FINAL JEE–MAIN EXAMINATION – APRIL, 2024

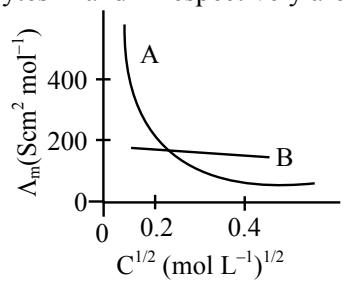
(Held On Tuesday 09th April, 2024) **TIME : 9 : 00 AM to 12 : 00 NOON**

CHEMISTRY

TEST PAPER WITH ANSWER

SECTION-A

61. The molar conductivity for electrolytes A and B are plotted against $C^{1/2}$ as shown below. Electrolytes A and B respectively are :



	A	B
(1)	Weak electrolyte	weak electrolyte
(2)	Strong electrolyte	strong electrolyte
(3)	Weak electrolyte	strong electrolyte
(4)	Strong electrolyte	weak electrolyte

Ans. (3)

62. Methods used for purification of organic compounds are based on :

(1) neither on nature of compound nor on the impurity present.

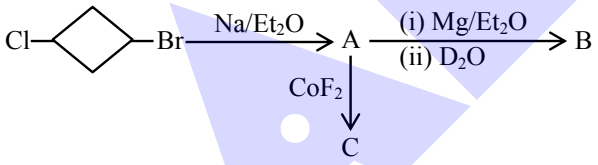
(2) nature of compound only.

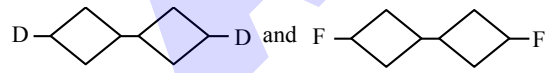
(3) nature of compound and presence of impurity.

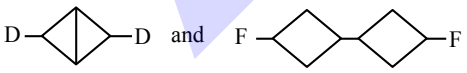
(4) presence of impurity only.

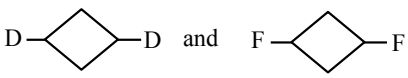
Ans. (3)

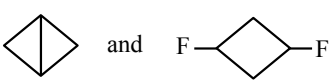
63. In the following sequence of reaction, the major products B and C respectively are :



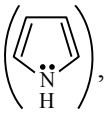
(1) 

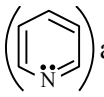
(2) 

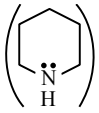
(3) 

(4) 

Ans. (1)

64. Correct order of basic strength of Pyrrole 

, Pyridine 

and Piperidine 

is:

(1) Piperidine > Pyridine > Pyrrole

(2) Pyrrole > Pyridine > Piperidine

(3) Pyridine > Piperidine > Pyrrole

(4) Pyrrole > Piperidine >Pyridine

Ans. (1)

65. In which one of the following pairs the central atoms exhibit sp^2 hybridization ?

(1) BF_3 and NO_2^-

(2) NH_2^- and H_2O

(3) H_2O and NO_2

(4) NH_2^- and BF_3

Ans. (1)

66. The F^- ions make the enamel on teeth much harder by converting hydroxyapatite (the enamel on the surface of teeth) into much harder fluoroapatite having the formula.

(1) $[3(Ca_3(PO_4)_2).CaF_2]$

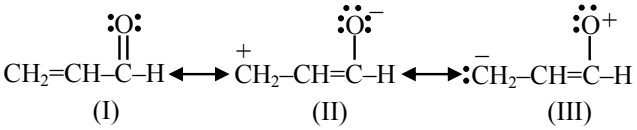
(2) $[3(Ca_2(PO_4)_2).Ca(OH)_2]$

(3) $[3(Ca_3(PO_4)_3).CaF_2]$

(4) $[3(Ca_3(PO_4)_2).Ca(OH)_2]$

Ans. (1)

67. Relative stability of the contributing structures is :



(1) (I) > (III) > (II)

(2) (I) > (II) > (III)

(3) (II) > (I) > (III)

(4) (III) > (II) > (I)

Ans. (2)

68. Given below are two statements :

Statement (I) : The oxidation state of an element in a particular compound is the charge acquired by its atom on the basis of electron gain enthalpy consideration from other atoms in the molecule.

Statement (II) : pπ-pπ bond formation is more prevalent in second period elements over other periods.

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

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

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

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

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

Ans. (4)

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

Assertion (A) : S_N2 reaction of $C_6H_5CH_2Br$ occurs more readily than the S_N2 reaction of CH_3CH_2Br.

Reason (R) : The partially bonded unhybridized p-orbital that develops in the trigonal bipyramidal transition state is stabilized by conjugation with the phenyl ring.

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

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

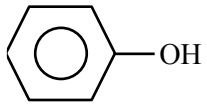
(2) Both **(A)** and **(R)** are correct but **(R)** is not the correct explanation of **(A)**

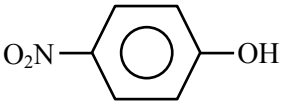
(3) Both **(A)** and **(R)** are correct and **(R)** is the correct explanation of **(A)**

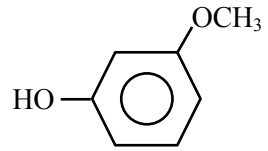
(4) **(A)** is correct but **(R)** is not correct

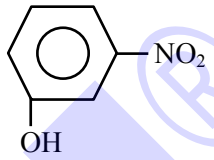
Ans. (3)

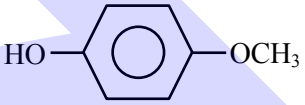
70. For the given compounds, the correct order of increasing pK_a value :

(A) 

(B) 

(C) 

(D) 

(E) 

(1) (E) < (D) < (C) < (B) < (A)

(2) (D) < (E) < (C) < (B) < (A)

(3) (E) < (D) < (B) < (A) < (C)

(4) (B) < (D) < (A) < (C) < (E)

Allen Ans. (BONUS)

NTA Ans. (4)

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

Assertion (A) : Both rhombic and monoclinic sulphur exist as S_8 while oxygen exists as O_2.

Reason (R) : Oxygen forms pπ-pπ multiple bonds with itself and other elements having small size and high electronegativity like C, N, which is not possible for sulphur.

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

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

(2) Both **(A)** and **(R)** are correct but **(R)** is not the correct explanation of **(A)**.

(3) **(A)** is correct but **(R)** is not correct.

(4) **(A)** is not correct but **(R)** is correct.

Ans. (3)

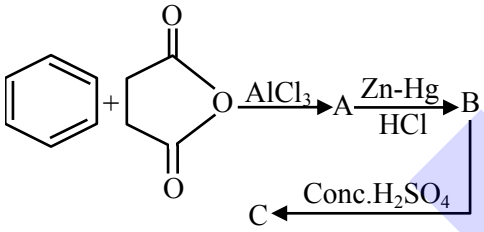
72. Given below are two statements : one is labelled as **Assertion (A)** and the other is labelled as **Reason (R).**
Assertion (A): The total number of geometrical isomers shown by $[Co(en)_2Cl_2]^+$ complex ion is three
Reason (R): $[Co(en)_2Cl_2]^+$ complex ion has an octahedral geometry.
In the light of the above statements, choose the **most appropriate** answer from the options given below :
(1) Both **(A)** and **(R)** are correct and **(R)** is the correct explanation of **(A)**.
(2) **(A)** is correct but **(R)** is not correct.
(3) **(A)** is not correct but **(R)** is correct.
(4) Both **(A)** and **(R)** are correct but **(R)** is not the correct explanation of **(A)**.

Ans. (3)

73. The electronic configuration of Cu(II) is $3d^9$ whereas that of Cu(I) is $3d^{10}$. Which of the following is correct ?
(1) Cu(II) is less stable
(2) Stability of Cu(I) and Cu(II) depends on nature of copper salts
(3) Cu(II) is more stable
(4) Cu(I) and Cu(II) are equally stable

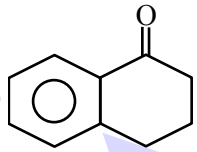
Ans. (3)

74.



What is the structure of C ?

(1)



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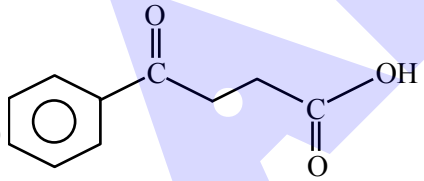

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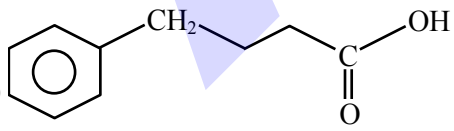
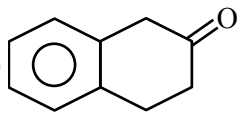


(4)

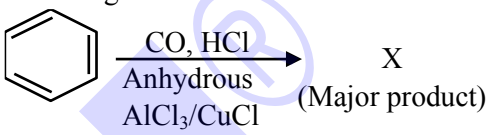


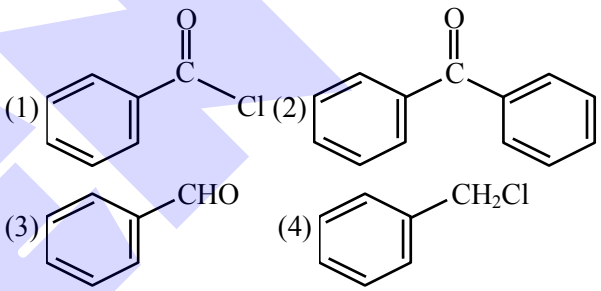
Ans. (1)

75. Compare the energies of following sets of quantum numbers for multielectron system.
(A) n = 4, l = 1 (B) n = 4, l = 2
(C) n = 3, l = 1 (D) n = 3, l = 2
(E) n = 4, l = 0
Choose the correct answer from the options given below :
(1) (B) > (A) > (C) > (E) > (D)
(2) (E) > (C) < (D) < (A) < (B)
(3) (E) > (C) > (A) > (D) > (B)
(4) (C) < (E) < (D) < (A) < (B)

Ans. (4)

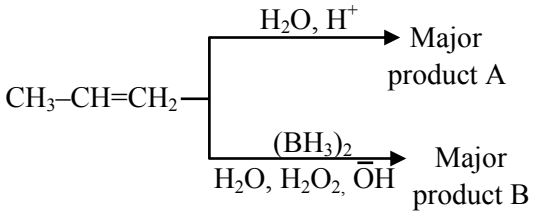
76. Identify major product "X" formed in the following reaction :





Ans. (3)

77. Identify the product A and product B in the following set of reactions.



(1) A-$CH_3CH_2CH_2$–OH, B-$CH_3CH_2CH_2$–OH
(2) A-$CH_3CH_2CH_2$–OH, B-CH_3CH(OH)–CH_3
(3) A- CH_3–CH(OH)–CH_3 , B-$CH_3CH_2CH_2$–OH
(4) A-$CH_3CH_2CH_3$, B-$CH_3CH_2CH_3$

Ans. (3)

78. On reaction of Lead Sulphide with dilute nitric acid which of the following is **not** formed ?
(1) Lead nitrate (2) Sulphur
(3) Nitric oxide (4) Nitrous oxide

Ans. (4)

79. Identify the **incorrect** statements regarding primary standard of titrimetric analysis

(A) It should be purely available in dry form.

(B) It should not undergo chemical change in air.

(C) It should be hygroscopic and should react with another chemical instantaneously and stoichiometrically.

(D) It should be readily soluble in water.

(E) $KMnO_4$ & NaOH can be used as primary standard.

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

(1) (C) and (D) only (2) (B) and (E) only

(3) (A) and (B) only (4) (C) and (E) only

Ans. (4)

80. 0.05M $CuSO_4$ when treated with 0.01M $K_2Cr_2O_7$ gives green colour solution of $Cu_2Cr_2O_7$. The [SPM : Semi Permeable Membrane]

$K_2Cr_2O_7$	$CuSO_4$
Side X	SPM Side Y

Due to osmosis :

(1) Green colour formation observed on side Y.

(2) Green colour formation observed on side X.

(3) Molarity of $K_2Cr_2O_7$ solution is lowered.

(4) Molarity of $CuSO_4$ solution is lowered.

Ans. (4)

SECTION-B

81. The heat of solution of anhydrous $CuSO_4$ and $CuSO_4 \cdot 5H_2O$ are –70 kJ mol^{-1} and +12 kJ mol^{-1} respectively.

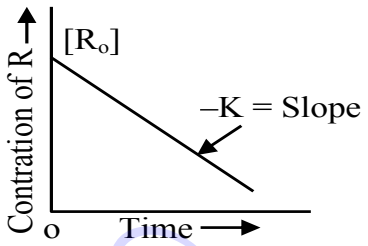
The heat of hydration of $CuSO_4$ to $CuSO_4 \cdot 5H_2O$ is –x kJ. The value of x is_____.

Ans. (82)

82. Given below are two statements :

Statement I : The rate law for the reaction A + B $\rightarrow$ C is rate (r) = $k[A]^2[B]$. When the concentration of both A and B is doubled, the reaction rate is increased "x" times.

Statement II :

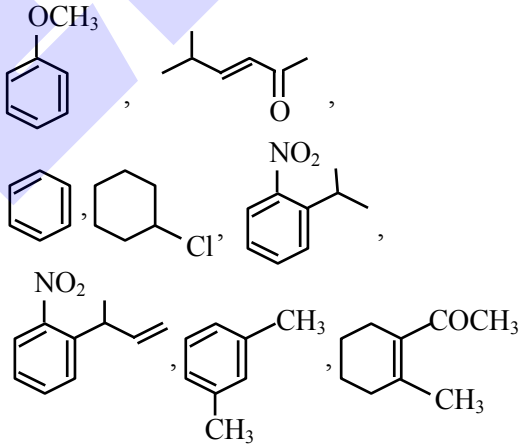


The figure is showing "the variation in concentration against time plot" for a "y" order reaction.

The value of x + y is _____.

Ans. (8)

83. How many compounds among the following compounds show inductive, mesomeric as well as hyperconjugation effects?



Ans. (4)

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

$Cr_2O_7^{2-} + 14H^+ + 6e^- \rightarrow 2Cr^{3+} + 7H_2O$, E° = 1.33V

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

$Ni^{2+}(aq) + 2e^- \rightarrow Ni$ E° = –0.25V

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

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

Consider the given electrochemical reactions,

The number of metal(s) which will be oxidized be $Cr_2O_7^{2-}$, in aqueous solution is _____.

Ans. (3)

85. When equal volume of 1M HCl and 1M H_2SO_4 are separately neutralised by excess volume of 1M NaOH solution. X and y kJ of heat is liberated respectively. The value of y/x is _____.

Ans. (2)

86. Molarity (M) of an aqueous solution containing x g of anhyd. $CuSO_4$ in 500 mL solution at 32 °C is 2×10^{-1} M. Its molality will be _____ $\times 10^{-3}$ m. (nearest integer).

[Given density of the solution = 1.25 g/mL.]

Allen Ans. (164)

NTA Ans. (81)

87. The total number of species from the following in which one unpaired electron is present, is _____.

$N_2, O_2, C_2^-, O_2^-, O_2^{2-}, H_2^+, CN^-, He_2^+$

Ans. (4)

88. Number of ambidentate ligands among the following is _____.

$NO_2^-, SCN^-, C_2O_4^{2-}, NH_3, CN^-, SO_4^{2-}, H_2O.$

Ans. (3)

89. Total number of essential amino acid among the given list of amino acids is _____.

Arginine, Phenylalanine, Aspartic acid, Cysteine, Histidine, Valine, Proline

Ans. (4)

90. Number of colourless lanthanoid ions among the following is _____.

Eu^{3+}, Lu^{3+}, Nd^{3+}, La^{3+}, Sm^{3+}

Ans. (2)

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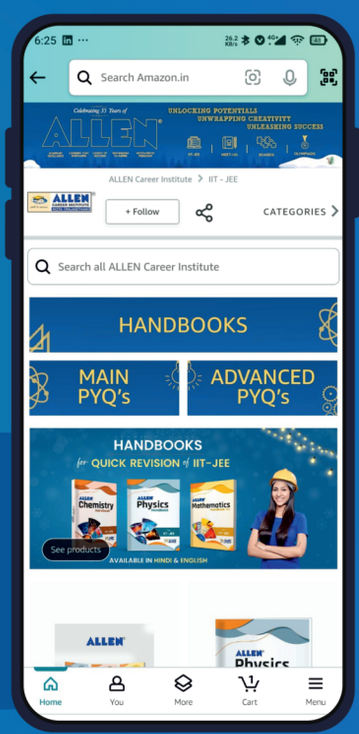

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