

# CHEMISTRY

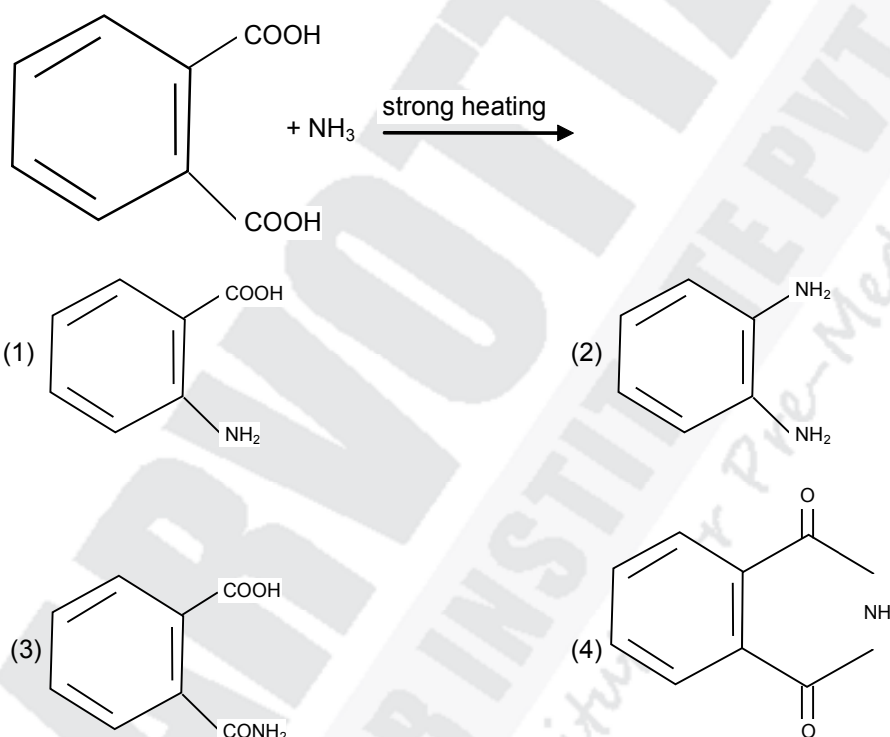
Q.1 Which of the following species is not stable ?

- (1)  $[\text{Sn}(\text{OH})_6]^{2-}$       (2)  $[\text{SiCl}_6]^{2-}$       (3)  $[\text{SiF}_6]^{2-}$       (4)  $[\text{GeCl}_6]^{2-}$

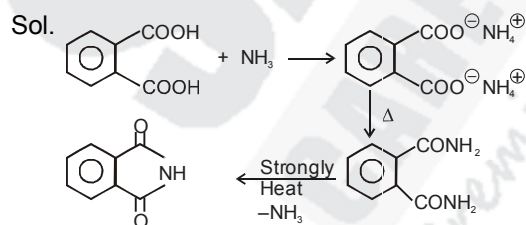
Ans. (2)

Sol.  $\text{SiCl}_6^{2-}$  does not exist  
due to steric hindrance of surrounding chlorine

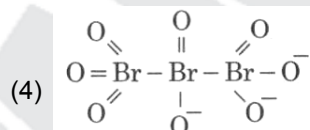
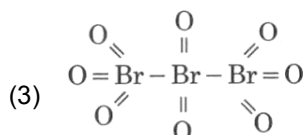
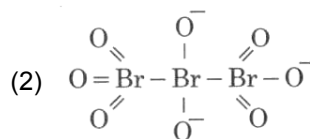
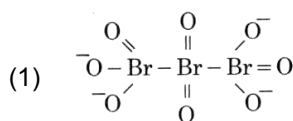
Q.2 The major product of the following reaction



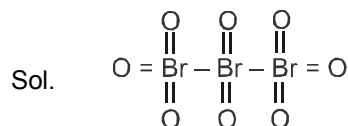
Ans. (4)



Q.3 The correct structure of tribromooxide is :



Ans. (3)



Q.4 Under isothermal condition, a gas at 300 K expands from 0.1 L to 0.25 L against a constant external pressure of 2 bar. The work done by the gas is

[Given that 1 L bar = 100 J]

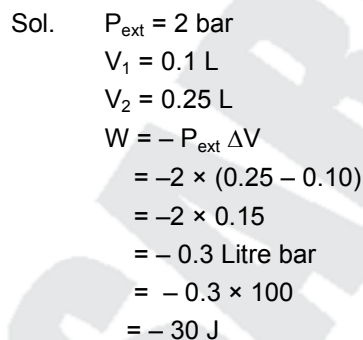
(1) 25 J

(2) 30 J

(3) -30 J

(4) 5 kJ

Ans. (3)



Q.5 A gas at 350 K and 15 bar has molar volume 20 percent smaller than that for an ideal gas under the same conditions. The correct option about the gas and its compressibility factor (Z) is :

(1)  $Z < 1$  and attractive forces are dominant

(2)  $Z < 1$  and repulsive forces are dominant

(3)  $Z > 1$  and attractive forces are dominant

(4)  $Z > 1$  and repulsive forces are dominant

Ans. (1)

Sol.  $Z = \frac{V_{\text{real}}}{V_{\text{ideal}}}$

$$V_{\text{real}} < V_{\text{ideal}} \quad \therefore Z < 1$$

For  $Z < 1$ , attractive forces are dominant.

Q.6 A compound is formed by cation C and anion A. The anions form hexagonal close packed (hcp) lattice and the cations occupy 75% of octahedral voids. The formula of the compound is:

- (1)  $C_3A_4$                       (2)  $C_4A_3$                       (3)  $C_2A_3$                       (4)  $C_3A_2$

Ans. (1)

Sol.  $A \longrightarrow \text{hcp} \longrightarrow 6$

$$C \longrightarrow 75\% \text{ of OHV} \longrightarrow \frac{75}{100} \times 6 = \frac{9}{2}$$

$$\therefore C_{\frac{9}{2}}A_6$$

Simplest formula =  $C_3A_4$

Q.7 If the rate constant for a first order reaction is k, the time (t) required for the completion of 99% of the reaction is given by:

- (1)  $t = 4.606/k$                       (2)  $t = 2.303/k$                       (3)  $t = 0.693/k$                       (4)  $t = 6.909/k$

Ans. (1)

Sol.  $K = \frac{2.303}{t} \log \left( \frac{a_0}{a_0 - x} \right)$

$$\therefore t_{99\%} = \frac{2.303}{K} \log \left( \frac{100}{1} \right)$$

$$t_{99\%} = \frac{2.303}{K} \times 2$$

$$t_{99\%} = \frac{4.606}{K}$$

Q.8 The **correct** order of the basic strength of methyl substituted amines in aqueous solution is :

- (1)  $(CH_3)_3N > (CH_3)_2NH > CH_3NH_2$                       (2)  $CH_3NH_2 > (CH_3)_2NH > (CH_3)_3N$   
 (3)  $(CH_3)_2NH > CH_3NH_2 > (CH_3)_3N$                       (4)  $(CH_3)_3N > CH_3NH_2 > (CH_3)_2NH$

Ans. (3)

So.  $(CH_3)_2NH > CH_3NH_2 > (CH_3)_3N$

Q.9 For a cell involving one electron  $E_{\text{cell}}^- = 0.59\text{V}$  at 298 K, the equilibrium constant for the cell reaction is :

$$\left[ \text{Given that } \frac{2.303RT}{F} = 0.059\text{V at } T = 298\text{K} \right]$$

- (1)  $1.0 \times 10^{10}$       (2)  $1.0 \times 10^{30}$       (3)  $1.0 \times 10^2$       (4)  $1.0 \times 10^5$

**Ans. (1)**

Sol.  $n = 1$ ;  $E^\circ = 0.59\text{V}$

$$E_{\text{cell}}^\circ = \frac{0.0591}{n} \log K_c$$

$$0.59 = \frac{0.0591}{1} \log K_c$$

$$\log K_c = \frac{0.59}{0.0591} = 10$$

$$\therefore K_c = 1 \times 10^{10}$$

Q.10 Which of the following is **incorrect** statement ?

- (1)  $\text{GeX}_4$  ( $X = \text{F, Cl, Br, I}$ ) is more stable than  $\text{GeX}_2$   
 (2)  $\text{SnF}_4$  is ionic in nature  
 (3)  $\text{PbF}_4$  is covalent in nature  
 (4)  $\text{SiCl}_4$  is easily hydrolysed

**Ans. (3)**

Sol.  $\text{PbF}_4$  is ionic in nature

Q.11 Match the Xenon compounds in **Column – I** with its structure is **Column – II** and assign the **correct** code:

	Column – I		Column-II
(a)	$\text{XeF}_4$	(i)	pyramidal
(b)	$\text{XeF}_6$	(ii)	square planar
(c)	$\text{XeOF}_4$	(iii)	distorted octahedral
(d)	$\text{XeO}_3$	(iv)	square pyramidal

Code:

(a)	(b)	(c)	(d)
(1)	(ii)	(iii)	(i) (iv)
(2)	(iii)	(iv)	(i) (ii)
(3)	(i)	(ii)	(iii) (iv)
(4)	(ii)	(iii)	(iv) (i)

Ans. (4)

Sol. VSEPR theory

XeF <sub>4</sub>	AB <sub>4</sub> L <sub>2</sub>	Square planar
XeF <sub>6</sub>	AB <sub>6</sub> L <sub>1</sub>	Distorted octahedral
XeOF <sub>4</sub>	AB <sub>5</sub> L <sub>1</sub>	Square pyramidal
XeO <sub>3</sub>	AB <sub>3</sub> L <sub>1</sub>	Pyramidal

Q.12 The number of moles of hydrogen molecules required to produce 20 moles of ammonia through Haber's process is :

- (1) 30                      (2) 40                      (3) 10                      (4) 20

Ans. (1)

Sol.  $N_2 + 3H_2 \longrightarrow 2NH_3$ 

Stoichiometric Ratio    1        3        2

∴ To form 20 mol of NH<sub>3</sub>, 30 mol of H<sub>2</sub> are required.

Q.13 The manganate and permanganate ions are tetrahedral due to :

- (1) The  $\pi$ -bonding involves overlap of p-orbitals of oxygen with p-orbitals of manganese  
 (2) The  $\pi$ -bonding involves overlap of d-orbitals of oxygen with d-orbitals of manganese  
 (3) The  $\pi$ -bonding involves overlap of p-orbitals of oxygen with d-orbitals of manganese  
 (4) There is no  $\pi$ -bonding

Ans. (3)

Sol.  $\pi$ -bonding involves overlap of p-orbital of oxygen with d-orbitals of manganese.

Q.14 Enzymes that utilize ATP in phosphate transfer require an alkaline earth metal (M) as the cofactor M is:

- (1) Ca                      (2) Sr                      (3) Be                      (4) Mg

Ans. (4)

Sol. All enzymes that utilise ATP in phosphate transfer require magnesium as the cofactor.

Q.15 What is the **correct** electronic configuration of the central atom in  $K_4[Fe(CN)_6]$  based on crystal field theory?

- (1)  $e^3 t_2^3$                       (2)  $e^4 t_2^2$                       (3)  $t_{2g}^4 e_g^2$                       (4)  $t_{2g}^6 e_g^0$

Ans. (4)

Sol.  $K_4 [Fe(CN)_6]$   
 $Fe^{2+} = 3d^6$

As  $CN^-$  is a strong field ligand

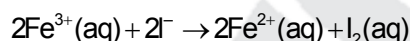
Hence  $t_{2g}^6 e_g^0$

Q.16 Among the following, the one that is **not** a green house gas is :

- (1) ozone                      (2) sulphur dioxide                      (3) nitrous oxide                      (4) methane

Ans. (2)

Q.17 For the cell reaction



$$E_{cell} = 0.24V \text{ at } 298 \text{ K.}$$

The standard Gibbs energy ( $\Delta_r G^\ominus$ ) of the cell reaction is :

[Given that Faraday constant  $F = 96500 \text{ C mol}^{-1}$ ]

- (1)  $46.32 \text{ kJ mol}^{-1}$                       (2)  $23.16 \text{ kJ mol}^{-1}$                       (3)  $-46.32 \text{ kJ mol}^{-1}$                       (4)  $-23.16 \text{ kJ mol}^{-1}$

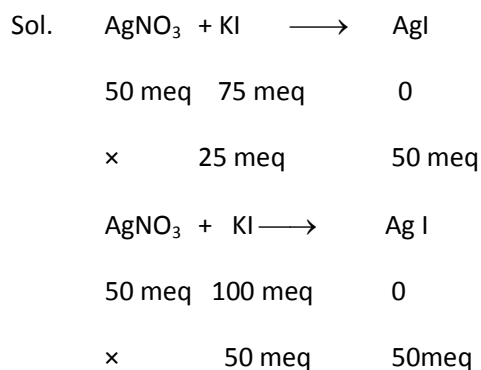
Ans. (3)

Sol.  $\Delta G^\ominus = -nFE^\ominus$   
 $= -2 \times 96500 \times 0.24$   
 $= -46.32 \text{ kJ mol}^{-1}$

Q.18 Which mixture of the solutions will lead to the formation of negatively charged colloidal  $[AgI]^-$  sol. ?

- (1) 50 mL of 2 M  $AgNO_3$  + 50 mL of 1.5 M KI  
 (2) 50 mL of 0.1 M  $AgNO_3$  + 50 mL of 0.1 M KI  
 (3) 50 mL of 1 M  $AgNO_3$  + 50 mL of 1.5 M KI  
 (4) 50 mL of 1 M  $AgNO_3$  + 50 mL of 2 M KI

Ans. (3, 4)



Q.19 Which one is malachite from the following?

- (1)  $\text{Fe}_3\text{O}_4$                     (2)  $\text{CuCO}_3 \cdot \text{Cu(OH)}_2$             (3)  $\text{CuFeS}_2$                     (4)  $\text{Cu(OH)}_2$

**Ans. (2)**

Sol.  $\text{CuCO}_3 \cdot \text{Cu(OH)}_2$  is malachite

Q.20 Among the following , the narrow spectrum antibiotic is :

- (1) amoxicillin                    (2) chloramphenicol            (3) penicillin G                    (4) ampicillin

**Ans. (3)**

Sol. Penicillin G

Q.21 Which of the following is an amphoteric hydroxide?

- (1)  $\text{Mg(OH)}_2$                     (2)  $\text{Be(OH)}_2$                     (3)  $\text{Sr(OH)}_2$                     (4)  $\text{Ca(OH)}_2$

**Ans. (2)**

Sol.  $\text{Be(OH)}_2$

Q.22 The non-essential amino acid among the following is :

- (1) alanine                    (2) lysine                    (3) valine                    (4) leucine

**Ans. (1)**

Sol. Alanine

Q.23 Which of the following diatomic molecular species has only  $\sigma$  bonds according to Molecular Orbital Theory ?

- (1)  $C_2$                       (2)  $Be_2$                       (3)  $O_2$                       (4)  $N_2$

**Ans. (1)**

Sol.  $C_2$  has 2  $\pi$ -bonds according to molecular orbital theory

Q.24 The biodegradable polymer is-

- (1) nylon-6                      (2) Buna-S                      (3) nylon-6,6                      (4) nylon 2-nylon 6

**Ans. (4)**

Q.25 In which case change in entropy is negative ?

- (1) Sublimation of solid to gas  
 (2)  $2H(g) \rightarrow H_2(g)$   
 (3) Evaporation of water  
 (4) Expansion of a gas at constant temperature

**Ans. (2)**

Sol. In reaction  $2 H(g) \rightarrow H_2(g)$  number of particles decreases in forward reaction

$\therefore$  Entropy decreases

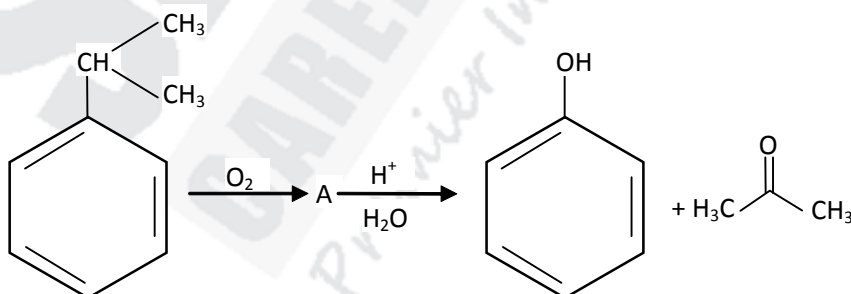
Q.26 The mixture that forms maximum boiling azeotrope is:

- (1) Acetone + Carbon disulphide  
 (2) Heptane + Octane  
 (3) Water + Nitric Acid  
 (4) Ethanol + Water

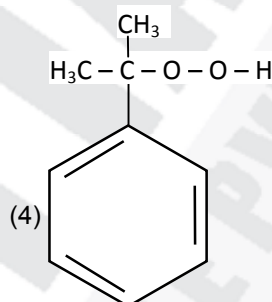
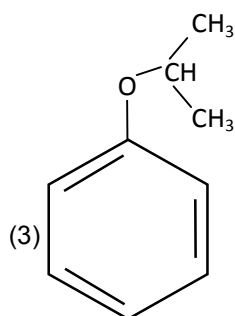
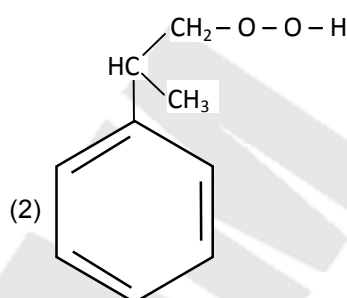
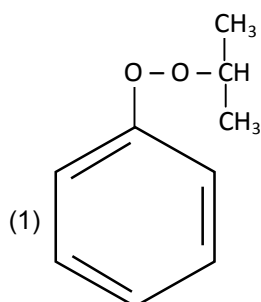
**Ans. (3)**

Sol.  $H_2O + HNO_3$  forms maximum boiling azeotrope

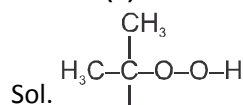
Q.27 The structure of intermediate A in the following reaction, is:







Ans. (4)



Intermediate

Q.28 Match the following:

- |                      |                                   |
|----------------------|-----------------------------------|
| (a) Pure nitrogen    | (i) Chlorine                      |
| (b) Haber process    | (ii) Sulphuric acid               |
| (c) Contact process  | (iii) Ammonia                     |
| (d) Deacon's process | (iv) Sodium azide or Barium azide |

Which of the following is the correct option ?

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

Ans. (2)

Q.29 For the chemical reaction  
 $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightleftharpoons 2\text{NH}_3(\text{g})$

The correct option is :

(1)  $-\frac{d[\text{N}_2]}{dt} = \frac{1}{2} \frac{d[\text{NH}_3]}{dt}$

(2)  $3 \frac{d[\text{H}_2]}{dt} = 2 \frac{d[\text{NH}_3]}{dt}$

(3)  $-\frac{1}{3} \frac{d[\text{H}_2]}{dt} = -\frac{1}{2} \frac{d[\text{NH}_3]}{dt}$

(4)  $-\frac{d[\text{N}_2]}{dt} = 2 \frac{d[\text{NH}_3]}{dt}$

Ans. (1)

Sol.  $-\frac{d\text{N}_2}{dt} = -\frac{1}{3} \frac{d\text{H}_2}{dt} = \frac{1}{2} \frac{d\text{NH}_3}{dt}$

$-\frac{d\text{N}_2}{dt} = \frac{1}{2} \frac{d\text{NH}_3}{dt}$

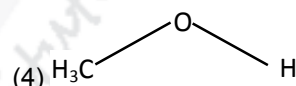
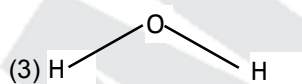
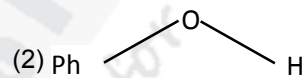
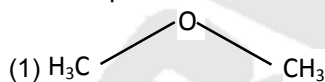
Q.30 Which will make basic buffer ?

- (1) 100 mL of 0.1 M HCl + 200 mL of 0.1 M  $\text{NH}_4\text{OH}$   
 (2) 100 mL of 0.1 M HCl + 100 mL of 0.1 M NaOH  
 (3) 50 mL of 0.1 M NaOH + 25 mL of 0.1 M  $\text{CH}_3\text{COOH}$   
 (4) 100 mL of 0.1 M  $\text{CH}_3\text{COOH}$  + 100 mL of 0.1 M NaOH

Ans. (1)

Sol.  $\text{NH}_4\text{OH} + \text{HCl} \rightarrow \text{NH}_4\text{Cl} + \text{H}_2\text{O}$   
 20 meq    10 meq        0        0  
 10 meq    0        10 meq    10 meq  
 $\therefore \text{NH}_4\text{OH} + \text{NH}_4\text{Cl}$  is a basic buffer.

Q.31 The compound that is most difficult to protonate is



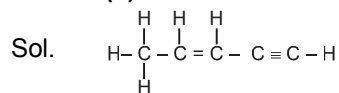
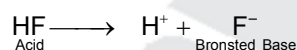
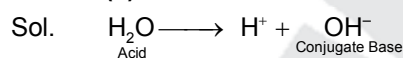
Ans. (2)

Sol.  $\text{Ph}-\overset{\text{O}}{\text{C}}-\text{H}$   
 P is involved in resonance

Q.32 Which of the following reactions are disproportionation reaction ?

- (a)  $2\text{Cu}^+ \rightarrow \text{Cu}^{2+} + \text{Cu}^0$   
 (b)  $3\text{MnO}_4^{2-} + 4\text{H}^+ \rightarrow 2\text{MnO}_4^- + \text{MnO}_2 + 2\text{H}_2\text{O}$   
 (c)  $2\text{KMnO}_4 \xrightarrow{\Delta} \text{K}_2\text{MnO}_4 + \text{MnO}_2 + \text{O}_2$   
 (d)  $2\text{MnO}_4^- + 3\text{Mn}^{2+} + 2\text{H}_2\text{O} \rightarrow 5\text{MnO}_2 + 4\text{H}^+$



**Ans. (3)**No. of  $\sigma$  bonds = 10No. of  $\pi$  bonds = 3Q.36 Which is the **correct** thermal stability order for  $\text{H}_2\text{E}$  (E = O, S, Se, Te and Po) ?(1)  $\text{H}_2\text{Po} < \text{H}_2\text{Te} < \text{H}_2\text{Se} < \text{H}_2\text{S} < \text{H}_2\text{O}$ (2)  $\text{H}_2\text{Se} < \text{H}_2\text{Te} < \text{H}_2\text{Po} < \text{H}_2\text{O} < \text{H}_2\text{S}$ (3)  $\text{H}_2\text{S} < \text{H}_2\text{O} < \text{H}_2\text{Se} < \text{H}_2\text{Te} < \text{H}_2\text{Po}$ (4)  $\text{H}_2\text{O} < \text{H}_2\text{S} < \text{H}_2\text{Se} < \text{H}_2\text{Te} < \text{H}_2\text{Po}$ **Ans. (1)**Sol.  $\text{H}_2\text{Po} < \text{H}_2\text{Te} < \text{H}_2\text{Se} < \text{H}_2\text{S} < \text{H}_2\text{O}$  $\text{H}_2\text{O}$  has maximum bond energy.Q.37 Conjugate base for Brönsted acids  $\text{H}_2\text{O}$  and  $\text{HF}$  are :(1)  $\text{OH}^-$  and  $\text{F}^-$ , respectively(2)  $\text{H}_3\text{O}^+$  and  $\text{H}_2\text{F}^+$ , respectively(3)  $\text{OH}^-$  and  $\text{H}_2\text{F}^+$ , respectively(4)  $\text{H}_3\text{O}^+$  and  $\text{F}^-$ , respectively**Ans. (1)**

Q.38 Which of the following series of transitions in the spectrum of hydrogen atom falls in visible region ?

(1) Paschen series

(2) Brackett series

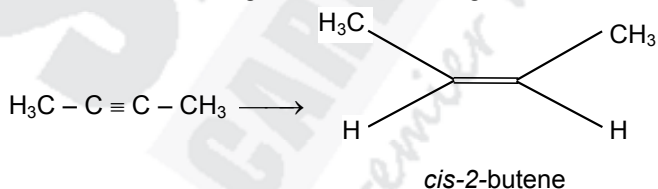
(3) Lyman series

(4) Balmer series

**Ans. (4)**

Sol. Balmer series

Q.39 The most suitable reagent for the following conversion is :

(1)  $\text{Zn}/\text{HCl}$ (2)  $\text{Hg}^{2+}/\text{H}^+$ ,  $\text{H}_2\text{O}$ (3)  $\text{Na}/\text{liquid NH}_3$ (4)  $\text{H}_2$ ,  $\text{Pd}/\text{C}$ , quinoline

Ans. (4)

Sol.  $H_2/Pd/C$  quinoline (The reaction involves syn addition)

Q.40 For the second period elements the **correct** increasing order of first ionization enthalpy is :

- (1)  $Li < B < Be < C < N < O < F < Ne$   
 (2)  $Li < Be < B < C < O < N < F < Ne$   
 (3)  $Li < Be < B < C < N < O < F < Ne$   
 (4)  $Li < B < Be < C < O < N < F < Ne$

Ans. (4)

Sol.  $Li < B < Be < C < O < N < F < Ne$

Q.41 pH of a saturated solution of  $Ca(OH)_2$  is 9. The solubility product ( $K_{sp}$ ) of  $Ca(OH)_2$  is :

- (1)  $0.125 \times 10^{-15}$       (2)  $0.5 \times 10^{-10}$       (3)  $0.5 \times 10^{-15}$       (4)  $0.25 \times 10^{-10}$

Ans. (3)

Sol. If  $p^H = 9$  then  $p^{OH} = 5$

$$\therefore [OH^-] = 10^{-5} = 25$$

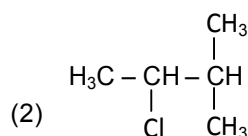
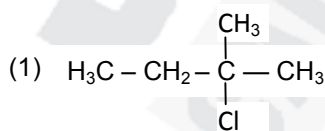
So  $S = \frac{1}{2} \times 10^{-5}$

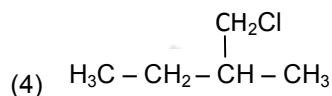
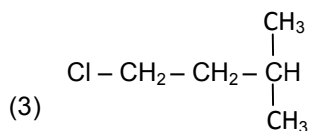
$$K_{sp} = 4S^3$$

$$= 4 \times \left(\frac{1}{2} \times 10^{-5}\right)^3$$

$$K_{sp} = 0.5 \times 10^{-15}$$

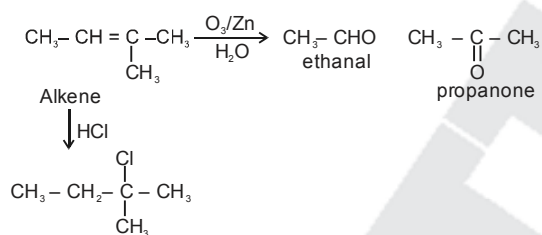
Q.42 An alkene "A" on reaction with  $O_3$  and  $Zn - H_2O$  gives propanone and ethanal in equimolar ratio. Addition of  $HCl$  to alkene "A" gives "B" as the major product. The structure of product "B" is :





**Ans. (1)**

Sol.



Q.43 The method used to remove temporary hardness of water is :

- (1) Ion-exchange method
- (2) Synthetic resins method
- (3) Calgon's method
- (4) Clark's method

**Ans. (4)**

Sol. Clark's method is used to remove temporary hardness.

Q.44 For an ideal solution, the **correct** option is :

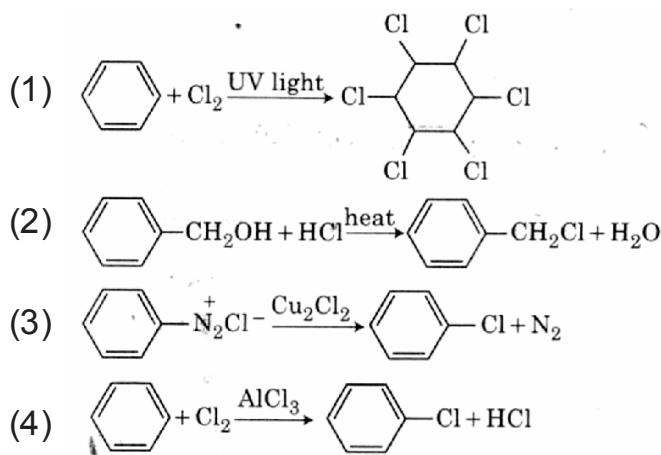
- (1)  $D_{\text{mix}} H = 0$  at constant T and P
- (2)  $D_{\text{mix}} G = 0$  at constant T and P
- (3)  $D_{\text{mix}} S = 0$  at constant T and P
- (4)  $D_{\text{mix}} V \neq 0$  at constant T and P

**Ans. (1)**

Sol. For ideal solution, enthalpy of mixing is zero.

$$\therefore \Delta H_{\text{mix}} = 0 \text{ at constant T \& P}$$

Q.45 Among the following, the reaction that proceeds through an electrophilic substitution, is :



Ans (4)  
Sol. (1) FRAR (2) S<sub>N</sub><sup>1</sup> (3) NSR (4) ESR

## ADMISSION OPEN Session 2019-20

### PRE-NURTURE

#### SUDHRADH

VII to VIII Moving Students  
Phase-2 **13<sup>th</sup> May 2019**  
Phase-3 **24<sup>th</sup> June 2019**  
(1 Yr. Classroom)  
Medium: English

#### SAKSHAM

VIII to IX Moving Students  
Phase-2 **13<sup>th</sup> May 2019**  
Phase-3 **24<sup>th</sup> June 2019**  
(1 Yr. Classroom)  
Medium: English

#### DAKSH

IX to X Moving Students  
Phase-2 **13<sup>th</sup> May 2019**  
Phase-3 **24<sup>th</sup> June 2019**  
(1 Yr. Classroom)  
Medium: English

### PRE-MEDICAL

#### NURTURE

X to XI Moving Students  
Phase-3 **20<sup>th</sup> May 2019**  
Phase-4 **10<sup>th</sup> June 2019**  
(2 Yr. Classroom)  
Medium: English

#### ENTHUSE

XI to XII Moving Students  
Phase-2 **15<sup>th</sup> May 2019**  
(1 Yr. Classroom)  
Medium: English

#### ACHIEVER

XII Passout Students  
Phase-1 **13<sup>th</sup> May 2019**  
Phase-2 **3<sup>rd</sup> June 2019**  
Phase-3 **17<sup>th</sup> June 2019**  
(1 Yr. Classroom)  
Medium: English & Hindi