

**PHYSICAL / INORGANIC
CHEMISTRY
DPP**
DAILY PRACTICE PROBLEMS

DPP No. 47

**Total Marks : 30
Max. Time : 30 min.**

Topic : Chemical Kinetics

Type of Questions

Single choice Objective ('-1' negative marking) Q.1 to Q.10

(3 marks 3 min.)

M.M., Min.

[30, 30]

- $2\text{NO} + 2\text{H}_2 \longrightarrow \text{N}_2 + 2\text{H}_2\text{O}$. The experimental rate law for above reaction is, Rate = $k[\text{NO}]^2[\text{H}_2]$. When time is in minutes and the concentration is in moles/L, the units for k are

(A) $\frac{\text{moles}^3}{\text{L}^3 - \text{min}}$ (B) $\frac{\text{moles}}{\text{L} - \text{min}}$ (C) $\frac{\text{moles}^2}{\text{L}^2 - \text{min}}$ (D) $\frac{\text{L}^2}{\text{moles}^2 - \text{min}}$
- The differential rate law equation for the elementary reaction $\text{A} + 2\text{B} \xrightarrow{k} 3\text{C}$, is :

(A) $-\frac{d[\text{A}]}{dt} = -\frac{d[\text{B}]}{dt} = \frac{d[\text{C}]}{dt} = k[\text{A}][\text{B}]^2$ (B) $-\frac{d[\text{A}]}{dt} = -\frac{1}{2}\frac{d[\text{B}]}{dt} = \frac{1}{3}\frac{d[\text{C}]}{dt} = k[\text{A}]^2[\text{B}]$

(C) $-\frac{d[\text{A}]}{dt} = -\frac{1}{2}\frac{d[\text{B}]}{dt} = \frac{1}{3}\frac{d[\text{C}]}{dt} = k[\text{A}][\text{B}]^2$ (D) None of these
- For the reaction $2\text{A} \longrightarrow \text{B} + 3\text{C}$; if $-\frac{d[\text{A}]}{dt} = k_1[\text{A}]^2$; $\frac{d[\text{B}]}{dt} = k_2[\text{A}]^2$; $\frac{d[\text{C}]}{dt} = k_3[\text{A}]^2$, the correct relation between k_1 , k_2 , and k_3 is :

(A) $k_1 = k_2 = k_3$ (B) $2k_1 = k_2 = 3k_3$ (C) $4k_1 = k_2 = 3k_3$ (D) $\frac{k_1}{2} = k_2 = \frac{k_3}{3}$
- Which of the following statement is incorrect?

(A) Unit of rate of disappearance is Ms^{-1} (B) Unit of rate of reaction is Ms^{-1}

(C) Unit of rate constant k is depend on order (D) Unit of k for first order reaction is Ms^{-1}
- The rate expression for reaction $\text{A}(\text{g}) + \text{B}(\text{g}) \rightarrow \text{C}(\text{g})$ is **rate = $k[\text{A}]^{1/2}[\text{B}]^2$** . What change in rate if initial concentration of A and B increase by factor 4 and 2 respectively ?

(A) 4 (B) 6 (C) 8 (D) None of these
- Reaction $\text{A} \rightarrow \text{B}$ follows second order kinetics. Doubling the concentration of A will increase the rate of formation of B by a factor of :

(A) 1/4 (B) 1/2 (C) 2 (D) 4
- For the reaction $2\text{NO}_2 \longrightarrow \text{N}_2\text{O}_2 + \text{O}_2$, rate expression is as follows

$-\frac{d[\text{NO}_2]}{dt} = K[\text{NO}_2]^n$, where $K = 3 \times 10^{-3} \text{ mol}^{-1} \text{ L sec}^{-1}$. If the rate of formation of oxygen is $1.5 \times 10^{-4} \text{ mol L}^{-1} \text{ sec}^{-1}$, then the molar concentration of NO_2 in mole L^{-1} is

(A) 1.5×10^{-4} (B) 0.0151 (C) 0.214 (D) 0.316
- Sodium ($\text{Na} = 23$) crystallizes in bcc arrangement with the interfacial separation between the atoms at the edge 53.6 pm. The density of sodium crystal is:

(A) 2.07 g/cc (B) 2.46 g/cc (C) 1.19 g/cc (D) none of these
- $\text{TlAl}(\text{SO}_4)_2 \cdot x\text{H}_2\text{O}$ is bcc with 'a' = 1.22 nm. If the density of the solid is 2.32 g/cc, then the value of x is (Given: $N_A = 6 \times 10^{23}$; at. wt. : Tl = 204, Al = 27, S = 32).

(A) 2 (B) 4 (C) 47 (D) 70
- An atomic solid crystallizes in a body centre cubic lattice and the inner surface of the atoms at the adjacent corner are separated by 60.3 pm. If the atomic weight of A is 48, then density of the solid, is nearly:

(A) 2.7 g/cc (B) 5.07 g/cc (C) 3.5 g/cc (D) 1.75 g/cc

Topic : Chemical Kinetics

Type of Questions

Single choice Objective ('-1' negative marking) Q.1 to Q.9

(3 marks 3 min.)

M.M., Min.

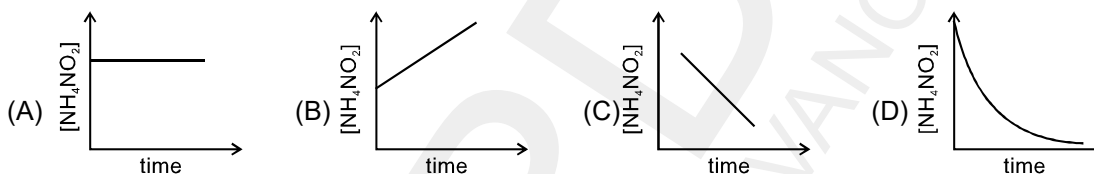
[27, 27]

Multiple choice objective ('-1' negative marking) Q.10 to Q.11

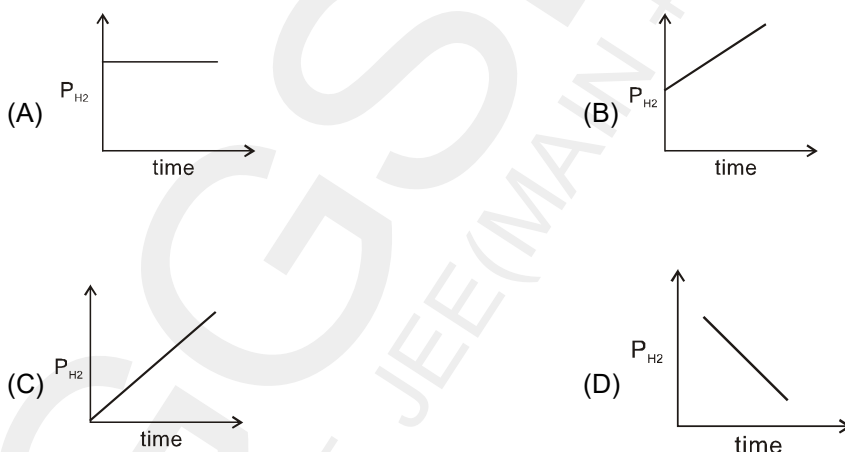
(4 marks 4 min.)

[8, 8]

1. Decomposition of $\text{NH}_4\text{NO}_2(\text{aq})$ into $\text{N}_2(\text{g})$ and $2\text{H}_2\text{O}(\ell)$ is first order reaction. Which of the following graph is correct?



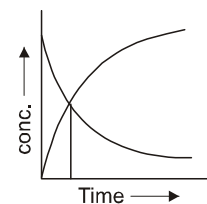
2. Decomposition of $\text{HI}(\text{g})$ on Gold surface is zero order reaction. Initially, few moles of H_2 are present in container then which of the following graph is correct ?



3. A first order reaction is 75% completed in 100 minutes. How long time will it take for its 87.5% completion?
 (A) 125 min (B) 150 min (C) 175 min (D) 200 min

4. For the zero order reaction $\text{A} \rightarrow \text{B} + \text{C}$; initial concentration of A is 0.1 M. If $\text{A} = 0.08 \text{ M}$ after 10 minutes, then its half-life and completion time are respectively :
 (A) 10 min; 20 min (B) $2 \times 10^{-3} \text{ min}$, 10^{-3} min
 (C) 25 min, 50 min (D) 250 min, 500 min.

5. The accompanying figure depicts the change in concentration of species A and B for the reaction $\text{A} \longrightarrow \text{B}$, as a function of time, the point of intersection of the two curves represents
 (A) $t_{1/2}$ (B) $t_{3/4}$
 (C) $t_{2/3}$ (D) data insufficient to predict



6. For the reaction $A \longrightarrow$ products, the graph of the fraction of A remaining as a function of time (x-axis) is a straight line with -ve slope. The order of the reaction is therefore
 (A) 1 (B) 2 (C) zero (D) -1

7. In the following reaction $A \rightarrow B + C$, rate constant is 0.001 Ms^{-1} . If we start with 1 M of A then, conc. of A and B after 10 minutes are respectively :
 (A) 0.5 M, 0.5 M (B) 0.6 M, 0.4 M (C) 0.4 M, 0.6 M (D) none of these

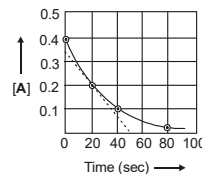
8. The rate law for the dimerisation of NO_2 into N_2O_4 is $-\frac{d[\text{NO}_2]}{dt} = k[\text{NO}_2]^2$.

Which of the following changes will change the value of the specific rate constant k ?

- (A) Doubling the total pressure (B) Decreasing the pressure
 (C) Changing the volume of the flask (D) Changing the temperature.
9. For an elementary reaction $aA \longrightarrow$ product, the graph plotted between $\log \left[\frac{-d[A]}{dt} \right]$ vs. time gives a straight line with intercept equal to 0.6 and showing an angle of 45° with origin, then :
 (A) rate constant = 3.98 time^{-1} and $a = 1$ (B) rate constant = $3.98 \text{ mol L}^{-1} \text{ t}^{-1}$ and $a = 1$
 (C) rate constant = 1.99 time^{-1} and $a = 1$ (D) rate constant = $1.99 \text{ mol}^{-1} \text{ L}^1 \text{ t}^{-1}$ and $a = 2$

10. A certain reaction $A \rightarrow B$ follows the given concentration (Molarity)-time graph. Which of the following statement(s) is/are true ?

- (A) The reaction is second order with respect to A
 (B) The rate for this reaction at 20 second will be $7 \times 10^{-3} \text{ M s}^{-1}$
 (C) The rate for this reaction at 80 second will be $1.75 \times 10^{-3} \text{ M s}^{-1}$
 (D) The [B] will be 0.35 M at $t = 60$ second



11. For the reaction $2A + B \longrightarrow C$ with the rate law $\frac{d[C]}{dt} = k[A]^1[B]^{-1}$ and started with A and B in stoichiometric proportion. Which is/are true?

- (A) unit of k is Ms^{-1} (B) [A], [B] and [C] all will be linear functions of time
 (C) $[C] = 2kt$ (D) $[C] = kt$

**PHYSICAL / INORGANIC
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 DAILY PRACTICE PROBLEMS

DPP No. 49

**Total Marks : 35
 Max. Time : 37 min.**

Topic : Chemical Kinetics

Type of Questions

M.M., Min.

Single choice Objective ('-1' negative marking) Q.1 to Q.9	(3 marks 3 min.)	[27, 27]
Match the Following (no negative marking) Q. 10	(8 marks 10 min.)	[8, 10]

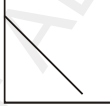
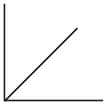


- A reaction, which is second order, has a rate constant of $0.002 \text{ L mol}^{-1} \text{ s}^{-1}$. If the initial conc. of the reactant is 0.2 M. how long will it take for the concentration to become 0.0400 M ?
 (A) 1000 s (B) 400 s (C) 200 s (D) 10,000 s
- The decomposition NH_3 gas on a heated tungsten surface gave the following results :

Initial pressure (mm)	65	105	y	185
Half-life (sec)	290	x	670	820

 Calculate approximately the values of x and y.
 (A) x = 410 sec (B) x = 467 sec (C) x = 490 sec (D) x = 430 sec
- A certain reaction obeys the three-half power law for its order. What function of the concentration may be plotted on the Y-axis against, t on the X-axis to get a linear plot ?
 (A) $C^{\frac{1}{2}}$ vs t (B) $\frac{1}{C}$ vs t (C) C^{-2} vs t (D) $C^{-\frac{1}{2}}$ vs t
- For the reaction $\text{A} \longrightarrow \text{C} + \text{D}$, the initial concentration of A is 0.01 M. After 100 sec, the concentration of A is 0.001M. The rate constant of the reaction has the numerical value of 9.0. What is the unit of the reaction rate constant ?
 (A) $\text{M}^{-1}\text{s}^{-1}$ (B) Ms^{-1} (C) s^{-1} (D) $\text{M}^{-1.5} \text{ s}^{-1}$
- The half lives of decomposition of gaseous CH_3CHO at constant temperature but at initial pressure of 364 mm and 170 mm Hg were 410 second and 880 second respectively. Hence order of reaction is
 (A) 2 (B) 3 (C) 1.5 (D) 1
- If the fermentation of sugar in an enzymatic solution, that is 0.12 M, the concentration of the sugar is reduced to 0.06 M in 10 h and to 0.03 M in 20 h. What is the order of the reaction ?
 (A) 1 (B) 2 (C) 3 (D) 0

7. The order of a reaction $A \rightarrow \text{product}$ in which half the reagent is reacted is half an hour, three quarters in one hour and seven - eighth in one and half hours is
 (A) 2 (B) 1 (C) zero (D) - 1
8. In a first order reaction, the concentrations of the reactant, 30 minutes and 40 minutes after the start are C_1 and C_2 (in moles/litre) respectively. What was C_0 , initial concentration ?
 (A) $C_0 = \left[\frac{C_1^3}{C_2^4} \right]$ (B) $C_0 = \left[\frac{C_1}{C_2} \right]^4$ (C) $C_0 = \left[\frac{C_1}{C_2} \right]^3$ (D) $C_0 = \left[\frac{C_1^4}{C_2^3} \right]$
9. Rate constant $k = 2.303 \text{ min}^{-1}$ for a particular reaction. The initial concentration of the reaction is 1 mol/litre then, rate of reaction after 1 minute is :
 (A) 2.303 M min^{-1} (B) $0.2303 \text{ M min}^{-1}$ (C) 0.1 M min^{-1} (D) none of these

10. Match the following for a 1st order reaction $A \rightarrow \text{products}$ with time on the x axis.

Column I	Column II
(A) $[A]$ v/s time	(p) 
(B) $\frac{-d[A]}{dt}$ v/s $[A]$	(q) 
(C) $\frac{-d[A]}{dt}$ v/s time	(r) 
(D) $\log [A]$ v/s time	(s) 

**PHYSICAL / INORGANIC
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 DAILY PRACTICE PROBLEMS

DPP No. 50

**Total Marks : 47
 Max. Time : 52 min.**

Topic : Chemical Kinetics

Type of Questions

Single choice Objective ('-1' negative marking) Q.1 to Q.9

(3 marks 3 min.)

M.M., Min.

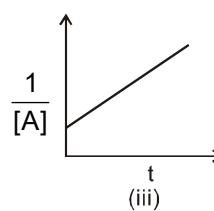
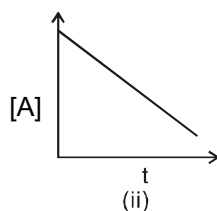
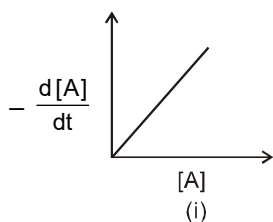
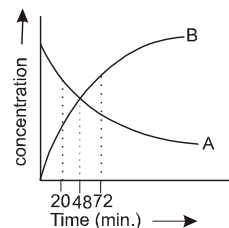
[27, 27]

Subjective Questions ('-1' negative marking) Q.10 to Q.14

(4 marks 5 min.)

[20, 25]

- For a 1st order reaction (gaseous) (cont. V, T)
 $aA \longrightarrow (b-1)B + 1C$ (with $b > a$), the pressure of the system rose by $50\left(\frac{b}{a}-1\right)\%$ in a time of 10 min. The half life of the reaction is therefore.
 (A) 10 min (B) 20 min (C) 30 min (D) 40 min
- Two first order reaction have half-lives in the ratio 8 : 1. Calculate the ratio of time intervals $t_1 : t_2$. The time t_1 and t_2 are the time period for $\left(\frac{1}{4}\right)^{\text{th}}$ completion of 1st reaction and $\left(\frac{3}{4}\right)^{\text{th}}$ 2nd completion rxn respectively.
 (A) 1 : 0.301 (B) 0.125 : 0.602 (C) 1 : 0.62 (D) none of these
- Under the same reaction conditions, initial concentration of $1.386 \text{ mol dm}^{-3}$ of a substance becomes half in 40 seconds and 20 seconds through first order and zero order kinetics, respectively. Ratio $\left(\frac{k_1}{k_0}\right)$ of the rate constant for first order (k_1) and zero order (k_0) of the reaction is.
 (A) $0.5 \text{ mol}^{-1} \text{ dm}^3$ (B) 1.0 mol dm^{-3} (C) 1.5 mol dm^{-3} (D) $2.0 \text{ mol}^{-1} \text{ dm}^3$
- For a first order reaction, the ratio of time for the completion of 99.9% and half of the reaction is
 (A) 8 (B) 10 (C) 9 (D) 12
- For a first order reaction, $nA \longrightarrow B$ whose concentration vs time curve is as shown in the figure. If half life for the reaction is 24 minutes . Find out the value of n.
 (A) 1
 (B) 2
 (C) 3
 (D) 4
- Number of natural life times (T_{av}) required for a first-order reaction to achieve 99.9% level of completion is:
 (A) 2.3 (B) 6.9 (C) 9.2 (D) 0.105
- Consider the plots for the types of reaction $nA \rightarrow B + C$



These plots respectively correspond to the reaction orders :

- (A) 0, 2, 1 (B) 0, 1, 2 (C) 1, 1, 2 (D) 1, 0, 2

8. Reaction $A + B \rightarrow C + D$ follows rate law, $r = k[A]^{1/2}[B]^{1/2}$ starting with 1 M of A and B each. What is the time taken for concentration of A become 0.1 M ?
 Given $k = 2.303 \times 10^{-2} \text{ sec}^{-1}$.
 (A) 10 sec (B) 100 sec (C) 1000 sec (D) 434 sec

9. At high temperature (504°C) dimethyl ether decomposes as per the reaction

	$(\text{CH}_3)_2\text{O}(\text{g})$	\longrightarrow	$\text{CH}_4(\text{g}) + \text{H}_2(\text{g}) + \text{CO}(\text{g})$	
time (sec.) :	0		400 1200 ∞	
p_{total} (mm) :	312		412 560 935	

Determine the half life of the reaction during this run. $(\ln \frac{623}{523}) = 0.175$, $(\ln \frac{623}{375}) = 0.5076$

- (A) 1311 sec (B) 1411 sec (C) 1511 sec (D) 1611 sec
10. A reaction between A and B is represented stoichiometrically by $A + B \rightarrow C$. Observations on the rate of this reaction are obtained in three separate experiments as follows :

	initial concentrations		duration of experiment Δt , hr	final concentration
	$[\text{A}]_0$, M	$[\text{B}]_0$, M		$[\text{A}]_t$, M
(1)	0.1000	1.0	0.5	0.0975
(2)	0.1000	2.0	0.5	0.0900
(3)	0.0500	1.0	2.0	0.0450

What is the order of the reaction with respect to each reactant and what is the value of the rate constant?

11. The gas phase decomposition of NOBr is second-order in $[\text{NOBr}]$, with $k = 0.810 \text{ M}^{-1} \text{ s}^{-1}$ at 10°C. We start with $4.00 \times 10^{-3} \text{ M}$ NOBr. in a flask at 10°C. How many seconds does it take to use up $1.50 \times 10^{-3} \text{ M}$ NOBr?



12. Let there be as first-order reaction of the type, $A \longrightarrow B + C$. Let us assume that all the three species are gases. We are required to calculate the value of rate constant based on the following data.

Time	0	T	∞
Partial pressure of A	P_0	P_t	—

13. Let there be a first order reaction, $A \longrightarrow B + C$. Let us assume all three are gases. We are required to calculate the value of rate constant based on the following data

Time	0	t	∞
Total pressure	P_0	P_t	—

Calculate the expression of rate constant.

14. $A(\text{g}) \longrightarrow B(\text{g}) + C(\text{g})$

Time	0	t	∞
Total pressure of B + C	0	P_t	P_∞

Calculate the expression of rate constant.

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DPP No. 51

Total Marks : 47
Max. Time : 54 min.

Topic : Chemical Kinetics

Type of Questions

Type of Questions	M.M., Min.
Single choice Objective ('-1' negative marking) Q.1 to Q.5	(3 marks 3 min.) [15, 15]
Multiple choice objective ('-1' negative marking) Q.6	(4 marks 4 min.) [4, 4]
Subjective Questions ('-1' negative marking) Q.7 to Q.13	(4 marks 5 min.) [28, 35]

- The decomposition of N_2O_5 in chloroform was followed by measuring the volume of O_2 gas evolved : $2N_2O_5 (CCl_4) \rightarrow 2N_2O_4 (CCl_4) + O_2 (g)$. The maximum volume of O_2 gas obtained was 100 cm^3 . In 500 minutes, 90 cm^3 of O_2 were evolved. The first order rate constant (in min^{-1}) for the disappearance of N_2O_5 is :
 (A) $\frac{2.303}{500}$ (B) $\frac{2.303}{500} \log \frac{100}{90}$ (C) $\frac{2.303}{500} \log \frac{90}{100}$ (D) $\frac{100}{10 \times 500}$
- The reaction $A(g) + 2B(g) \rightarrow C(g)$ is an elementary reaction. In an experiment involving this reaction, the initial partial pressures of A and B are $P_A = 0.40 \text{ atm}$ and $P_B = 1.0 \text{ atm}$ respectively. When pressure of C becomes 0.3 atm in the reaction the rate of the reaction relative to the initial rate is :
 (A) $\frac{1}{12}$ (B) $\frac{1}{50}$ (C) $\frac{1}{25}$ (D) none of these
- A reaction is catalysed by H^+ ion; and in the rate law the dependence of rate is of first order with respect to the concentration of H^+ ions, in presence of HA rate constant is $2 \times 10^{-3} \text{ min}^{-1}$ and in presence of HB rate constant is $1 \times 10^{-3} \text{ min}^{-1}$. HA and HB (both strong acids) have relative strength as :
 (A) 0.5 (B) 0.002 (C) 0.001 (D) 2
- The gaseous decomposition reaction, $A(g) \longrightarrow 2B(g) + C(g)$ is observed to first order over the excess of liquid water at 25°C . It is found that after 10 minutes the total pressure of system is 188 torr and after very long time it is 388 torr. The rate constant of the reaction (in hr^{-1}) is : [Given : vapour pressure of H_2O at 25° is 28 torr ($\ln 2 = 0.7$, $\ln 3 = 1.1$, $\ln 10 = 2.3$)]
 (A) 0.02 (B) 1.2 (C) 0.2 (D) none of these.
- The hydrolysis of cane sugar was studied using an optical polarimeter and the following readings were taken:

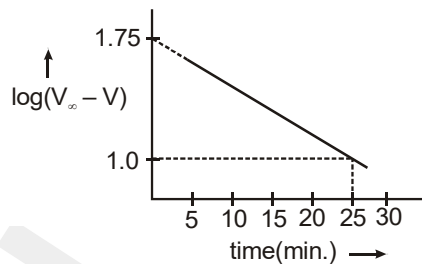
time (min.) :	0	84 min	∞
observed rotation (degrees) :	50	20	-10

 When was the mixture optically inactive? ($\log 2 = 0.3$, $\log 3 = 0.48$)
 (A) 118 min (B) 218 min (C) 318 min (D) 418 min
- For a certain reaction $A \longrightarrow$ products, the $t_{1/2}$ as a function of $[A]_0$ is given as below :

$[A]_0$ (M) :	0.1	0.025
$t_{1/2}$ (min.) :	100	50

 Which of the following is/are true ?
 (A) The order is $\frac{1}{2}$ (B) $t_{1/2}$ would be $100\sqrt{10}$ min for $[A]_0 = 1 \text{ M}$
 (C) The order is 1 (D) $t_{1/2}$ would be 100 min for $[A]_0 = 1 \text{ M}$

7. The plot of $\log(V_\infty - V)$ versus t (where V is the volume of nitrogen collected under constant temperature and pressure conditions) for the decomposition of $C_6H_5N_2Cl$ is given at $50^\circ C$ with an amount of $C_6H_5N_2Cl$ equivalent to 58.3 cc N_2 .



Calculate the rate constant for the reaction in hr^{-1} expressing your answer in a single significant digit.

8. Now, let us assume a first-order reaction, $A \longrightarrow B + C$, such that A, B and C, such that A, B and C are in solution. At time zero, a small amount of the solution is taken, cooled (to stop the reaction from proceeding) and titrated with a suitable reagent. Let us assume that the reagent reacts only with A and not with B and C. The same process is repeated at time t .

Time	0	t
Volume of reagent	V_0	V_t

Calculate the expression of rate constant.

9. $A(\text{soln.}) \longrightarrow B(\text{soln.}) + C(\text{soln.})$
 Reagent reacts with all species A, B and C.

Time	0	t	∞
Volume of reagent	V_0	V_t	V_∞

The n factor of A, B and C with the reagent and that of the reagent with A, B and C are not known. Calculate the expression of rate constant.

10. $A(\text{soln.}) \xrightarrow{D(\text{soln.})} B(\text{soln.}) + C(\text{soln.})$
 D is catalyst present in the solution whose n -factor is not known. Catalyst have a constant concentration throughout the reaction.

Time	0	t	∞
Volume of reagent	V_0	V_t	V_∞

Calculate the expression of rate constant.

11. Now, let us assume that A, B and C are optically active compounds, which rotate the plane polarized light in the clockwise or anticlockwise direction.
 $A(\text{soln.}) \longrightarrow B(\text{soln.}) + C(\text{soln.})$

Time	0	t	∞
Total rotation in degrees	r_0	r_t	r_∞

Calculate the expression of rate constant.

12. For the reaction, $2NO + H_2 \longrightarrow N_2O + H_2O$ the value of $-dp/dt$ was found to be 1.50 Torr s^{-1} for a pressure of 359 Torr of NO and 0.25 Torr s^{-1} for a pressure of 152 Torr, the pressure of H_2 being constant. On the other hand, when the pressure of NO was kept constant, $-dp/dt$ was 1.60 Torr s^{-1} for a hydrogen pressure of 289 Torr and 0.79 Torr s^{-1} for a pressure of 147 Torr. Determine the order of the reaction.

13. Decomposition of N_2O_5 follows first-order kinetics, $2N_2O_5(g) \longrightarrow 4NO_2(g) + O_2(g)$. If pressure of the system at time, t and ∞ are P_t and P_∞ respectively, find the expression of rate constant (k).

**PHYSICAL / INORGANIC
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 DAILY PRACTICE PROBLEMS

DPP No. 52

**Total Marks : 31
 Max. Time : 32 min.**

Topic : Chemical Kinetics

Type of Questions

Single choice Objective ('-1' negative marking) Q.1 to Q.9

(3 marks 3 min.)

M.M., Min.

[27, 27]

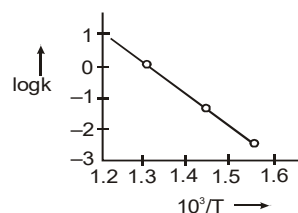
Subjective Questions ('-1' negative marking) Q.5 to Q.10

(4 marks 5 min.)

[4, 5]

- For a certain reaction the variation of the rate constant with temperature is given by the equation

$$\ln k_t = \ln k_0 + 0.0693 t \quad (t \geq 0^\circ\text{C})$$
 The value of the temperature coefficient of the reaction rate is, therefore
 (A) 0.1 (B) 1.0 (C) 10 (D) 2
- The activation energies of two reactions are E_a and E_a' with $E_a > E_a'$. If temperature of the reacting systems is increased from T_1 to T_2 , predict which of the following alternatives is correct?
 (Where k_1' and k_2' are rate constant at higher temperature).
 (A) $\frac{k_1'}{k_1} = \frac{k_2'}{k_2}$ (B) $\frac{k_1'}{k_1} > \frac{k_2'}{k_2}$ (C) $\frac{k_1'}{k_1} < \frac{k_2'}{k_2}$ (D) $\frac{k_1'}{k_1} < 2 \frac{k_2'}{k_2}$
- Two reactions $A \longrightarrow \text{products}$ and $B \longrightarrow \text{products}$ have rate constants k_A and k_B at temperature, T and activation energies E_A and E_B respectively. If $k_A > k_B$ and $E_A < E_B$ and assuming that 'A', pre-exponential factor for both the reactions is same, then.
 (A) at higher temperatures k_B will be greater than k_A
 (B) at lower temperatures k_A and k_B will be close to each other in magnitude
 (C) as temperature rises k_A and k_B will be close to each other in magnitude.
 (D) at lower temperature $k_B > k_A$
- On introduction a catalyst at 500 K, the rate of a first order reaction increases by 1.718 times. If the activation energy in the presence of a catalyst is 4.15 kJ mol⁻¹. Then, the E_a in absence of catalyst is ($R = 8.3 \text{ MKS}$)
 (A) 4.15 kJ (B) 2.08 kJ (C) 2.718 kJ (D) 8.3 kJ.
- What percentage fraction of the molecule will cross over the energy barrier at 1000 K temperature for 18.424 KJ activation energy ($R = 8 \text{ J mol}^{-1} \text{ K}^{-1}$)
 (A) 10% (B) 20% (C) 90% (D) 80%
- For the decomposition of HI the following logarithmic plot is shown : [$R = 1.98 \text{ cal/mol-K}$]
 The activation energy of the reaction is about
 (A) 45600 cal (B) 13500 cal
 (C) 24600 cal (D) 32300 cal



7. Decomposition of A follows first order kinetics by the following equation. $4A(g) \longrightarrow B(g) + 2C(g)$
 If initially, total pressure was 800 mm of Hg and after 10 minutes it is found to be 650 mm of Hg. What is half-life of A ? (Assume only A is present initially)
- (A) 10 mins (B) 5 mins (C) 7.5 mins (D) 15 mins
8. In a hypothetical reaction, $A(aq) \rightleftharpoons 2B(aq) + C(aq)$ (1st order decomposition)
 'A' is optically active (dextro-rotatory) while 'B' and 'C' are optically inactive but 'B' takes part in a titration reaction (fast reaction) with H_2O_2 . Hence, the progress of reaction can be monitored by measuring rotation of plane polarised light or by measuring volume of H_2O_2 consumed in titration.
 In an experiment the optical rotation was found to be $\theta = 40^\circ$ at $t = 20$ min and $\theta = 10^\circ$ at $t = 50$ min. from start of the reaction. If the progress would have been monitored by titration method, volume of H_2O_2 consumed at $t = 15$ min. (from start) is 40 ml then volume of H_2O_2 consumed at $t = 60$ min will be:
- (A) 60 ml (B) 75 ml (C) 52.5 ml (D) 90 ml
9. **S₁** : The frequency factor has the same unit as the rate constant, k
S₂ : A plot \ln rate vs \ln C for the nth order reaction gives a straight line with slope $-n$ and intercept k_n
S₃ : The order of a reaction $A \rightarrow$ product in which half the reagent is reacted in half an hour, three quarters in one hour and seven - eighth in one and half hours must be 1 (unity).
S₄ : The unit of rate constant for a second order reaction will be $M^{-1}s^{-1}$. (M is representing the molarity of solution)
- (A) T F T T (B) T T T T (C) F F T T (D) T F F T
10. The activation energy of $H_2 + I_2 \rightarrow 2HI$, in equilibrium, for forward reaction is 167 kJ mol^{-1} where as for the reverse reaction is 180 kJ mol^{-1} . The presence of catalyst lowers the activation energy by 80 kJ mol^{-1} . Assuming that the reactions are made at 27°C and the frequency factor for forward and backward reactions are 4×10^{-4} and 2×10^{-3} respectively. Calculate K_c .
- Given :** $e^{13/8.314 \times 0.3} = 183$.

Topic : Chemical Kinetics

Type of Questions

		M.M., Min.
Single choice Objective ('-1' negative marking) Q.1 to Q.4	(3 marks 3 min.)	[12, 12]
Multiple choice objective ('-1' negative marking) Q.5 to Q.6	(4 marks 4 min.)	[8, 8]
Subjective Questions ('-1' negative marking) Q.7 to Q.10	(4 marks 5 min.)	[16, 20]

1. For a two step reaction



(where, R is a reactive intermediate, whose concentration is maintained at some low steady state throughout the reaction) the rate law expression will be

(A) $\frac{dx}{dt} = \frac{k_1[A]}{1 + \frac{k_2[B]}{k_3[C]}}$ (B) $\frac{dx}{dt} = k_1[A]$ (C) $\frac{dx}{dt} = k_1[R][C]$ (D) $\frac{dx}{dt} = k_1[A][B][R]$

2. For $2A \xrightleftharpoons[k_{-1}]{k_1} B + 3C$, $2C \xrightarrow{k_2} 3D$, assuming all reactions to be single step (Elementary) reactions,

which of the following is **correct**:

(A) $d[C] / dt = 3k_1[A]^2 - 3k_{-1}[B][C]^3 - 2k_2[C]^2$ (B) $d[B] / dt = k_1[A]^2$
 (C) $d[A] / dt = 2k_{-1}[B][C]^3 - 2k_1[B][C]^3$ (D) None

3. For the following parallel chain reaction $A \begin{cases} \rightarrow B \\ \rightarrow C \end{cases}$ the overall half life of A is 12 hours. If rate of formation

of C is 60% of a rate of decomposition of A then what will be half life of A while it is converting into B ?
 (A) 40 hours (B) 60 hours (C) 50 hours (D) 30 hours

4. For the following parallel chain reaction $A \begin{cases} \xrightarrow{k_1 = 2 \times 10^{-4} \text{ s}^{-1}} 2B \\ \xrightarrow{k_2 = 3 \times 10^{-4} \text{ s}^{-1}} 3C \end{cases}$ if the sum of the concentration of B and C at

any time is 2M then, what will be $[B]_t$ and $[C]_t$ respectively?

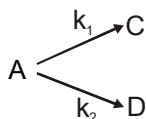
(A) $\frac{11}{12}M, \frac{13}{12}M$ (B) $\frac{3}{4}M, \frac{5}{4}M$ (C) $\frac{4}{5}M, \frac{6}{5}M$ (D) $\frac{8}{13}M, \frac{18}{13}M$

5. For the reaction $\text{CH}_4 + \text{Br}_2 \rightarrow \text{CH}_3\text{Br} + \text{HBr}$, the experimental data require the following rate equation:

$$\frac{d}{dt} [\text{CH}_3\text{Br}] = \frac{k_1[\text{CH}_4][\text{Br}_2]}{1 + k_2[\text{HBr}]/[\text{Br}_2]}$$

Which of the following is/are true regarding this ?

- (A) The reaction is a single step reaction
 (B) The reaction is 2nd order in the initial stages $\{[\text{HBr}] \approx 0\}$
 (C) The reaction is 2nd order in the final stages $\{[\text{Br}_2] \approx 0\}$
 (D) The molecularity of the reaction is two.
6. Consider the following case of COMPETING 1ST ORDER REACTIONS

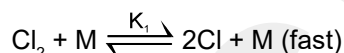


After the start of the reaction at $t = 0$ with only A, the $[\text{C}]$ is equal to the $[\text{D}]$ at all times. The time in which all three concentrations will be equal is given by

7. For the reaction $\text{Cl}_2 + \text{CO} \rightarrow \text{Cl}_2\text{CO}$ the rate law is :

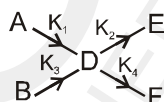
$$\frac{d[\text{Cl}_2\text{CO}]}{dt} = k [\text{Cl}_2]^{3/2} [\text{CO}]$$

The mechanism which is accepted is



Find the expression relating k with the other constants given.

8. Write $\frac{dC_D}{dt}$ for the following parallel series 1st order reaction



9. For the reaction process $\text{A} + \text{B} \longrightarrow \text{products}$, the rate is first order w.r.t. A and second order w.r.t. B. If 1 mole each of A and B were introduced into a 1 L vessel and the initial rate was 1×10^{-2} (mol/L sec). Calculate the rate when half the reactants has been converted into products.
10. The catalysed decomposition of N_2O by gold at 900°C and at an initial pressure of 200 mm, is 50% complete in 53 minutes and 73% complete in 100 minutes.
 (A) What is the order of the reaction ?
 (B) How much of it will decompose in 100 minutes at the same temperature but at initial pressure of 600 mm of Hg?

**PHYSICAL / INORGANIC
 CHEMISTRY
 DPP**
DAILY PRACTICE PROBLEMS

DPP No. 54

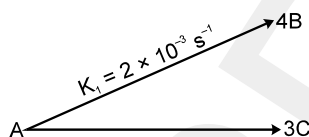
**Total Marks : 38
 Max. Time : 43 min.**

Topic : Chemical Kinetics

Type of Questions

Single choice Objective ('-1' negative marking) Q.1	(3 marks 3 min.)	M.M., Min. [3, 3]
Comprehension ('-1' negative marking) Q.2 to Q.6	(3 marks 3 min.)	[15, 15]
Subjective Questions ('-1' negative marking) Q.7 to Q.9	(4 marks 5 min.)	[12, 15]
Match the Following (no negative marking) Q.10	(8 marks 10 min.)	[8, 10]

1. For the following parallel chain reaction

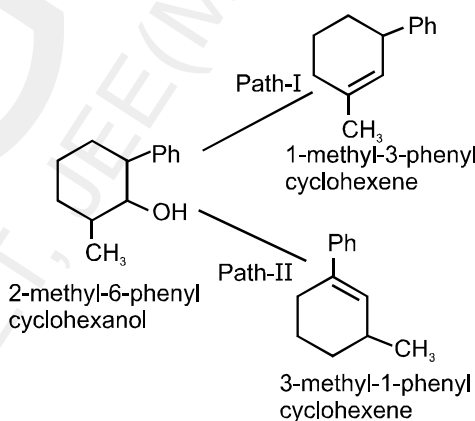


what will be that value of overall half-life of A in minutes? Given that $\frac{[B]_t}{[C]_t} = \frac{16}{9}$

- (A) 3.3 (B) 6.3 (C) 3.6 (D) None

Comprehension # (Q.2 to Q.6)

Dehydration of 2-methyl-6-phenyl cyclohexanol is a first order kinetics. Dehydration of this cyclohexanol gives 3-methyl-1-phenyl cyclohexene and 1-methyl-3-phenyl cyclohexene. Yields of these products are different due to different rate constant of their respective parallel paths. $4 \times 10^{-4} \text{M sec}^{-1}$ is the rate constant of first path in which 1-methyl-3-phenyl-cyclohexene is formed. After 2303 seconds, 3M and 2M of 3-methyl-1-phenyl cyclohexene and 1-methyl-3-phenyl-cyclohexene are obtained respectively.

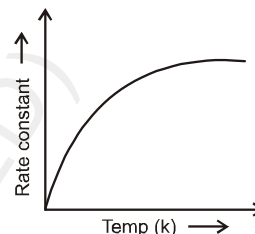


2. Which of the following is the value of rate constant of second path –
 (A) $4 \times 10^{-4} \text{ sec}^{-1}$ (B) $6 \times 10^{-4} \text{ sec}^{-1}$ (C) $3 \times 10^{-4} \text{ sec}^{-1}$ (D) $2 \times 10^{-4} \text{ sec}^{-1}$
3. The half life period of dehydration of 2-methyl-6-phenyl cyclohexanol is :
 (A) 463 sec (B) 599 sec (C) 735 sec (D) 693 sec
4. The average life period of the above process is :
 (A) 1000 sec (B) 1200 sec (C) 888.8 sec (D) 1271.92 sec
5. The initial concentration of 2-methyl-6-phenyl cyclohexanol taken is :
 (A) 4.545 (B) 6.555 (C) 5.555 (D) 7.545

6. The rate of dehydration of alcohol at 2303 seconds is
 (A) 5.55×10^{-4} mol/L-sec (B) 4×10^{-4} mol/L-sec
 (C) 12×10^{-4} mol/L-sec (D) 6.55×10^{-4} mol/L-sec
7. For the reaction $A \longrightarrow$ products, the following data is given for a particular run.
- | | | | | |
|--------------------------------|---|---|----|----|
| time (min.) : | 0 | 5 | 15 | 35 |
| $\frac{1}{[A]}$ (M^{-1}) : | 1 | 2 | 4 | 8 |

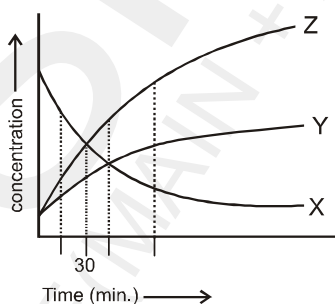
Determine the order of the reaction.

8. If for a first order reaction, rate constant varies with temperature according to the graph given below. At $27^\circ C$, 1.5×10^{-4} percent of the reactant molecules are able to cross over the potential barrier. At $52^\circ C$, the slope of this graph is equal to $0.2 K^{-1} sec^{-1}$, calculate the value of rate constant at $52^\circ C$, assuming that activation energy does not change in this temperature range.



9. For a Parallel first order reaction
- $$X \begin{matrix} \xrightarrow{K_1} Y \\ \xrightarrow{K_2} Z \end{matrix}$$

Concentration of reactant and product change according to the graph given below.



Calculate the value of k_1 and k_2 . Given, $\frac{k_1}{k_2} = \frac{1}{2}$

10. For a general reaction $A \rightarrow B$ let $\alpha =$ Degree of dissociation. Other notations have their usual meaning

Column – I

(A) α (if order = 1)

(B) α (if order = 2)

(C) α (if order = 0)

(D) α (if order = 0.5)

Column – II

(p) $1 - e^{-kt}$

(q) $\frac{kt}{C_{A0}}$

(r) $\frac{C_{A0}kt}{C_{A0}kt + 1}$

(s) $1 - \frac{C_{At}}{C_{A0}}$

**PHYSICAL / INORGANIC
 CHEMISTRY
 DPP
 DAILY PRACTICE PROBLEMS**

DPP No. 55

**Total Marks : 29
 Max. Time : 31 min.**

Topic : Metallurgy

Type of Questions

Single choice Objective ('-1' negative marking) Q.1 to Q.7

(3 marks 3 min.)

M.M., Min.

[21, 21]

Match the Following (no negative marking) Q.8

(8 marks 10 min.)

[8, 10]

1. (a) Mg metal is extracted from
 (A) Cryolite (B) Carnallite (C) Malachite (D) Cassiterite
- (b) Match correctly
- | | |
|---------------|------------------|
| I Bauxite | (a) Lead |
| II Carnallite | (b) Copper |
| III Malachite | (c) Magnesium |
| IV Galena | (d) Hall Process |
- (A) I – a, II – b, III – c, IV – d (B) I – d, II – c, III – b, IV – a
 (C) I – b, II – a, III – d, IV – c (D) I – d, II – b, III – c, IV – a
2. (a) Copper is extracted from :
 (A) steffinite (B) dolomite (C) galena (D) malachite
- (b) Corundum is :
 (A) ZnO (B) Al₂O₃ (C) Fe₃O₄ (D) Ag₂O
3. (a) Important ore of Zinc is :
 (A) calamine (B) magnetite (C) cryolite (D) Anglesite
- (b) Which of the following ores is concentrated by magnetic separation method ?
 (A) Bauxite (B) Haematite (C) Argentite (D) Dolomite
4. (a) Which of the following processes is used for the concentration of ores ?
 (A) Bessemerisation (B) Electrolytic reduction
 (C) Froth floatation process (D) Smelting
- (b) When lime stone is heated, CO₂ gas is liberated. In metallurgy, this process is called as :
 (A) calcination (B) roasting (C) ore dressing (D) sublimation
5. (a) Main function of frothers is:
 (A) Stick to the ore and then take it to rise upto the top
 (B) Convert the insoluble ore into soluble part
 (C) Make the ore hydrophobic
 (D) None
- (b) Main function of the collectors in metallurgy is :
 (A) Stick to the ore and then take it to rise upto the top
 (B) Convert the insoluble ore into soluble part
 (C) Make the ore hydrophobic
 (D) None

6. (a) A metal obtained by a hydrometallurgical operation is :
 (A) Silver (B) Iron (C) Tin (D) Aluminium
- (b) When haematite ore is burnt in air with coke along with lime at 200°C, the process not only produces steel but also produces an important compound (A), which is useful in making building materials. The compound (A) is
 (A) SiO₂ (B) CaSiO₃ (C) FeO (D) Fe₂O₃
7. (a) The substance which is used as flux in the extraction of iron from haematite ore is :
 (A) silica (B) borax (C) lime stone (D) salt cake
- (b) (i) The slag obtained during the extraction is lighter and has lower melting point than the metal (Fe or Cu).
 (ii) Froth floatation process may be used to increase the concentration of mineral chalcopyrites.
 (iii) High purify metals can be obtained by zone refining method if the impurity has lower melting point.
 (A) T, T, T (B) T, F, T (C) F, T, T (D) F, F, F
8. Match the ionization processes listed in column-I with the changes observed as listed in column-II. For this use the codes given below :
- | Column-I | Column-II |
|--|---|
| (A) N ₂ → N ₂ ⁺ | (p) Bond order increases and magnetic property is changed |
| (B) O ₂ ⁺ → O ₂ ²⁺ | (q) Bond order decreases and magnetic property is not changed |
| (C) B ₂ → B ₂ ⁺ | (r) Bond order increases and magnetic property is not changed |
| (D) NO ⁻ → NO | (s) Bond order decreases and magnetic property is changed |
| | (t) Bond energy decreases and bond length increases. |
- Note :** Here change in magnetic property refers to change from diamagnetic to paramagnetic or paramagnetic to diamagnetic.

**PHYSICAL / INORGANIC
 CHEMISTRY
 DPP**
 DAILY PRACTICE PROBLEMS

DPP No. 56

**Total Marks : 44
 Max. Time : 44 min.**

Topic : Metallurgy

Type of Questions

Type of Questions	M.M., Min.
Single choice Objective ('-1' negative marking) Q.1 to Q.6	(3 marks 3 min.) [18, 18]
Multiple choice objective ('-1' negative marking) Q.7	(4 marks 4 min.) [4, 4]
Comprehension ('-1' negative marking) Q.8 to Q.10	(3 marks 3 min.) [9, 9]
Assertion and Reason (no negative marking) Q.11	(3 marks 3 min.) [3, 3]
Match the Following (no negative marking) Q.12	(8 marks 10 min.) [8, 10]

- Which one of the following statements is incorrect ?
 (A) Tin is extracted by carbon reduction (smelting)
 (B) Aluminium is extracted by Hall's process which involves carbon reduction.
 (C) Extraction of lead does not involve bessemerisation
 (D) Silver is extracted by cyanide process
- In purification of bauxite ore, it is mixed with coke and heated at 1800 °C in presence of nitrogen. this is :
 (A) Hall's process (B) Serpeck's process
 (C) Baeyer's process (D) Electrolytic reduction.
- Reducing agent of haematite in blast-furnace is
 (A) Coke in furnace (B) Coke in upper part and CO in lower part of furnace.
 (C) CO in most parts of the furnace (D) CO in the furnace.
- $\text{PbS} \xrightarrow[\Delta]{\text{air}} \text{X}, \quad \text{X} + \text{PbS} \longrightarrow \text{Pb} + \text{SO}_2$
 'X' is :
 (A) PbO (B) PbO₂ (C) PbO and PbSO₄ (D) PbO₂ and PbO
- Select the incorrect statement
 (A) Carbon is a better reducing agent below 983K than carbon monoxide.
 (B) Sulphide ores generally roasted to oxide for the extraction of metals instead of being directly reduced.
 (C) Zinc not extracted from zinc oxide through reduction using CO but instead coke is used.
 (D) Leaching of native ores of silver/gold or of their sulphide ores and the extraction of metals (silver/gold), is an example of hydrometallurgy.
- Consider the following metallurgical processes
 (i) Heating impure metal with CO and distilling the resulting volatile carbonyl (boiling point 43°C) and finally decomposing at 150°C to 200°C to get the pure metal.
 (ii) Heating the sulphide ore in air until a part is converted to oxide and then further heating in the absence of air to let the oxide react with unchanged sulphide.
 (iii) Electrolysing the molten electrolyte containing approximately equal amounts of the metal chloride and CaCl₂ to obtain the metal.
 The process used for obtaining sodium, nickel and copper are, respectively,
 (A) (i), (ii) and (iii) (B) (ii), (iii) and (i) (C) (iii), (i) and (ii) (D) (ii), (i) and (iii)
- * Calcium silicate (slag) formed in the slag formation zone in extraction of iron from haematite ore :
 (A) does not dissolve in molten iron (B) being lighter floats on the molten iron
 (C) is used in cement industry (D) prevents the re-oxidation of molten iron

Comprehension # (Q.8 to Q.10)

Electrolytic purification of copper is required since the product of the Bessemer converter is impure. Sheets of pure copper are made the cathodes and blister copper is used as the anodes. The bath contains CuSO_4 , H_2SO_4 and NaCl . Metallic copper goes into solution as Cu^{+2} ions at the anode and deposited at the cathode. Zinc and iron go into solution and do not deposit at the cathode alongwith copper. Silver goes into solution as Ag^+ ions, but forms a sludge in the electrolysis cell. The noble metals such as gold and platinum do not dissolve; they fall to the bottom when released from the copper anode. They help to pay for the copper refining process.

8. The different chemical behaviour of various metal ions (for example only Cu is deposited on the cathode) involved are explainable best using
 (A) their amounts in impure copper (B) the electrochemical series
 (C) their ionization potentials (D) their hydration energies
9. The voltage is kept low enough during the operation. This is to ensure that
 (A) Fe^{+2} and Zn^{+2} ions are kept in solution only
 (B) there is no risk of electric shock to the plant operators
 (C) gold and platinum do not dissolve in solution and are recovered as solids
 (D) temperature control is maintained to effect reaction rate control
10. The most important role of various electrolytes added to the electrorefining bath in this case is
 (A) to reduce the temperature of bath
 (B) to result in good electrical connectivity so as to have high production rates
 (C) so that the anode acts as an attackable electrode
 (D) to enhance the viscosity of electrolyte thus preventing leakage from bath.
11. **Statement-1** : Haematite ore containing a small quantity of siderite ore is always calcined in presence of a limited supply of air.



Prevents the loss of iron as FeSiO_3 .

- (A) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1.
 (B) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1.
 (C) Statement-1 is True, Statement-2 is False.
 (D) Statement-1 is False, Statement-2 is True.
12. **Column – I** (A) Chalcopyrites (B) Galena (C) Argentite (D) Malachite
- Column – II** (p) Self – reduction (q) Sulphur containing ore (r) Carbon reduction (s) Leaching followed by displacement method.

**PHYSICAL / INORGANIC
 CHEMISTRY
 DPP**
DAILY PRACTICE PROBLEMS

DPP No. 57

**Total Marks : 42
 Max. Time : 42 min.**

Topic : Metallurgy

Type of Questions

Single choice Objective ('-1' negative marking) Q.1 to Q.8 (3 marks 3 min.) **M.M., Min.** [24, 24]
Comprehension ('-1' negative marking) Q.9 to Q.11 (3 marks 3 min.) [9, 9]

Revision Question

Comprehension ('-1' negative marking) Q.12 to Q.14 (3 marks 3 min.) [9, 9]

- In froth floatation process for the purification of ores, the particles of ore float because :
 (A) their surface is not easily wetted by water (B) they are light
 (C) they are insoluble (D) they bear electrostatic charge
- The purpose of adding Na_3AlF_6 to Al_2O_3 during electrolysis is
 (A) To decrease melting point of Al_2O_3 (B) To increase conductivity of electrolyte
 (C) To provide reducing condition in the bath (D) A & B
- Match List-I with List-II and select the correct answer using codes given below in the list :

List-I		List-II	
I Cyanide process		(A) Ultrapure Ge	
II Floation process		(B) Pine oil	
III Electrolytic reduction		(C) Extraction of Al	
IV Zone refining		(D) Extraction of Au	
(A) I – C, II – A, III – D, IV – B		(B) I – D, II – B, III – C, IV – A	
(C) I – C, II – B, III – D, IV – A		(D) I – D, II – A, III – C, IV – B	

- Match list I with list II and select the correct answer using the codes given below the lists .

List I				List II			
A van Arkel method				1. Manufacture of caustic soda			
B Solvay process				2. Purification of titanium			
C Cupellation				3. Manufacture of Na_2CO_3			
D Poling				4. Purification of copper			
				5. Refining of silver			
A	B	C	D	A	B	C	D
(A) 2	1	3	4	(B) 4	3	2	5
(C) 2	3	5	4	(D) 5	1	3	4

- Match List-I with List-II and select the correct answer using the codes given below the lists.

List-I (Metals)				List-II (Process/methods involved in extraction process)			
(a) Au				1. Self reduction			
(b) Al				2. Liquation			
(c) Pb				3. Electrolysis			
(d) Sn				4. Bayer's process			
(a)	(b)	(c)	(d)	(a)	(b)	(c)	(d)
(A) 3	1	2	4	(B) 3	4	1	2
(C) 1	2	4	3	(D) 3	2	4	1

- In the Hoop's process of aluminium extraction , the fused materials remain in three different layers. These layers remain separated even in electrolytic reduction, because :
 (A) upper layer is attracted by cathode and lower layer is attracted by anode
 (B) cell has the arrangement for separating the layers
 (C) all the layers have different densities
 (D) all the layers are at different temperature

7. In steel making the impurities are removed by
 (A) Oxidation
 (B) reduction
 (C) Converted into high melting compounds by addition of some elements
 (D) Gasification



The above method of purification is :

- (A) Van – arkel process for Zr, Hg etc
 (B) Distillation for Zn, Cd, Hg etc
 (C) Electro refining for W, Ag, Au, etc
 (D) Zone refining of germanium gallium, silicon etc.

Comperhension # (Q.9 to Q.11)

The choice of reducing agent for metal oxide is decided by thermodynamic principle of metallurgy. ΔG must be negative. Ellingham diagram is a plot of $\Delta_f G^\circ$ Vs T for the formation of oxides of various elements. All the plots slope upwards when temperature increases. Each plot is a straight line except when some change in phase takes place. A metal will reduce the oxide of other metals which lie above it in this diagram.

9. ΔG° vs T plot in the Ellingham's diagram slopes downward for the reaction
 (A) $\text{Mg} + \frac{1}{2} \text{O}_2 \longrightarrow \text{MgO}$
 (B) $2\text{Ag} + \frac{1}{2} \text{O}_2 \longrightarrow \text{Ag}_2\text{O}$
 (C) $\text{C} + \frac{1}{2} \text{O}_2 \longrightarrow \text{CO}$
 (D) $\text{CO} + \frac{1}{2} \text{O}_2 \longrightarrow \text{CO}_2$
10. Free energies of formation ($\Delta_f G^\circ$) of MgO(s) and CO(g) at 1273 K are -941 and -439 kJ mol⁻¹ respectively. At this temperature the nature of the reaction :

$$\text{MgO(s)} + \text{C(s)} \longrightarrow \text{Mg(s)} + \text{CO(g)}$$
 is
 (A) reversible
 (B) spontaneous
 (C) non-spontaneous
 (D) highly spontaneous
11. Why is zinc not extracted from zinc oxide through reduction using CO ?
 (A) Out of C and CO, C is always a better reducing agent.
 (B) The line for $\Delta_f G^\circ$ (CO, CO₂) in the Ellingham diagram is always higher than the line for $\Delta_f G^\circ$ (ZnO, Zn) at the temperature employed.
 (C) The line for $\Delta_f G^\circ$ (CO, CO₂) in the Ellingham diagram is always lower than the line for $\Delta_f G^\circ$ (ZnO, Zn) at the temperature employed.
 (D) None of these.

Revision Question

Comperhension # (Q.12 to Q.14)

Suppose Bohr theory is applicable to a negative particle of mass $2m_e$ and charge $2e^-$ revolving around the nucleus of charge Ze . Let r_1 , v_1 and E_1 be the radius of the orbit, speed of the particle in the orbit and energy of the particle in the orbit respectively. The value for these variable for electron revolving in the corresponding Bohr's orbit are r , v and E respectively.

12. Which of the following expression regarding the ratio of radii is correct ?
 (A) $\frac{r_1}{r} = 2$
 (B) $\frac{r_1}{r} = \frac{1}{2}$
 (C) $\frac{r_1}{r} = 4$
 (D) $\frac{r_1}{r} = \frac{1}{4}$
13. Which of the following expressions regarding the ratio of speeds are correct ?
 (A) $\frac{v_1}{v} = 2$
 (B) $\frac{v_1}{v} = \frac{1}{2}$
 (C) $\frac{v_1}{v} = 4$
 (D) $\frac{v_1}{v} = \frac{1}{4}$
14. Which of the following expressions regarding the ratio of energies is correct ?
 (A) $\frac{E_1}{E} = 4$
 (B) $\frac{E_1}{E} = \frac{1}{4}$
 (C) $\frac{E_1}{E} = 8$
 (D) $\frac{E_1}{E} = \frac{1}{8}$

**PHYSICAL / INORGANIC
CHEMISTRY
DPP**
DAILY PRACTICE PROBLEMS

DPP No. 58

**Total Marks : 40
Max. Time : 43 min.**

Topic : Metallurgy

Type of Questions

Type of Questions	M.M., Min.
Single choice Objective ('-1' negative marking) Q.1 to Q.6	(3 marks 3 min.) [18, 18]
Multiple choice objective ('-1' negative marking) Q.7	(4 marks 4 min.) [4, 4]
Assertion and Reason (no negative marking) Q.8 to Q.9	(3 marks 3 min.) [6, 6]

Integer Answer Type

Subjective Questions ('-1' negative marking) Q.10 to Q.12	(4 marks 5 min.) [12, 15]
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- 1.(a)_ The substance which is used as flux in the extraction of iron from haematite ore is :
 (A) silica (B) borax (C) lime stone (D) salt cake
- 1.(b)_ The composition of matte is :
 (A) Cu_2S and FeS (B) CuS and Fe_2S_3 (C) Cu_2S and FeO (D) Cu_2O and FeO
- 2.(a)_ Cyanide solution is used in the extraction of :
 (A) Mg (B) Sn (C) Zn (D) Ag
- 2.(b)_ In the extractive metallurgy of iron, the highest temperature in the blast furnace is found :
 (A) in the upper most part where reduction takes place.
 (B) in the lower part where fusion takes place.
 (C) in the middle part where slag formation takes place.
 (D) in the lower most part where combustion of carbon takes place.
- 3.(a)_ Al is obtained in large quantity by :
 (A) heating cryolite
 (B) reduction of Al_2O_3 with carbon
 (C) reduction of Al_2O_3 with potassium
 (D) electrolytic reduction of Al_2O_3 dissolved in molten cryolite.
- 3.(b)_ Chemical reduction method is not used for :
 (A) the extraction of Mg from anhydrous magnesium chloride.
 (B) the extraction of Cu from cuprite.
 (C) the extraction of Fe from haematite.
 (D) the extraction of Zn from zincite.
- 4.(a)_ In the electrolytic reduction of fused mixture of Al_2O_3 and Na_3AlF_6 gas liberated at graphite anode is :
 (A) F_2 (B) OF_2 (C) O_2 (D) O_3
- 4.(b)_ Which of the following statements is incorrect?
 (A) Silver glance mainly contains silver sulphide.
 (B) Copper pyrites mainly contains CuFeS_2 .
 (C) Zinc blende mainly contains ZnSO_4 .
 (D) Magnetite is the mixed oxide of FeO and Fe_2O_3 i.e. Fe_3O_4 .
- 5.(a)_ In which of the following metallurgical processes leaching is not involved ?
 (A) Al from Al_2O_3 (B) Ag from Ag_2S
 (C) Mg from MgCl_2 (anhydrous) (D) From low grade copper ore and scrapes

- 5(b). Which of the following statements is incorrect?
 (A) Beneficiation of ores involve the processes which are used for the removal of unwanted impurities.
 (B) In metallurgy, flux is a substance which is used to convert infusible impurities to fusible mass.
 (C) Aluminium is extracted by the electrolysis of alumina.
 (D) In smelting processes the metal is obtained in fused state.
6. Which of the following processes are used for the extraction of Mg and Ag respectively?
 (A) Carbon reduction and cyanide process. (B) Cyanide process and electrolytic reduction.
 (C) Electrolytic reduction and cyanide process. (D) Carbon monoxide reduction and cyanide process.
- 7.* Which of the following pair(s) of metals is/are correctly matched with their purification methods?
 (A) Si, B – Zone refining (B) Ni, Zr – Vapour phase refining
 (C) Zn, Hg – Distillation (D) Cu, Ag – Electrolytic refining
8. **Statement-1:** $\text{Ag}_2\text{S} + 4\text{KCN} \xrightleftharpoons{\text{O}_2} 2\text{K}[\text{Ag}(\text{CN})_2] + \text{K}_2\text{S}$
Statement-2 : The reaction is carried out in presence of air or O_2 so that K_2S is oxidised to K_2SO_4 thereby shifting the equilibrium in forward direction.
 (A) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1.
 (B) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1
 (C) Statement-1 is True, Statement-2 is False
 (D) Statement-1 is False, Statement-2 is True
9. **Statement-1 :** Oxide ores of iron are haematite, limonite and magnetite.
Statement-2 : Pig iron is obtained by carbon monoxide reduction of calcined haematite.
 (A) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1.
 (B) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1
 (C) Statement-1 is True, Statement-2 is False
 (D) Statement-1 is False, Statement-2 is True

Integer Answer Type

This section contains 4 questions. The answer to each of the questions is a single digit integer, ranging from 0 to 9.

10. How many of the following ores are oxide ores?
 haematite, limonite, magnetite, magnesite, cuprite, argentite, bauxite, sphalerite, zincite
11. How many of the following metallurgies involve leaching?
 $\text{Al}_2\text{O}_3 \longrightarrow \text{Al}$; $\text{Ag}_2\text{S} \longrightarrow \text{Ag}$; $\text{Au} \longrightarrow \text{Au}$; $\text{CuFeS}_2 \longrightarrow \text{Cu}$; $\text{PbS} \longrightarrow \text{Pb}$
 $\text{MgCl}_2 \longrightarrow \text{Mg}$; $\text{FeCO}_3 \longrightarrow \text{Fe}$; Low grade copper ore $\longrightarrow \text{Cu}$; $\text{HgS} \longrightarrow \text{Hg}$
12. What is the coordination number of aluminium in mineral cryolite ?

PHYSICAL / INORGANIC
CHEMISTRY
DPP
DAILY PRACTICE PROBLEMS

DPP No. 59

Total Marks : 33
Max. Time : 34 min.

Topic : Metallurgy

Type of Questions

Type of Questions	M.M., Min.
Single choice Objective ('-1' negative marking) Q.1 to Q.4	(3 marks 3 min.) [12, 12]
Comprehension ('-1' negative marking) Q.5 to Q.7	(3 marks 3 min.) [9, 9]
Assertion and Reason (no negative marking) Q.8	(3 marks 3 min.) [3, 3]

Integer Answer Type

Subjective Questions ('-1' negative marking) Q.9 to Q.11	(4 marks 5 min.) [12, 15]
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1(a)._ Leaching the silver and gold metal with CN^- :

- (A) is oxidation reaction (B) is complexation reaction
(C) is reduction reaction (D) is both (A) and (B)

1(b)._ Leaching of low grade copper ores is carried out by :

- (A) sulphuric acid (B) sodium hydroxide (C) sodium sulphate (D) sodium nitrate

2(a)._ Which of the following reactions represents Goldschmidt aluminothermite process?

- (A) $2\text{Al} + \text{HCl} \longrightarrow 2\text{AlCl}_3 + 3\text{H}_2$ (B) $\text{Al}_2\text{O}_3 + 2\text{NaOH} + 2\text{H}_2\text{O} \longrightarrow 2\text{NaAlO}_2 + 3\text{H}_2\text{O}$
(C) $2\text{Al} + \text{N}_2 \longrightarrow 2\text{AlN}$ (D) $2\text{Al} + \text{Cr}_2\text{O}_3 \longrightarrow 2\text{Cr} + \text{Al}_2\text{O}_3$

2(b)._ Calcium is extracted by the electrolysis of :

- (A) fused mixture of CaCl_2 and CaF_2 (B) fused mixture of CaCl_2 and NaF
(C) aqueous solution of CaCl_2 (D) aqueous solution of $\text{Ca}_3(\text{PO}_4)_2$ solution

3(a)._ The materials which are added along with the calcined iron ore into the blast furnace in the extraction of iron from haematite ore are :

- (A) coke and silica (B) coke and lime stone
(C) lime stone and silica (D) coke and borax

3(b). Match the method of concentration of the ore in column I with the ore in column II and select the correct alternate.

Column I	Column II
(1) Leaching.	(p) Copper pyrite.
(2) Calcination.	(q) Magnesite.
(3) Froth floatation.	(r) Bauxite.
(4) Magnetic separation.	(s) Chromite.
(1) (2) (3) (4)	(1) (2) (3) (4)
(A) (s) (q) (p) (r)	(B) (r) (q) (p) (s)
(C) (p) (q) (r) (s)	(D) (q) (r) (p) (s)

4(a). In which of the following pair of metals, both are commercially extracted from their respective ores by self reduction method ?

- (A) Zn, Cu (B) Pb, Cu (C) Sn, Zn (D) Al, Ag

4(b)._ Which of the following is obtained by zone refining method?

- (A) Highly pure ore (B) Highly pure aluminium
(C) Ultra pure oxide (D) Ultra pure metals used as semi-conductors

Comprehension # (Q.5 to Q.7)

Read the following comprehension carefully and answer the questions :

Main ore of lead is galena. This is mined and separated from other minerals by froth flotation. There are two methods of extracting the lead.

- (i) First method involves the roasting of ore followed by reduction with coke or CO.
 (ii) Second method involves the partial roasting of ore followed by self reduction.

5. Partial roasting of galena gives :
 (A) only PbS (B) only PbO (C) PbS + PbO (D) PbO + Pb
6. In self reduction process, the species which bring about the reduction is :
 (A) O₂ (B) S²⁻ (C) O²⁻ (D) H₂S
7. Which of the following statements is incorrect about the extraction of lead from galena ?
 (A) Galena is a sulphide ore and therefore, it is concentrated by froth flotation process.
 (B) Self reduction takes place in absence of air.
 (C) Complete roasting of galena gives PbO which is then reduced by coke or CO to give metallic lead.
 (D) FeSiO₃ is obtained as slag.
8. **Statement-1** : Dow's process is the extraction of magnesium from sea water.
Statement-2 : Hydrated magnesium chloride is made anhydrous by heating in a current of dry HCl gas.
 (A) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1.
 (B) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1.
 (C) Statement-1 is True, Statement-2 is False.
 (D) Statement-1 is False, Statement-2 is True.

Integer Answer Type

This section contains 4 questions. The answer to each of the questions is a single digit integer, ranging from 0 to 9.

9. How many water of crystallisation is present in the ore carnallite ?
10. The number of reducing agents involved in the extraction of iron (as pig iron) using blast furnace from ore haematite is(are).
11. Among the following metals how many metals are extracted by self-reduction method from their respective ores. Hg, Zn, Cu, Al, Mg, Pb, Fe, Sn.
12. The number of different metals present in the ore copper pyrites is :

**PHYSICAL / INORGANIC
 CHEMISTRY
 DPP**
 DAILY PRACTICE PROBLEMS

DPP No. 60

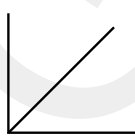
**Total Marks : 37
 Max. Time : 37 min.**

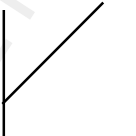
Topic : Surface Chemistry

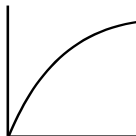
Type of Questions

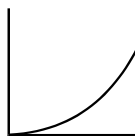
Type of Questions	M.M., Min.
Multiple choice objective ('-1' negative marking) Q. 1	[4, 4]
Single choice Objective ('-1' negative marking) Q.2 to Q.12	[33, 33]

- Which of the following statements is correct?
 - The efficiency of a heterogeneous catalyst depends upon its surface area.
 - Catalyst operates by providing alternate path for the reaction that involves a lower activation energy.
 - Catalyst lowers the energy of activation of the forward direction without affecting the energy of activation of the backward direction.
 - Catalyst does not affect the overall enthalpy change of the reaction.
- Most effective ion to coagulate a negative sol is :
 - PO_4^{3-}
 - Al^{3+}
 - Ba^{2+}
 - K^+
- Which one is colloid :
 - NaCl
 - Urea
 - Cane Sugar
 - Blood
- Oil soluble dye is mixed with water in oil emulsion. Then :
 - dispersion medium is coloured
 - different phase is coloured
 - both coloured
 - none is coloured
- Sorption is term used when :
 - adsorption takes place
 - absorption takes place
 - both (A) and (B)
 - None of these
- Negatively charged colloidal solution is obtained from AgNO_3 & KI , when moles of :
 - AgNO_3 are more
 - KI are more
 - both AgNO_3 and KI are more
 - can't say
- Zeolites have shape selectivity depending on :
 - pore structure
 - atomic structure
 - molecular structure
 - none of these
- The variation of $\frac{p}{(x/m)}$ as a function of p when Langmuir's isotherm is valid is :

(A) 

(B) 

(C) 

(D) 
- The removal of grease, dirt by soap during washing is an example of
 - adsorption
 - emulsification
 - coagulation
 - dissolution
- The difference in color of colloidal particles of gold obtained by different methods is related to
 - variable valency of gold
 - different concentration of gold particles
 - different types of impurity present
 - different size of colloidal particles
- Sulphur sol contains
 - discrete sulfur atoms
 - discrete sulfur molecules (S_8)
 - large aggregates of S_8 molecules
 - water dispersed in solid sulfur
- Among the following sols the one which is hydrophobic is
 - gum
 - sulfur
 - starch
 - gelatin

**PHYSICAL / INORGANIC
 CHEMISTRY
 DPP**
 DAILY PRACTICE PROBLEMS

DPP No. 61

**Total Marks : 33
 Max. Time : 33 min.**

Topic : Surface Chemistry

Type of Questions

Single choice Objective ('-1' negative marking) Q.1 to Q.11

(3 marks 3 min.)

M.M., Min.

[33, 33]

- The protein which acts as an emulsifying agent in milk is named
 (A) casein (B) lactose (C) fat (D) lactic acid
- Which of the following natural polymers has the highest gold number ?
 (A) gelatin (B) albumin (C) gum arabic (D) potato starch
- Which of the following is not true of Brownian motion ?
 (A) the movement is more vigorous for smaller particles.
 (B) the movement does not change with time and remains the same for months and years.
 (C) the moment does not depend on the temperature
 (D) it can be sometimes seen with naked eyes or using a simple microscope at most.
- A colloidal solution has which of the following properties which is not shown by a true solution.
 (A) Homogeneity (B) Filterability (C) Tyndall effect (D) Osmotic pressure
- If a bag made of a dialyzing material and containing a mixture of water, dissolved salt, and colloiddally dispersed protein were placed in a beaker of pure water, the water would eventually contain
 (A) dissolved salt (B) protein
 (C) both salt and protein (D) no additional material
- Identify the incorrect statement
 (A) Brownian motion and tyndall effect is shown by colloidal particles
 (B) Gold number is a measure of the protective power of a lyophilic colloid
 (C) The colloidal solution with both the dispersed phase and the dispersion medium in liquid state is called a gel.
 (D) Hardy-Schulze rule is related with coagulation
- On adding a few drops of dil HCl to freshly precipitated ferric hydroxide, a red colored colloidal solution is obtained, this is an example of
 (A) Protective action (B) dissolution (C) peptisation (D) dialysis
- At the cmc the surfactant molecules
 (A) decompose (B) dissociate (C) associate (D) become soluble
- Colloidal particles in a sol can be coagulated by
 (A) Heating (B) adding an electrolyte
 (C) adding oppositely charged sol (D) any of the above
- A colloidal solution of a solid as dispersed phase and liquid as dispersion medium is known as :
 (A) Gel (B) Sol (C) Solid foam (D) Emulsion
- Which of the following process is not based on adsorption?
 (A) catalysis (B) chromatography
 (C) printing of photograph (D) decolorization of sugar

**PHYSICAL / INORGANIC
CHEMISTRY
DPP**
DAILY PRACTICE PROBLEMS

DPP No. 62

Total Marks : 41
Max. Time : 41 min.

Topic : Surface Chemistry

Type of Questions

Type of Questions	M.M., Min.
Subjective Questions ('-1' negative marking) Q.1,2, 5,6,7	(4 marks 5 min.) [20, 20]
Single choice Objective ('-1' negative marking) Q.3,4,8,9,11,12	(3 marks 3 min.) [18, 18]
Assertion and Reason (no negative marking) Q.10	(3 marks 3 min.) [3, 3]

- Give reasons for the following in one or two sentences only :
BeCl₂ can be easily hydrolysed.
- A white solid is either Na₂O or Na₂O₂. A piece of red litmus paper turns white when it is dipped into a freshly made aqueous solution of the white solid.
 - Identify the substance and explain with balanced equation.
 - Explain what would happen to the red litmus if the white solid were the other compound.
- Statement-1** : LiCl is predominantly a covalent compound.

Statement-2 : Electronegativity difference between Li and Cl is too small.

(A) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1.
 (B) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1
 (C) Statement-1 is True, Statement-2 is False
 (D) Statement-1 is False, Statement-2 is True
- Highly pure dilute solution of sodium in liquid ammonia :

(A) show blue colour	(B) exhibits electrical conductivity
(C) produces sodium amide	(D) produces hydrogen gas
- Arrange the following sulphates of alkaline earth metals in order of decreasing thermal stability :
BeSO₄, MgSO₄, CaSO₄, SrSO₄
- The crystalline salts of alkaline earth metals contain more water of crystallisation than the corresponding alkaline metal salts. Why ?
- Element A burns in nitrogen to give an ionic compound B. Compound B reacts with water to give C and D. A solution of C becomes 'milky' on bubbling carbon dioxide. Identify A, B, C and D.
- A dilute aqueous solution of Na₂SO₄ is electrolysed using platinum electrodes. The products at the anode and cathode are

(A) O ₂ , H ₂	(B) S ₂ O ₈ ²⁻ , Na	(C) O ₂ , Na	(D) S ₂ O ₈ ²⁻ , H ₂
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- The following compounds have been arranged in order of their increasing thermal stabilities. Identify the correct order.

K ₂ CO ₃ (I)	MgCO ₃ (II)	CaCO ₃ (III)	BeCO ₃ (IV)
(A) I < II < III < IV	(B) IV < II < III < I	(C) IV < II < I < III	(D) II < IV < III < I

10. **Statement-1** : The alkali metals can form ionic hydrides which contain the hydride ion H^- .
Statement-2 : The alkali metals have low electronegativity; their hydrides conduct electricity when fused and liberate hydrogen at the anode.
 Evaluate the above statement and the explanation.
 (A) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1.
 (B) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1
 (C) Statement-1 is True, Statement-2 is False
 (D) Statement-1 is False, Statement-2 is True
11. Which is not correctly matched ?
 (1) Basic strength of oxides $Cs_2O < Rb_2O < K_2O < Na_2O < Li_2O$
 (2) Stability of peroxides $Na_2O_2 < K_2O_2 < Rb_2O_2 < Cs_2O_2$
 (3) Stability of bicarbonates $LiHCO_3 < NaHCO_3 < KHCO_3 < RbHCO_3 < CsHCO_3$
 (4) Melting point $NaF < NaCl < NaBr < NaI$
 (A) 1 and 4 (B) 1 and 3 (C) 1 and 2 (D) 2 and 3
12. $Li + N_2 \xrightarrow{\Delta} A \xrightarrow{H_2O} B + (C) \text{ gas}$
 Then the correctly matched pair for A, B, C are
- | | | | | | | | |
|-----|---------|--------|--------|-----|---------|--------|--------|
| | A | B | C | | A | B | C |
| (A) | LiN_3 | $LiOH$ | NH_3 | (B) | LiN_3 | LiH | NO_2 |
| (C) | Li_3N | $LiOH$ | NO_2 | (D) | Li_3N | $LiOH$ | NH_3 |

**PHYSICAL / INORGANIC
 CHEMISTRY
 DPP
 DAILY PRACTICE PROBLEMS**

DPP No. 63

**Total Marks : 30
 Max. Time : 30 min.**

Topic : s-block

Type of Questions

Single choice Objective ('-1' negative marking) Q.1 to Q.10

(3 marks 3 min.)

M.M., Min.

[30, 30]

- Sodium and potassium react with water much more vigorously than lithium because :
 (A) sodium and potassium have high values of hydration energy as compared to that of lithium.
 (B) sodium and potassium have higher melting point than that of lithium.
 (C) sodium and potassium have lower melting point than that of lithium.
 (D) sodium and potassium have lower hydration energy than that of lithium.
- The following compounds have been arranged in order of their increasing thermal stabilities. Identify the correct order. K_2CO_3 (I), $MgCO_3$ (II), $CaCO_3$ (III), $BeCO_3$ (IV)
 (A) I < II < III < IV (B) IV < II < III < I (C) IV < II < I < III (D) II < IV < III < I.
- Identify the correct statement :
 (A) Sodium metal can be prepared by the electrolysis of an aqueous solution of NaCl.
 (B) Sodium metal can be kept under ethyl alcohol.
 (C) Sodium metal is insoluble in liquid NH_3 at low temperature.
 (D) Elemental sodium is easily oxidised.
- Which of the following statements are true about the alkali metals ?
 (1) All alkali-metal salts impart a characteristic colour to the Bunsen flame.
 (2) The correct order of increasing thermal stability of the carbonates of alkali metals is $Li_2CO_3 < Na_2CO_3 < K_2CO_3 < Rb_2CO_3 < Cs_2CO_3$.
 (3) Among the alkali metals, cesium is the most reactive.
 (4) The reducing character of the alkali metal hydrides follow the order : $LiH > NaH > KH > RbH > CsH$.
 (A) (1), (2) and (3) (B) (1), (3) and (4) (C) (2), (3) and (4) (D) (1), (2), (3) and (4)
- Statement-1** : Solubilities of alkali metal fluorides and carbonates increase down the group.
Statement-2 : Hydration energies of alkali metal halides decrease down the group with increase in size of cations.
 (A) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1.
 (B) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1
 (C) Statement-1 is True, Statement-2 is False
 (D) Statement-1 is False, Statement-2 is True
- The melting point of lithium ($180^\circ C$) is almost double the melting point of sodium ($97^\circ C$) because :
 (A) down the group, the hydration energy decreases
 (B) down the group, the ionization energy decreases
 (C) down the group, the cohesive energy decreases
 (D) none of these
- Which of the following statement (s) is/are true for the solutions of alkali metals and alkaline earth metals in ammonia (ℓ) ?
 (A) Concentrated solutions of alkali metals in ammonia are copper - bronzed coloured and have a metallic lusture.
 (B) Dilute solutions of alkaline earth metals are deep blue-black in colour due to the spectrum from the solvated electron.
 (C) Concentrated solutions of the alkaline earth metals in ammonia are bronze coloured.
 (D) Evaporation of the ammonia from solutions of alkali metals yields the metal, but with alkaline earth metals evaporation of ammonia gives hexammoniates of the metals.

8. **Statement-1** : Lithium is the most powerful reducing agent and sodium is the least powerful reducing agent amongst the alkali metals in aqueous solutions.
Statement-2 : Lithium has the highest hydration enthalpy and the sodium the least value.
(A) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1.
(B) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1
(C) Statement-1 is True, Statement-2 is False
(D) Statement-1 is False, Statement-2 is True
9. Which of the following statements is incorrect ?
(A) The superoxide ion (i.e. O_2^-) is stable only in presence of larger cations such as K^+ , Rb^+ , Cs^+ .
(B) Alkali metals are normally kept in kerosene oil.
(C) All the alkali metal hydrides are ionic solids with high melting points.
(D) The concentrated solution of alkali metals in liquid ammonia is paramagnetic in nature.
10. Property of the alkaline earth metals that increases with their atomic number is :
(A) Ionisation energy
(B) solubility of their hydroxides
(C) solubility of their sulphates
(D) Electronegativity

**PHYSICAL / INORGANIC
 CHEMISTRY
 DPP**
 DAILY PRACTICE PROBLEMS

DPP No. 64

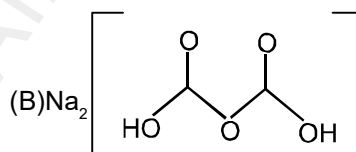
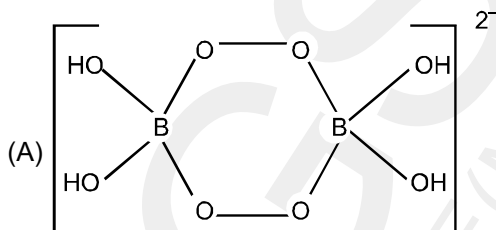
Total Marks : 47
 Max. Time : 39 min.

Topic : p-block (Boron and Carbon family)

Type of Questions

Type of Questions	M.M., Min.
Single choice Objective ('-1' negative marking) Q.1 to Q.9	[27, 27]
Comprehension ('-1' negative marking) Q.10 to Q. 13	[12, 12]
Match the Following (no negative marking) Q. 14	[8, 10]

- Which metal container is used for contains concentrated HNO_3 .
 (A) Al (B) Cr (C) Fe (D) Sn
- Which of the following compounds does not undergo hydrolysis completely
 (A) BF_3 (B) BCl_3 (C) BBr_3 (D) AlI
- Which is not correct about the alums
 (A) They are used as mordants (B) They are used as coagulants
 (C) Their aq. solutions all acidic (D) $(\text{NH}_4)_2\text{SO}_4 \cdot \text{FeSO}_4 \cdot 6\text{H}_2\text{O}$ is not an alum
- The correct order of basic strength will be
 (A) $\text{BN} > \text{AlN}$ (B) $\text{AlN} > \text{GaN}$ (C) $\text{BN} > \text{GaN}$ (D) $\text{Mg}_3\text{N}_2 > \text{AlN}$
- H_2O_2 can react with aq. NaBO_2 to produce.



- Which of the following species does not exist
 (A) TlI_3 (B) TlBr_3 (C) $[\text{CO}_4]^{4-}$ (D) PbBr_4
- Which of the following will produced metal oxide on heating?
 (A) NaHCO_3 (B) $\text{AlCl}_3 \cdot 6\text{H}_2\text{O}$ (C) Na_2CO_3 (D) $\text{Al}_2(\text{CO}_3)_3$
- General formula of boranes can be
 (A) $\text{B}_n \text{H}_{2n+n}$ (B) $\text{B}_n \text{H}_{n+4}$ (C) $\text{B}_n \text{H}_{n+6}$ (D) $\text{B}_n \text{H}_{2n+4}$
- Which of the following is correct about $\text{Al}_2(\text{CH}_3)_6$
 (A) each 'B' atom is sp^3 hybridised
 (B) It consists of two-"3 centre 2 electron bonds"
 (C) The two bridging C-atoms are in the plane of the molecules
 (D) all the above are correct

Comprehension # (Q. 10 to 13)

The highest oxidation state of p-block element is equal to the group number minus 10. Moving down the group, the oxidation state two less than the highest group oxidation state becomes more stable in groups 13 to 16 due to inert pair effect.

10. Which of the following statement is incorrect ?
 (A) PbI_4 does not exist.
 (B) Boron shows +3 oxidation state.
 (C) $TiCl_3$ does not undergo disproportionation reaction.
 (D) In thallium +3 oxidation state is more stable than +1.
11. The strongest reducing agent among the following is :
 (A) Ge (II) chloride (B) Sn (II) chloride (C) Pb (II) chloride (D) None
12. The strongest oxidising agent among the following is :
 (A) Pb (IV) oxide (B) Si (II) oxide (C) Sn (II) oxide (D) Ge (II) oxide
13. Which of the following compound exist at room temperature
 (A) BiF_5 (B) $MnCl_7$ (C) $Tl(CH_3)_3$ (D) $BiCl_5$
14. **Match the Column :**
- | Column-I | Column-II |
|-------------------------------|-------------------------------------|
| (A) $B_3O_3H_3$ | (p) Six members ring |
| (B) $B_3N_3H_6$ | (q) Eight members ring |
| (C) $Na_2B_4O_7 \cdot 10H_2O$ | (r) Hetero atomic ring |
| (D) P_4O_{10} | (s) Oxygen atom not present in ring |
| | (t) Even number atoms ring |

**PHYSICAL / INORGANIC
 CHEMISTRY
 DPP**
 DAILY PRACTICE PROBLEMS

DPP No. 65

Total Marks : 50
 Max. Time : 52 min.

Topic : p-block (Boron and Carbon family)

Type of Questions

		M.M., Min.
Single choice Objective ('-1' negative marking) Q.1 to Q.10	(3 marks 3 min.)	[30, 30]
Comprehension ('-1' negative marking) Q.11 to Q. 14	(3 marks 3 min.)	[12, 12]
Match the Following (no negative marking) Q. 15	(8 marks 10 min.)	[8, 10]

- (a) Pyrosilicate ion is :

(A) SiO_4^{4-} (B) SiO_4^{2-} (C) $\text{Si}_2\text{O}_6^{4-}$ (D) $\text{Si}_2\text{O}_7^{6-}$

(b) In group IVA or 14 of the extended from of the periodic table with increases in atomic number, the oxidising power of tetravalent species increases in the order :

(A) $\text{Ge} > \text{Pb} > \text{Sn}$ (B) $\text{Ge} > \text{Sn} > \text{Pb}$ (C) $\text{Pb} > \text{Ge} > \text{Sn}$ (D) $\text{Pb} > \text{Sn} > \text{Ge}$
- CO forms a volatile compound with :

(A) nickel (B) copper (C) sodium (D) aluminium
- H_2SO_4 is not used for the preparation of CO_2 from marble chips because :

(A) It does not react
 (B) huge amount of heat is evolved
 (C) the reaction is vigorous
 (D) calcium sulphate is sparingly soluble and get deposited on marble chips and stops the reaction
- $(\text{Me})_2\text{SiCl}_2$ gives on hydrolysis :

(A) $(\text{Me})_2\text{Si}(\text{OH})_2$ (B) $(\text{Me})_2\text{Si} = \text{O}$
 (C) $-\text{[O}-(\text{Me})_2\text{Si}-\text{O}]_n-$ (D) $\text{Me}_2\text{SiCl}(\text{OH})$
- Corundum is :

(A) SiC (B) SiCl_4 (C) Al_2O_3 (D) CCl_4
- Which is formed when SiCl_4 vapours are passed over hot Mg ?

(A) Si (B) MgCl_2 (C) Mg_2Si (D) MgSiCl_6
- The carbide which gives propyne on hydrolysis :

(A) Al_4C_3 (B) CaC_2 (C) Fe_3C (D) Mg_2C_3
- Which among the following carbide is methanide ?

(A) Al_4C_3 (B) CaC_2 (C) Be_2C (D) SiC

9. $[\text{CF}_6]^{2-}$ is not possible but $[\text{SiF}_6]^{2-}$ is possible due to :
- (A) large difference in the electronegativity of carbon and silicon
 (B) large difference in size of carbon and silicon atoms
 (C) the inability of carbon to expand its octet
 (D) The inability of silicon to form double bonds

10. The formula of white lead is :

- (A) $\text{Pb}(\text{OH})_2 \cdot \text{PbCO}_3$ (B) $2\text{PbCO}_3 \cdot \text{Pb}(\text{OH})_2$
 (C) $\text{Pb}(\text{OH})_2 \cdot \text{Pb}(\text{CH}_3\text{COO})_2$ (D) $\text{PbCO}_3 \cdot \text{PbO}$

Comprehension # (11 to 14)

Pb insoluble in H_2O due to passive layer of oxide but soluble in excess of oxygen is called plumbosolvency. Plumbosolvency can be increase by NO_3^- , HCO_3^- , ions & decreases by PO_4^{2-} , Cl^- ions.

11. Which of the following metal does not react with H_2O :

- (A) Lead (B) Boron (C) Sodium (D) Tin

12. Plumbosolvency can be increase by :

- (A) SO_4^{2-} (B) PO_4^{3-} (C) Cl^- (D) CH_3COO^-

13. Pb insoluble in water because :

- (A) it is hard metal (B) it has less SRP
 (C) due to passive layer of oxide (D) none

14. Which of the following statement is not correct ?

- (A) Lead salts are slow poisons
 (B) Lead metal is used in accumulators
 (C) Plumbosolvency increases by the presence of carbonates, sulphates, phosphates, etc.
 (D) Lead is a soft metal

15. Match the following :

Column-I

- (A) Si
 (B) Ge
 (C) Sn
 (D) Pb

Column-II

- (p) Forms Na_2MO_2 with NaOH
 (q) Forms mono & dioxide both
 (r) solid at room temperature
 (s) Shows +2, +4 oxidation state
 (t) shows -4 oxidation state