JEE (Main) CHEMISTRY SOLVED PAPER

2023
13th April Shift 1

Section A

1. Given below are two statements:

Statement I: Permutit process is more efficient compared to the synthetic resin method for the softening of water.

Statement II: Synthetic resin method results in the formation of soluble sodium salts.

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

(1) Both the Statements I and II are correct
(2) Statement I is incorrect but Statement II is correct
(3) Statement I is correct but Statement II is incorrect
(4) Both the Statements I and II are incorrect

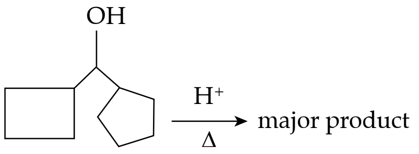
2. Which one of the following is most likely a mismatch?

(1) Zinc - Liquation
(2) Copper – Electrolysis
(3) Titanium - van Arkel Method
(4) Nickel - Mond process

3. The energy of an electron in the first Bohr orbit of hydrogen atom is -2.18×10^{-18} J. Its energy in the third Bohr orbit is__________.

(1) $\frac{1}{27}$ of this value **(2)** $\frac{1}{9}$ of this value
(3) One third of this value
(4) Three times of this value

4.



In the above reaction, left hand side and right hand side rings are named as ' A ' and ' B ' respectively. They undergo ring expansion. The correct statement for this process is:

(1) Finally both rings will become six membered each.
(2) Ring expansion can go upto seven membered rings
(3) Finally both rings will become five membered each.
(4) Only A will become 6 membered.

5. Match the following

Column–A	Column–B
(a) Nylon 6	I. Natural Rubber
(b) Vulcanized Rubber	II. Cross Linked
(c) cis–1, 4–polyisoprene	III. Caprolactam
(d) Polychloroprene	IV. Neoprene

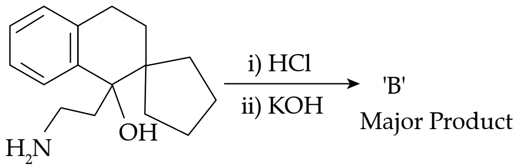
Choose the correct answer from options given below:

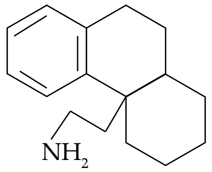
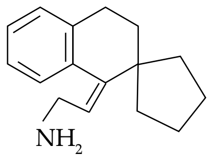
(1) a→II, b→III, c→IV, d→I
(2) a→IV, b→III, c→II, d→I
(3) a→III, b→II, c→I, d→IV
(4) a→III, b→IV, c→I, d→II

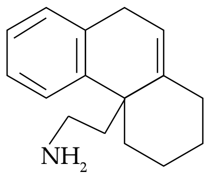
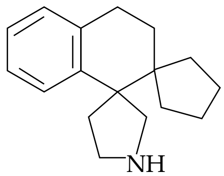
6. What happens when a lyophilic sol is added to a lyophobic sol?

(1) Film of lyophobic sol is formed over lyophilic sol.
(2) Lyophilic sol is dispersed in lyophobic sol.
(3) Lyophobic sol is coagulated.
(4) Film of lyophilic sol is formed over lyophobic sol.

7. In the reaction given below:



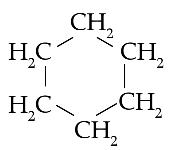
(1)  **(2)** 

(3)  **(4)** 

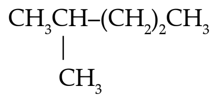
8. In the following reaction 'X'is

$$CH_3(CH_2)CH_3 \xrightarrow[\text{HCl, }\Delta]{\text{Anhy.AlCl}_3} \text{'X'}$$
major product

(1) $CH_3(CH_2)_4CH_2Cl$

(2) 

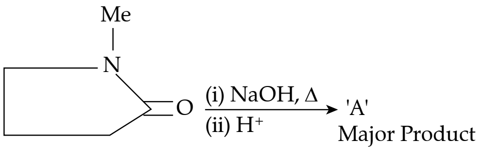
(3) $Cl–CH_2–(CH_2)_4–CH_2–Cl$

(4) 

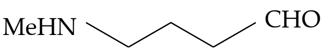
9. 2-Methyl propyl bromide reacts with $C_2H_5O^–$ and gives 'A' whereas on reaction with C_2H_5OH it gives 'B'. The mechanism followed in these reactions and the products 'A' and 'B' respectively are:

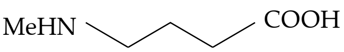
(1) S_N1, A= tert-butyl ethyl ether; S_N1, B= 2-butyl ethyl ether
(2) S_N2, A= 2-butyl ethyl ether; S_N2, B= iso-butyl ethyl ether
(3) S_N2, A= iso-butyl ethyl ether; S_N1, B= tert-butyl ethyl ether
(4) S_N1, A= tert-butyl ethyl ether; S_N2, B= iso-butyl ethyl ether

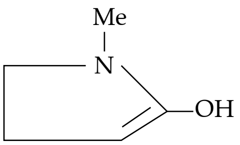
10. In the reaction given below:

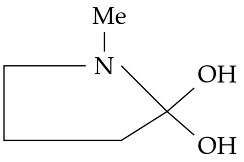


'A' is

(1) 

(2) 

(3) 

(4) 

11. D-(+)Glyceraldehyde $\xrightarrow[\text{ii)}H_2O/H^+ \;\; \text{iii)}HNO_3]{\text{i)}HCN}$

The products formed in the above reaction are
(1) Two optically active products
(2) One optically inactive and one meso product.
(3) One optically active and one meso product
(4) Two optically inactive products

12. ClF_5 at room temperature is a:
(1) Colourless liquid with square pyramidal geometry
(2) Colourless gas with trigonal bipyramidal geometry
(3) Colourless gas with square pyramidal geometry
(4) Colourless liquid with trigonal bipyramidal geometry

13. The pair of lanthanides in which both elements have high third - ionization energy is:
(1) Dy, Gd (2) Eu,Gd (3) Lu,Yb (4) Eu,Yb

14. The mismatched combinations are
(A) Chlorophyll - Co
(B) Water hardness - EDTA
(C) Photography – $[Ag(CN)_2]^-$
(D) Wilkinson catalyst - $[(Ph_3P)_3RhCl]$
(E) Chelating ligand - D-Penicillamine

Choose the correct answer from the options given below :
(1) A and C Only (2) D and E Only
(3) A and E Only (4) A, C, and E Only

15. Which of the following statements are not correct?
(A) The electron gain enthalpy of F is more negative than that of Cl.
(B) Ionization enthalpy decreases in a group of periodic table.
(C) The electronegativity of an atom depends upon the atoms bonded to it.
(D) Al_2O_3 and NO are examples of amphoteric oxides.

Choose the most appropriate answer from the options given below :
(1) A, C and D Only (2) B and D Only
(3) A, B and D Only (4) A, B, C and D

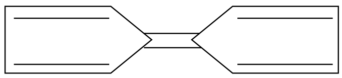
16. The radical which mainly causes ozone depletion in the presence of UV radiations is:

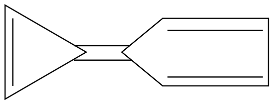
(1) $NO^{\bullet}$ (2) $\dot{O}H$ (3) $\dot{C}H_3$ (4) $Cl^{\bullet}$

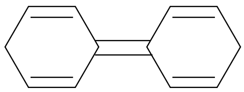
17. In which of the following processes, the bond order increases and paramagnetic character changes to diamagnetic one?
(1) $O_2 \rightarrow O_2^+$ (2) $O_2 \rightarrow O_2^{2-}$
(3) $NO \rightarrow NO^+$ (4) $N_2 \rightarrow N_2^+$

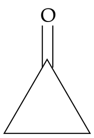
18. The incorrect statement from the following for borazine is:
(1) It is a cyclic compound.
(2) It has electronic delocalization.
(3) It can react with water.
(4) It contains banana bonds.

19. Among the following compounds, the one which shows highest dipole moment is

(1) 

(2) 

(3) 

(4) 

20. $Be(OH)_2$ reacts with $Sr(OH)_2$ to yield an ionic salt. Choose the incorrect option related to this reaction from the following:
(1) Be is tetrahedrally coordinated in the ionic salt.
(2) The reaction is an example of acid - base neutralization reaction.
(3) The element Be is present in the cationic part of the ionic salt.
(4) Both Sr and Be elements are present in the ionic salt.

Section B

21. Solution of 12 g of non-electrolyte (A) prepared by dissolving it in 1000 mL of water exerts the same osmotic pressure as that of 0.05M glucose solution at the same temperature. The empirical formula of A is CH_2O. The molecular mass of A is________ g. (Nearest integer)

22. $KMnO_4$ is titrated with ferrous ammonium sulphate hexahydrate in presence of dilute H_2SO_4. Number of water molecules produced for 2 molecules of $KMnO_4$ is_________.

23. 20 mL of calcium hydroxide was consumed when it was reacted with 10 mL of unknown solution of H_2SO_4. Also 20 mL standard solution of 0.5 MHCl containing 2 drops of phenolphthalein was titrated with calcium hydroxide, the mixture showed pink colour when burette displayed the value of 35.5 mL whereas the burette showed 25.5 mL initially. The concentration of H_2SO_4 is____________ M. (Nearest integer)

24. $t_{87.5}$ is the required for the reaction to undergo 87.5% completion and t_{50} is the time required for the reaction to undergo 50% completion. The relation between $t_{87.5}$ and t_{50} for a first order reaction is ________ $t_{87.5}=x\times t_{50}$. The value of x is ______. (Nearest integer)

25. A certain quantity of real gas occupies a volume of 0.15 dm^3 at 100 atm and 500 K when its compressibility factor is 1.07. Its volume at 300 atm and 300 K (When its compressibility factor is 1.4) is $\times 10^{-4}$ dm^3. (Nearest integer)

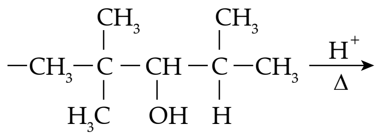
26. A metal surface of 100cm^2 area has to be coated with nickel layer of thickness 0.001 mm. A current of 2A was passed through a solution of $Ni(NO_3)_2$ for 'x' seconds to coat the desired layer. The value of x is____________. (Nearest integer)
(ρ_{Ni} (density of Nickel) is 10 g mL^{-1}, Molar mass of Nickel is 60 g mol^{-1} F = 96500 C mol^{-1})

27. 25.0 mL of 0.050 $MBa(NO_3)_2$ is mixed with 25.0 mL of 0.020 M NaF. K_{sp} of BaF_2 is 0.5×10^{-6} at 298 K. The ratio of $[Ba^{2+}][F^-]^2$ and K_{sp} is __________(Nearest integer)

28. $A_2 + B_2 \rightarrow 2AB$. $\Delta H_f^0 = -200kJmol^{-1}$ new line AB, A_2 and B_2 are diatomic molecules. If the bond enthalpies of A_2, B_2 and AB are in the ratio 1:0.5:1, then the bond enthalpy of A_2 is ________kJ mol^{-1}. (Nearest integer)

29. An organic compound gives 0.220 g of CO_2 and 0.126 g of H_2O on complete combustion. If the % of carbon is 24 then the % of hydrogen is ____________ $\times 10^{-1}$ (Nearest integer)

30. For the given reaction



'A'

The total number of possible products formed by tertiary carbocation of A is___________.

Answer Key

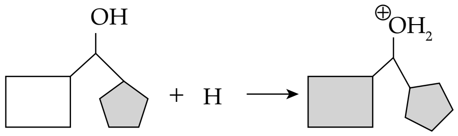
Q. No.	Answer	Topic name	Chapter name
1	(4)	Zeolite Proceed	Hydrogen
2	(1)	Refining Method	Metallurgy
3	(2)	Comparison of Energy of different Orbit	Structure of Atom
4	(1)	Formation of alkene through dehydration of Alcohol	Alcohol Phenol and Ether
5	(3)	Monomers of different Polymer	Polymer
6	(4)	Protective Colloid	Surface Chemistry
7	(3)	Dehydration of alcohol	Alcohol Phenol and Ether
8	(4)	Isomerization reaction of Alkane	Hydrocarbon
9	(3)	Biomolecular Nucleophilic substitution Reaction	Halo Arene and Halo Alkanes
10	(2)	Chemical Reactions of Cyclic Amide	Amines
11	(3)	Chemical Properties of Biomolecules	Biomolecules
12	(1)	Interhalogen Compounds	p Block
13	(4)	Electronic configuration of f Block ions	d and F fBlock
14	(1)	Metals present in various complex	Coordination Chemistry
15	(1)	Electron Gain Enthalpy and Electronegativity	Periodic Classification of Elements

16	(4)	Ozone Layer Depletion Reaction	Environmental Chemistry
17	(3)	Molecular Orbital Theory	Chemical Bonding
18	(4)	Structure and Reaction of Borazine	p Block
19	(2)	Aromatic Compounds	Aromatic Hydrocarbons
20	(3)	Amphoteric Nature of Beryllium Hydroxide	s Block
21	[240]	Osmotic Pressure	Liquid Solution
22	[68]	Balance Chemical Reactions of Redox Reaction	Redox Reaction
23	[1]	Comparison between the Molarity of two Solution	Some Basic Concepts of Chemistry
24	[3]	First Order Reaction	Chemical Kinetics
25	[392]	Compressibility Factors	States of Matter
26	[161]	Faraday's 2^{nd} Law of Electrolysis	Electro Chemistry
27	[5]	Solubility Product	Ionic Equilibrium
28	[400]	Enthalpy change during the reaction	Thermodynamics and Thermochemistry
29	[56]	Percentage composition of the elements	Some Basic Concepts of Chemistry
30	[5]	Number of [roduct formed during dehydration of Alcohol	Alcohol Phenol and Ether

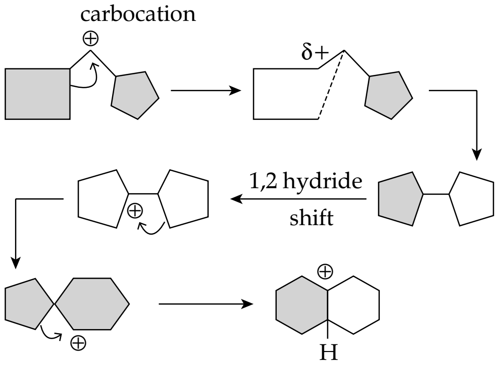
Solutions

Section A

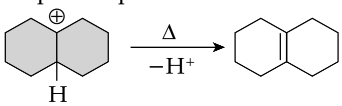
1. **Option (4) is correct.**
   Zeolite process is also known as permutit process. In this sodium aluminum silicate is used for softening of hard water.
   Statement I and II are incorrect
   Synthetic resins method is more efficient than zeolite process, here cation exchange resins contain large organic molecules with $–SO_3H$ group are water insoluble.
2. **Option (1) is correct.**
   The metals which have lower value of boiling point are refined by distillation method. Here the boiling point of Zn is low ∴ it is refined through distillation process not by liquation method.
3. **Option (2) is correct.**
   Given, Energy of an electron = $–2.18 \times 10^{–18}$ J
   $E_1 = –2.18 \times 10^{–18}$J
   To find energy of an e^- in 3^{rd} orbit = E_3
   $$E_3 = E_1 \times \frac{z^2}{n^2},\quad E_3 = E_1 \times \frac{1^2}{3^2},\quad E_3 = \frac{1}{9} \times E_1$$
4. **Option (1) is correct.**
   Here formation of alkene takes place through dehydration of alcohol in the presence of acidic medium
   Step 1 : Protonation of alcohol



Step 2 : Removal of H_2O takes place to form carbocation



Step 3 : Deprotonation



Finally both rings will become six membered each.

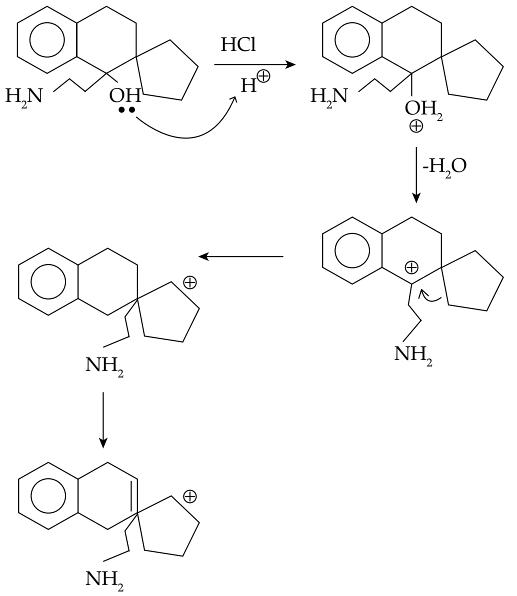
5. **Option (3) is correct.**

	A		**B**
a)	Nylon-6	III.	Caprolactam
b)	Vulcanized Rubber	II.	Cross linked
c)	cis-1,4-polyisoprene	I.	Natural Rubber
d)	Poly chloroprene	IV.	Neoprene

A-III , B-II , C-I , D-IV

6. **Option (4) is correct.**
   Lyophilic sol are more stable than lyophobic sols. This is due to the fact that lyophilic sol are extensively solvated ∴ it lyophilic particles form a later around lyophobic particles & thus protect the letter from electrolytes. Lyophilic sol are called protective colloid.

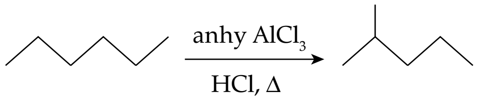
7. Option (3) is correct.



Here protonation of alcohol leads to the formation of alkene.

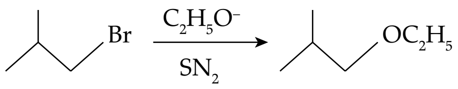
8. Option (4) is correct.

When n-alkene heated in the presence of anhy. $AlCl_3$ and HCl gas, formation of isomeric alkane takes place here due to 1,2-methyl shift formation of iso hexane takes place from n-hexane.



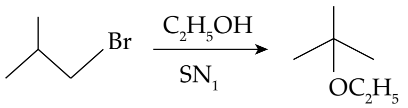
9. Option (3) is correct.

In SN^2 mechanism both substrate and nucleophile molecule required for the reaction, here strong nucleophile is required to participate in the reaction to form the nucleophillic substituted product.



Iso butylethyl ether

In SN^1 mechanism, the reaction depends upon the concentration of substrate molecule. It is independent of concentration of nucleophile.

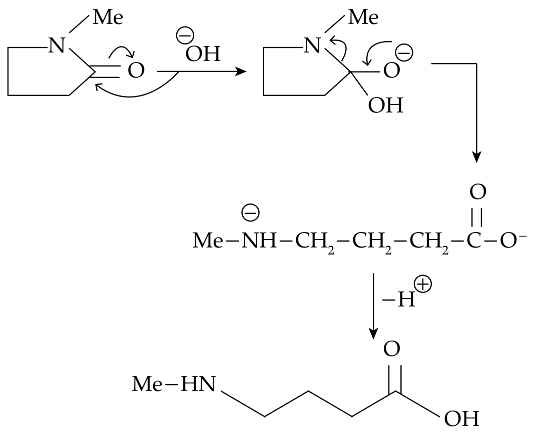


tert-butyl ether

In SN^1 –C_2H_5OH act as a weak nucleophile while in SN^2 $C_2H_5O^-$ is a strong nucleophile.

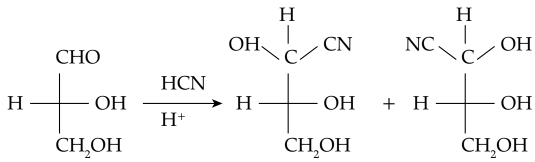
10. Option (2) is correct.

Here the ring opening of cyclic amide takes place in the presence of base to obtain N-alkyl amino acid.

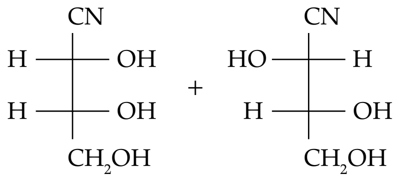


N-methyl butanoic acid

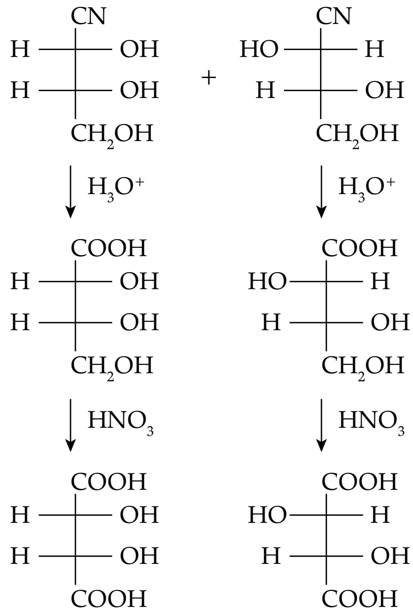
11. Option (3) is correct.



D–(+)-glyceraldehyde



Both are optically active



optically inactive

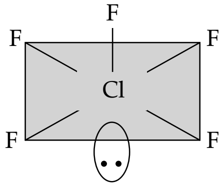
(It contain plane of symmetry)

optically active

(It do not contain plane of symmetry)

12. Option (1) is correct.

ClF_5 is an interhalogen compound, in which central atom chlorine is sp^3d^2 hybridised and form a square pyramidal structure.



sp^3d^2 square pyramidal

It is also a colourless liquid.

13. Option (4) is correct.

Eu : $4f^7 6s^2$
(z = 63)
Eu^{2+} : $4f^7$ (half filled configuration)
Yb : $4f^{14} 6s^2$
(z = 70)
Yb^{2+} : $4f^{14}$ (full filled configuration)

The pair of lanthanide in which both elements have high 3rd ionization energy is Yb^{2+} & Eu^{2+} and the reasons of high ionization is half filled and full filled configuration of the ions.

14. Option (1) is correct.

A is incorrect: In chlorophyll Mg-atom is present not cobalt.

C is incorrect: In photography, the developed film is fixed by washing with hypo solution which get dissolved in un decomposed AgBr to form a complex a complex of $[Ag(S_2O_3)_2]^{3-}$ not $[Ag(CN)_2]^-$

So A and C is incorrect i.e., Option (1)

15. Option (1) is correct.

A is incorrect: The electron gain enthalpy of F is less negative than that of Cl due to high electron-electron repulsion in F compared to Cl atom.

C is incorrect: The electronegativity of an atom is the tendency of an atom to get attached itself with the other atom via single covalent bond.

D is incorrect: Al_2O_3 is an amphoteric oxide while NO is a neutral oxide

Statement A,C and D is incorrect i.e., Option (1) only.

16. Option (4) is correct.

The ozone depletion in the presence of UV radiation is mainly due to Cl radiacal.

$$O_2(g) \xrightarrow{UV} O(g) + O(g)$$
$$O_2(g) + O(g) \rightarrow O_3(g)$$
$$CF_2Cl_2(g) \rightarrow \dot{C}l(g) + \dot{C}F_2Cl(g)$$
$$\dot{C}l(g) + O_3(g) \rightarrow Cl\dot{O}(g) + O_2(g)$$
$$Cl\dot{O}(g) + O(g) \rightarrow \dot{C}l(g) + O_2(g)$$

The main source of $\dot{C}l$ radical in the atmosphere is CF_2Cl_2 (Chlorofluorocarbon) which gets banned in the world.

17. Option (3) is correct.

The number of e^- in NO = 15

The electronic configuration of NO =
$\sigma 1s^2, \sigma^* 1s^2, \sigma 2s^2, \sigma^* 2s^2, \sigma 2P_z^2, \pi 2P_x^2 = \pi 2p^2 y, \pi 2p^1 x,$
$= \pi 2p^0 y$

Here bond order $= \dfrac{N_b - N_a}{2} = \dfrac{10-5}{2} = 2.5$

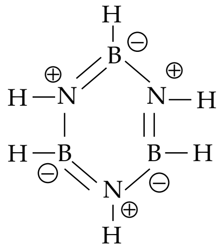
Nature is paramagnetic, due to the presence of one unpaired electron.

On the removal of one e^- from $\pi 2Px^1 = \pi 2Py^0$ the bond order get changed from 2.5 to 3.0 i.e., bond order increases.

Similarly the paramagnetic nature of the substance also gets changed to diamagnetic

	NO $\longrightarrow$	$NO^{\oplus}$
Bond order	2.5	3.0
Magnetic nature	paramagnetic	diamagnetic

18. Option (4) is correct



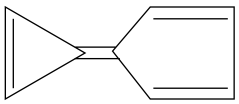
The structure of benzene is –

- Cyclic compound
- It contain conjugated system in which delocalization of e^- takes place.
- It can react with water to produce H_3BO_3 and releases NH_3 gas.

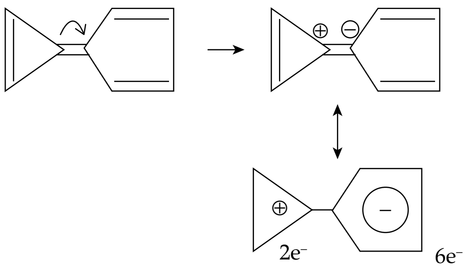
$$B_3N_3H_6 + 9H_2O \rightarrow 3NH_3 + 3H_3BO_3 + 3H_2$$

19. Option (2) is correct.

Among the given compounds



Contains highest dipole moment because both the + ve and –ve ends of the above complex acquire aromatic nature.



Both follow $(4n + 2)\pi e^-$

$\therefore$ They are aromatic in nature.

20. Option (3) is correct.

Be $(OH)_2$ is amphoteric in nature which can react with both acidic as well as basic substance.

$$Be(OH)_2 + Sr(OH)_2 \rightarrow Sr[Br(OH)_4]$$
acid base salt

Be contains vacant orbital in $Be(OH)_2$ and act as an e^- deficient compound as well as lewis acid 08 it accepts e^- pair in the form of OH^- from $Sr(OH)_2$ to form salt.

Here in the $Sr[Be(OH)_4]$ salt, element Be is present in the anionic part of the salt not in the cationic part.

$$Sr[Be(OH)_4] \rightarrow Sr^{2+} + [Be(OH)_4]^{2-}$$

So statement (3) is incorrect.

Section B

21. Correct answer is [240].

Given $W_A = 12$ gm V = 1000 mL

$C_{glucose} = 0.05$ M

As osmotic pressure of both is same

$\pi_A = \pi_{glucose}$

$C_A RT = C_{glucose} RT$

$$\frac{12}{M_A} \times \frac{1}{1L} \times RT = 0.05RT$$

$$M_A = \frac{12}{0.05} = \frac{1200}{5} = 240 \text{ gm}$$

22. Correct answer is [68].

The balanced chemical reaction of $KMnO_4$ with mohr salt is as follows-

$$2KMNnO_4 + 8H_2SO_4 + 10FeSO_4.(NH_4)_2SO_4.6H_2O \rightarrow 10(NH_4)_2SO_4 + K_2SO_4 + 2MnSO_4 + 5Fe_2(SO_4)_3 + 68H_2O$$

From the given balanced chemical reaction 68 molecules of H_2O will be produced from 2 molecules of $KMnO_4$

23. Correct answer is [1].

Initially $Ca(OH)_2$ reacts with unknown H_2SO_4 solution.

$$Ca(OH)_2 + H_2SO_4 \rightarrow CaSO_4 + 2H_2O$$

m.eq of $Ca(OH)_2$ = m.eq of H_2SO_4

$M_1 \times 2 \times 20 = M_2 \times 2 \times 10$

$2M_1 = M_2$ ...(1)

The remaining $Ca(OH)_2$ reacts with HCl to form salt and water

$$Ca(OH)_2 + 2HCl \rightarrow CaCl_2 + 2H_2O$$

m.eq of HCl = m.eq of $Ca(OH)_2$

$20 \times 0.5 = 10 \times M_1 \times 2$

$M_1 = 0.5$ M ...(2)

From (1) and (2)

$M_2 = 2M_1 = 2 \times 0.5M = 1M$

24. Correct answer is [3].

For 87.5% completion

$$K = \frac{2.303}{t_{87.5}} \times \log\frac{100}{100 - 87.5}$$

$$K = \frac{2.303}{t_{87.5}} \times \log\frac{100}{12.5} \quad ...(1)$$

For 50% completion

$$K = \frac{2.303}{t_{50}} \times \log\frac{100}{100 - 50}$$

$$K = \frac{2.303}{t_{50}} \times \log\frac{100}{50} \quad ...(2)$$

Form (1) and (2)

$$\frac{2.303}{t_{50}} \times \log 2 = \frac{2.303}{t_{87.5}} \times \log 8$$

$$\log\left(\frac{8}{2}\right) = \frac{t_{50}}{t_{87.5}}$$

$T_{87.5} = 3 \times t_{50}$

25. Correct answer is [392].

From $Z = \frac{PV}{nRT}$

$$\frac{Z_1}{Z_2} = \frac{P_1V_1}{nRT_1} \times \frac{nRT_2}{P_2V_2}$$

Given $Z_1 = 1.07$ $Z_2 = 1.4$

$P_1 = 100$ atm $V_1 = 0.15$ dm^3 $T_1 = 500$ K

$P_2 = 3000$ atm $V_2 = ?$ $T_2 = 300$ K

$$\frac{1.07}{1.4} = \left(\frac{1000\text{atm} \times 0.15\text{dm}^3}{500\text{k}}\right) \times \left(\frac{300\text{k}}{300\text{atm} \times V_2}\right)$$

$$V_2 = \frac{0.03 \times 1.4}{1.07} = 0.03925 \text{ dm}^3$$

$$V_2 = 392 \times 10^{-4} \text{dm}^3$$

26. Correct answer is [161].

Vol of nickel required = $(100 \text{ cm})^2 \times 0.001 \times 10^{-3}$cm

= 0.01cm^3 = 0.01mL

Mass of nickel required = $d \times V$

= 10gm/mL × 0.01mL

= 0.1gm

Moles of Ni = $\frac{0.1\text{gm}}{60\text{gm/mol}} = \frac{1}{600}$mol

$$Ni^{2+}(aq) + 2e^- \rightarrow Ni(s)$$

For coating of 1 mol Ni

charges required = 2 × 96500C

So for coating of $\frac{1}{600}$ mol NI

charges required = $2 \times 96500c \times \frac{1}{600} = \frac{965}{3}$

As Q = It

So $t = \frac{q}{I} = \frac{965/3C}{2A}$

≈161 sec

27. Correct answer is [5].

Mmol of $Ba(NO_3)_2$ = mmol of Ba^{2+}

= 25 ml × 0.05M = 1.25 mmol

Mmol of NaF = mmol of F^-

= 25ml × 0.02M = 0.5 mmol

After mixing volume gets double new conc^n of Ba^{2+} and F^- is-

$$[Ba^{2+}] = \frac{1.25 \text{ mmol}}{50 \text{ mL}} = 0.025 \text{ M}$$

$$[F^-] = \frac{0.5 \text{ mmol}}{50 \text{ mL}} = 0.01 \text{ M}$$

$Ksp = [Ba^{2+}][F^-]^2$
Given ksp $= 5 \times 10^{-7}$

$$\text{Ratio of } \frac{[Ba^{2+}][F^-]}{Ksp} = \frac{(0.025)(0.01)^2}{5\times10^{-7}}$$

$$= \frac{2.5\times10^{-7}}{5\times10^{-7}} = 5$$

$$\text{Ratio of } \frac{[Ba^{2+}][F^-]}{Ksp} = 5$$

28. Correct answer is [400].

The balanced chemical reaction is

$A_2 + B_2 \rightarrow 2AB \qquad \Delta H_f = -200$ kJ/mol

Given bond enthalpy of $A_2 = x$
Given bond enthalpy of $B_2 = 0.5x$
Given bond enthalpy of $AB = x$

$\Delta H_f = (B.E)_R - (B.E)_p = -200$
$= (A_2) + (B_2) - 2(AB) = -200$
$= x + 0.5x - 2x = -200$

$$= x = \frac{200}{0.5} = 400 \text{ KJ/mol}$$

29. Correct answer is [56].

$$\%\text{of carbon} = \frac{\text{mass of } CO_2}{\dfrac{\text{molar mass}}{x}\times 100}\times 12$$

Where x = mass of organic compound

$$\% \text{ of carbon} = \frac{0.220}{\dfrac{44}{x}\times 100}\times 12$$

$$24 = \frac{6}{x}$$

$$x = 0.25$$

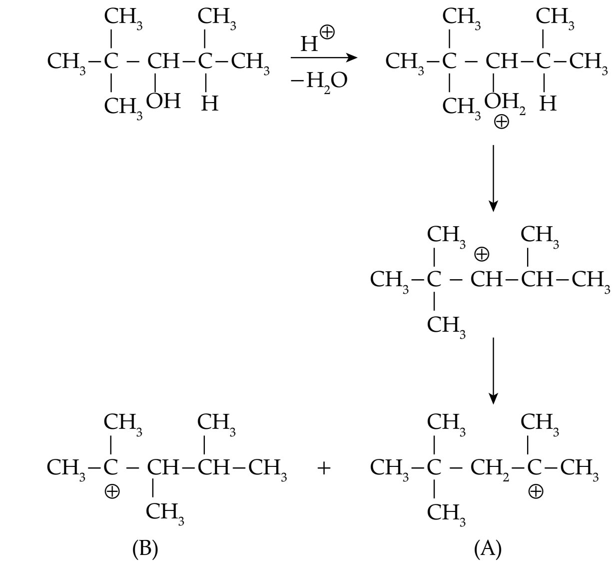
For H-atom

$$\% \text{ of H-atom} = \frac{\text{mass of H}}{\dfrac{\text{molar mass}}{x}\times 100}\times 2$$

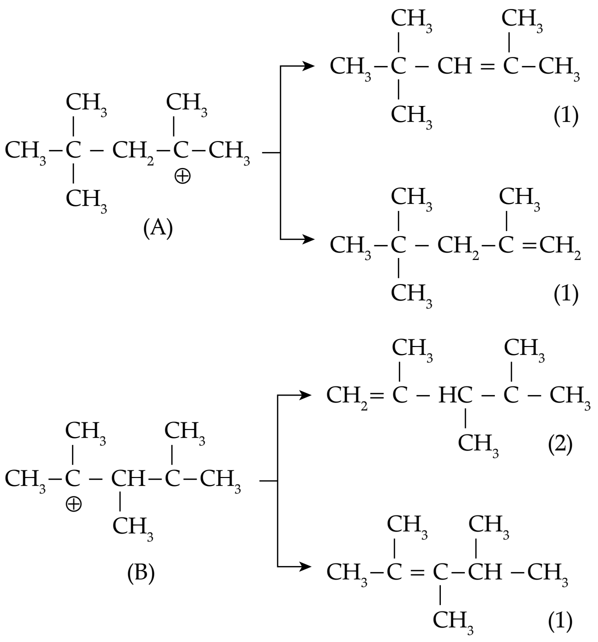
$$= \frac{\dfrac{0.126}{18}}{0.25}\times 2\times 100$$

$\%$of H $= 5.6$
$= 56 \times 10^{-1}$

30. Correct answer is [5].



A gives two product while B gives 3 product



Total five products are formed.

❑❑