)K

Answer:A

Solution:Rate=k[A][B]

JEE MAINS LEVEL

SINGLE CORRECT ANSWERSTYPE :

1. Which of the following reactions is faster?

A : 2NaCl + H_2SO_4 $\longrightarrow$ Na_2SO_4+ 2HCl

B : CH_4 + 2O_2 $\longrightarrow$ CO_2+ 2H_2O

1) Reaction A 2) Reaction B

3) Same in both the cases 4) None

Answer:1

Solution:Reaction A is faster.It proceeds rapidly under mild conditions, while Reaction B needs a significant energy input to start.

2. For a reaction $mA+nB\rightarrow PC$ **if** $-\frac{d[A]}{dt}=-\frac{d[B]}{dt}=1.5\frac{d[C]}{dt}$ **then m:A:P**

A) 2:1:1/2 B)2:2:1 C)3:3:2 D)1;2/3:1

Answer:C

Solution:

$$-\frac{1}{m}\frac{d[A]}{dt}=-\frac{1}{n}\frac{d[B]}{dt}=+\frac{1}{p}\frac{d[C]}{dt}$$

$$-\frac{1}{m}=-1\Rightarrow m=1$$

$$-\frac{1}{n}=-1\Rightarrow n=1$$

$$\frac{1}{p}=1.5\Rightarrow p=\frac{2}{3}$$

$$m:n:P=1:1:\frac{2}{3}=3:3:2$$

3. For a reaction $2O_3 \rightarrow 3O_2$ rate of consumption of ozone is $3\text{x}10^{-2}$ Mmin^{-1} calculate rate of formation of oxygen

A) $1.5\text{x}10^{-2}$M min^{-1} **B)$2.5\text{x}10^{-2}$M min^{-1}**

C)$4.5\text{x}10^{-2}$M min^{-1} **D)$2\text{x}10^{-2}$ M min^{-1}**

Answer:C

Solution:

$$-\frac{1}{2}\frac{d[O_3]}{dt}=\frac{1}{3}\frac{d[O_2]}{dt}$$

$$-\frac{3}{2}\frac{d[O_3]}{dt}=\frac{d[O_2]}{dt}$$

$$\frac{d[O_2]}{dt}=-\frac{3}{2}\times 3\text{x}10^{-2}=-4.5\text{x}10^{-2}$$

4. For a reaction $2NOBr \rightarrow 2NO + Br_2$ the formation of Br_2 is

A)$1.6\text{x}10^{-3}$M sec^{-1} **B) $0.8\text{x}10^{-3}$M sec^{-1}**

C)$4.8\text{x}10^{-3}$M sec^{-1} **D) $2\text{x}10^{-3}$ M sec^{-1}**

Answer:B

Solution: $\frac{dt[NO]}{dt} = 1.6\times10^{-3}$

$$-\frac{1}{2}\frac{dt[NOBr]}{dt}=+\frac{1}{2}\frac{dt[NO]}{dt}=+\frac{dt[Br_2]}{dt}$$

$$+\frac{1}{2}\frac{dt[NO]}{dt}=+\frac{dt[Br_2]}{dt}$$

$$+\frac{1}{2}1.6\times10^{-3}=+\frac{dt[Br_2]}{dt}$$

$$\frac{dt[Br_2]}{dt}=0.8\times10^{-3}Msec^{-1}$$

5. For a reaction $2SO_2+O_2\rightarrow2SO_3$ rate of So_2 6.4 x 10^{-3} kg min^{-1}. Calculate rate of formation of SO_3 in the same units

A) 6.4 x 10^{-3}kg min^{-1} **B) 3.2x10^{-3}kg min^{-1}**

C)8x10^{-3} kg min^{-1} **D) 1.6 x 10^{-3} kg min^{-1}**

Answer:A

Solution: $2SO_2+O_2\rightarrow2SO_3$

$$-\frac{1}{2}\frac{d[SO_2]}{dt}=-\frac{d[O_2]}{dt}=+\frac{1}{2}\frac{d[SO_3]}{dt}$$

$$-\frac{1}{2}\frac{d[SO_2]}{dt}=+\frac{1}{2}\frac{d[SO_3]}{dt}$$

$$-\frac{d[SO_2]}{dt}=+\frac{d[SO_3]}{dt}$$

$$\frac{d[SO_3]}{dt}=\ 6.4\ \text{x}\ 10^{-3}\ \text{kg min}^{-1}$$

6. For the reaction $N_2+3H_2\rightarrow2NH_3$ rate of consumption of H_2 is

A) $\frac{-d[N_2]}{dt}$ **B)** $-\frac{1}{3}\left[\frac{-d[H_2]}{dt}\right]$ **C)** $\frac{1}{3}\left[\frac{-d[N_2]}{dt}\right]$ **D)** $2\left[\frac{-d[NH_3]}{dt}\right]$

Answer:B

Solution: $N_2+3H_2\rightarrow2NH_3$

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

$$\frac{d[H_2]}{dt}=3\frac{d[N_2]}{dt}$$

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

7. Rate of reaction is a

A) decrease in conc. of reactants **B) increase in conc. of products**

C) change in coc in unit time **D) all**

Answer:D

Solution:The rate of reaction is defined as the change in concentration of reactants or products per unit time. It can be expressed as the decrease in concentration of reactants or the increase in concentration of products over time. Therefore, all options A, B, and C are correct descriptions.

8. 10^{-3} is a

A) deci **B) centi** **C) mili** **D) none**

Answer:C

Solution:The prefix 10^{-3} corresponds to "milli" (e.g., 1 millimeter = 10^{-3}meters).

Deci = 10^{-1}

Centi = 10^{-2}

Milli = 10^{-3}

9. Formation of $BaSO_4$ ppt is a

A) very fast reaction **B) slow reaction**

C) moderate reaction **D) very slow reaction**

Answer:A

Solution:The formation of barium sulfate ($BaSO_4$) precipitate is an ionic reaction that occurs almost instantaneously when solutions containing Ba^{2+} and SO_4^{2-} ions are mixed. It is considered a very fast reaction.

10. Instantaneous reactions are also called

A) very slow reactions **B) slow reactions**

C) Very fast reactions **D) Moderate reactions**

Answer:C

Solution:Instantaneous reactions are those that occur very rapidly, often in a fraction of a second (e.g., precipitation reactions or neutralization reactions). They are also referred to as very fast reactions.

More than one correct Answer Type :

11. For a reaction $H_2O_2 \rightarrow H_2O+\frac{1}{2}O_2$ then rate is

A) $\frac{dn}{dt}$ **B)** $\frac{-d[H_2O_2]}{dt}$ **C)** $\frac{d[H_2O]}{dt}$ **D)** $\frac{2d[O_2]}{dt}$

Answer:B,C,D

Solution: $H_2O_2 \rightarrow H_2O+\frac{1}{2}O_2$

Rate of reaction= $-\frac{d[H_2O_2]}{dt}=\frac{d[H_2O]}{dt}=+2\frac{d[O_2]}{dt}$

12. For a reaction $N_2 + 3H_2 \rightarrow 2NH_3$

A) rate of consumption of N_2 **B) 1/3 rate of consumption of H_2**

C)1/2 rate of formation of NH_3 **D) 1/2 rate of consumption of NH_3**

Answer:A,B,C

Solution: $N_2 + 3H_2 \rightarrow 2NH_3$

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

- indicates consumption

+ indicates formation

STATEMENT TYPE

A) Both **Statement** – I and **Statement** – II are true and **Statement** – II is the correct explanation of **Statement** – I

B) Both **Statement** – I and **Statement** – II are true and **Statement** – II is not the correct explanation of **Statement** – I

C) **Statement** – I is true but **Statement** – II is false

D) **Statement** – I is false but **Statement** – II is true

13. Statement I: Ionic reactions are very fast reactions

Statement II: there is a transfer of electrons takes place in ioic reactions

Answer:A

Solution:During the formation of ionic compounds, transfer of electrons takes place, thus it is a redox reaction.

Reaction involving ions are fast reactions.

14. Statement -I :Rusting of iron is a slow reaction

Statement -II : water formation is a very fast reaction.

Answer:C

Solution:Statement I is true: Rusting (oxidation of iron to form iron oxide) is a slow process that occurs over time due to environmental exposure.

Statement II is true: The formation of water very slow reaction.

COMPREHENSION TYPE

Comprehension - I

A chemical reaction is also called as chemical transformation. In any chemical reaction the starting materials (elements or compounds) are known as reactants. The materials obtained after the completion of a chemical change are known as products.

15. The starting materials of chemical reaction

A) reactants **B) products** **C)catalyst** **D)none**

Answer:A

Solution: In any chemical reaction the starting materials (elements or compounds) are known as reactants.

16. A chemical reaction is also called

A) chemical trasformation **B) chemical disproportion**

C) redox reaction **D)chemical displacement**

Answer:A

Solution:A chemical reaction is also called as chemical transformation.

COMPREHENSION - II

Rate of a reaction can be understood as, either a decrease in the concentration of reactants or increase in the concentration of products per unit time.

17. Rate with respect to reactant_____

A) $\frac{d[C]}{dt}$ **B)** $\frac{d[A]}{dt}$ **C)** $-\frac{d[A]}{dt}$ **D)** $-\frac{b[C]}{dt}$

Answer:C

Solution:The rate with respect to a reactant (e.g., A) is the rate at which it is consumed, which is $-\frac{d[A]}{dt}$

18. Rate with respect to product

A) $\frac{+d[C]}{dt}$ **B)** $\frac{d[A]}{dt}$ **C)** $-\frac{d[A]}{dt}$ **D)** $-\frac{b[C]}{dt}$

Answer:A

Solution:The rate with respect to a product (e.g., C) is the rate at which it is formed, which is $\frac{+d[C]}{dt}$.

INTEGER TYPE

19. $2A + B \rightarrow A_2B$ for this reaction , the consumption of A is _____

Answer:1/2

Solution: $2A + B \rightarrow A_2B$

$$-\frac{1}{2}\frac{d[A]}{dt} = -\frac{d[B]}{dt} = +\frac{d[A_2B]}{dt}$$

The consumption of A $= -\frac{1}{2}\frac{d[A]}{dt}$

MATCH THE FOLLOWING

20.

List - I	**List - II**
a) Very fast reaction	1) $Hcl_{(aq)} + NaOH_{(aq)} \rightarrow Nacl_{(aq)} + H_2O_{(1)}$
b) Slow reaction	2) $2H_{2_{(g)}} + O_{2_{(g)}} \rightarrow 2H_2O_{(1)}$
c) Moderate reaction	3) $C_2H_5OH_{(1)}\ CH_3COOH_{(1)} \rightarrow CH_3COOC_2H_{5(1)} + H_2O_{(1)}$
d) Precipitation reaction	4) $Nacl_{(aq)} + AgNo_{3(aq)} \rightarrow Agcl\downarrow + NaNo_{3(aq)}$
	5) $H_2SO_4 + 2NaOH \rightarrow Na_2SO_4 + 2H_2O$

Answer:A-1,5,B-2,C-3,D-4

Solution:

a) Very fast reaction — 1) $Hcl_{(aq)} + NaOH_{(aq)} \rightarrow Nacl_{(aq)} + H_2O_{(1)}$,
5) $H_2SO_4 + 2NaOH \rightarrow Na_2SO_4 + 2H_2O$

b) Slow reaction — 2) $2H_{2_{(g)}} + O_{2_{(g)}} \rightarrow 2H_2O_{(1)}$

c) Moderate reaction — 3) $C_2H_5OH_{(1)}\ CH_3COOH_{(1)} \rightarrow CH_3COOC_2H_{5(1)} + H_2O_{(1)}$

d) Precipitation reaction — 4) $Nacl_{(aq)} + AgNo_{3(aq)} \rightarrow Agcl\downarrow + NaNo_{3(aq)}$

KEY

				Teaching Task					
1	2	3	4	5	6	7	8	9	10
C	B	A	B	C	A	C	C	D	A
11	12	13	14	15	16	17	18	19	
A,B,C,D	A,B,D	A	A	D	A	1	0.5	A-q,B-p,C-r,D-s	
				LEARNER'S TASK					
			Conceptual Under Standing Question (CUQ;s)						
1	2	3	4	5	6	7	8	9	10
C	A	A	C	C	A	C	D	A	A
			JEE MAINS&ADVANCED LEVEL						
1	2	3	4	5	6	7	8	9	10
1	C	C	B	A	B	D	C	A	C
11	12	13	14	15	16	17	18	19	
B,C,D	A,B,C	A	C	A	A	C	A	0-Jan	
20									
A-1,5,B-2,C-3,D-4									