NEET 2019

Chemistry

1. 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

   A. -30 J
   B. 5 kJ
   C. 25 kJ
   D. 30 J

   Answer (A)

   Solution:

   $W_{irr} = - P_{ext} \Delta V$

   $= - 2 \text{ bar} \times (0.25 - 0.1) \text{ L}$

   $= - 2 \times 0.15 \text{ L-bar} = - 0.30 \text{ L-bar} = - 0.30 \times 100 \text{ J}$

   $= - 30 \text{ J}$

2. 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) C2A3 (
   (2) C3A2
   (3) C3A4
   (4) C4A3

   Answer (3)

   Sol.

   Anions(A) are in hcp, so number of anions (A) = 6

   Cations(C) are in 75% O.V., so number of cations (C)

= 6 × 3/4 = 18/ 4 = 9 /2

So formula of compound will be

$C_9A_6 \Rightarrow C_9A_{12} \Rightarrow C_3A_4$

3. pH of a saturated solution of Ca(OH)2 is 9. The solubility product (Ksp) of Ca(OH)2 is:
(1) 0.5×10^{-15}
(2) 0.25×10^{-10}
(3) 0.125×10^{-15}
(4) 0.5×10^{-10}
Answer (1)
Solution:

$$Ca(OH)_2 \rightleftharpoons Ca^{2+} + 2OH^-$$

pH = 9 Hence pOH = 14 – 9 = 5

$[OH^-] = 10^{-5}$ M

$$\text{Hence } [Ca^{2+}] = \frac{10^{-5}}{2}$$

$$\text{Thus } K_{sp} = [Ca^{2+}][OH^-]^2$$

$$= \left(\frac{10^{-5}}{2}\right)(10^{-5})^2$$

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

4. The number of moles of hydrogen molecules required to produce 20 moles of ammonia through Haber's process is :
(1) 10
(2) 20
(3) 30
(4) 40

Answer (3)
Sol.
Haber's process

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

20 moles need to be produced 2 moles of NH3 $\rightarrow$ 3 moles of H_2
Hence 20 moles of $NH_3 \rightarrow =$ 3x20/2 = 30 moles of H_2

5. For an ideal solution, the correct option is :
   (1) Δmix S = 0 at constant T and P
   (2) Δmix V $\neq$ 0 at constant T and P
   (3) Δmix H = 0 at constant T and P
   4) Δmix G = 0 at constant T and P
   Answer (3)
   Sol.
   For ideal solution,
   $\Delta_{mix}H = 0$
   $\Delta_{mix}S > 0$
   $\Delta_{mix}G < 0$
   $\Delta_{mix}V = 0$

6. For a cell involving one electron E°cell = 0.59 V at 298 K, the equilibrium constant for the cell reaction is :
   (1) 1.0×10^2
   (2) 1.0×10^5
   (3) 1.0×10^{10}
   (4) 1.0×10^{30}
   Ans (3)
   Solution:

$$E_{cell} = E°_{cell} - \frac{0.059}{n}\log Q \qquad ...(i)$$

(At equilibrium, $Q = K_{eq}$ and $E_{cell} = 0$)

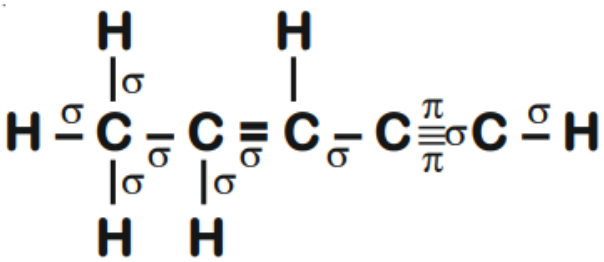
$$0 = E°_{cell} - \frac{0.059}{1}\log K_{eq} \text{ (from equation (i))}$$

$$\log K_{eq} = \frac{E°_{cell}}{0.059} = \frac{0.59}{0.059} = 10$$

$$K_{eq} = 10^{10} = 1 \times 10^{10}$$

7. Among the following, the one that is not a green house gas is
   (1) Nitrous oxide
   (2) Methane
   (3) Ozone
   (4) Sulphur dioxide
   Answer (4)
   Sol. Fact SO_2 (g) is not a greenhouse gas.

8. The number of sigma (σ) and pi (π) bonds in pent-2-en-4-yne is
   (1) 10σ bonds and 3π bonds
   (2) 8σ bonds and 5π bonds
   (3) 11σ bonds and 2π bonds
   (4) 13σ bonds and no π bonds
   Answer (1)
   Sol.



   Number of σ bonds = 10 and number of π bonds = 3

9. Which of the following diatomic molecular species has only π bonds according to Molecular Orbital Theory?
   (1) O_2
   (2) N_2
   (3) C_2
   4) Be_2
   Answer (3)
   Sol.

MO configuration C2 is: $\sigma 1s^2$, $\sigma^* 1s^2$, $\sigma 2s^2$, $\sigma^* 2s^2$, $\pi 2p_x^2 = \pi 2p_y^2$

10. Which of the following reactions are disproportionation reaction?

(a) $2Cu^{+} \longrightarrow Cu^{2+} + Cu^{0}$

(b) $3MnO_4^{2-} + 4H^{+} \longrightarrow 2MnO_4^{-} + MnO_2 + 2H_2O$

(c) $2KMnO_4 \xrightarrow{\Delta} K_2MnO_4 + MnO_2 + O_2$

(d) $2MnO_4^{-} + 3Mn^{2+} + 2H_2O \longrightarrow 5MnO_2 + 4H^{\oplus}$

Select the correct option from the following

(1) (a) and (b) only

(2) (a), (b) and (c)

(3) (a), (c) and (d)

(4) (a) and (d) only

Answer (1)

(a) $\overset{+1}{2Cu}^{+1} \longrightarrow$

$\overset{+2}{Cu}^{2(+)} + \overset{0}{Cu^0}\}$ Disproportionation

(b) $3\overset{+6}{MnO}_4^{2(-)} + 4H^{(+)} \longrightarrow$

$2\overset{+7}{Mn}O_4^{-} + \overset{+4}{MnO_2} + 2H_2O\}$ Disproportionation

(c) $2\overset{+7}{K}\overset{-2}{MnO_4} \xrightarrow{\Delta} K_2\overset{+6}{Mn}O_4 +$

$\overset{+4}{MnO_2} + \overset{0}{O_2}\}$ $\therefore$ Not a disproportionation

(d) $2\overset{+7}{MnO}_4^{-} + 3\overset{+2}{Mn}^{2(+)} + 2H_2O \longrightarrow$

$\overset{+4}{5MnO_2} + 4H^{\oplus}\}$

11. Among the following, the narrow spectrum antibiotic is :

(1) Penicillin G

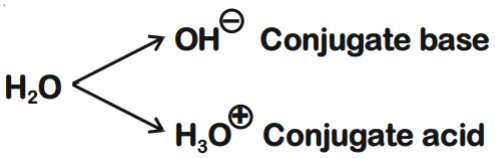
(2) Ampicillin
(3) Amoxycillin
(4) Chloramphenicol
Answer (1)
Sol.
Penicillin G

12. The correct order of the basic strength of methyl substituted amines in aqueous solution is :
(1) $(CH_3)_2NH > CH_3NH_2 > (CH_3)_3N$
(2) $(CH_3)_3N > CH_3NH_2 > (CH_3)_2NH$
(3) $(CH_3)_3N > (CH_3)_2NH > CH_3NH_2$
(4) $CH_3NH_2 > (CH_3)_2NH > (CH_3)_3N$
Answer (1)
Sol.
In aqueous solution, electron donating inductive effect, solvation effect (H-bonding) and steric hindrance all together affect basic strength of substituted amines
Basic character :
$(CH_3)_2NH > CH_3NH_2 > (CH_3)_3N$
2° 1° 3°

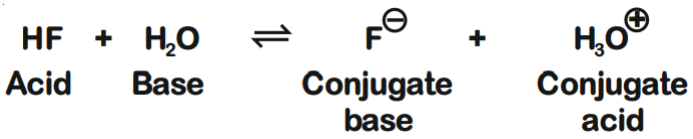
13. Which mixture of the solutions will lead to the formation of negatively charged colloidal [AgI]I^- sol ?
(1) 50 mL of 1 M $AgNO_3$ + 50 mL of 1.5 M KI
(2) 50 mL of 1 M $AgNO_3$ + 50 mL of 2 M KI
(3) 50 mL of 2 M $AgNO_3$ + 50 mL of 1.5 M KI
(4) 50 mL of 0.1 M $AgNO_3$ + 50 mL of 0.1 M KI
Answer (2)
Sol.
Generally charge present on the colloid is due to adsorption of common ion from dispersion medium.
Millimole of KI is maximum in option (2) (50 × 2 = 100) so

act as solvent and anion I– is adsorbed by the colloid AgI formed

14. Conjugate base for Bronsted acids H2O and HF are :
(1) OH^- and H_2F^+, respectively
(2) H_3O^+ and F^-, respectively
(3) OH^- and F^-, respectively
(4) H_3O^+ and H_2F^+, respectively
Answer (3)
Sol.
H_2O



HF on loss of H^+ ion becomes F^- is the conjugate base of HF
Example :



15. Which will make basic buffer?
(1) 50 mL of 0.1 M NaOH + 25 mL of 0.1 M CH_3COOH
(2) 100 mL of 0.1 M CH_3COOH + 100 mL of 0.1 M NaOH
(3) 100 mL of 0.1 M HCl + 200 mL of 0.1 M NH_4OH
(4) 100 mL of 0.1 M HCl + 100 mL of 0.1 M NaOH

Answer (3)

(1)

	CH_3COOH	+ $NaOH$	→ CH_3COONa + H_2O
Before	25 mL × 0.1 M = 2.5 mmol	50 mL × 0.1 M = 5 mmol	0
After	0	2.5 mmol	2.5 mmol

This is basic solution due to NaOH.

This is not basic buffer.

(2)

	CH_3COOH	+ $NaOH$	→ CH_3COONa + H_2O
Before	100 mL × 0.1 M = 10 mmol	100 mL × 0.1 M = 10 mmol	0
After	0	0	10 mmol

Hydrolysis of salt takes place.

This is not basic buffer.

(3)

	HCl	+ NH_4OH	→ NH_4Cl + H_2O
Before	100 mL × 0.1 M = 10 mmol	200 mL × 0.1 M = 20 mmol	0
After	0	10 mmol	10 mmol

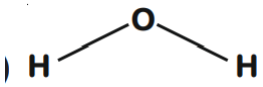
This is basic buffer

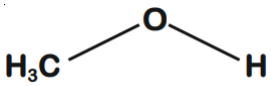
(4)

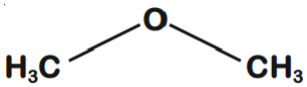
	HCl	+ $NaOH$	→ $NaCl$ + H_2O
Before	100 mL × 0.1 M = 10 mmol	100 mL × 0.1 M = 10 mmol	0
After	0	0	10 mmol

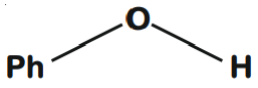
⇒ Neutral solution

16. The compound that is most difficult to protonate is :

(1) 

(2) 

(3) 

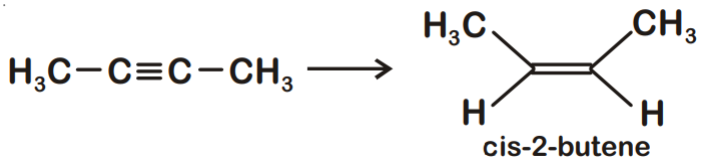
(4) 

Answer (4)

Sol.

17. Due to involvement of lone pair of electrons in resonance in phenol, it will have positive charge (partial), hence incoming proton will not be able to attack easily.

The most suitable reagent for the following conversion, is :



(1) Na/liquid NH_3

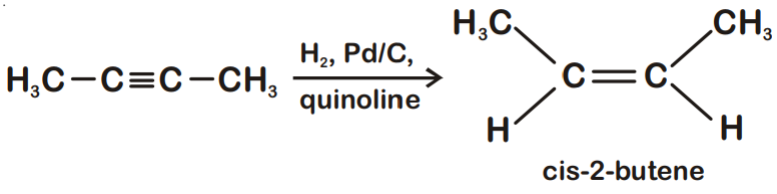
(2) H_2, Pd/C, quinoline

(3) Zn/HCl

(4) Hg^{2+}/H^+, H_2O

Answer (2)

Sol.



18. Which of the following species is not stable?

(1) $[SiF_6]^{2-}$

(2) $[GeCl_6]^{2-}$

(3) $[Sn(OH)_6]^{2-}$

(4) $[SiCl_6]^{2-}$

Answer (4)

Sol.

Due to presence of d-orbital in Si, Ge and Sn they form species like $[SiF_6]^{2-}$, $[GeCl_6]^{2-}$, $Sn(OH)_6]^{2-}$

$[SiCl_6]^{2-}$does not exist because six large chloride ions cannot be accommodated around Si^{4+} due to limitation of its size.

19. Which of the following is an amphoteric

hydroxide?

(1) $Sr(OH)_2$

(2) $Ca(OH)_2$

(3) $Mg(OH)_2$

(4) $Be(OH)_2$

Answer (4)

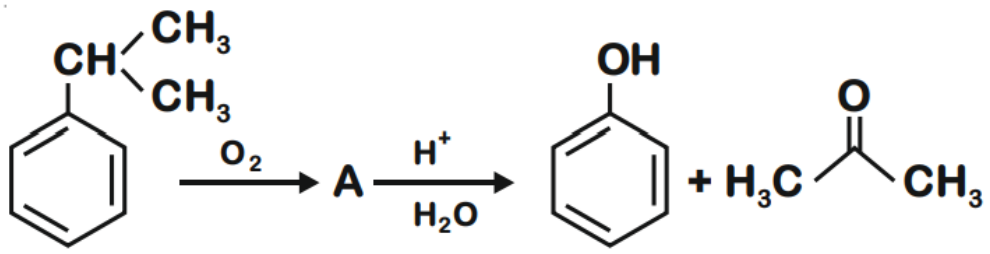
Sol. $Be(OH)_2$ amphoteric in nature, since it can

react both with acid and base

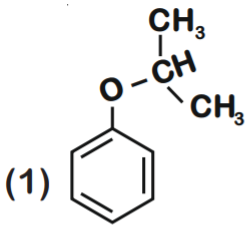
$Be(OH)_2 + 2HCl \rightarrow BeCl_2 + 2H_2O$

$Be(OH)_2 + 2NaOH \rightarrow Na_2 [Be(OH)_4]$

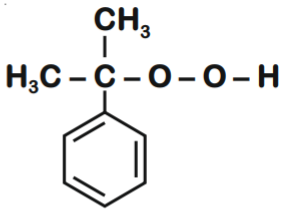
20. The structure of intermediate A in the following reaction, is



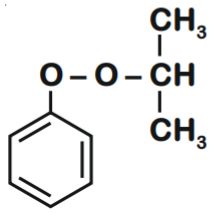
(1)



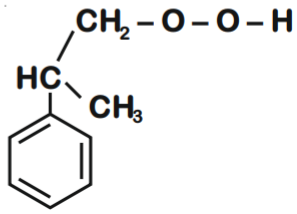
(2)



(3)

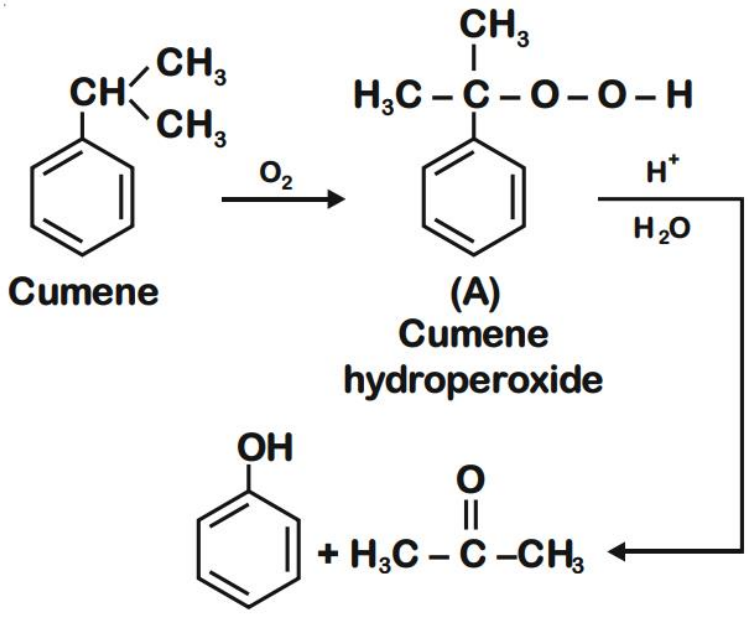


(4)



Ans (3)

Solution:



21. The manganate and permanganate ions are tetrahedral, due to :

(1) The π-bonding involves overlap of p-orbitals of oxygen with d-orbitals of manganese

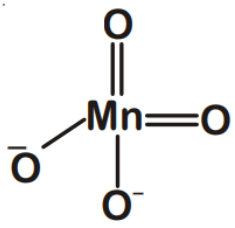
(2) There is no π -bonding

(3) The π -bonding involves overlap of p-orbitals of oxygen with p-orbitals of manganese

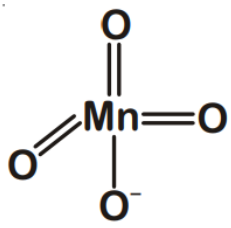
(4) The π -bonding involves overlap of d-orbitals of oxygen with d-orbitals of manganese

Answer (1)

Sol.

. • **Manganate (MnO_4^{2-}) :** 

⇒ **π-bonds are of dπ–pπ type**

• **Permanganate (MnO_4^-) :** 

⇒ **π-bonds are of dπ–pπ type**

22. For the second period elements the correct

increasing order of first ionisation enthalpy is:

(1) Li < Be < B < C < N < O < F < Ne

(2) Li < B < Be < C < O < N < F < Ne

(3) Li < B < Be < C < N < O < F < Ne

(4) Li < Be < B < C < O < N < F < Ne

Answer (2)

Sol.

'Be' and 'N' have comparatively more stable valence sub-shell than 'B' and 'O'.

Correct order of first ionisation enthalpy

is: Li < B < Be < C < O < N < F < Ne

23. 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 = 0.693/k

(2) t = 6.909/k

(3) t = 4.606/k

(4) t = 2.303/k

Answer (3)

Sol.

First order rate constant is given as,

$$k = \frac{2.303}{t}\log\frac{[A_0]}{[A]_t}$$

99% completed reaction,

$$k = \frac{2.303}{t}\log\frac{100}{1}$$

$$= \frac{2.303}{t}\log 10^2$$

$$k = \frac{2.303}{t} \times 2\log 10$$

$$t = \frac{2.303}{k} \times 2 = \frac{4.606}{k}$$

$$t = \frac{4.606}{k}$$

24. Identify the incorrect statement related to PCl5 from the following:

(1) Three equatorial P–Cl bonds make an angle of 120° with each other

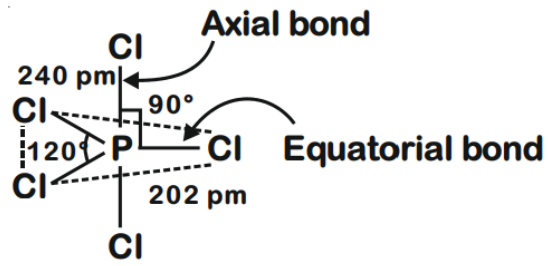
(2) Two axial P–Cl bonds make an angle of 180° with each other

(3) Axial P–Cl bonds are longer than equatorial P–Cl bonds

(4) PCl_5 molecule is non-reactive

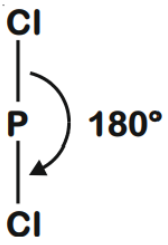
Answer: (4)

Sol.



(1) True

(2) True



(3) True

Axial bond : 240 pm

Equatorial bond : 202 pm

(4) False

Due to longer and hence weaker axial bonds, PCl_5 is a reactive molecule.

25. 4d, 5p, 5f and 6p orbitals are arranged in the order of decreasing energy. The correct option is

(1) 5f > 6p > 5p > 4d

(2) 6p > 5f > 5p > 4d

(3) 6p > 5f > 4d > 5p

(4) 5f > 6p > 4d > 5p

Answer (1)

Sol.

(n + l) values for, 4d = 4 + 2 = 6

5p = 5 + 1 = 6

5f = 5 + 3 = 8

6p = 6 + 1 = 7

Correct order of energy would be

$$5f > 6p > 5p > 4d$$

26. The biodegradable polymer is:
    1) Nylon-6,6
    2) Nylon-2-Nylon 6
    3) Nylon-6
    4) Buna-S

Answer (2)

Sol. Nylon-2-Nylon 6

27. Match the Xenon compounds in Column-I with its structure in Column-II and assign the correct code:

Column-I	Column-II
(a) XeF_4	(i) Pyramidal
(b) XeF_6	(ii) Square planar
(c) $XeOF_4$	(iii)Distorted octahedral
(d) XeO_3	(iv) Square pyramidal

Code:

(a) (b) (c) (d)

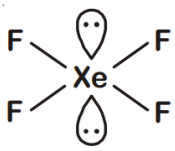
(1) (i) (ii) (iii) (iv)

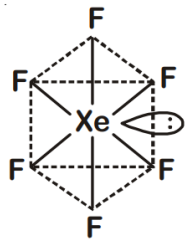
(2) (ii) (iii) (iv) (i)

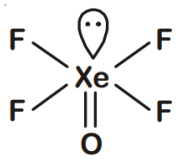
(3) (ii) (iii) (i) (iv)

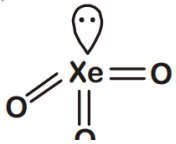
(4) (iii) (iv) (i) (ii)

Answer (2)

(a) XeF_4 :  ⇒ Square planar

(b) XeF_6 :  ⇒ Distorted octahedral

(c) $XeOF_4$:  ⇒ Square pyramidal

(d) XeO_3 :  ⇒ Pyramidal

28. Which is the correct thermal stability order for H_2E (E = O, S, Se, Te and Po)?

(1) $H_2S < H_2O < H_2Se < H_2Te < H_2Po$

(2) $H_2O < H_2S < H_2Se < H_2Te < H_2Po$

(3) $H_2Po < H_2Te < H_2Se < H_2S < H_2O$

(4) $H_2Se < H_2Te < H_2Po < H_2O < H_2S$

Answer (3)

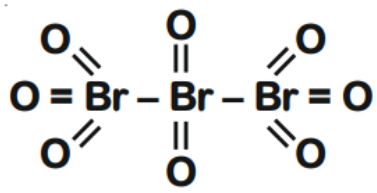
Sol.

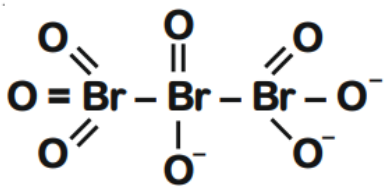
On going down the group thermal stability order for H_2E decreases because H–E bond energy decreases

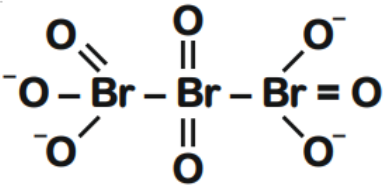
Order of stability would be:-

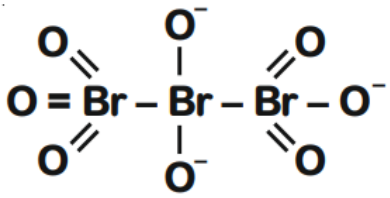
$H_2Po < H_2Te < H_2Se < H_2S < H_2O$

29. The correct structure of tribromooctaoxide is:

(1) 

(2) 

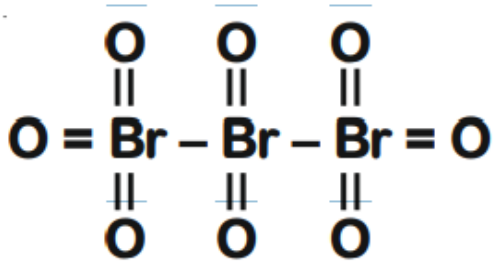
(3) 

(4) 

Answer (1)

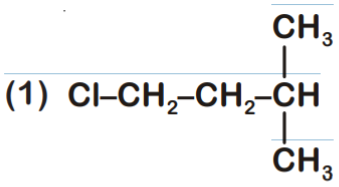
Sol.

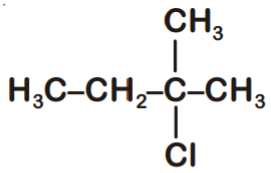
The correct structure is

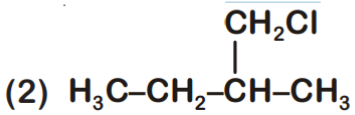


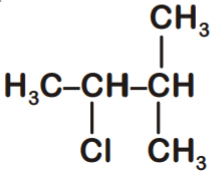
Tribromooctaoxide

30. 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:

(1) 

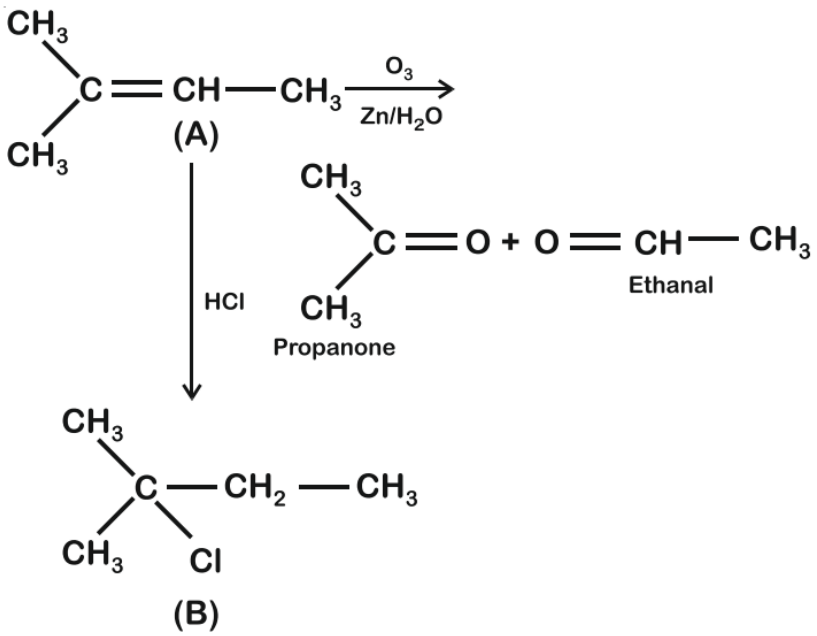
(3) 

(2) 

(4) 

Answer (3)

Solution:



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

(1) Be

(2) Mg

(3) Ca

(4) Sr

Answer (2)

Sol.

All enzymes that utilize ATP in phosphate transfer require magnesium(Mg) as the co-factor.

32. Which one is malachite from the following?

(1) $CuFeS_2$

(2) $Cu(OH)_2$

(3) Fe_3O_4

(4) $CuCO_3.Cu(OH)_2$

Answer (4)

Sol.

Malachite : $CuCO_3.Cu(OH)_2$ (Green colour)

33. Which of the following series of transitions in the spectrum of hydrogen atom fall in visible region?
(1) Lyman series
(2) Balmer series
(3) Paschen series
(4) Brackett series
Answer (2)
Sol.
In H-spectrum, Balmer series transitions fall in visible region.

34. The mixture that forms maximum boiling azeotrope is:
(1) Water + Nitric acid
(2) Ethanol + Water
(3) Acetone + Carbon disulphide
(4) Heptane + Octane
Answer (1)
Sol.
Solutions showing negative deviation from Raoult's law for maximum boiling azeotrope Water and Nitric acid forms maximum boiling azeotrope

35. For the cell reaction

$$2Fe^{3+}(aq)+2I^{-}(aq)\rightarrow 2Fe^{2+}(aq)+I_2(aq)$$

E_{Cell}^{0}=0.24 V at 298 K. The standard Gibbs energy $\Delta_r G$ of the cell reaction is
[Given that Faraday constant F = 96500 C mol^{-1}]
(1) – 46.32 kJ mol^{-1}
(2) – 23.16 kJ mol^{-1}
(3) 46.32 kJ mol^{-1}
(4) 23.16 kJ mol^{-1}
Answer (1)

Sol.

$\Delta_r G^0 = - nFE_{cell}$

$= – 2 \times 96500 \times 0.24$ J mol^{-1}

$= – 46320$ J mol^{-1}

$= – 46.32$ kJ mol^{-1}

36. In which case change in entropy is negative?

(1) Evaporation of water

(2) Expansion of a gas at constant temperature

(3) Sublimation of solid to gas

(4) $2H(g) \rightarrow H_2(g)$

Answer (4)

Sol.

- $\mathbf{H_2O(\ell) \rightleftharpoons H_2O(v),\ \Delta S > 0}$
- **Expansion of gas at constant temperature, $\Delta S > 0$**
- **Sublimation of solid to gas, $\Delta S > 0$**
- $\mathbf{2H(g) \longrightarrow H_2(g),\ \Delta S < 0\ (\because \Delta n_g < 0)}$

37. 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) (i) (ii) (iii) (iv)

(2) (ii) (iv) (i) (iii)

(3) (iii) (iv) (ii) (i)

(4) (iv) (iii) (ii) (i)

Answer (4)

Sol.

(a) Pure nitrogen : Sodium azide or Barium azide

(b) Haber process : Ammonia
(c) Contact process : Sulphuric acid
(d) Deacon's process : Chlorine

38. Which of the following is incorrect statement?

(1) PbF_4 is covalent in nature

(2) $SiCl_4$ is easily hydrolysed

(3) GeX_4 (X = F, Cl, Br, I) is more stable than GeX_2

(4) SnF_4 is ionic in nature

Answer (1)

Sol.

PbF_4 and SnF_4 are ionic in nature.

39. The non-essential amino acid among the following is:
(1) Valine
(2) Leucine
(3) Alanine
(4) Lysine

Answer (3)

Sol. Alanine

40. 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

Answer (3)

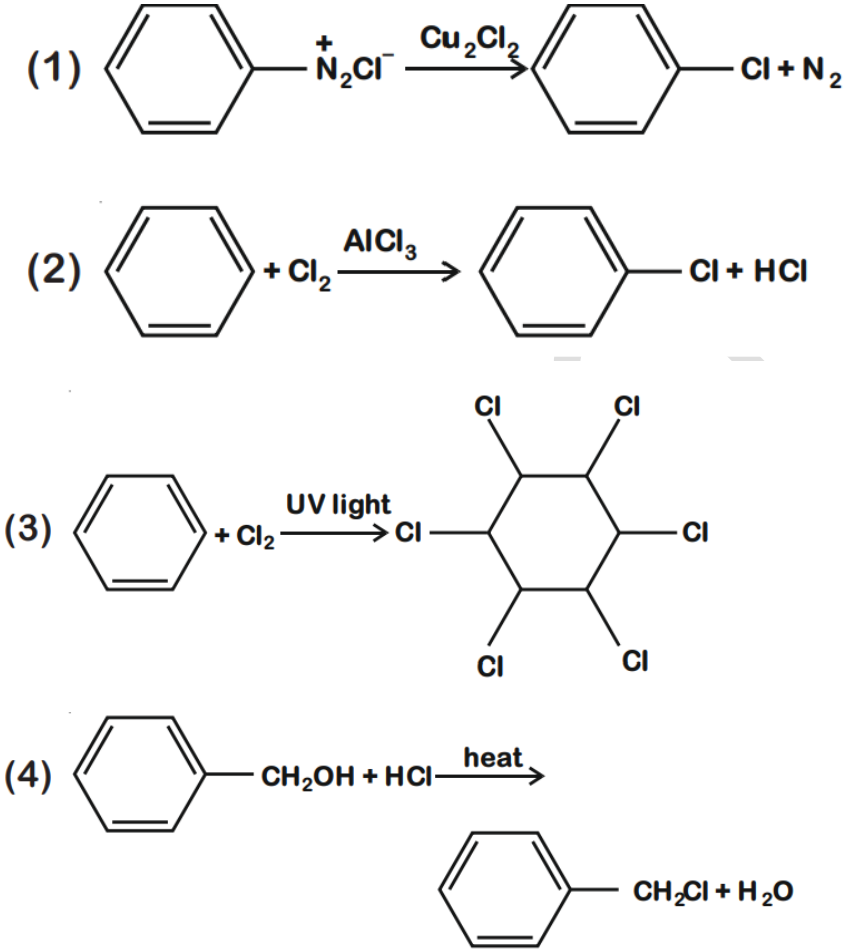
Sol.

Compressibility factor(Z) = V_{real}/V_{ideal}

$\because V_{real} < V_{ideal}$; Hence $Z < 1$

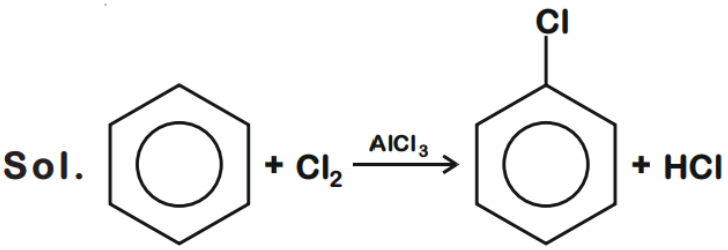
If $Z < 1$, attractive forces are dominant among gaseous molecules and liquefaction of gas will be easy.

41. Among the following, the reaction that proceeds through and electrophilic substitution,is:

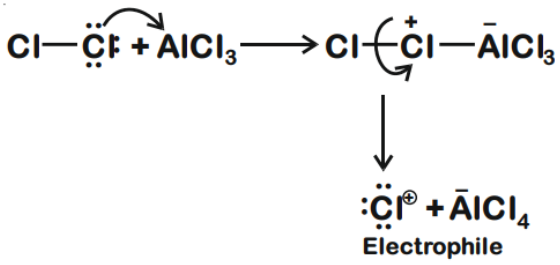


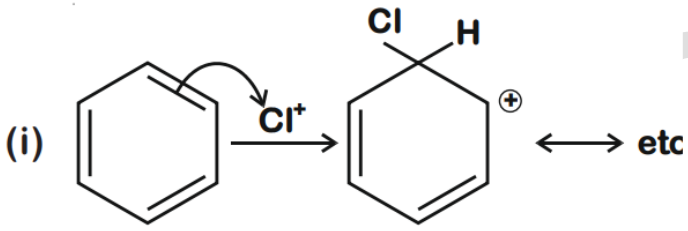
Answer: (2)

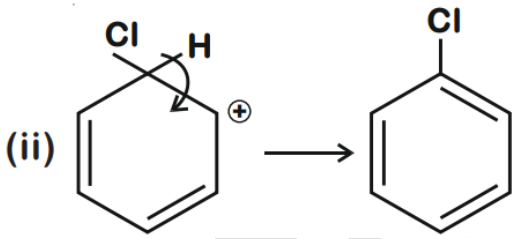
Sol.



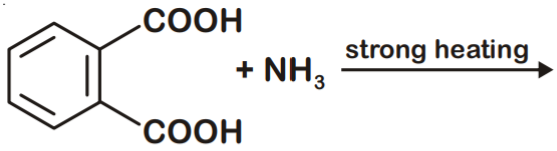
Generation of electrophile:



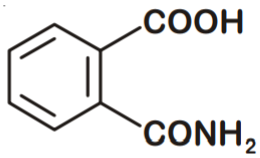




42. The major product of the following reaction is:



(1)



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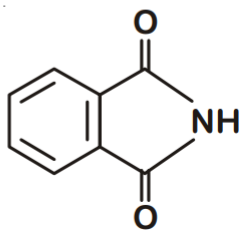
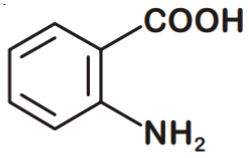
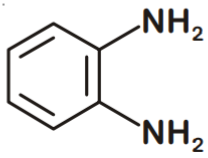
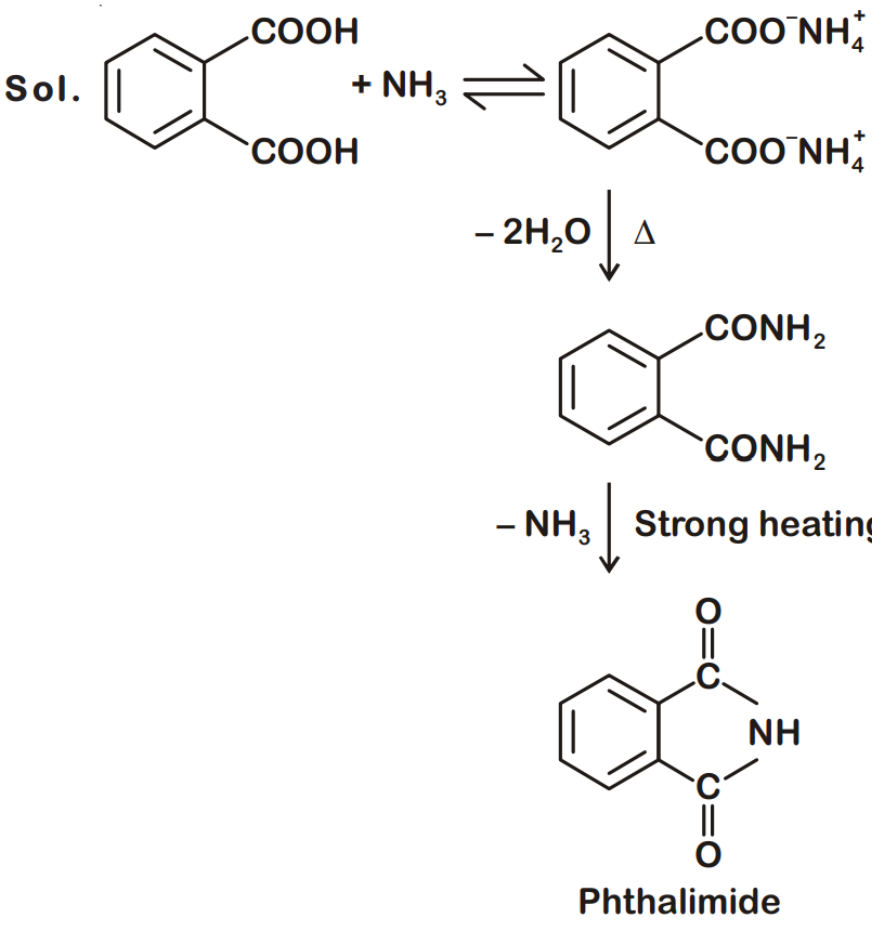


(3) 

(4) 

Answer (2)

Sol. 

Phthalimide

43. For the chemical reaction

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

The correct option is:

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

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

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

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

Answer (3)

Solution:

$N_2+3H_2 \rightleftharpoons 2NH_3$

Rate of reaction is given as

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

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

(1) $t_{2g}^4 e_g^2$

(2) $t_{2g}^6 e_g^0$

(3) $e^3 t_2^3$

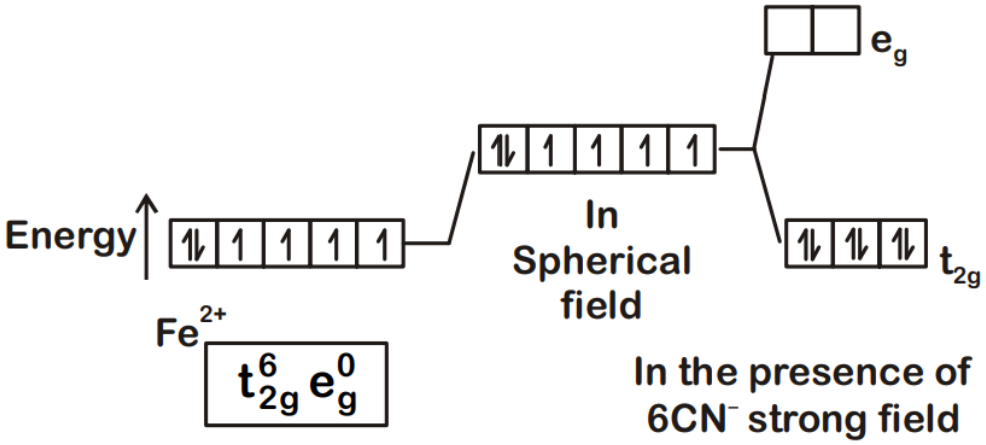
(4) $e^4 t_2^2$

Answer: (2)

Solution: $K_4[Fe(CN)_6]$

Fe ground state: $[Ar]3d^6 4s^2$

Fe^{2+}: $3d^6 4s^0$



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

(1) Calgon's method

(2) Clark's method

(3) Ion-exchange method

(4) Synthetic resins method

Answer (2)

Sol. Clark's method is used to remove temporary hardness of water, in which bicarbonates of calcium and magnesium are reacted with slaked lime $Ca(OH)_2$