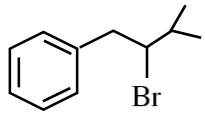
JEE MAIN 2024 SESSION-2

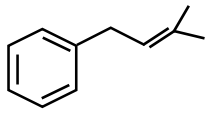
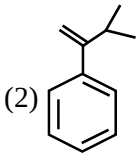
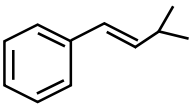
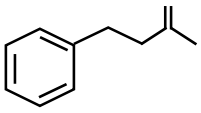
Paper with Solution

CHEMISTRY | 04th April 2024 _ Shift-2

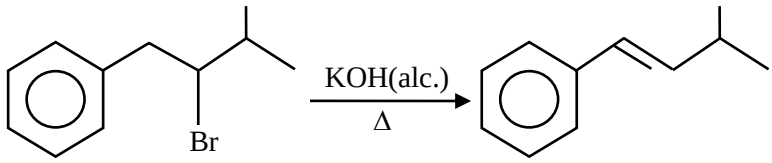
SECTION – A

61. 

Product P is

(1) 
(2) 
(3) 
(4) 

Sol. **3**



Saytzeff's alkene

62. Given below are two statements:
Statement I: The correct order of first ionization enthalpy values of Li, Na, F and Cl is Na < Li < Cl < F.
Statement II: The correct order of negative electron gain enthalpy values of Li, Na, F and Cl is Na < Li < F < Cl
In the light of the above statements, choose the correct answer from the options given below:
(1) Both Statement I and Statement II are false
(2) Both Statement I and Statement II are true
(3) Statement I is false but Statement II is true
(4) Statement I is true but Statement II is false

Sol. **2**

Fact both statement are correct

63. Choose the Incorrect Statement about Dalton's Atomic Theory
(1) All the atoms of a given element have identical properties including identical mass.
(2) Matter consists of indivisible atoms.
(3) Compounds are formed when atoms of different elements combine in any ratio.
(4) Chemical reactions involve reorganization of atoms

Sol. **3**

Compounds are formed when atoms of different elements combine in any ratio $\Rightarrow$ Incorrect

64. Fuel cell, using hydrogen and oxygen as fuels,
A. has been used in spaceship
B. has as efficiency of 40 % to produce electricity
C. uses aluminum as catalysts
D. is eco-friendly
E. is actually a type of Galvanic cell only
Choose the correct answer from the options given below:
(1) A, B, D only (2) A, B, D, E only (3) A, D, E only (4) A, B, C only

Sol. **3**

has been used in spaceship
eco friendly
type of Galvanic cell

65. A first row transition metal in its +2 oxidation state has a spin-only magnetic moment value of 3.86 BM. The atomic number of the metal is

(1) 25 (2) 26 (3) 23 (4) 22

Sol. **3**

$u = 3.86 \text{ B.M.} = \sqrt{15} \text{ B.M.} = \sqrt{n(n+2)}$

n = 3 unpaired $e^- \rightarrow$ d^3 or d^7

$\downarrow$ $\downarrow$

23 27

to given option $d^3(23)$ is correct.

66. Match List I with List II

LIST I		LIST II	
A.	α - Glucose and α - Galactose	I.	Functional isomers
B.	α - Glucose and β - Glucose	II.	Homologous
C.	α - Glucose and α - Fructose	III.	Anomers
D.	α - Glucose and α - Ribose	IV.	Epimers

Choose the correct answer from the options given below:

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

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

Sol. **3**

(A) α – Glucose & α – Galactose → C_4 epimer

(B) α – Glucose & β - Glucose → Anomer

(C) α – Glucose & α – fructose → functional isomer

(D) α – Glucose & α – Ribose → Homologous

67. The equilibrium constant for the reaction

$SO_3(g) \rightleftharpoons SO_2(g) + \frac{1}{2}O_2(g)$ is $K_c = 4.9 \times 10^{-2}$. The value of K_c for the reaction given below is

$2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g)$ is:

(1) 416 (2) 49 (3) 41.6 (4) 4.9

Sol. **1**

$$k^1 = \frac{1}{k_e^2} = \frac{1}{\left(4.9 \times 10^{-2}\right)^2}$$

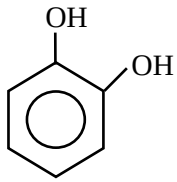
$$k^1 = \frac{10^4}{(4.9)(4.9)} = 416.5$$

$$= 416$$

68. Common name of benzene -1, 2 - diol is -

(1) resorcinol (2) catechol (3) o-cresol (4) quinol

Sol. **2**



Benzene –1, 2 – diol

'Catechol'

69. If an iron (III) complex with the formula $\left[Fe(NH_3)_x(CN)_y\right]^-$ has no electron in its e_g orbital, then the value of x + y is

(1) 5 (2) 6 (3) 4 (4) 3

Sol. **2**

If there is no e^- in eg. orbital

ie t_2g^5 is req in +3 O.S. of Fe.

Which is possible in C.N. = 6.

Thus x + y = 6

70. $CH_3-CH_2-CH_2-Br + NaOH \xrightarrow{C_2H_5OH}$ Product 'A'

Product A $\xrightarrow[H^+]{H_2O}$ Product "B"

Product A $\xrightarrow[H_2O/H_2O_2/\bar{O}H]{\text{Diborane}}$ Product "C"

Consider the above reactions, identify product B and product C.

(1) B = C = 2-Propanol (2) B = C = 1-Propanol

(3) B = 1-Propanol C = 2-Propanol (4) B = 2-Propanol C = 1-Propanol

Sol. **4**

$$CH_3-CH_2-CH_2-Br + NaOH \xrightarrow{C_2H_5-OH} CH_3-CH=CH_2$$

(A)

$$CH_3-CH=CH_2 \xrightarrow[H^+]{H_2O} CH_3-\underset{\underset{OH}{|}}{CH}-CH_3 \quad (B)$$

$$CH_3-CH=CH_2 \xrightarrow[H_2O/H_2O_2/OH^-]{B_2H_6} CH_3-CH_2-\underset{\underset{OH}{|}}{CH_2} \quad (C)$$

71. The correct statement/s about Hydrogen bonding is/are

A. Hydrogen bonding exists when H is covalently bonded to the highly electro negative atom.

B. Intermolecular H bonding is present in o-nitro phenol

C. Intramolecular H bonding is present in HF.

D. The magnitude of H bonding depends on the physical state of the compound.

E. H-bonding has powerful effect on the structure and properties of compounds

Choose the correct answer from the options given below:

(1) A, D, E only (2) A only (3) A, B, D only (4) A, B, C only

Sol. **1**

Fact

72. For a strong electrolyte, a plot of molar conductivity against (concentration)$^{1/2}$ is a straight line, with a negative slope, the correct unit for the slope is

(1) $S cm^2\ mol^{-3/2}\ L^{1/2}$ (2) $S\ cm^2\ mol^{-3/2}\ L^{-1/2}$ (3) $S\ cm^2\ mol^{-1}\ L^{1/2}$ (4) $S\ cm^2\ mol^{-3/2}\ L$

Sol. **2**

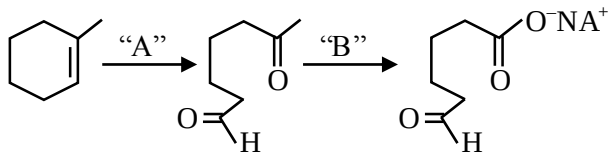
$\lambda_m \quad V/s \quad \sqrt{c}$

$\lambda_m = \lambda_m^0 - b\sqrt{c}$

unit of $b\sqrt{c}$ = unit of λ_m

$$\text{unit of } b = \frac{S cm^2 m_0 l^{-1}}{mol^{1/2} L^{-1/2}} = S\ cm^2\ mol^{-3/2}\ L^{1/2}$$

73.

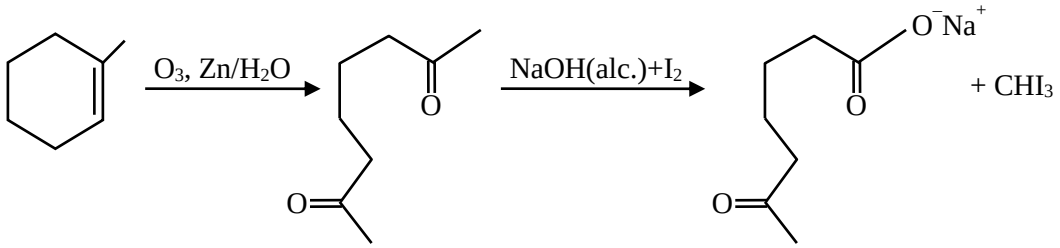


In the above chemical reaction sequence "A" and "B" respectively are

(1) H_2O, H^+ and $KMnO_4$ (2) $O_3, Zn/H_2O$ and $NaOH_{(alc)}/I_2$

(3) H_2O, H^+ and $NaOH_{(alc)}/I_2$ (4) $O_3, Zn/H_2O$ and $KMnO_4$

Sol. **2**



74. When MnO_2 and H_2SO_4 is added to a salt (A), the greenish yellow gas liberated as salt (A) is:

(1) CaI_2 (2) KNO_3 (3) NaBr (4) NH_4Cl

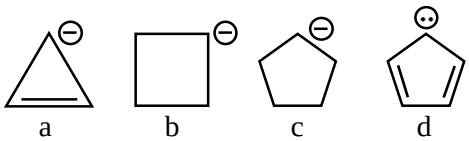
Sol. **4**

$$4MnO_2 + 4H_2SO_4 \rightarrow 4MnSO_4 + 4H_2O + 4[O]$$

$$2NH_4Cl + 4[O] \rightarrow N_2 + Cl_2 + 4H_2O$$

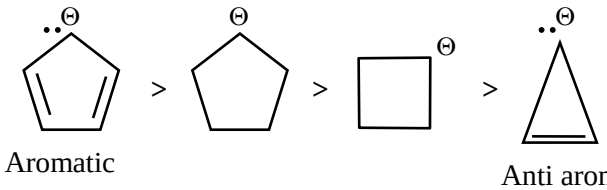
$$4MnO_2 + 4H_2SO_4 + 2NH_4Cl \rightarrow 4MnSO_4 + 8H_2O + N_2\uparrow + Cl_2\uparrow$$

75. Correct order of stability of carbanion is –



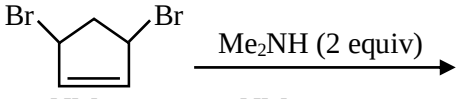
(1) d > a > c > b (2) a > b > c > d (3) d > c > b > a (4) c > b > d > a

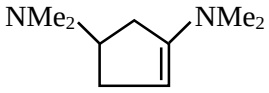
Sol. **3**

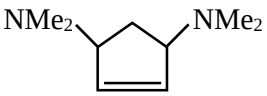


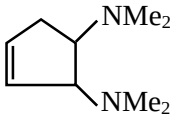
Aromatic Anti aromatic

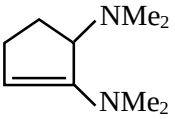
76. Find out the major product formed form the following reaction. [Me : $-CH_3$]



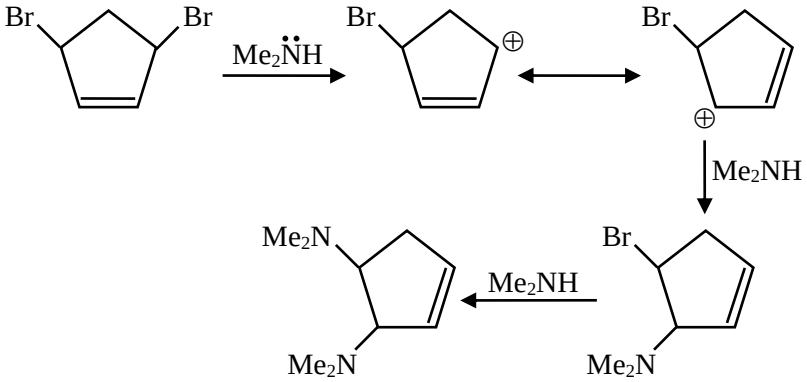
(1) 

(2) 

(3) 

(4) 

Sol. **3**

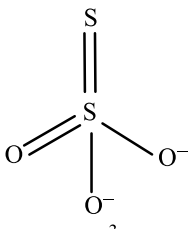


77. The number of species from the following that have pyramidal geometry around the central atom is____

$S_2O_3^{2-}, SO_4^{2-}, SO_3^{2-}, S_2O_7^{2-}$

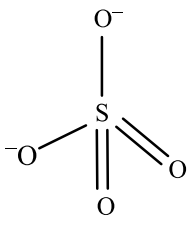
(1) 4 (2) 2 (3) 3 (4) 1

Sol. **4**



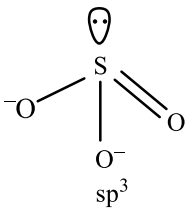
sp^3

Td geo.



sp^3

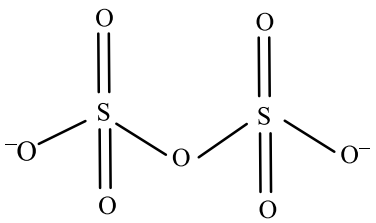
Td geo.



sp^3

Td geo.

Pyramidal shape



sp^3

Td geo.

According to question SO_3^{-2} have only pyramidal shape.

78. The correct order of the first ionization enthalpy is

(1) Al > Ga > Tl (2) Tl > Ga > Al (3) B > Al > Ga (4) Ga > Al > B

Sol. **2**

Tl > Ga > Al

Tl: due to Lanthanide contration

Ga: due to d-contraction

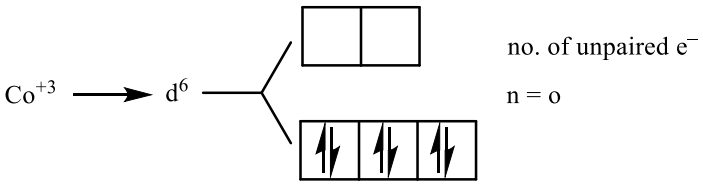
79. The number of unpaired d-electrons in $\left[Co(H_2O)_6\right]^{3+}$ is ____.

(1) 4 (2) 0 (3) 2 (4) 1

Sol. **2**

$\left[Co(H_2O)_6\right]^{+3}$ in higher OS of CO H_2O work as SFL

Thus



80. The adsorbent used in adsorption chromatography is/are -

A. silica gel B. alumina C. quick lime D. magnesia

Choose the most appropriate answer from the options given below :

(1) A only (2) B only (3) A and B only (4) C and D only

Sol. **3**

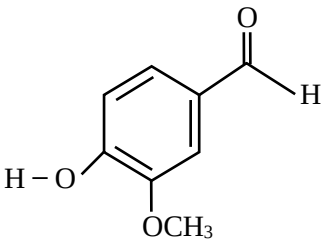
Polar & Basic adsorbent used in adsorption chromatography.

(Alumina or Silica gel can be used)

SECTION – B

81. Vanillin compound obtained from vanilla beans, has total sum of oxygen atoms and π electrons is ____.

Sol. **11**



Vanillin

Total oxygen atom = 3

Total π-electron = 8

3 + 8 = 11

82. Consider the following reaction, the rate expression of which is given below

$A + B \rightarrow C$

rate $= k[A]^{1/2}[B]^{1/2}$

The reaction is initiated by taking 1 M concentration of A and B each. If the rate constant (k) is $4.6 \times 10^{-2}\ s^{-1}$, then the time taken for A to become 0.1 M is ____ sec.

(nearest integer)

Sol. **50**

$\gamma = k(A)^{1/2}(B)^{1/2}$

$A + B \longrightarrow C$

t = 0 1M 1M

t 0.1 0.1

$r_t = k(0.1)^1$ t = ?

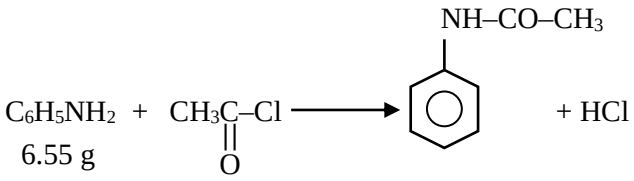
$r_0 = k(1)^1$

$t = \frac{2.303}{4.6\times10^{-2}} \log \frac{1}{0.1} = \frac{230.3}{4.6} = 50s$

t = 50s

83. From 6.55 g of aniline, the maximum amount of acetanilide that can be prepared will be ____$\times 10^{-1}$ g.

Sol. **95**



$$\text{Moles of anline} = \frac{6.55}{93} = 0.07$$

Moles of Acetanilide = 0.07

Mass = (0.07) (135) = 9.5 g

= 95

84. Three moles of an ideal gas are compressed isothermally from 60 L to 20 L using constant pressure of 5 atm. Heat exchange Q for the compression is ____ Lit. atm.

Sol. **200**

n = 3

V_1 = 60 L V_2 = 20 L

Pext = 5 atm

$\Delta U = W + Q = 0$

$W = -Q$

$W = -P_2 (V_2 - V_1)$ $= -(5)(-40)$

$= 200$ atm.L

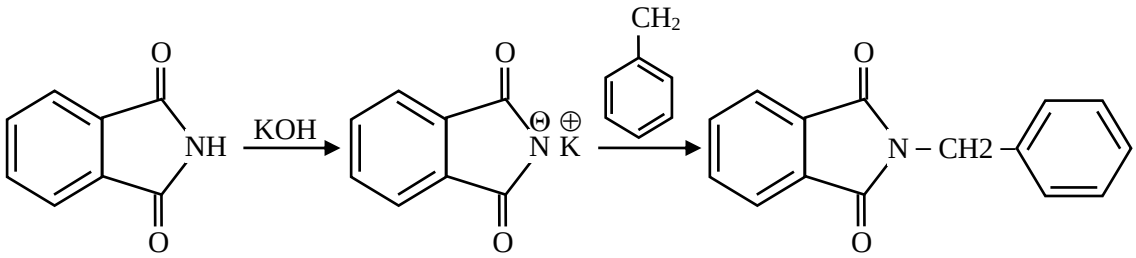
Q = – 200 atm.L

85. Phthalimide is made to undergo following sequence of reactions.

$$\text{Phthalimide} \xrightarrow[\text{(ii) Benzylchloride}]{\text{(i) KOH}} \text{'P'}$$

Total number of π bonds present in product 'P' is/are____

Sol. **8**



Phthalimide K - phthalimide N – benzyl phthalimide

Total π–bonds = 8

86. The maximum number of orbitals which can be identified with n = 4 and $m_l = 0$ is

Sol. **4**

n = 4 & m = 0

⇓

s, p, d, f

no. of orbitals with n = 4 & m = 0

$\Rightarrow 4$

87. 2.7 kg of each of water and acetic acid are mixed. The freezing point of the solution will be –x °C. Consider the acetic acid does not dimerise in water, nor dissociates in water. x = _____ (nearest integer)

[Given: Molar mass of water =18 g mol^{-1}, acetic acid = 60 g mol^{-1}

K_f H_2O : 1.86 K kg mol^{-1}

K_f acetic acid : 3.90 K kg mol^{-1}

freezing point : H_2O = 273 K, acetic acid = 290 K]

Sol. **21**

$M_{H_2O} = 2.7\,kg \qquad \Delta T_f = x^{\circ}C$

$M_{CH_3COOH} = 2.7\,kg$

i = 1 (as given is Q^n)

as moles of CH_3COOH is lower $\Rightarrow$ solute

$$\Delta T_f = \frac{(1.86)\left(2.7\times10^3\right)}{(60)(2.7)} = 31^{\circ}C$$

88. Number of compounds / species from the following with non-zero dipole moment is____.

$BeCl_2$, BCl_3, NF_3, XeF_4, CCl_4, H_2O, H_2S, HBr, CO_2, H_2, HCl

Sol. **5**

$u \neq O$ for the following compounds.

NF_3, H_2O, H_2S(drago), HBr, HCl

89. A first row transition metal with highest enthalpy of atomisation, upon reaction with oxygen at high temperature forms oxides of formula M_2O_n (where n = 3, 4, 5). The 'spin-only' magnetic moment value of the amphoteric oxide from the above oxides is _____ BM (near integer)

(Given atomic number: Sc : 21, Ti : 22, V : 23, Cr : 24, Mn : 25, Fe : 26, Co : 27, Ni : 28, Cu : 29, Zn : 30)

Sol. **0**

Highest enthalpy of atomization = vanadium (V) = 515 kJ/mol

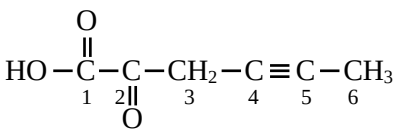
Oxide = V_2O_5 (Amphoteric)

V^{+5} O.S $\Rightarrow d^o \Rightarrow$ no of unpaired e^- = 0

$u = \sqrt{n(n+2)} = 0$.

90. The total number of 'sigma' and 'Pi' bonds in 2-oxohex-4-ynoic acid is____.

Sol. **18**



total no. of σ-bond are 14

total no. of π-bond are 4

= 18

Continuing to keep the pledge
of **imparting education** for the **last 17 Years**

65136+
SELECTIONS SINCE 2007

JEE (Advanced)	JEE (Main)	NEET/AIIMS	NTSE/OLYMPIADS
12142	32584	17875 (Under 50000 Rank)	2535 (6th to 10th class)

Most Promising RANKS
Produced by MOTION Faculties

NEET / AIIMS

- AIR-1 to 10 — 25 Times
- AIR-11 to 50 — 84 Times
- AIR-51 to 100 — 84 Times

JEE MAIN+ADVANCED

- AIR-1 to 10 — 8 Times
- AIR-11 to 50 — 37 Times
- AIR-51 to 100 — 41 Times

NITIN VIIJAY (NV Sir)
Founder & CEO

Nation's Best SELECTION
Percentage (%) Ratio

Student Qualified in NEET

(2023)
6492/7084 = **91.64%**
(2022)
4837/5356 = **90.31%**

Student Qualified in JEE ADVANCED

(2023)
2747/5182 = **53.01%**
(2022)
1756/4818 = **36.45%**

Student Qualified in JEE MAIN

(2024-First Attemp)
6495/10592 = **61.31%**
(2023)
5993/8497 = **70.53%**
(2022)
4818/6653 = **72.41%**

MOTION