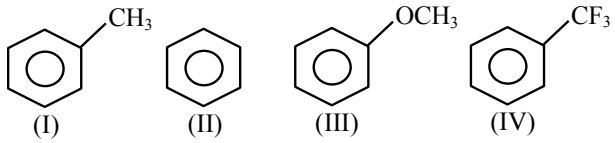
FINAL JEE–MAIN EXAMINATION – APRIL, 2024

(Held On Saturday 06th April, 2024) **TIME : 3 : 00 PM to 6 : 00 PM**

CHEMISTRY

TEST PAPER WITH ANSWER

SECTION-A

61. 

The **correct** arrangement for decreasing order of electrophilic substitution for above compounds

(1) (IV) > (I) > (II) > (III)
(2) (III) > (I) > (II) > (IV)
(3) (II) > (IV) > (III) > (I)
(4) (III) > (IV) > (II) > (I)

Ans. (2)

62. Molality (m) of 3 M aqueous solution of NaCl is:
(Given : Density of solution = 1.25 g mL^{-1}, Molar mass in g mol^{-1} : Na-23, Cl-35.5)

(1) 2.90 m (2) 2.79 m
(3) 1.90 m (4) 3.85 m

Ans. (2)

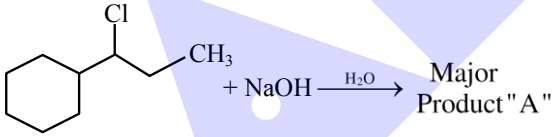
63. The incorrect statements regarding enzymes are:

(A) Enzymes are biocatalysts.
(B) Enzymes are non-specific and can catalyse different kinds of reactions.
(C) Most Enzymes are globular proteins.
(D) Enzyme - oxidase catalyses the hydrolysis of maltose into glucose.

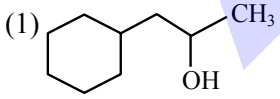
Choose the correct answer from the option given below:

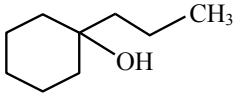
(1) (B) and (C) (2) (B), (C) and (D)
(3) (B) and (D) (4) (A), (B) and (C)

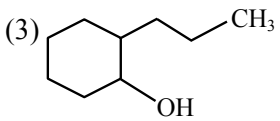
Ans. (3)

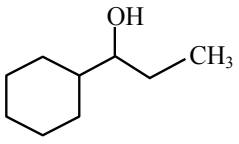
64. 

Consider the above chemical reaction. Product "A" is:

(1) 

(2) 

(3) 

(4) 

Ans. (2)

65. During the detection of acidic radical present in a salt, a student gets a pale yellow precipitate soluble with difficulty in NH_4OH solution when sodium carbonate extract was first acidified with dil. HNO_3 and then $AgNO_3$ solution was added. This indicates presence of:

(1) Br^- (2) CO_3^{2-}
(3) I^- (4) Cl^-

Ans. (1)

66. How can an electrochemical cell be converted into an electrolytic cell ?

(1) Applying an external opposite potential greater than E^0_{cell}
(2) Reversing the flow of ions in salt bridge.
(3) Applying an external opposite potential lower than E^0_{cell}.
(4) Exchanging the electrodes at anode and cathode.

Ans. (1)

67. Arrange the following elements in the increasing order of number of unpaired electrons in it.

(A) Sc (B) Cr
(C) V (D) Ti
(E) Mn

Choose the correct answer from the options given below:

(1) (C) < (E) < (B) < (A) < (D)
(2) (B) < (C) < (D) < (E) < (A)
(3) (A) < (D) < (C) < (B) < (E)
(4) (A) < (D) < (C) < (E) < (B)

Ans. (4)

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

List-I Alkali Metal	**List-II** Emission Wavelength in nm
(A) Li	(I) 589.2
(B) Na	(II) 455.5
(C) Rb	(III) 670.8
(D) Cs	(IV) 780.0

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

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

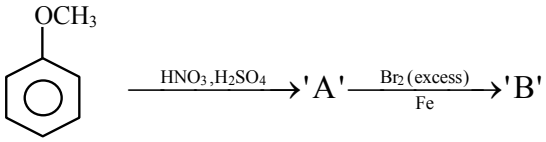
(2) (A)-(III), (B)-(I), (C)-(IV), (D)-(II)

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

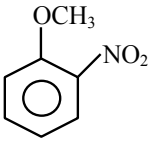
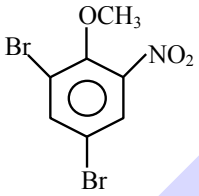
(4) (A)-(II), (B)-(IV), (C)-(III), (D)-(I)

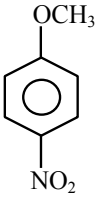
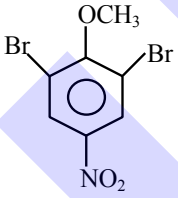
Ans. (2)

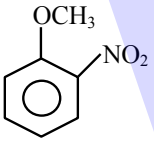
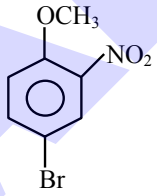
69. The major products formed:

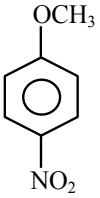
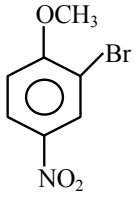


A and B respectively are:

(1)  and 

(2)  and 

(3)  and 

(4)  and 

Ans. (2)

70. The incorrect statement regarding the geometrical isomers of 2-butene is:

(1) cis-2-butene and trans-2-butene are not interconvertible at room temperature.

(2) cis-2-butene has less dipole moment than trans-2-butene.

(3) trans-2-butene is more stable than cis-2-butene.

(4) cis-2-butene and trans-2-butene are stereoisomers.

Ans. (2)

71. Given below are two statements:

Statement I: PF_5 and BrF_5 both exhibit sp^3d hybridisation.

Statement II: Both SF_6 and $[Co(NH_3)_6]^{3+}$ exhibit sp^3d^2 hybridisation.

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

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

Ans. (3)

72. The number of ions from the following that are expected to behave as oxidising agent is:

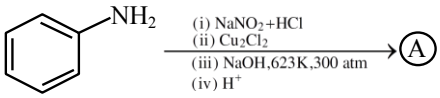
Sn^{4+}, Sn^{2+}, Pb^{2+}, Tl^{3+}, Pb^{4+}, Tl^{+}

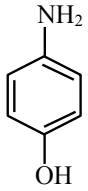
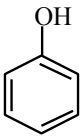
(1) 3 (2) 4

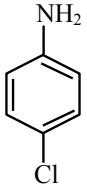
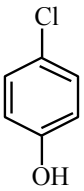
(3) 1 (4) 2

Ans. (4)

73. Identify the product (A) in the following reaction.



(1)  (2) 

(3)  (4) 

Ans. (2)

74. The correct statements among the following, for a "chromatography" purification method is:

(1) Organic compounds run faster than solvent in the thin layer chromatographic plate.

(2) Non-polar compounds are retained at top and polar compounds come down in column chromatography.

(3) R_f of a polar compound is smaller than that of a non-polar compound.

(4) R_f is an integral value.

Ans. (3)

75. Evaluate the following statements related to group 14 elements for their correctness.

(A) Covalent radius decreases down the group from C to Pb in a regular manner.

(B) Electronegativity decreases from C to Pb down the group gradually.

(C) Maximum covalence of C is 4 whereas other elements can expand their covalence due to presence of d orbitals.

(D) Heavier elements do not form pπ-pπ bonds.

(E) Carbon can exhibit negative oxidation states.

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

(1) (C), (D) and (E) Only (2) (A) and (B) Only

(3) (A), (B) and (C) Only (4) (C) and (D) Only

Ans. (1)

76. Match **List-I** with the **List-II**

List-I **Reaction**	**List-II** **Type of redox reaction**
(A) $N_{2(g)} + O_{2(g)} \rightarrow 2NO_{(g)}$	(I) Decomposition
(B) $2Pb(NO_3)_{2(s)} \rightarrow 2PbO_{(s)} + 4NO_{2(g)} + O_{2(g)}$	(II) Displacement
(C) $2Na_{(s)} + 2H_2O_{(l)} \rightarrow 2NaOH_{(aq.)} + H_{2(g)}$	(III) Disproportionation
(D) $2NO_{2(g)} + 2^-OH_{(aq.)} \rightarrow NO^-_{2(aq.)} + NO^-_{3(aq.)} + H_2O_{(l)}$	(IV) Combination

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

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

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

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

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

Ans. (4)

77. Consider the given reaction, identify the major product P.

$$CH_3 - COOH \xrightarrow[\text{(iv) } H_2O/\bar{O}H,\Delta]{\text{(i) } LiAlH_4 \quad \text{(ii) PCC} \quad \text{(iii) } HCN/\bar{O}H} \text{"P"}$$

(1) $CH_3 - CH_2 - CH_2 - OH$

(2) $CH_3 - CH_2 - \overset{\overset{O}{\|}}{C} - NH_2$

(3) $CH_3 - \overset{\overset{O}{\|}}{C} - CH_2CH_3$

(4) $CH_3 - \overset{\overset{OH}{|}}{CH} - COOH$

Ans. (4)

78. The correct IUPAC name of $[PtBr_2(PMe_3)_2]$ is:

(1) bis(trimethylphosphine)dibromoplatinum(II)

(2) bis[bromo(trimethylphosphine)]platinum(II)

(3) dibromobis(trimethylphosphine)platinum(II)

(4) dibromodi(trimethylphosphine)platinum(II)

Ans. (3)

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

List-I **Tetrahedral Complex**	**List-II** **Electronic configuration**
(A) $TiCl_4$	(I) e^2, t_2^0
(B) $[FeO_4]^{2-}$	(II) e^4, t_2^3
(C) $[FeCl_4]^-$	(III) e^0, t_2^0
(D) $[CoCl_4]^{2-}$	(IV) e^2, t_2^3

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

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

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

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

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

Ans. (4)

80. The ratio $\frac{K_P}{K_C}$ for the reaction:

$$CO_{(g)} + \frac{1}{2}O_{2(g)} \rightleftharpoons CO_{2(g)} \text{ is:}$$

(1) $(RT)^{1/2}$ (2) RT

(3) 1 (4) $\frac{1}{\sqrt{RT}}$

Ans. (4)

SECTION-B

81. An amine (X) is prepared by ammonolysis of benzyl chloride. On adding p-toluenesulphonyl chloride to it the solution remains clear. Molar mass of the amine (X) formed is_____ g mol^{-1}.
(Given molar mass in $gmol^{-1}$ C : 12, H : 1, O : 16, N : 14)

Ans. (287)

82. Consider the following reactions

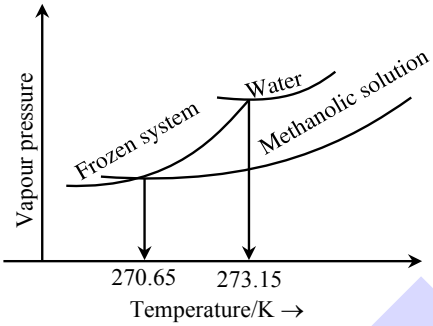
$$NiS + HNO_3 + HCl \rightarrow A + NO + S + H_2O$$

$$A + NH_4OH + H_3C - \underset{\displaystyle H_3C - \underset{|}{C} = N - OH}{\underset{|}{C}} = N - OH \longrightarrow B + NH_4Cl + H_2O$$

The number of protons that do not involve in hydrogen bonding in the product B is_____.

Ans. (12)

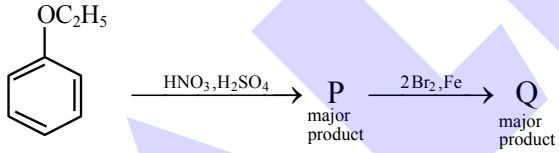
83. When 'x' × 10^{-2} mL methanol (molar mass = 32 g; density = 0.792 g/cm^3) is added to 100 mL water (density = 1 g/cm^3), the following diagram is obtained.



x =……(nearest integer)
[Given: Molal freezing point depression constant of water at 273.15 K is 1.86 K kg mol^{-1}]

Ans. (543)

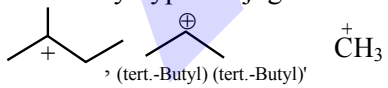
84.

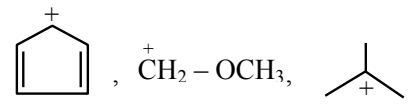


The ratio of number of oxygen atoms to bromine atoms in the product Q is_____ × 10^{-1}.

Ans. (15)

85. Number of carbocation from the following that are **not** stabilized by hyperconjugation is…….. .





Ans. (5)

86. For the reaction at 298 K, 2A + B → C. ΔH = 400 kJ mol^{-1} and ΔS = 0.2 kJ mol^{-1} K^{-1}. The reaction will become spontaneous above_____ K.

Ans. (2000)

87. Total number of species from the following with central atom utilising $2p^2$ hybrid orbitals for bonding is…… .

NH_3, SO_2, SiO_2, $BeCl_2$, C_2H_2, C_2H_4, BCl_3, HCHO, C_6H_6, BF_3, $C_2H_4Cl_2$

Ans. (6)

88. Consider the two different first order reactions given below

A + B → C (Reaction 1)

P → Q (Reaction 2)

The ratio of the half life of Reaction 1 : Reaction 2 is 5 : 2. If t_1 and t_2 represent the time taken to complete $\frac{2}{3}^{rd}$ and $\frac{4}{5}^{th}$ of Reaction 1 and Reaction 2, respectively, then the value of the ratio $t_1 : t_2$ is_____ × 10^{-1} (nearest integer).

[Given: $\log_{10}(3) = 0.477$ and $\log_{10}(5) = 0.699$]

Ans. (17)

89. For hydrogen atom, energy of an electron in first excited state is – 3.4 eV, K.E. of the same electron of hydrogen atom is x eV. Value of x is_____ × 10^{-1} eV. (Nearest integer)

Ans. (34)

90. Among VO_2^+, MnO_4^- and $Cr_2O_7^{2-}$, the spin-only magnetic moment value of the species with least oxidising ability is……BM (Nearest integer).

(Given atomic member V = 23, Mn = 25, Cr = 24)

Ans. (0)

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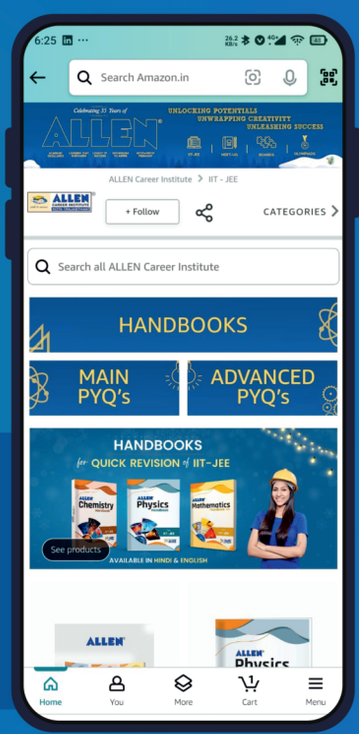

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