FINAL JEE–MAIN EXAMINATION – APRIL, 2023
Held On Thursday 06th April, 2023
TIME : 09:00 AM to 12:00 PM

SECTION - A

61. Match List I with List II

List I (Natural Amino acid)	List II (One Letter Code)
(A) Arginine	(I) D
(B) Aspartic acid	(II) N
(C) Asparagine	(III) A
(D) Alanine	(IV) R

Choose the correct answer from the options given below:
(1) (A) – III, (B) – I, (C) – II (D) –IV (2) (A) – IV, (B) – I, (C) – II (D) –III
(3) (A) – IV, (B) – I, (C) – III (D) –II (4) (A) – I, (B) – III, (C) – IV (D) –II

Sol. **2**

Natural Amino acid	One Letter Code
(i) Arginine	R
(ii) Aspartic acid	D
(iii) Asparagine	N
(iv) Alanine	A

62. Formation of which complex, among the following, is not a confirmatory test of Pb^{2+} ions
(1) lead sulphate (2) lead nitrate (3) lead chromate (4) lead iodide

Sol. **2**

$\because$ $Pb(NO_3)_2$ is a soluble colourless compound so it cannot be used in confirmatory test of Pb^{+2} ion.

63. The volume of 0.02 M aqueous HBr required to neutralize 10.0 mL of 0.01 M aqueous $Ba(OH)_2$ is (Assume complete neutralization)
(1) 5.0 mL (2) 10.0 mL (3) 2.5 mL (4) 7.5 mL

Sol. **2**

m.eq. of HBr = m.eq. of $Ba(OH)_2$
$M_1 \times n_1 \times V_1(mL) = M_2 \times n_2 \times V_2(mL)$
$0.02 \times 1 \times V_1(mL) = 0.02 \times 2 \times 10$
$V_1(mL) = 10$ mL

64. Group–13 elements react with O_2 in amorphous form to form oxides of type M_2O_3 (M = element). Which among the following is the most basic oxide?
(1) Al_2O_3 (2) Tl_2O_3 (3) Ga_2O_3 (4) B_2O_3

Sol. **2**

As electropositive character increases basic character of oxide increases.

$$\underbrace{B_2O_3}_{\text{acidic}} < \underbrace{Al_2O_3 < Ga_2O_3}_{\text{amphoteric}} < \underbrace{In_2O_3 < Tl_2O_3}_{\text{basic}}$$

65. The IUPAC name of $K_3[Co(C_2O_4)_3]$ is -
(1) Potassium tris(oxalate) cobaltate(III) (2) Potassium trioxalatocobalt(III)
(3) Potassium trioxalatocobaltate(III) (4) Potassium tris(oxalate)cobalt(III)

Sol. **3**

IUPAC name of $K_3[Co(C_2O_4)_3]$ is Potassium trioxalatocobaltate(III)

66. If the radius of the first orbit of hydrogen atom is a_0, then de Broglie's wavelength of electron in 3rd orbit is

(1) $\frac{\pi a_0}{6}$ (2) $\frac{\pi a_0}{3}$ (3) $6\pi a_0$ (4) $3\pi a_0$

Sol. **3**

By De-Broglie principle

$2\pi r = n\lambda$

$$2\pi \times \frac{n^2}{z} a_0 = n\lambda$$

$$2\pi \times \frac{n}{z} a_0 = \lambda$$

$$\lambda = 2\pi \times \frac{3}{1} a_0 = 6\pi a_0$$

67. The group of chemicals used as pesticide is

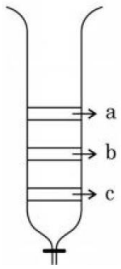
(1) Sodium chlorate, DDT, PAN (2) DDT, Aldrin

(3) Aldrin, Sodium chlorate, Sodium arsinite (4) Dieldrin, Sodium arsinite, Tetrachlorothene

Sol. **2**

(Fact base) DDT & Aldrin are used as pesticide

68. From the figure of column, chromatography given below, identify incorrect statements.



A. Compound 'c' is more polar than 'a' and 'b'

B. Compound 'a' is least polar

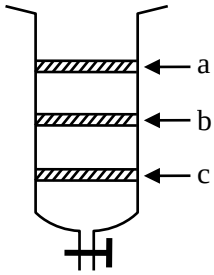
C. Compound 'b' comes out of the column before 'c' and after 'a'

D. Compound 'a' spends more time in the column

Choose the correct answer from the options given below:

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

Sol. **2**



Adsorption of compound α Attraction

α Polarity

α Spend time in column

$$\alpha \frac{1}{\text{come out from column}}$$

Order of polarity $\rightarrow$ a > b > c

Come out from column order $\rightarrow$ c > b > a

Spend time in column $\rightarrow$ a > b > c

69. Ion having highest hydration enthalpy among the given alkaline earth metal ions is:

(1) Be^{2+} (2) Ba^{2+} (3) Ca^{2+} (4) Sr^{2+}

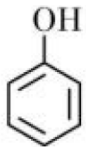
Sol. **1**

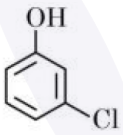
Hydration enthalpy $\propto \frac{1}{\text{size}}$

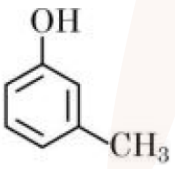
Down the group as size increases hydration enthalpy decreases

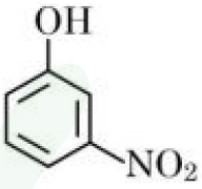
Order: $Be^{2+} > Mg^{+2} > Ca^{+2} > Sr^{+2} > Ba^{+2}$

70. The strongest acid from the following is

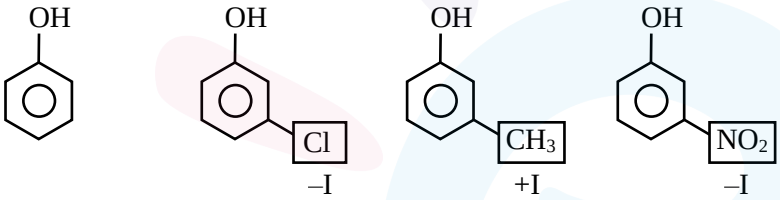
(1) 

(2) 

(3) 

(4) 

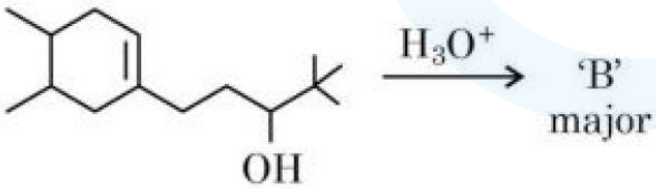
Sol. **4**

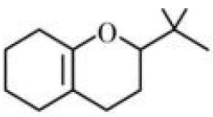


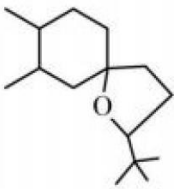
Since –I of $–NO_2$ > Cl

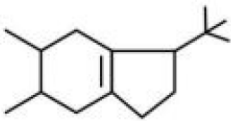
So, most acidic will be (4)

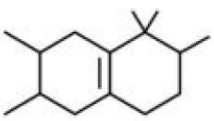
71. In the following reaction, 'B' is



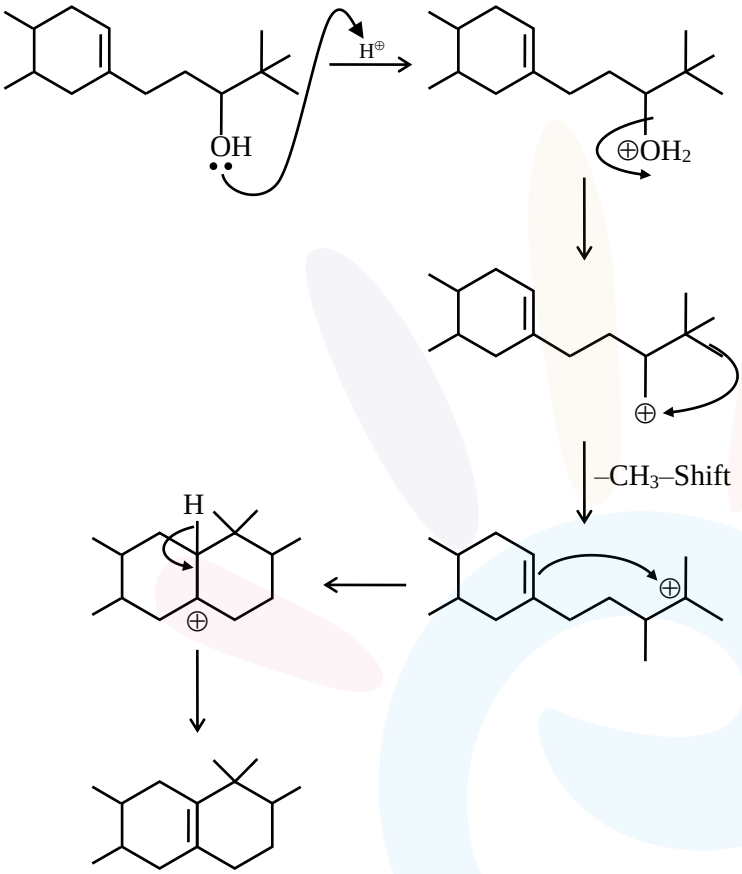
(1) 

(2) 

(3) 

(4) 

Sol. **4**



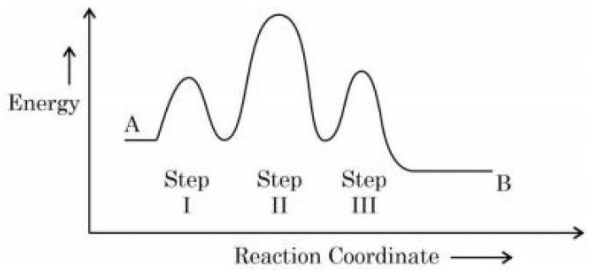
72. Structures of $BeCl_2$ in solid state, vapour phase and at very high temperature respectively are:

(1) Polymeric, Dimeric, Monomeric
(2) Dimeric, Polymeric, Monomeric
(3) Monomeric, Dimeric, Polymeric
(4) Polymeric, Monomeric, Dimeric

Sol. **1**

In solid state $BeCl_2$ as polymer, in vapour state it form chloro-bridged dimer while above 1200K it is monomer.

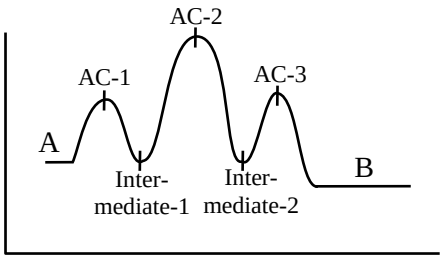
73. Consider the following reaction that goes from A to B in three steps as shown below:



Choose the correct option

	Number of intermediates	Number of Activated complex	Rate determining step
(1)	2	3	II
(2)	3	2	II
(3)	2	3	III
(4)	2	3	I

Sol. **1**



Number of Intermediate → 2

Number of Activated complex → 3

Rate determining step → II

74. The product, which is not obtained during the electrolysis of brine solution is

(1) HCl (2) NaOH (3) Cl_2 (4) H_2

Sol. **1**

Brine solution ($NaCl + H_2O$)

Electrolyte $\begin{cases} NaCl \rightarrow Na^+ + Cl^- \\ H_2O \rightarrow 2H^+ + OH^- \end{cases}$

At Cathode $\rightarrow 2H^{\oplus} + 2e^{\ominus} \rightarrow H_2\uparrow$

At Anode $\rightarrow 2Cl^- \rightarrow Cl_2\uparrow + 2e^{\ominus}$

$Na^+ + OH^- \rightarrow NaOH$

Answer 1 (HCl)

75. Which one of the following elements will remain as liquid inside pure boiling water?

(1) Li (2) Ga (3) Cs (4) Br

Sol. **2**

Li, Cs reacts vigorously with water.

Br_2 changes in vapour state in boiling water (BP = 58°C)

Ga reacts with water above 100°C (MP = 29°C, BP = 2400°C)

76. Given below are two statements: one is labelled as "**Assertion A**" and the other is labelled as "**Reason R**"

Assertion A: In the complex $Ni(CO)_4$ and $Fe(CO)_5$, the metals have zero oxidation state.

Reason R: Low oxidation states are found when a complex has ligands capable of π–donor character in addition to the σ– bonding.

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

(1) A is not correct but R is correct.

(2) A is correct but R is not corret

(3) Both A and R are 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.

Sol. **2**

Low oxidation state of metals can stabilized by synergic bonding so ligand has to be π-acceptor.

77. Given below are two statements:

Statement I: Morphine is a narcotic analgesic. It helps in reliving pain without producing sleep.

Statement II: Morphine and its derivatives are obtained from opium poppy.

In the light of the above statements, choose the correct answer from the options given below

(1) Statement I is true but statement II is false (2) Both statement I and statement II are true

(3) Statement I is false but statement II is true (4) Both Statement I and Statement II are false

Sol. **3**

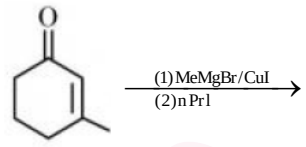
Fact

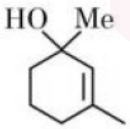
Morphine→

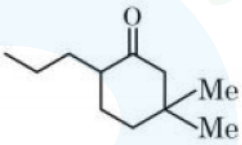
(i) Morphine is a narcotic analgesic, it help in relieving plan and producing sleep.

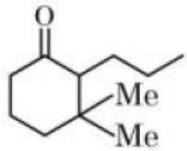
(ii) Morphine and its derivatives are obtained from opium.

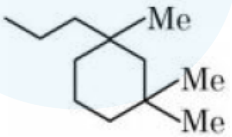
78. Find out the major product from the following reaction.



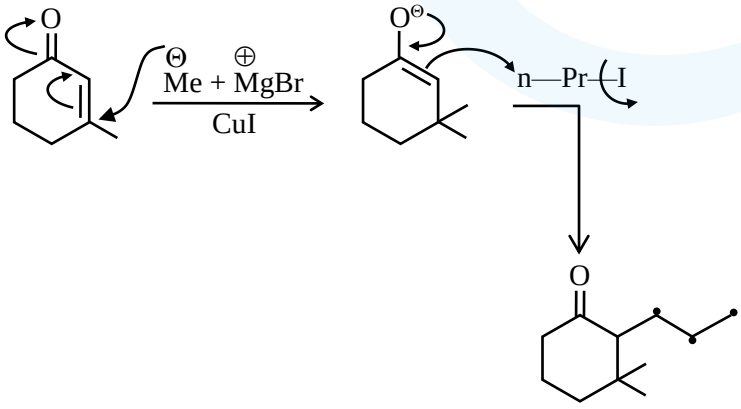
(1) 

(2) 

(3) 

(4) 

Sol. **3**



79. During the reaction of permanganate with thiosulphate, the change in oxidation of manganese occurs by value of 3. Identify which of the below medium will favour the reaction

(1) aqueous neutral (2) aqueous acidlic

(3) both aqueous acidic and neutral (4) both aqueous acidic and faintly alkaline

Sol. **1**

In neutral or weakly alkaline solution oxidation state of Mn changes by 3 unit

$\overset{+7}{Mn}O_4^{-1} \rightarrow \overset{+4}{Mn}O_2$

80. Element not present in Nessler's reagent is
(1) K (2) N (3) I (4) Hg

Sol. **2**
Nessler reagent is- $K_2[HgI_4]$

SECTION - B

81. The standard reduction potentials at 298 K for the following half cells are given below:

$NO_3^- + 4H^+ + 3e^- \rightarrow NO(g) + 2H_2O$ $E^\theta = 0.97V$

$V^{2+}(aq) + 2e^- \rightarrow V$ $E^\theta = -1.19V$

$Fe^{3+}(aq) + 3e^- \rightarrow Fe$ $E^\theta = -0.04V$

$Ag^+(aq) + e^- \rightarrow Ag(s)$ $E^\theta = 0.80V$

$Au^{3+}(aq) + 3e^- \rightarrow Au(s)$ $E^\theta = 1.40V$

The number of metal(s) which will be oxidized by NO_3^- in aqueous solution is _____

Sol. **3**
Metal + $NO_3^- \rightarrow$ Metal Nitrate
(V, Fe, Ag)
↓
Less value of reaction potential then 0.97 volt.
Answer 3

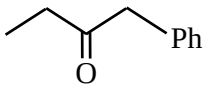
82. Number of crystal system from the following where body centred unit cell can be found, is_____
Cubic, tetragonal, orthorhombic, hexagonal, rhombohedral, monoclinic, triclinic

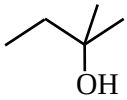
Sol. **3**
BCC present in → Cubic, Tetragonal orthorhombic

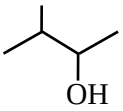
83. Among the following the number of compounds which will give positive iodoform reaction is_____
(a) 1–Phenylbutan–2–one (b) 2–Methylbutan–2–ol
(c) 3–Methylbutan–2–ol (d) 1–Phenylethanol
(e) 3,3–dimethylbutan–2–one (f) 1–Phenylpropan –2–ol

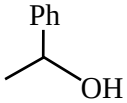
Sol. **4**

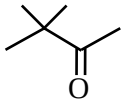
Iodo form test

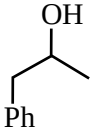
(a)  –NO

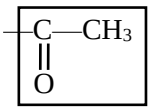
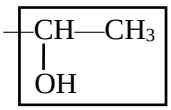
(b)  –NO

(c)  –Yes

(d)  –Yes

(e)  –Yes

(f)  –Yes

For carbonyl compound  for alcohol  should be present for idoform test.

84. Number of isomeric aromatic amines with molecular formula $C_8H_{11}N$, which can be synthesized by Gabriel Phthalimide synthesis is_____

Sol. **6**

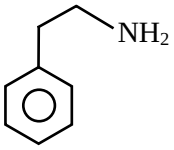
By Gabriel phthalimide synthesis $\rightarrow$ i-amine is prepared

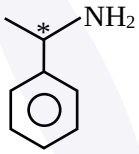
$C_8H_{11}N \rightarrow$ Should be aromatic & i-amine

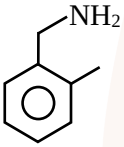
$$Du = C + 1 - \frac{H - N}{2}$$

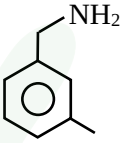
$$= 8 + 1 - \frac{11 - 1}{2}$$

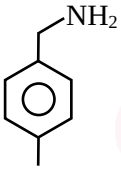
$$= 9 - \frac{10}{2} = 9 - 5 = 4 \rightarrow \text{it means benzene ring}$$

(i) 

(ii) 

(iii) 

(iv) 

(v) 

85. Consider the following pairs of solution which will be isotonic at the same temperature. The number of pairs of solutions is/are_____

A. 1 M aq. NaCl and 2 M aq. Urea

B. 1 M aq. $CaCl_2$ and 1.5 M aq. KCl

C. 1.5 M aq. $AlCl_3$ and 2 M aq. Na_2SO_4

D. 2.5 M aq. KCl and 1 M aq. $Al_2(SO_4)_3$

Sol. **4**

A. 1 M aq. NaCl $\Rightarrow$ 2 M aq. Ions
2 M aq. Urea $\Rightarrow$ 2 M aq. Urea } Isotonic

B. 1 M aq. $CaCl_2 \Rightarrow$ 3 M aq. Ions
1.5 M aq. KCl $\Rightarrow$ 3 M aq. Ions } Isotonic

C. 1.5 M aq. $AlCl_3 \Rightarrow$ 6 M aq. Ions
2 M aq. $Na_2SO_4 \Rightarrow$ 6 M aq. Ions } Isotonic

D. 2.5 M aq. KCl $\Rightarrow$ 5 M aq. Ions
1 M aq. $Al_2(SO_4)_3 \Rightarrow$ 5 M aq. Ions } Isotonic

86. The number of colloidal systems from the following, which will have 'liquid' as the dispersion medium, is_____

Gem stones, paints, smoke, cheese, milk, hair cream, insecticide sprays, froth, soap lather

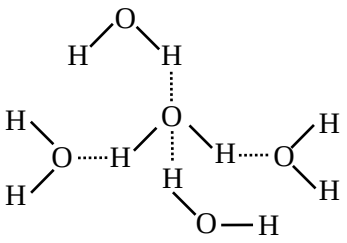
Sol. **5**

Liquid dispersion medium

Paints, milk, hair cream, froth, soap lather

87. In an ice crystal, each water molecule is hydrogen bonded to neighbouring molecules.

Sol. **4**



88. Consider the following date

Heat of combustion of $H_2(g)$ = –241.8 kJ mol^{-1}

Heat of combustion of C(s) = –393.5 kJ mol^{-1}

Heat of combustion of $C_2H_5OH(l)$ = –1234.7 kJ mol^{-1}

The heat of formation of $C_2H_5OH(l)$ is (–) _____kJ mol^{-1} (Nearest integer).

Sol. **278**

$2C_{(s)} + O_2 \rightarrow 2CO_2$ –393.5 × 2 = –787 kJ …(1)

$3H_2 + \frac{3}{2}O_2 \rightarrow 3H_2O$ –241.5 × 8 × 3 = –725.4 kJ …(2)

$C_2H_5OH + 3O_2 \rightarrow 2CO_2 + 3H_2O$ –1234.7 kJ …(3)

$3H_2O + 2CO_2 \rightarrow C_2H_5OH + 3O_2$ +1234.7 kJ …(4)

$2C_{(s)} + 3H_2(g) + \frac{1}{2}O_2 \; C_2H_5OH$ …(5)

---

eq (5) = eq (1) + eq (2) + eq (4)

= (–787) + (–72537) + (1234.7)

= –277.7 = 278

89. The equilibrium composition for the reaction $PCl_3 + Cl_2 \rightleftharpoons PCl_5$ at 298 K is given below:

$[PCl_3]_{eq} = 0.2 \, mol \; L^{-1}, [Cl_2]_{eq} = 0.1 \; mol \; L^{-1}, [PCl_5]_{eq} = 0.40 \; mol \; L^{-1}$

If 0.2 mol of Cl_2 is added at the same temperature, the equilibrium concentrations of PCl_5 is _____× $10^{-2} \, mol \, L^{-1}$

Given: K_C for the reaction at 298 K is 20

Sol. **49**

NTA answer 48

$$K_c = \frac{[PCl_5]}{[PCl_3][Cl_2]} = \frac{0.4}{0.2 \times 0.1} = 20$$

	PCl_3	+	Cl_2	$\rightleftharpoons$	PCl_5
t_{eq1}	0.2 M		0.1 M		0.4 M
t_{eq2}	0.2 – x		0.1 + 0.2 – x		0.4 + x

$$K_c = 20 = \frac{0.4 + x}{(0.2 - x)(0.3 - x)}$$

After solving by quadratic equation. We can get value of x.

X = 0.086

$[PCl_5]$ = 0.4 + x

= 0.4 + 0.086

= 0.486 = 48.6 × 10^{-2}

Ans. 49

90. The number of species having a square planar shape from the following is_____

$XeF_4, SF_4, SiF_4, BF_4^-, BrF_4^- [Cu(NH_3)_4]^{2+}, [FeCl_4]^{2-}, [PtCl_4]^{2-}$

Sol. **4**

$XeF_4, BrF_4^- [Cu(NH_3)_4]^{2+}, [PtCl_4]^{2-}$ has square planar shape.