FINAL JEE–MAIN EXAMINATION – APRIL, 2024

(Held On Friday 05th April, 2024) **TIME : 3 : 00 PM to 6 : 00 PM**

CHEMISTRY

TEST PAPER WITH ANSWER

SECTION-A

61. Match **List - I** with **List - II**.

List - I	List - II
(A) ICl	(I) T -Shape
(B) ICl_3	(II) Square pyramidal
(C) ClF_5	(III) Pentagonal bipyramidal
(D) IF_7	(IV) Linear

Choose the **correct** answer from the options given below:

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

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

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

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

Ans. (3)

62. While preparing crystals of Mohr's salt, dil. H_2SO_4 is added to a mixture of ferrous sulphate and ammonium sulphate, before dissolving this mixture in water, dil. H_2SO_4 is added here to:

(1) prevent the hydrolysis of ferrous sulphate

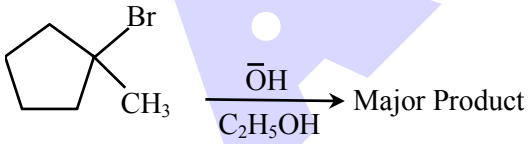
(2) prevent the hydrolysis of ammonium sulphate

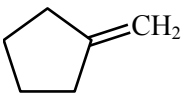
(3) make the medium strongly acidic

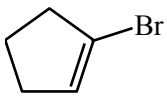
(4) increase the rate of formation of crystals

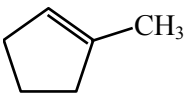
Ans. (1)

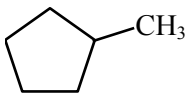
63. Identify the major product in the following reaction.



(1) 

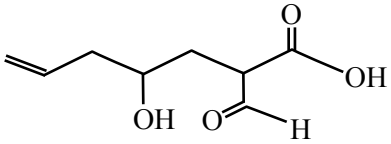
(2) 

(3) 

(4) 

Ans. (3)

64. The correct nomenclature for the following compound is:



(1) 2–carboxy–4–hydroxyhept–6–enal

(2) 2–carboxy–4–hydroxyhept–7–enal

(3) 2–formyl–4–hydroxyhept–6–enoic acid

(4) 2–formyl–4–hydroxyhept–7–enoic acid

Ans. (3)

65. Given below are two statements : one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A) : NH_3 and NF_3 molecule have pyramidal shape with a lone pair of electrons on nitrogen atom. The resultant dipole moment of NH_3 is greater than that of NF_3.

Reason (R) : In NH_3, the orbital dipole due to lone pair is in the same direction as the resultant dipole moment of the N–H bonds. F is the most electronegative element.

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

(1) Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**

(2) **(A)** is false but **(R)** is true

(3) **(A)** is true but **(R)** is false

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

Ans. (1)

66. Given below are two statements:

Statement I : On passing $HCl_{(g)}$ through a saturated solution of $BaCl_2$, at room temperature white turbidity appears.

Statement II : When HCl gas is passed through a saturated solution of NaCl, sodium chloride is precipitated due to common ion effect.

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

(1) **Statement I** is correct but **Statement II** is incorrect

(2) Both **Statement I** and **Statement II** are incorrect

(3) **Statement I** is incorrect but **Statement II** is correct

(4) Both **Statement I** and **Statement II** are correct

Ans. (1)

67. The metal atom present in the complex MABXL (where A, B, X and L are unidentate ligands and M is metal) involves sp^3 hybridization. The number of geometrical isomers exhibited by the complex is:

(1) 4 (2) 0

(3) 2 (4) 3

Ans. (2)

68. Match **List - I** with **List - II**.

List - I (Pair of Compounds)	**List - II (Isomerism)**
(A) n-propanol and Isopropanol	(I) Metamerism
(B) Methoxypropane and ethoxyethane	(II) Chain Isomerism
(C) Propanone and propanal	(III) Position Isomerism
(D) Neopentane and Isopentane	(IV) Functional Isomerism

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

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

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

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

Ans. (4)

69. The quantity of silver deposited when one coulomb charge is passed through $AgNO_3$ solution:

(1) 0.1 g atom of silver

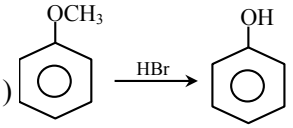
(2) 1 chemical equivalent of silver

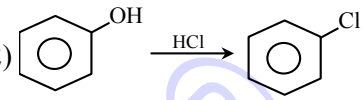
(3) 1 g of silver

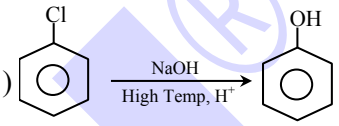
(4) 1 electrochemical equivalent of silver

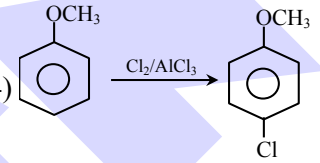
Ans. (4)

70. Which one of the following reactions is NOT possible?

(1) 

(2) 

(3) 

(4) 

Ans. (2)

71. Given below are two statements :

Statement I : The metallic radius of Na is 1.86 A° and the ionic radius of Na^+ is lesser than 1.86 A°.

Statement II : Ions are always smaller in size than the corresponding elements.

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

(1) **Statement I** is correct but **Statement II** is false

(2) Both **Statement I** and **Statement II** are true

(3) Both **Statement I** and **Statement II** are false

(4) **Statement I** is incorrect but **Statement II** is true

Ans. (1)

72. $CH_3CH_2–OH \xrightarrow[\text{(ii) } KMnO_4]{\text{(i) Jone's Reagent}} \xrightarrow[\text{(iii)NaOH, CaO,}\Delta]{} P$

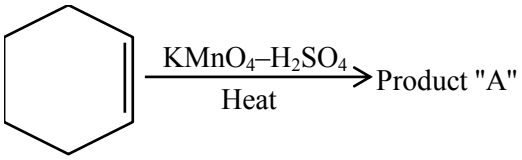
Consider the above reaction sequence and identify the major product P.

(1) Methane (2) Methanal

(3) Methoxymethane (4) Methanoic acid

Ans. (1)

73. Consider the given chemical reaction :



Product "A" is :

(1) picric acid (2) oxalic acid

(3) acetic acid (4) adipic acid

Ans. (4)

74. For the electro chemical cell

$M|M^{2+}||X|X^{2-}$

If $E^0_{(M^{2+}/M)} = 0.46\,V$ and $E^0_{(X/X^{2-})} = 0.34V$.

Which of the following is **correct** ?

(1) $E_{cell} = -0.80$ V

(2) $M + X \rightarrow M^2 + X^{2-}$ is a spontaneous reaction

(3) $M^{2+} + X^{2-} \rightarrow M + X$ is a spontaneous reaction

(4) $E_{cell} = 0.80$ V

Ans. (3)

75. The number of moles of methane required to produce 11 g $CO_2(g)$ after complete combustion is :

(Given molar mass of methane in g mol^{-1} : 16)

(1) 0.75 (2) 0.25

(3) 0.35 (4) 0.5

Ans. (2)

76. The number of complexes from the following with no electrons in the t_2 orbital is _____.

$TiCl_4$, $[MnO_4]^-$, $[FeO_4]^{2-}$, $[FeCl_4]^-$, $[CoCl_4]^{2-}$

(1) 3 (2) 1

(3) 4 (4) 2

Ans. (1)

77. The number of ions from the following that have the ability to liberate hydrogen from a dilute acid is __.

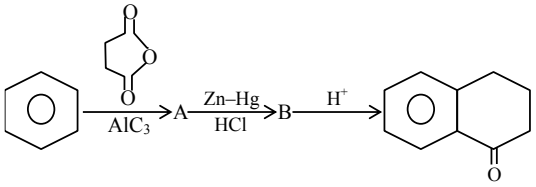
Ti^{2+}, Cr^{2+} and V^{2+}

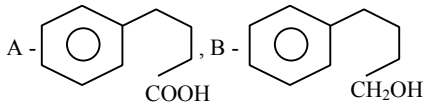
(1) 0 (2) 2

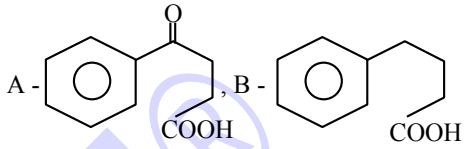
(3) 3 (4) 1

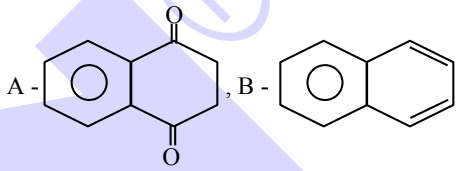
Ans. (3)

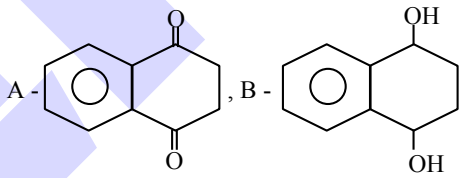
78. Identify A and B in the given chemical reaction sequence : -



(1) 

(2) 

(3) 

(4) 

Ans. (2)

79. The correct statements from the following are :

(A) The decreasing order of atomic radii of group 13 elements is Tl > In > Ga > Al > B.

(B) Down the group 13 electronegativity decreases from top to bottom.

(C) Al dissolves in dil. HCl and liberate H_2 but conc. HNO_3 renders Al passive by forming a protective oxide layer on the surface.

(D) All elements of group 13 exhibits highly stable +1 oxidation state.

(E) Hybridisation of Al in $[Al(H_2O)_6]^{3+}$ ion is sp^3d^2.

Choose the **correct** answer from the options given below :

(1) (C) and (E) only

(2) (A), (C) and (E) only

(3) (A), (B), (C) and (E) only

(4) (A) and (C) only

Ans. (1)

80. Coagulation of egg, on heating is because of :

(1) Denaturation of protein occurs

(2) The secondary structure of protein remains unchanged

(3) Breaking of the peptide linkage in the primary structure of protein occurs

(4) Biological property of protein remains unchanged

Ans. (1)

SECTION-B

81. Combustion of 1 mole of benzene is expressed at

$$C_6H_6(1) + \frac{15}{2}O_2(g) \rightarrow CO_2(g) + 3H_2O(1).$$

The standard enthalpy of combustion of 2 mol of benzene is – 'x' kJ.

x = ___.

(1) standard Enthalpy of formation of 1 mol of $C_6H_6(1)$, for the reaction

$6C(\text{graphite}) + 3H_2(g) \rightarrow C_6H_6(1)$ is 48.5 kJ mol^{-1}.

(2) Standard Enthalpy of formation of 1 mol of $CO_2(g)$, for the reaction

$C(\text{graphite}) + O_{2(g)} \rightarrow CO_2(g)$ is –393.5 kJ mol^{-1}.

(3) Standard and Enthalpy of formation of 1 mol of $H_2O(1)$, for the reaction

$H_2(g) + \frac{1}{2}O_2(g) \rightarrow H_2O(1)$ is –286 kJ mol^{-1}.

Ans. (6535)

82. The fusion of chromite ore with sodium carbonate in the presence of air leads to the formation of products A and B along with the evolution of CO_2. The sum of spin-only magnetic moment values of A and B is ___ B.M. (Nearest integer)

(Given atomic number : C : 6, Na : 11, O : 8, Fe : 26, Cr : 24]

Ans. (6)

83. X of enthanamine was subjected to reaction with $NaNO_2$/HCl followed by hydrolysis to liberate N_2 and HCl. The HCl generated was completely neutralised by 0.2 moles of NaOH. X is ____ g.

Ans. (9)

84. In an atom, total number of electrons having quantum numbers n = 4, $|m_l| = 1$ and $m_s = -\frac{1}{2}$ is

Ans. (6)

85. Using the given figure, the ratio of R_f values of sample A and sample C is x × 10^{-2}. Value of x is _____.

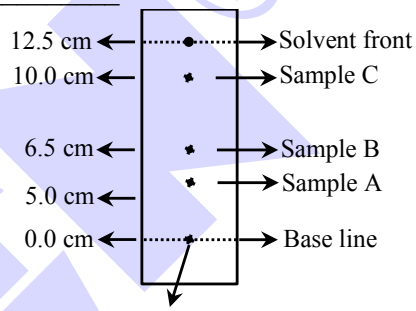


Fig : Paper chromatography of Samples

Ans. (50)

86. In the Claisen-Schmidt reaction to prepare 351 g of dibenzalacetone using 87 g of acetone, the amount of benzaldehyde required is _____g. (Nearest integer)

Ans. (318)

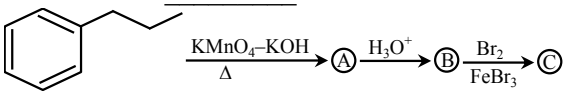
87. Consider the following single step reaction in gas phase at constant temperature.

$2A_{(g)} + B_{(g)} \rightarrow C_{(g)}$

The initial rate of the reaction is recorded as r_1 when the reaction starts with 1.5 atm pressure of A and 0.7 atm pressure of B. After some time, the rate r_2 is recorded when the pressure of C becomes 0.5 atm. The ratio $r_1 : r_2$ is _____ × 10^{-1}. (Nearest integer)

Ans. (315)

88. The product © in the following sequence of reactions has _____ π bonds.



Ans. (4)

89. Considering acetic acid dissociates in water, its dissociation constant is 6.25×10^{-5}. If 5 mL of acetic acid is dissolved in 1 litre water, the solution will freeze at $-x \times 10^{-2}$ °C, provided pure water freezes at 0 °C.

x = _____. (Nearest integer)

Given : $(K_f)_{water} = 1.86$ K kg mol^{-1}.

density of acetic acid is 1.2 g mol^{-1}

molar mass of water = 18 g mol^{-1}.

molar mass of acetic acid = 60 g mol^{-1}.

density of water = 1 g cm^{-3}

Acetic acid dissociates as

$$CH_3COOH \rightleftharpoons CH_3COO^{\ominus} + H^{\oplus}$$

Ans. (19)

90. Number of compounds from the following with zero dipole moment is _____.

HF, H_2, H_2S, CO_2, NH_3, BF_3, CH_4, $CHCl_3$, SiF_4, H_2O, BeF_2

Ans. (6)

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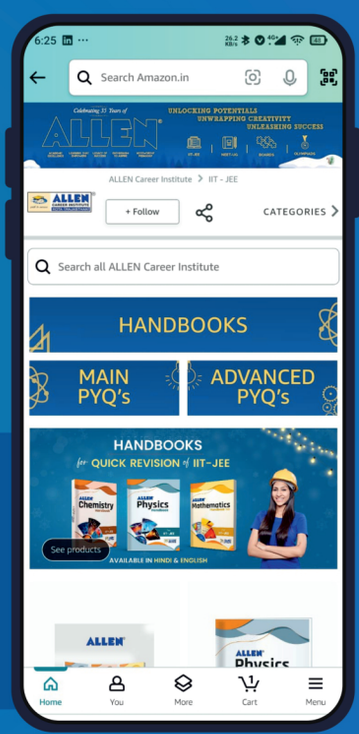

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