JEE (Main) CHEMISTRY SOLVED PAPER

2023

11th April Shift 1

Section A

1. Which of the following complex has a possibility to exist as meridional isomer?

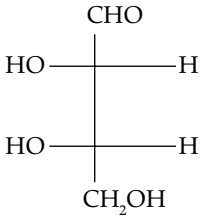
(1) $[Co(en)_2Cl_2]$ **(2)** $[Pt(NH_3)_2Cl_2]$

(3) $[Co(en)_3]$ **(4)** $[Co(NH_3)_3(NO_2)_3]$

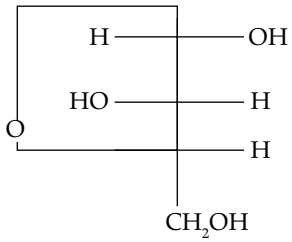
2. L-isomer of tetrose X ($C_4H_8O_4$) gives positive schiff's test and has two chiral carbons.On acetylation, 'X' yields triacetate. 'X' undergoes following reactions

$$A \xleftarrow{HNO_3} X \xrightarrow{NaBH_4} \underset{\text{chiral compound}}{B}$$

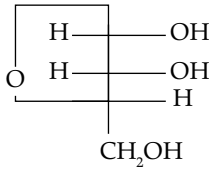
(1)



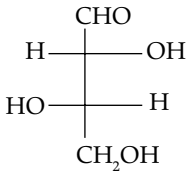
(2)



(3)



(4)



3. Match list I with list II

List I	List II
(A) K	**I** Thermonuclear reactions
(B) KCl	**II** Fertilizer
(C) KOH	**III** Sodium potassium pump
(D) Li	**IV** Absorbent of CO_2

Choose the correct answer from the options given below:

(1) A-III, B-IV, C-II, D-I **(2)** A-IV, B-III, C-I, D-II

(3) A-III, B-II, C-IV, D-I **(4)** A-IV, B-I, C-III, D-II

4. For compound having the formula $GaAlCl_4$, the correct option from the following is

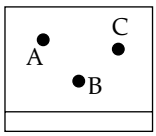
(1) Cl forms bond with both Al and Ga in $GaAlCl_4$

(2) Ga is coordinated with Cl in $GaAlCl_4$

(3) Ga is more electronegative than Al and is present as a cationic part of the salt

(4) Oxidation state of Ga in the salt $GaAlCl_4$ is +3

5. Thin layer chromatography of a mixture shows the following observation:



The correct order of elution in the silica gel column chromatography is

(1) B, A, C **(2)** C, A, B **(3)** A, C, B **(4)** B, C, A

6. When a solution of mixture having two inorganic salts was treated with freshly prepared ferrous sulphate in acidic medium, a dark brown ring was formed whereas on treatment with neutral $FeCl_3$ it gave deep red colour which disappeared on boiling and a brown red ppt was formed. The mixture contains

(1) $C_2O_4^{2-}$ & NO_3^- **(2)** SO_3^{2-} & $C_2O_4^{2-}$

(3) CH_3COO^- & NO_3^- **(4)** SO_3^{2-} & CH_3COO^-

7. The polymer X-consists of linear molecules and is closely packed. It prepared in the presence of triethylaluminium and titranium tetrachloride under low pressure. The polymer X is-

(1) Polyacrylonitrile

(2) Polytetrafluoroethane

(3) High density polythene

(4) Low density polythene

8. Match list I with list II

List I Species	List II Geometry/Shape
(A) H_3O^+	I. Tetrahedral
(B) Acetylide anion	II. Linera
(C) NH_4^+	III. Pyramidal
(D) ClO_2^-	IV. Bent

Choose correct answer from the options given below:

(1) A-III, B-IV, C-I, D-II **(2)** A-III, B-IV, C-II, D-I

(3) A-III, B-I, C-II, D-IV **(4)** A-III, B-II, C-I, D-IV

9. Given below are two statement :

Statement I: Methane and steam passed over a heated Ni catalyst produces hydrogen gas

Statement II: Sodium nitrite reacts with NH_4Cl to give H_2O, N_2 and NaCl

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

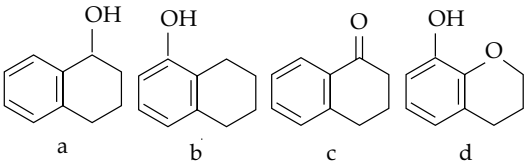
(1) Both the statement I and II are incorrect

(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 correct

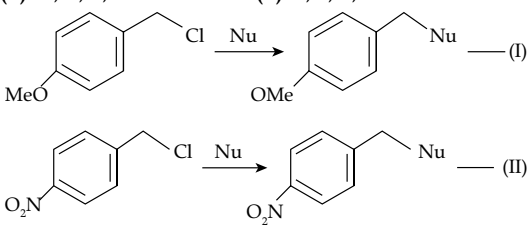
10. The set which does not have ambidentate ligand (s) is
(1) $C_2O_4^{2-}$, NO_2^-, NCS^- **(2)** $EDTA^{4-}$, NCS^-. $C_2O_4^{2-}$
(3) NO_2^-, $C_2O_4^{2-}$, $EDTA^{4-}$
(4) $C_2O_4^{2-}$, ethylene diamine, H_2O

11. Arrange the following compounds in increasing order of rate of aromatic electrophilic substitution reaction



(1) c, a, b, d **(2)** d, b, c, a
(3) d, b, a, c **(4)** b, c, a, d

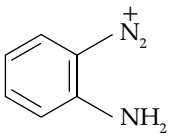
12.

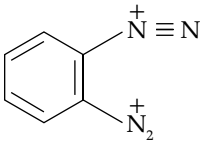


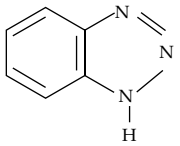
Where Nu=Nucleophile

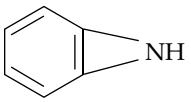
Find out the correct statement from the options given below for the above 2 reactions.
(1) Reaction (I) is of 1st order and reaction (II) is of 2nd order
(2) Reaction (I) and (II) both are 2nd order
(3) Reaction (I) and (II) both are 1st order
(4) Reaction (I) is of 2nd order and reaction (II) is of 1st order

13. o-Phenylenediamine $\xrightarrow{HNO_3}$ 'X' Major Product
'X' is

(1)


(2)


(3)


(4)


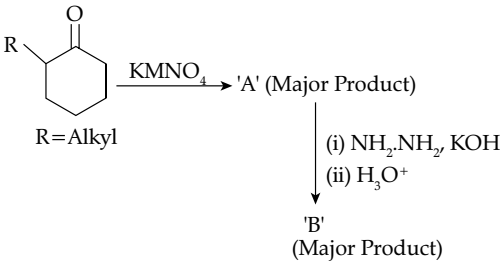
14. For elements B, C, N, Li, Be, O and F, the correct order of first ionization enthalpy is
(1) B>Li>Be>C>N>O>F
(2) Li<Be<B<C<N<O<F
(3) Li<Be<B<C<O<N<F
(4) Li<B<Be<C<O<N<F

15. In the extraction process of copper, the product obtained after carrying out the reactions
(i) $2Cu_2S+3O_2 \rightarrow 2Cu_2O+2SO_2$
(ii) $2Cu_2O+Cu_2S \rightarrow 6Cu+SO_2$ is called
(1) Reduced copper **(2)** Blister copper
(3) Copper matte **(4)** Copper scrap

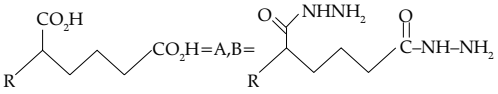
16. 25 mL of silver nitrate solution (1M) is added dropwise to 25 mL of potassium iodide (1.05 M) solution. The ion(s) present in very small quantity in the solution is/are
(1) NO_3^- only **(2)** Ag^+ and I^- both
(3) K^+ only **(4)** I^- only

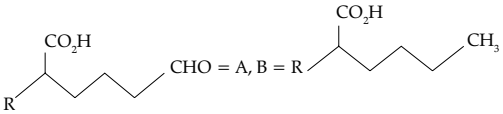
17. Given below are two statements:
Statement I: If BOD is 4 ppm and dissolved oxygen is 8 ppm, it is a good quality water.
Statement II: If the concentration of zinc and nitrate salts are 5 ppm each, than it can be good quality water.
In the light of the above statements choose the most appropriate answer from the options given below:
(1) Statement I is incorrect but statement II is correct
(2) Statement I is correct but statement II is incorrect
(3) Both the statements I and II are incorrect
(4) Both the statement I and II are correct

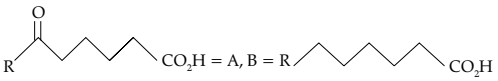
18.

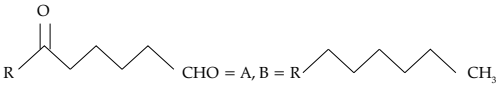


'A' and 'B' in the above reactions are :

(1)


(2)


(3)


(4)


19. Given below are two statements: one is labelled as Assertion A and the other is labelled as Reason R:
Assertion A: In the photoelectric effect electrons are ejected from the metal surface as soon as the beam of light of frequency greater than threshold frequency strikes the surface.
Reason R: When the photon of any energy strikes an electron in the atom transfer of energy from the photon to the electron takes place.
In the light of the above statements, choose the most appropriate answer from the options given below:
(1) A is correct but R is not correct
(2) A is not correct but R is correct

(3) Both A and R correct and R is the correct explanation of A

(4) Both A and R are correct but R is NOT the correct explanation of A

20. The complex that dissolves in water is

(1) $[Fe_3(OH)_2(OAc)_6]Cl$ **(2)** $Fe_4[Fe(CN)_6]_3$

(3) $K_3[Co(NO_2)_6]$ **(4)** $(NH_4)_3[As(Mo_3O_{10})_4]$

Section B

21. Solid fuel used in rocket is a mixture of Fe_2O_3 and Al (in ratio 1 : 2) the heat evolved (KJ) per gram of the mixture is _____ (Nearest integer)

Given $\Delta H_f^0 = -1700$ KJ mol^{-1}

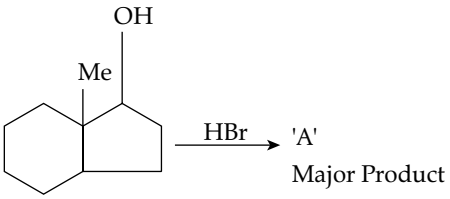
$\Delta H_f^0(Fe_2O_3) = -840$ KJ mol^{-1}

22. $KClO_3 + 6FeSO_4 + 3H_2SO_4 \rightarrow KCl + 3Fe_2(SO_4)_3 + 3H_2O$

The above reaction was studied at 300 K by monitoring the concentration of $FeSO_4$ in which initial concentration was 10 M and after half an hour became 8.8 M. The rate of production of $Fe_2(SO_4)_3$ is _____$\times 10^{-6}$ mol L^{-1} s^{1}

23. 0.004 M K_2SO_4 solution is isotonic with 0.01 M glucose solution. Percentage dissociation of K_2SO_4 is _____

24.



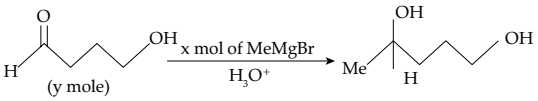
The number of hyper conjugation structures involved to stabilize carbocation formed in the above reaction is_____

25. A mixture of 1 mole of H_2O and 1 mole of CO is taken in a 10 litre container and heated to 725 K. At equilibrium 40% of water by mass reacts with carbon monoxide according to the equation: $CO(g) + H_2O(g) \rightleftharpoons CO_2(g) + H_2(g)$. The equilibrium constant Kc $\times 10^2$ for the reaction is_____ (Nearest integer)

26. An atomic substance A of molar mass 12 g mol^{-1} has a cubic crystal structure with edge length of 300 pm. The no. of atoms present in one unit cell of A is _____ (Nearest integer)

Given the density of A is 3.0 g mL^{-1} and $N_A = 6.02 \times 10^{23}$ mol^{-1}

27.



The ratio x/y on completion of the above reaction is_____

28. The ratio of spin-only magnetic moment values $\mu_{eff}[Cr(CN)_6^{3-}]/\mu_{eff}[Cr(H_2O)_6]^{3+}$ is _____

29. In an electrochemical reaction of lead, at standard temperature, if

$E^0_{(Pb^{2+}/Pb)} = m$ volt and $E^0_{(Pb^{2+}/Pb)} = n$ volt, then the value of $E^0_{(Pb^{2+}/Pb)}$ is given by $m - nx$. The value of x is _____ (Nearest integer)

30. A solution of sugar is obtained by mixing 200 g of its 25% solution and 500 g of its 40% solution (both by mass). The mass percentage of the resulting sugar solution is_____(Nearest integer)

Answer Key

Q. No.	Answer	Topic name	Chapter name
1	(4)	Types of Isomerism	Coordination Chemistry
2	(4)	Functional Group Test	Qualitative Analysis
3	(3)	Uses of Metals and their Compounds	s Block
4	(3)	Dissociation of salt	p Block
5	(3)	Column Chromatography	General Organic Chemistry
6	(3)	Identification of Basic Radical	Qualitative Analysis
7	(3)	Classification of Monomers	Polymer
8	(4)	Shape of the ion and molecules	Chemical Bonding
9	(4)	Mixed Concept of Gases	p Block
10	(4)	Classification of Ligands	Coordination Chemistry
11	(1)	Directing influence of Benzene and its Derivatives	Aromatic Hydrocarbons
12	(1)	Nucleophilic Aromatic Substitution Reaction	Haloalkane and Haloarenes
13	(3)	Electrophilic Aromatic Substitution Reaction	Aromatic Hydrocarbons
14	(4)	Ionization Energy	Periodic classification of elements
15	(2)	Extraction of Metals	Metallurgy
16	(2)	Solubility of Ions in the Solution	Coordination Chemistry
17	(4)	Biological Oxygen Demand	Environmental Chemistry

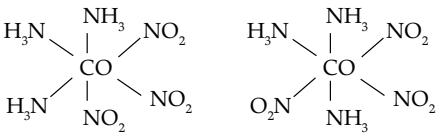
18	**(3)**	Oxidation Reaction of Alkene	Hydrocarbon
19	**(1)**	Photoelectric Effect	Atomic Structure
20	**(1)**	Solubility of Coordination Salts	Coordination Chemistry
21	**[4]**	Enthalpy change during the reaction	Thermodynamics
22	**[333]**	Rate of the Reactant in Mol Per Litre	Chemical Kinetics
23	**[75]**	Osmotic Pressure	Liquid Solution
24	**[7]**	Hyper Conjugating Structure	General Organic Chemistry
25	**[44]**	Equilibrium Constant	Ionic Equilibrium
26	**[4]**	Calculation of Effective Atomic Number	Solid State
27	**[2]**	Nucleophilic Addition Reaction	Aldehyde and Ketones
28	**[1]**	Magnetic Moment of Coordination Compounds	Coordination Chemistry
29	**[2]**	Calculation of Standard Reduction Potential	Electro Chemistry
30	**[36]**	Calculation of percentage of an element	Some Basic Concepts of Chemistry

Solutions

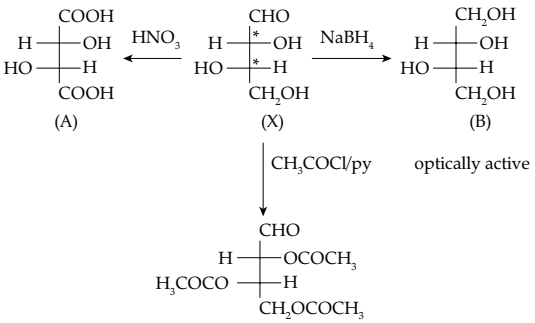
Section A

1. Option (4) is correct.

The complex which exists as meridional isomer is $[Co(NH_3)_3(NO_2)_3]$. Here both ligand arranged themselves in either facial form or meridional form.



2. Option (4) is correct.



(x) gives positive Schiff's test due to – CHO group.

3. Option (3) is correct.

List-I		List II
A. K	III.	Sodium potassium pump
B. KCl	II.	Fertilizer
C. KOH	IV.	Absorbent of CO_2
D. Li	I.	Thermonuclear reaction.

4. Option (3) is correct.

The dissociation of $GaAlCl_4$ takes place as follows-

$$GaAlCl_4 \rightarrow Ga^+ + AlCl_4^-$$

Here Ga is less electronegative than Al and is present as a cationic part of the salt.

5. Option (3) is correct.

According to the observation,

A is more mobile and interacts with the mobile phase more than C, and C is more drawn to the mobile phase than B

Hence, the correct order of elution in the silica gel column chromatography is B<C<A.

6. Option (3) is correct.

Here the reaction of $FeCl_3$ with CH_3COO^- takes place to give blood red colour.

$$CH_3COO^- + FeCl_3 \rightarrow Fe(CH_3COO)_3$$

$$\text{or } [Fe_3(OH)_2(CH_3COO)_6]^+$$

Blood red colour

$$\downarrow \Delta$$

$$[Fe_3(OH)_2(CH_3COO)]\downarrow$$

Red brown precipitate

Similarly Fe^{2+} on reaction with NO_3^- ion in presence of acidic medium to give brown red ppt.

$$2NO_3^- + 4H_2SO_4 + 6Fe^{2+} \rightarrow 6Fe^{3+} + 2NO\uparrow + 4SO_4^{2-} + 4H_2O$$

$$[Fe(H_2O)_6]^{2+} + NO \rightarrow [Fe(H_2O)_5NO]^{2+} + H_2O$$

brown colour complex

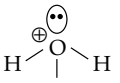
7. Option (3) is correct.

Ethene undergoes addition polymerisation to high density polythene in the presence of catalyst such as $AlEt_3$ and $TiCl_4$ (Ziegler – Natta catalyst) at a temperature of 333 K to 343 K and under a pressure of 6–7 atmosphere.

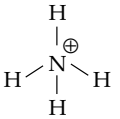
$$nCH_2 = CH_2 \xrightarrow[\text{catalyst}]{\text{Ziegler – Natta}} \left\{CH_2 - CH_2\right\}_n$$

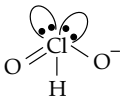
High density polythene

8. Option (4) is correct.

A. H_3O^+ III.  Pyramidal (sp^3)

B. acetylide anion II.  Linear (sp)

C. NH_4 I.  tetrahedral (sp^3)

D. ClO_2^- IV.  Bent (sp^3)

9. Option (4) is correct.

Statement I is correct, Methane and steam passed over a heated Ni catalyst produces H_2 gas.

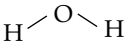
$$CH_4(g) + \underset{\text{Steam}}{H_2O(g)} \xrightarrow[1270\,K]{Ni} CO(g) + 3H_2(g)$$

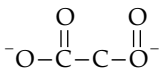
Statement (II) is correct

Sodium nitrile reacts with NH_4Cl to give H_2O, N_2 and NaCl.

$$NaNO_2(aq) + NH_4Cl(aq) \rightarrow N_2(g) + NaCl(aq) + 2H_2O(l)$$

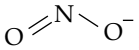
10. Option (4) is correct.

 water is mono dentate ligand

 $C_2O_4^{2-}$ is bidentate ligand

$H_2N–CH_2–CH_2–NH_2$ ethylene diamine is bidentate ligand.

The set which does not have ambidentate ligand is set (4)

Here  is ambidentate ligand

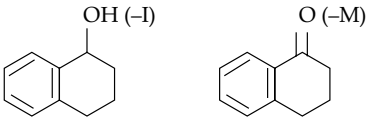
$N \equiv C–S^-$ is ambidentate ligand.

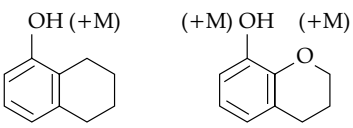
Both of the above ligand are not present in set (4)

11. Option (1) is correct.

In benzene e^- density is symmetrically distributed all C-atom therefore it readily undergo electrophilic aromatic substitution.

If we attach e^- donating group on benzene ring then its e^- density increases and its rate of electrophilic aromatic substitution increases and if we attach e^- withdrawing group on benzene ring its e^- density decreases which decreases its rate of electrophilic aromatic substitution. Here,





+M group increases the rate of EAS while –I and –M group decreases the rate of EAS.

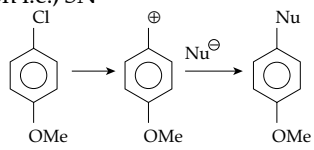
So correct increasing order of rate of EAS

C < A < B < D

12. Option (1) is correct.

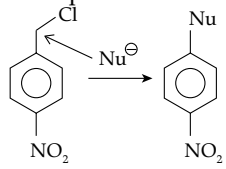
The rate of nucleophillic substitution depends upon the stability of carbocation as well as on the strength of nucleophile.

In the reaction (I), due to the presence of –Ome group stability of carbocation increases which favours unimolecular nucleophilic substitution reaction i.e., SN^1



Stable carbocation due to +M nature of –OMe group

In the reaction (II), due to the presence of $–NO_2$ group stability of carbocation decreases which favours nucleophilic substitution reaction i.e., SN^2



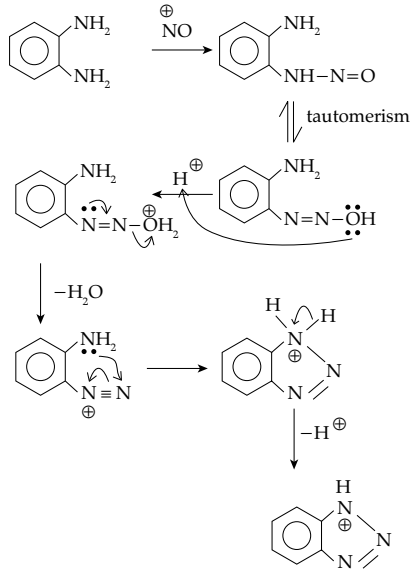
Un stable carbocation due to $–NO_2$ group

13. Option (3) is correct.

Generation of electrophile

$$HO–NO + H^{\oplus} \rightarrow \overset{\oplus}{H_2}O–NO$$

$$\overset{\oplus}{H_2}O–NO \rightarrow H_2\ddot{O} + \overset{\oplus}{N}O$$



14. Option (4) is correct.

In a periodic table, the properties of an element are study either left to right in a period or top to bottom in a group.

Here left to right in a period, due to increase in effective nuclear charge and decreases in atomic radii ionization energy increases.

Similarly due to stable electronic configuration the ionization energy exceptionally increases incase of Be and N.

So the correct order of first ionization energy is as follows-

Li < B < Be < C < O < N < F

Li	– 520 kJ/mol	Be	– 899 kJ/mol
B	– 801 kJ/mol	C	– 1086 kJ/mol
N	– 1402 kJ/mol	O	– 1314 kJ/mol
F	– 1681 kJ/mol		

15. Option (2) is correct.

The extraction of copper mainly takes place from copper sulphide.

The extraction of copper from copper sulphide is mainly done through self reduction or auto reduction. In this process copper sulphide is get roasted in the presence of oxygen to produce copper oxide which on further reduction with copper sulphide gives rise to copper.

In this process due to evolution of SO_2 the solidified copper formed has a blistered look and it is called as blister copper.

$$2Cu_2S + 3O_2 \rightarrow 2Cu_2O + 2SO_2$$

$$2Cu_2O + Cu_2S \rightarrow 6Cu + SO_2$$

Blister copper

16. Option (2) is correct.

On addition of silver nitrate drop wise into potassium iodide, formation of silver iodide takes place

$$AgNO_3(aq) + KI(aq) \rightarrow AgI(s)\downarrow + KNO_3(aq)$$

As the solubility of AgI is very low

$\therefore$ in very small quantity both Ag^+ and I^- ions are present in the solution.

$$AgI \rightleftharpoons Ag^+ + I^- \qquad ksp = 8.3 \times 10^{-17}$$

17. Option (4) is correct.

Statement 1 is correct,

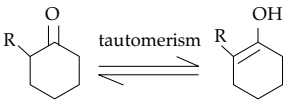
If Biochemical Oxygen Demand (BOD) in water is less than 5 ppm and the dissolved oxygen is upto 10 ppm then it is a clean water where as highly polluted water have BOD value greater than 17.

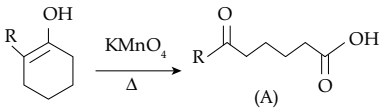
Statement 2 is also correct

The maximum limit of nitrate in drinking water is 50 ppm excess nitrate in drinking water can cause methemoglobinemia called blue body syndrome.

Similarly the maximum prescribed concentration of Zinc in drinking water is 5 ppm.

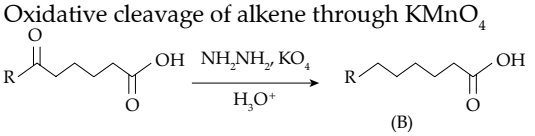
18. Option (3) is correct.





(A)

Oxidative cleavage of alkene through $KMnO_4$



(B)

Reduction of carbonyl group into $-CH_2$ group takes place through wolf kishner reduction.

19. Option (1) is correct.

Assertion is correct, reason is not

20. Option (1) is correct.

Complex	Solubility water
$Fe_4[Fe(CN)_6]$	Insoluble
$K_3[Co(NO_2)_6]$	Insoluble
$(NH_4)_3[As(Mo_3O_{10})_4]$	Insoluble
$[Fe_3(OH)_2(OAC)_6]Cl$	Soluble

Section B

21. Correct answer is [4].

$$Fe_2O_3 + 2Al \rightarrow Al_2O_3 + 2Fe$$

From $\Delta Hr = \Delta H_f^0(\text{Product}) - \Delta H_f^0(\text{Reactant})$

$$\Delta Hr = (\Delta \dot{H}f)_{Al_2O_3} - (\Delta \dot{H}f)_{Fe_2O_3}$$

$$\Delta Hr = -1700\frac{kJ}{mol} - \left(-840\frac{kJ}{mol}\right) = -860\frac{kJ}{mol}$$

Fe_2O_3 and Al are in the ratio of 1:2

Molar mass of $Fe_2O_3 = (2 \times 56 + 3 \times 16)$

$= 112 + 48 = 160$ gm

Molar mass of 2 mol Al $= 2 \times 27 = 54$ gm

Total mass $= 160 + 54 = 214$ gm

The amount of heat evolved per gm $= \frac{-860}{214}$kJ

$= -4.01 \approx 4$ kJ

22. Correct answer is [333].

$$\frac{\text{Change in the concentration of } FeSO_4}{\text{Change in time}} = \frac{-d[FeSO_4]}{dt}$$

$$\frac{-d[FeSO_4]}{dt} = \frac{10 - 8.8}{60 \times 30} = \frac{1.2}{1800}$$

$$KClO_3 + 6FeSO_4 + 3H_2SO_4 \rightarrow KCl + 3Fe_2(SO_4)_3 + 3H_2O$$

From given equation:

$$\frac{-1}{6}\frac{dFeSO_4}{dt} = \frac{1}{3} \times \frac{d[Fe(SO_4)_3]}{dt} +$$

$$\frac{d[Fe(SO_4)_3]}{dt} = \frac{3}{6} \times \frac{-d[FeSO_4]}{dt}$$

$$= \frac{3}{6} \times \frac{1.2}{1800}(\text{mol/L})S^{-1} = \frac{1}{3} \times 10^{-3} \text{ mol/L } S^{-1}$$

$$= \frac{1000}{3} \times 10^{-6} \text{ mol/L } S^{-1}$$

$$\approx 333.33 \times 10^{-6} \text{ mol/L } S^{-1}$$

23. Correct answer is [75].

For isotonic solution, Osmotic pressure of glucose (π glucose) =Osmotic pressure of K_2SO_4 (πK_2SO_4)

As $\pi = icRT$ or $\pi = iC$ (RT is constant)

$\pi_{glucose} = \pi_{K_2SO_4}$ or $i \times C = i \times C$

for glucose i = 1, c = 0.01 M

For k_2SO_4 i=? c = 0.004, $1 \times 0.01 = i \times 0.004$

$$i = \frac{0.01}{0.004} = \frac{5}{2} = 2.5$$

As $i = 1 + (n - 1)\alpha$ (For K_2SO_4 n=3)

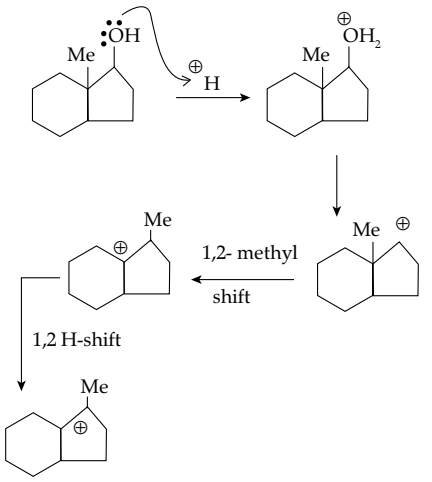
$2.5 = 1 + (3 - 1)\alpha \Rightarrow 2.5 = 1 + 2\alpha \Rightarrow \alpha = 0.75$

Our percent dissociation $= \alpha \times 100\%$

$= 0.75 \times 100\% = 75\%$

24. Correct answer is [7].

Here reaction states with protonation of alcohol to from a carbocation.



Here no of α–H atom present in the sturcture = 6
No. of Hyper conjugation structure=no. of αH + 1
= 6 + 1 = 7

25. Correct answer is [44].

$$Co(g) + H_2O(g) \rightleftharpoons CO_2(g) + H_2(g)$$

Initial	1 mole	1 mole	–	–
Equilibrium	$1-x$	$1-x$	x	x

Given at equilibrium =40% H_2O by mass ≈ 0.4 mole
So mole of CO = mole of H_2O=$1-x$
= 1 – 0.4 = 0.6 mol
Mole of CO_2 = mole of H_2 = x = 0.4 mole

$$K_c = \frac{[CO_2][H_2]}{[Co][H_2O]} = \frac{0.4\times0.4}{0.6\times0.6} = \frac{4}{9}$$

$$K_c \times 10^2 = \frac{4}{9}\times100 = \frac{400}{9} = 44.44 \approx 44$$

26. Correct answer is [4].

Formula used $d = \frac{Z\times M}{N_A \times a^3}$

Given d = 3 gm/ mL, M = 12 gm/ mol
A = 300 pm = 300×10^{-10} cm
By putting all the value in the given formula

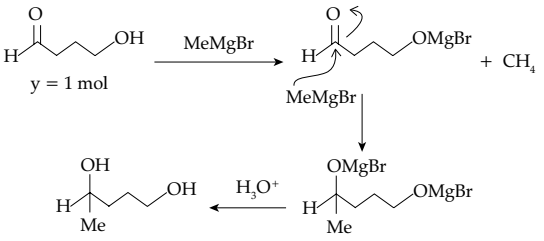
$$3gm/mL = \frac{Z\times12gm/mol}{6.02\times10^{23}mol^{-1}\times(300\times10^{-10})^3}$$

$$Z = \frac{3\times6.02\times10^{23}mol^{-1}\times(300\times10^{-10})^3}{12}$$

= $40.635 \times 10^{-1} \approx 4.0635 \approx 4$

27. Correct answer is [2].

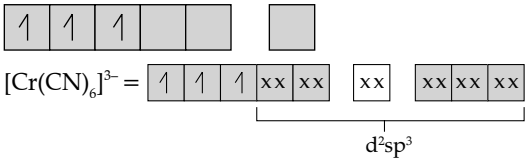
Here MeMgBr undergo acid base as well as nucleophilic addition reaction to form the final product



y = 1 mole, x = 2mole, So $\frac{x}{y} = \frac{2}{1} \approx 2$

28. Correct answer is [1].

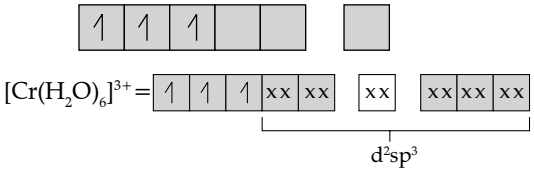
The oxidation state of Cr atom in $[Cr(CN)_6]^{3-}$ = +3
$Cr = 3d^54s^1$, $Cr^{+3} = 3d^34s^0$



Number of unpaired e^-=3

$$\mu_1 = \sqrt{n(n+2)}\ BM = \sqrt{3(3+2)} = \sqrt{15}\ BM$$

The oxidation state of Cr atom in $[Cr(H_2O)_6]^{3+}$=+3
$Cr = 3d^54s^1$, $Cr^{+3} = 3d^34s^0$



Number of unpaired e^-=3

$$\mu_2 = \sqrt{n(n+2)}BM = \sqrt{3(3+2)} = \sqrt{15}\ BM$$

$$\frac{\mu_1}{\mu_2} = \frac{\sqrt{15}}{\sqrt{15}} = 1$$

29. Correct answer is [2].

Given

$$Pb^{2+} + 2e^- \rightarrow Pb \quad E^\circ = m \quad \Delta G^\circ_1 = -2Fm$$
$$\underline{Pb^{4+} + 4e^- \rightarrow Pb \quad E^\circ = n \quad \Delta G^\circ_2 = -4Fn}$$
$$Pb^{2+} \rightarrow Pb^{4+} + 2e^- \quad \Delta G^\circ_3 = \Delta G^\circ_1 + \Delta G^\circ_2$$
$$-2FE^\circ = -2Fm + 4Fn$$
$$E^\circ = m - 2n$$
$$x = 2$$

30. Correct answer is [36].

$$\%\ \text{mass of solution} = \frac{\text{mass of sugar}}{\text{mass of solution}}\times100$$

Solution (I) $25 = \frac{\text{mass of sugar}}{200}\times100$

$$\text{mass of sugar} = \frac{25\times200}{100} = 50gm$$

Solution(II) $40 = \frac{\text{mass of sugar}}{500}\times100$

$$\text{mass of sugar} = \frac{500\times40}{100} = 200gm$$

$$\text{final }\%\ w/W = \frac{\text{Total mass of sugar}}{\text{Total mass of solution}}\times100$$

$$= \frac{200+50}{500+200}\times100 = \frac{250}{7} \approx 35.71\% = 36\%$$

❑❑