FINAL JEE–MAIN EXAMINATION – JANUARY, 2024

(Held On Saturday 27th January, 2024) **TIME : 9 : 00 AM to 12 : 00 NOON**

CHEMISTRY | **TEST PAPER WITH SOLUTION**

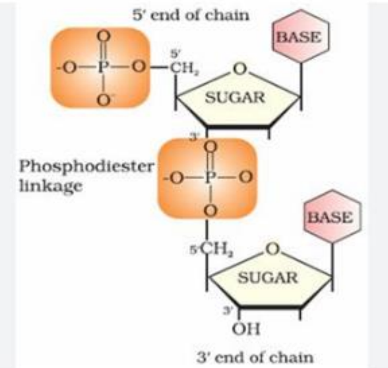
SECTION-A

61. Two nucleotides are joined together by a linkage known as :

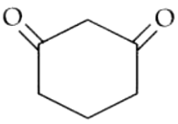
(1) Phosphodiester linkage
(2) Glycosidic linkage
(3) Disulphide linkage
(4) Peptide linkage

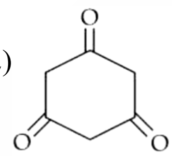
Ans. (1)

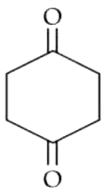
Sol. Phosphodiester linkage

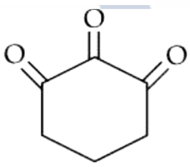


62. Highest enol content will be shown by :

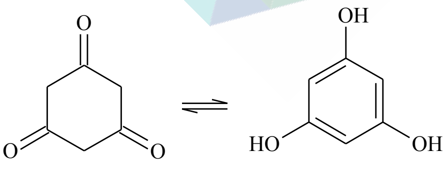
(1) 

(2) 

(3) 

(4) 

Ans. (2)

Sol. 

Aromatic

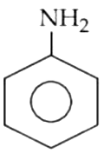
63. Element not showing variable oxidation state is :

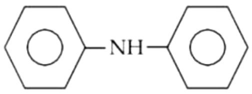
(1)Bromine (2)Iodine
(3)Chlorine (4)Fluorine

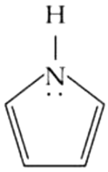
Ans. (4)

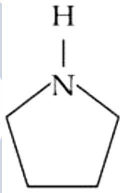
Sol. Fluorine does not show variable oxidation state.

64. Which of the following is strongest Bronsted base?

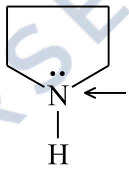
(1) 

(2) 

(3) 

(4) 

Ans. (4)

Sol.  localised lone pair& sp^3

65. Which of the following electronic configuration would be associated with the highest magnetic moment ?

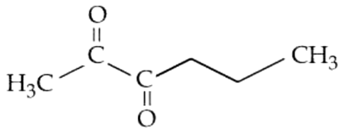
(1) $[Ar]\ 3d^7$ (2) $[Ar]\ 3d^8$
(3) $[Ar]\ 3d^3$ (4) $[Ar]\ 3d^6$

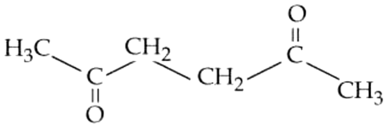
Ans. (4)

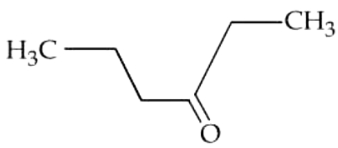
Sol.

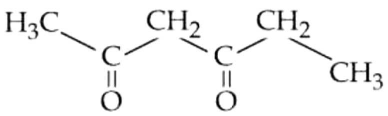
	$3d^7$	$3d^8$	$3d^3$	$3d^6$
No.of. unpaired e^-	3	2	3	4
Spin only Magnetic moment	$\sqrt{15}$ BM	$\sqrt{8}$ BM	$\sqrt{15}$ BM	$\sqrt{24}$ BM

66. Which of the following has highly acidic hydrogen?

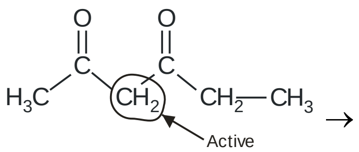
(1) 

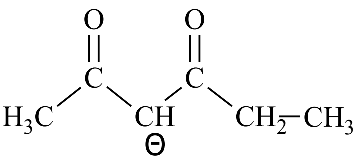
(2) 

(3) 

(4) 

Ans. (4)

Sol. 



Conjugate base is more stable due to more resonance of negative charge.

67. A solution of two miscible liquids showing negative deviation from Raoult's law will have :

(1) increased vapour pressure, increased boiling point

(2) increased vapour pressure, decreased boiling point

(3) decreased vapour pressure, decreased boiling point

(4) decreased vapour pressure, increased boiling point

Ans. (4)

Sol. Solution with negative deviation has

$P_T < P_A^0 X_A + P_B^0 X_B$

$P_A < P_A^0 X_A$

$P_B < P_B^0 X_B$

If vapour pressure decreases so boiling point increases.

68. Consider the following complex ions

$P = [FeF_6]^{3-}$

$Q = [V(H_2O)_6]^{2+}$

$R = [Fe(H_2O)_6]^{2+}$

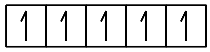
The correct order of the complex ions, according to their spin only magnetic moment values (in B.M.) is :

(1) R < Q < P (2) R < P < Q

(3) Q < R < P (4) Q < P < R

Ans. (3)

Sol. $[FeF_6]^{3-}$: Fe^{+3} : [Ar] $3d^5$

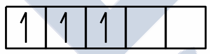
F : Weak field Ligand 

No. of unpaired electron's = 5

$\mu = \sqrt{5(5+2)}$

$\mu = \sqrt{35}$ BM

$[V(H_2O)_6]^{+2}$: V^{+2} : $3d^3$

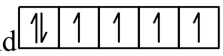


No. of unpaired electron's = 3

$\mu = \sqrt{3(3+2)}$

$\mu = \sqrt{15}$ BM

$[Fe(H_2O)_6]^{+2}$: Fe^{+2} : $3d^6$

H_2O : Weak field Ligand 

No. of unpaired electron's = 4

$\mu = \sqrt{4(4+2)}$

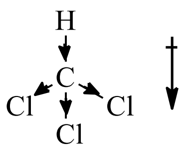
$\mu = \sqrt{24}$ BM

69. Choose the polar molecule from the following :

(1) CCl_4 (2) CO_2

(3) $CH_2 = CH_2$ (4) $CHCl_3$

Ans. (4)

Sol. 

$\mu \neq 0$

$CHCl_3$ is polar molecule and rest all molecules are non-polar.

70. Given below are two statements :

Statement (I) : The 4f and 5f - series of elements are placed separately in the Periodic table to preserve the principle of classification.

Statement (II) :S-block elements can be found in pure form in nature. In the light of the above statements, choose the most appropriate answer from the options given below :

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

Ans. **(3)**

Sol. s-block elements are highly reactive and found in combined state.

71. Given below are two statements :

Statement (I) : p-nitrophenol is more acidic than m-nitrophenol and o-nitrophenol.

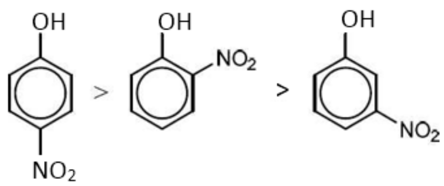
Statement (II) : Ethanol will give immediate turbidity with Lucas reagent.

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. **(1)**

Sol. Acidic strength



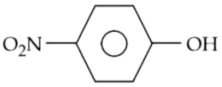
Ethanol give lucas test after long time

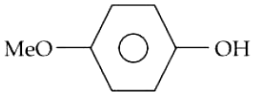
Statement (I)→correct

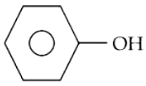
Statement (II) → incorrect

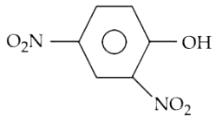
72. The ascending order of acidity of –OH group in the following compounds is :

(A) Bu – OH

(B) 

(C) 

(D) 

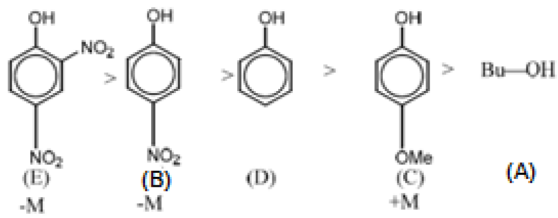
(E) 

Choose the correct answer from the options given below :

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

Ans. **(4)**

Sol.



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

Assertion (A) : Melting point of Boron (2453 K) is unusually high in group 13 elements.

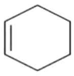
Reason (R) : Solid Boron has very strong crystalline lattice.

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

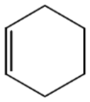
(1) Both (A) and (R) are correct but (R) Is not the correct explanation of (A)
(2) Both (A) and (R) are correct and (R) is the correct explanation of (A)
(3) (A) is true but (R) is false
(4) (A) is false but (R) is true

Ans. **(2)**

Sol. Solid Boron has very strong crystalline lattice so its melting point unusually high in group 13 elements

74. Cyclohexene  is ________ type of an organic compound.
(1) Benzenoid aromatic
(2) Benzenoid non-aromatic
(3) Acyclic
(4) Alicyclic

Ans. **(4)**

Sol.  is Alicyclic

75. Yellow compound of lead chromate gets dissolved on treatment with hot NaOH solution. The product of lead formed is a :
(1) Tetraanionic complex with coordination number six
(2) Neutral complex with coordination number four
(3) Dianionic complex with coordination number six
(4) Dianionic complex with coordination number four

Ans. **(4)**

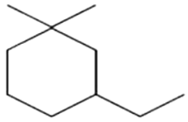
Sol. $PbCrO_4 + NaOH$ (hot excess) $\rightarrow [Pb(OH)_4]^{-2} + Na_2CrO_4$
Dianionic complex with coordination number four

76. Given below are two statements :
Statement (I) : Aqueous solution of ammonium carbonate is basic.
Statement (II) : Acidic/basic nature of salt solution of a salt of weak acid and weak base depends on K_a and K_b value of acid and the base forming it.
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 correct
(2) Statement I is correct but Statement II is incorrect
(3) Both Statement I and Statement II are incorrect
(4) Statement I is incorrect but Statement II is correct

Ans. **(1)**

Sol. Aqueous solution of $(NH_4)_2CO_3$is Basic
pH of salt of weak acid and weak base depends on Ka and Kb value of acid and the base forming it

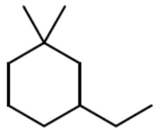
77. IUPAC name of following compound (P) is :



(P)

(1) l-Ethyl-5, 5-dimethylcyclohexane
(2) 3-Ethyl-1,1-dimethylcyclohexane
(3) l-Ethyl-3, 3-dimethylcyclohexane
(4) l,l-Dimethyl-3-ethylcyclohexane

Ans. **(2)**

Sol. 

3-ethy 1, 1 -dimethylcyclohexane

78. NaCl reacts with conc. H_2SO_4 and $K_2Cr_2O_7$ to give reddish fumes (B), which react with NaOH to give yellow solution (C). (B) and (C) respectively are ;
(1) CrO_2Cl_2, Na_2CrO_4 (2) Na_2CrO_4, CrO_2Cl_2
(3) CrO_2Cl_2, $KHSO_4$ (4) CrO_2Cl_2, $Na_2Cr_2O_7$

Ans. **(1)**

Sol. $NaCl + \text{conc. } H_2SO_4 + K_2Cr_2O_7$
$\rightarrow CrO_2Cl_2 + KHSO_4 + NaHSO_4 + H_2O$
(B)
Reddish brown
$CrO_2Cl_2 + NaOH \rightarrow Na_2CrO_4 + NaCl + H_2O$
(C)
Yellow colour

79. The correct statement regarding nucleophilic substitution reaction in a chiral alkyl halide is ;
(1) Retention occurs in S_N1 reaction and inversion occurs in S_N2 reaction.
(2) Racemisation occurs in S_N1 reaction and retention occurs in S_N2 reaction.
(3) Racemisation occurs in both S_N1 and S_N2 reactions.
(4) Racemisation occurs in S_N1 reaction and inversion occurs in S_N2 reaction.

Ans. **(4)**

Sol. SN^1 – Racemisation
SN^2 – Inversion

80. The electronic configuration for Neodymium is:

[Atomic Number for Neodymium 60]

(1)[Xe] $4f^4\ 6s^2$ (2) [Xe] $5f^4 7s^2$

(3) [Xe] $4f^6\ 6s^2$ (4) [Xe] $4f^1 5d^1 6s^2$

Ans. **(1)**

Sol. Electronic configuration of Nd(Z = 60) is;

[Xe] $4f^4\ 6s^2$

SECTION-B

81. The mass of silver (Molar mass of Ag : 108 $gmol^{-1}$) displaced by a quantity of electricity which displaces 5600 mL of O_2 at S.T.P. will be ______ g.

Ans. **107 gm or 108**

Sol. Eq. of Ag = Eq. of O_2

Let x gm silver displaced,

$$\frac{x\times 1}{108}=\frac{5.6}{22.7}\times 4$$

(Molar volume of gas at STP = 22.7 lit)

x = 106.57 gm

Ans. 107

OR,

as per old STP data, molar volume=22.4 lit

$$\frac{x\times 1}{108}=\frac{5.6}{22.4}\times 4\text{ , x= 108 gm.}$$

Ans. 108

82. Consider the following data for the given reaction

$2HI_{(g)} \rightarrow H_{2(g)} + I_{2(g)}$

	1	2	3
HI (mol L^{-1})	0.005	0.01	0.02
Rate (mol L^{-1}s–1)	7.5×10^{-4}	3.0×10^{-3}	1.2×10^{-2}

The order of the reaction is __________.

Ans. **(2)**

Sol. Let, $R = k[HI]^n$

using any two of given data,

$$\frac{3\times 10^{-3}}{7.5\times 10^{-4}}=\left(\frac{0.01}{0.005}\right)^n$$

n = 2

83. Mass of methane required to produce 22 g of CO_2 after complete combustion is ______g.

(Given Molar mass in g mol–1 C = 12.0

H = 1.0

O = 16.0)

Ans. **(8)**

Sol. $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$

Moles of $CO_2 = \frac{22}{44} = 0.5$

So, required moles of CH_4 = 0.5

Mass = 0.5 × 16 = 8gm

84. If three moles of an ideal gas at 300 K expand isotherrnally from 30 dm^3 to 45 dm^3 against a constant opposing pressure of 80 kPa, then the amount of heat transferred is_______ J.

Ans. **(1200)**

Sol. Using, first law of thermodynamics,

$\Delta U = Q + W$,

$\Delta U = 0$: Process is isothermal

$Q = -W$

$W = -P_{ext}\Delta V$: Irreversible

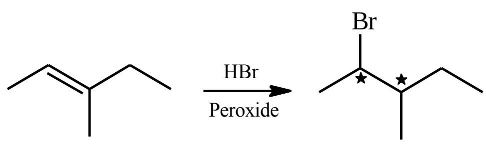
$= -80 \times 10^3\ (45 - 30) \times 10^{-3}$

$= -1200$ J

85. 3-Methylhex-2-ene on reaction with HBr in presence of peroxide forms an addition product (A). The number of possible stereoisomers for 'A' is_________.

Ans. **(4)**

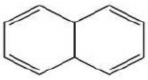
Sol.

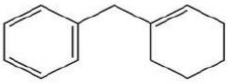


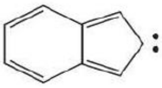
2chiral centres

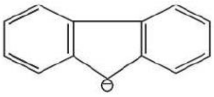
No. of stereoisomers = 4

86. Among the given organic compounds, the total number of aromatic compounds is

(A) 

(B) 

(C) 

(D) 

Ans. (3)

Sol. B,C and D are Aromatic

87. Among the following, total number of meta directing functional groups is (Integer based)

$-OCH_3$, $-NO_2$, $-CN$, $-CH_3$ $-NHCOCH_3$,

$-COR$, $-OH$, $-COOH$, $-Cl$

Ans. (4)

Sol. $-NO_2$, $-C\equiv N$, $-COR$, $-COOH$

are meta directing.

88. The number of electrons present in all the completely filled subshells having n=4 and $s=+\frac{1}{2}$ is ______.

(Where n = principal quantum number and

s = spin quantum number)

Ans. (16)

Sol. $n=4$ can have,

	4s	4p	4d	4f
Total e^-	2	6	10	14
Total e^- with $S=+\frac{1}{2}$	1	3	5	7

So, Ans.16

89. Sum of bond order of CO and NO^+ is _____.

Ans. (6)

Sol. $CO \Rightarrow \quad \overset{-}{C}\equiv\overset{+}{O}$: BO = 3

$NO^+ \Rightarrow \quad N\equiv O^+$: BO = 3

90. From the given list, the number of compounds with + 4 oxidation state of Sulphur ________.

SO_3, H_2SO_3, $SOCl_2$, SF_4, $BaSO_4$, $H_2S_2O_7$

Ans. (3)

Sol.

Compounds	SO_3	H_2SO_3	$SOCl_2$	SF_4	$BaSO_4$	$H_2S_2O_7$
O.S.of Sulphur:	+6	+4	+4	+4	+6	+6