JEE Main January 2026

Question Paper With Text Solution

23 January | Shift-2

CHEMISTRY

MATRIX

JEE Main & Advanced | XI-XII Foundation| VI-X Pre-Foundation

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JEE MAIN JANUARY 2026 | 23 JANUARY SHIFT-2

SECTION – A

Question ID : 444792511

51. Identify the **CORRECT** set of details from the following :

A. $[Co(NH_3)_6]^{3+}$: Inner orbital complex; d^2sp^3 hybridized

B. $[MnCl_6]^{3-}$: Outer orbital complex; sp^3d^2 hybridized

C. $[CoF_6]^{3-}$: Outer orbital complex; d^2sp^3 hybridized

D. $[FeF_6]^{3-}$: Outer orbital complex; sp^3d^2 hybridized

E. $[Ni(CN)_4]^{2-}$: Inner orbital complex; sp^3 hybridized

Choose the correct answer from the options given below :

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(1) C & D only
(2) A, C & E only
(3) A, B & D only
(4) A, B, C, D & E

Ans. Official answer NTA (3)

Sol. (A) $[Co(NH_3)_6]^{3+}$: Co^{3+} : d^6

NH_3 : Strong $\rightarrow$ forced pairing

So, complex is inner orbital complex and d^2sp^3.

(B) $[MnCl_6]^{3-}$: Mn^{3+} : d^4 : Cl^- : weak

So, complex is outer orbital complex and sp^3d^2

(C) $[CoF_6]^{3-}$: Co^{3+} : d^6 : F^- : weak

complex is outer orbtal complex and sp^3d^2.

(D) $[FeF_6]^{3-}$: Fe^{3+} : d^5 : F^- : weak,

complex is outer orbital complex and sp^3d^2

(E) $[Ni(CN)_4]^2$: Ni^{2+} : d^8 : $\overline{C}N$: strong, forced pairing $\rightarrow$ square planar

So, inner orbital complex and dsp^2

Question ID : 444792519

52. Both human DNA and RNA are chiral molecules. The chirality in DNA and RNA arised due to the presence of

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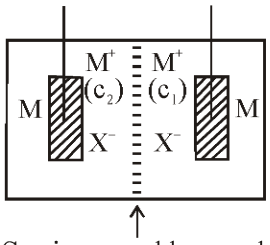
(1) L–sugar component
(2) Base unit
(3) D–sugar component
(4) Chiral phosphate unit

Ans. Official answer NTA (3)

Sol. DNA is chiral due to D-2-deoxyribose sugar and RNA due to D-ribose sugar

Question ID : 444792505

53.



Consider the above electrochemical cell where a metal electrode (M) is undergoing redox reaction by forming M^+ ($M \rightarrow M^+ + e^-$). The cation M^+ is present in two different concentrations c_1 and c_2 as shown above. Which of the following statement is correct for generating a positive cell potential ?

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(1) If c_1 is present at anode, then $c_1 > c_2$.

(2) If c_1 is present at anode, then $c_1 = c_2$.

(3) If c_1 is present at cathode, then $c_1 > c_2$.

(4) If c_1 is present at cathode, then $c_1 < c_2$.

Ans. Official answer NTA (3)

Sol. When C_1 is anode :

Anode : $M \rightarrow M^+ + e^-$

c_1

Cathode : $M^+ + e^- \rightarrow M$

c_2

$M^+ + e^- \rightarrow M$

$c_2 \qquad c_1$

So, $E_{cell} = -\frac{RT}{nF}\ln\frac{C_1}{C_2} = \frac{RT}{nF}\ln\frac{C_2}{C_1}$

for, positive cell potential $C_2 > C_1$

When C_1 is cathode, then cell reaction

$M^+ + e^- \rightarrow M$

$C_1 \qquad C_2$

So, $E_{cell} = -\frac{RT}{nF}\ln\frac{C_1}{C_2}$

Hence, $C_1 > C_2$ for positive cell potential.

Question ID : 444792509

54. Elements X and Y belong to Group 15. The difference between the electronegativity values of 'X' and phosphorus is higher than that of the difference between phosphorus and 'Y'. 'X' & 'Y' are respectively

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(1) Bi & N (2) N & As (3) As & Sb (4) As & Bi

Ans. Official answer NTA (2)

Sol.

	N	P	As	Sb	Bi
EN :	3	2.1	2.0	1.9	1.9

So, when x = N and y = As

then given condition is satisfied.

Question ID : 444792503

55. Which statements are **NOT TRUE** about XeO_2F_2 ?

A. It has a see-saw shape.

B. Xe has 5 electron pairs in its valence shell in XeO_2F_2.

C. The O–Xe–O bond angle is close to 180°.

D. The F–Xe–F bond angle is close to 180°.

E. Xe has 16 valence electrons in XeO_2F_2.

Choose the correct answer from the options given below :

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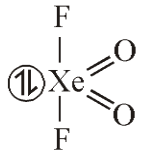
(1) B and D only (2) A and D only

(3) B, D and E only (4) B, C and E only

Ans. Official answer NTA (4)

Sol. 

→ See-saw shape.

→ Xe has 7 electron pairs in valence shell and total 14 electrons

→ O–Xe–O bond angle is close to 120°

→ F – Xe –F bond angle is close to 180°

Question ID : 444792508

56. Given below are two statements :

Statement I : The second ionisation enthalpy of Na is larger than the corresponding ionisation enthalpy of Mg.

Statement II : The ionic radius of O^{2-} is larger than that of F^-.

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

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(1) Statement I is false but Statement II is true

(2) Both statement I and statement II are false.

(3) Both statement I and statement II are true.

(4) Statement I is true but statement II is false.

Ans. Official answer NTA (3)

Sol. The second IE of Na is large than Mg because for Na the electron is being removed from stable noble gas configuration

→ The ionic radius of O^{2-} is larger than F^-

Question ID : 444792510

57. The oxidation state of chromium in the final product formed in the reaction between KI and acidified $K_2Cr_2O_7$ solution is

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(1) +3 (2) +2 (3) +6 (4) +4

Ans. Official answer NTA (1)

Sol. The reaction involved is :

$$Cr_2O_7^{2-} + 14H^+ + 6I^- \longrightarrow 2Cr^{3+} + 7H_2O + 3I_2$$

So, oxidation state of Cr in final product is +3.

Question ID : 444792504

58. It is noticed that Pb^{2+} is more stable than Pb^{4+} but Sn^{2+} is less stable than Sn^{4+}.

Observe the following reactions.

$PbO_2 + Pb \rightarrow 2PbO; \Delta_rG^\circ(1)$

$SnO_2 + Sn \rightarrow 2SnO; \Delta_rG^\circ(2)$

Identify the correct set from the following.

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(1) $\Delta_rG^\circ(1) < 0; \Delta_rG^\circ(2) > 0$ (2) $\Delta_rG^\circ(1) > 0; \Delta_rG^\circ(2) > 0$

(3) $\Delta_rG^\circ(1) < 0; \Delta_rG^\circ(2) < 0$ (4) $\Delta_rG^\circ(1) > 0; \Delta_rG^\circ(2) < 0$

Ans. Official answer NTA (1)

Sol. $PbO_2 + Pb \rightarrow 2PbO$

Pb^{2+} is more stable than Pb^{4+}. so $\Delta rG^\circ(1) < 0$

$Sn O_2 + Sn \rightarrow 2 Sn O$

As Sn^{4+} is more stable than Sn^{2+}

so, $\Delta rG^\circ(2) > 0$

Question ID : 444792501

59. The work function of two metals (M_A and M_B) are in the 1 : 2 ratio. When these metals are exposed to photons of energy 6 eV, the kinetic energy of liberated electrons of $M_A : M_B$ is in the ratio of 2.642 : 1. The work function (in eV) of M_A and M_B are respectively.

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(1) 2.3, 4.6 (2) 1.4, 2.8 (3) 3.1, 6.2 (4) 1.5, 3.0

Ans. Official answer NTA (1)

Sol. $\frac{\phi_A}{\phi_B} = \frac{1}{2}; \frac{KE_A}{KE_B} = \frac{2.642}{1}; E = 6eV$

as $E = \phi + KE_{max}$

For A : $6 = \phi_A + KE_A$ ...(1)

For B : $6 = \phi_B + KE_B$ ...(2)

Put : $\phi_A = \frac{\phi_B}{2}$; $KE_A = 2.642KE_B$ in (1)

$6 = \frac{\phi_B}{2} + 2.642KE_B$ ...(3)

Multiply (2) by 2.462, we get

$6 \times 2.642 = 2.642\phi_B + 2.642KE_B$ ...(4)

Subtracting (3) from (4), we get

$15.852 = 2.642\phi_B + 2.642KE_B$ ...(4)

$6 = \frac{\phi_B}{2} + 2.642KE_B$ ...(3)

$9.852 = 2.142\phi_B$

$\phi_B = \frac{9.852}{2.142} = 4.6eV$

as $\phi_A = \frac{\phi_B}{2} = \frac{4.6}{2} = 2.3eV$

Question ID : 444792502

60. Identify the INCORRECT statements from the following :

A. Notation $^{24}_{12}Mg$ represents 24 protons and 12 neutrons.

B. Wavelength of a radiation of frequency $4.5 \times 10^{15}\ s^{-1}$ is 6.7×10^{-8} m.

C. One radiation has wavelength = λ_1 (900 nm) and energy = E_1. Other radiation has wavelength = λ_2 (300 nm) and energy = E_2. $E_1 : E_2 = 3 : 1$.

D. Number of photons of light of wavelength 2000 pm that provides 1 J of energy is 1.006×10^{16}.

Choose the correct answer from the options given below :

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(1) A and C only (2) B and C only

(3) A and D only (4) A and B only

Ans. Official answer NTA (1)

Sol. A. $^{24}_{12}Mg$ represents 24 mass number and 12 protons

B. Frequency, $V = 4.5\times10^{15}s^{-2}; \lambda = \frac{c}{y} = \frac{3\times10^{8}ms^{-2}}{4.5\times10^{15}} = 6.7\times10^{-8}m$

C. $\lambda_1 = 900nm; Energy = E_1 and\ \lambda_2 = 300nm, Energy = E_2$

as $E \propto \frac{1}{\lambda}; \frac{\lambda_1}{\lambda_2} = \frac{E_2}{E_1} \Rightarrow \frac{900}{300} \Rightarrow \frac{E_2}{E_1} \Rightarrow \frac{E_1}{E_2} = \frac{1}{3}$

D. $\lambda = 2000$ pm $= 2000 \times 10^{-12}$ m ; E = 1J.

as $E = \frac{nhc}{\lambda}; n = \frac{E\lambda}{hc} = \frac{1\times2000\times10^{-12}}{6.626\times10^{-34}\times3\times10^{8}}$

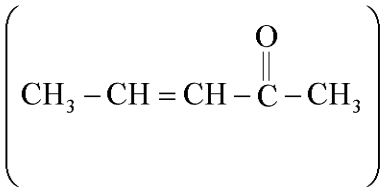
$= 100.614 \times 10^{14} = 1.006\times10^{16}$

Question ID : 444792515

61. Which of the following statements are **TRUE** about Haloform reaction ?

A. Sodium hypochlorite reacts with KI to give KOI.

B. KOI is a reducing agent.

C. α, β–unsaturated methylketone  will give iodoform reaction.

D. Isopropyl alcohol will not give iodoform test.

E. Methanoic acid will give positive iodoform test.

Choose the correct answer from the options given below :

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(1) A & C only
(2) A, B & C only
(3) A, C & E only
(4) B, D & E only

Ans. Official answer NTA (1)

Sol. A. $KI + NaOCl \rightarrow KOI + NaCl$

B. KOI is an oxidising agent

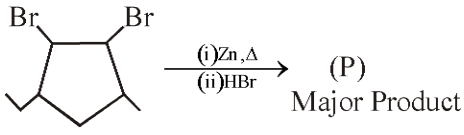
C.  is a methyl ketone

So give iodoform test.

D. Isopropyl alcohol gives iodoform teset.

E. Methanoic acid does not give iodoform test.

Question ID : 444792514

62. 

Identify (P).

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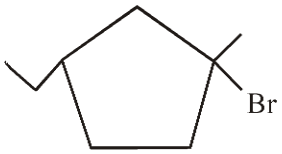
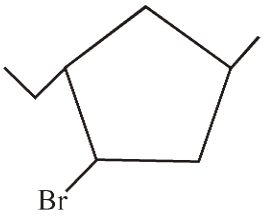
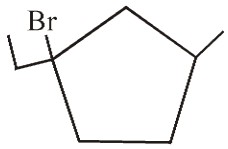
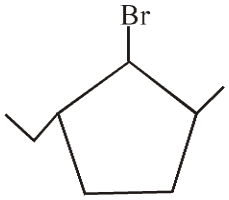
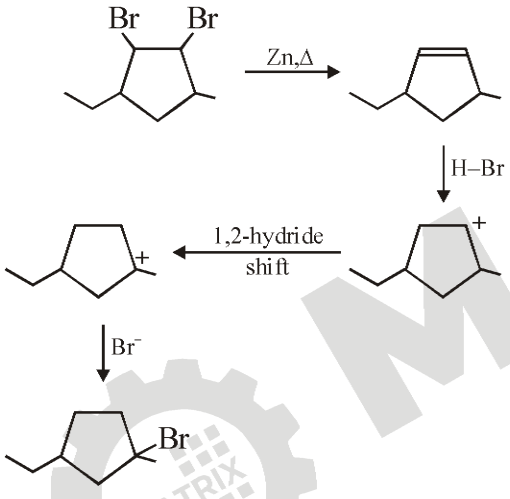
(1) 

(2) 

(3) 

(4) 

Ans. Official answer NTA (1)

Sol. 

Question ID : 444792518

63. A student has been given a compound "x" of molecular formula–C_6H_7N. 'x' is sparingly soluble in water. However, on addition of dilute mineral acid, 'x' becomes soluble in water. 'x' when treated with $CHCl_3$ and KOH (alc.), 'y' is produced. 'y' has a specific unpleasant smell. On treatment with benzenesulphonyl chloride, 'x' gives a compound 'z' which is soluble in alkali. The number of different "H" atoms present in 'z' is :-

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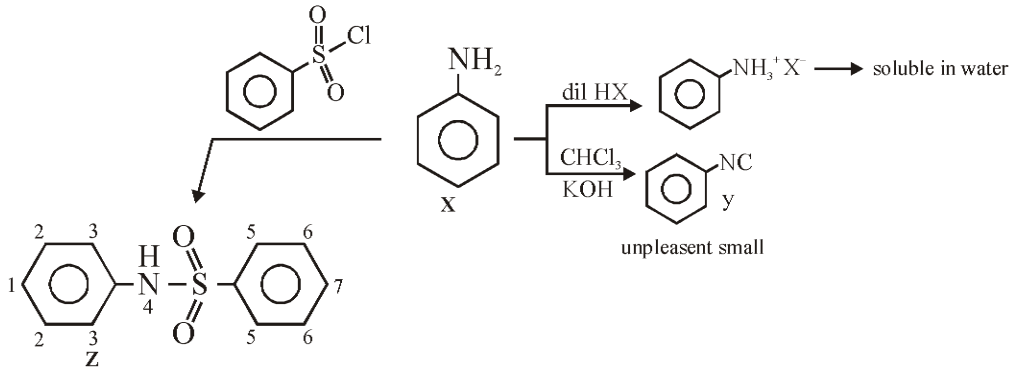
(1) 8 (2) 4 (3) 5 (4) 7

Ans. Official answer NTA (4)

Sol.



Number of different H-atoms = 7

Question ID : 444792516

64. A mixed ether (P), when heated with excess of hot concentrated hydrogen iodide produces two different alkyl iodides which when treated with aq. NaOH give compounds (Q) and (R). Both (Q) and (R) give yellow precipitate with NaOI. Identify the mixed ether (P) :

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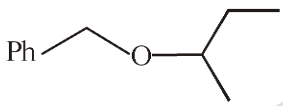
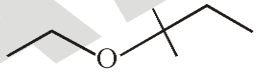
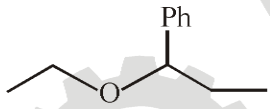
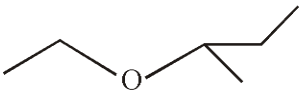
(1) 

(2) 

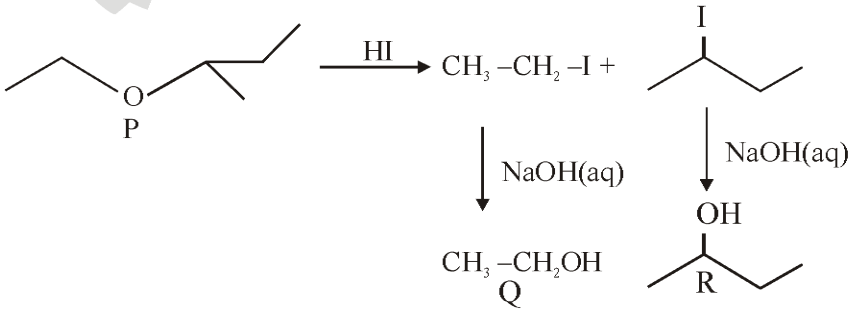
(3) 

(4) 

Ans. Official answer NTA (4)

Sol. Both Q and R give yellow precipitate with NaOI means both give iodoform test.

So, P may be :



Both give iodoform test

Question ID : 444792520

65. Iodoform test can differentiate between

A. Methanol and Ethanol

B. CH_3COOH and CH_3CH_2COOH

C. Cyclohexene and cyclohexanone

D. Diethyl ether and Pentan–3–one

E. Anisole and acetone

Choose the correct answer from the options given below :

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(1) A & E only (2) B, C & E only

(3) A & D only (4) A, B & E only

Ans. Official answer NTA (1)

Sol. Iodoform test can distinguish between

A. Methanol and ethanol

Ethanol gives positive test

E. Anisole and acetone

Acetone gives positive test

Question ID : 444792512

66. In Carius method 0.2425 g of an organic compound gave 0.5253 g silver chloride. The percentage of chlorine in the organic compound is

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(1) 37.57% (2) 34.79% (3) 53.58% (4) 87.65%

Ans. Official answer NTA (3)

Sol. Mass of AgCl = 0.5253g

$$\text{moles of AgCl} = \frac{0.5253}{143.5} = \text{moles of } Cl^-$$

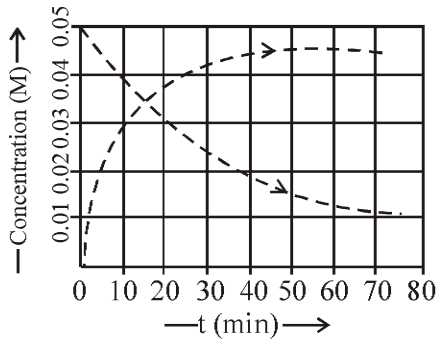
$$\text{mass of chlorine in AgCl} = \frac{0.5253}{143.5} \times 35.5 = \text{mass of Cl in organic compound}$$

$$\% \text{ of chlorine} = \frac{0.5253}{143.5} \times \frac{35.5}{0.2425} \times 100$$

= 53.58%

Question ID : 444792506

67.



Given above is the concentration vs time plot for a dissociation reaction : $A \rightarrow nB$.

Based on the data of the initial phase of the reaction (initial 10 min), the value of n is _____ .

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(1) 2 (2) 3 (3) 5 (4) 4

Ans. Official answer NTA (2)

Sol. During the initial phase of reaction : $A \rightarrow nB$

$\Delta t = 10$ min

$$\text{Rate} = -\frac{\Delta A}{\Delta t} = \frac{1}{n}\frac{\Delta B}{\Delta t}$$

$$-\frac{(0.04-0.05)}{10} = \frac{1}{n}\frac{(0.03-0)}{10}$$

$n = 3$

Question ID : 444792513

68. Given below are two statements :

Statement I : $(CH_3)_3\overset{\oplus}{C}$ is more stable than $\overset{\oplus}{C}H_3$ as nine hyperconjugation interactions are possible in $(CH_3)_3\overset{\oplus}{C}$.

Statement II : $\overset{\oplus}{C}H_3$ is less stable than $(CH_3)_3\overset{\oplus}{C}$ as only three hyperconjugation interactions are possible in $\overset{\oplus}{C}H_3$.

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

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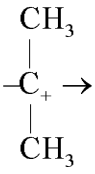
(1) Statement I is true but statement II is false.

(2) Statement I is false but statement II is true.

(3) Both statement I and statement II are false.

(4) Both statement I and Statement II are true.

Ans. Official answer NTA (1)

Sol.  hyperconjugating interactions, So, more stable

$\overset{+}{C}H_3 \rightarrow$ no hyperconjugation

Question ID : 444792507

69. Observe the following reactions at T(K).

I. $A \rightarrow$ products

II. $5Br^-(aq) + BrO_3^-(aq) + 6H^+(aq) \rightarrow 3Br_2(aq) + 3H_2O(l)$

Both the reactions are started at 10.00 am. The rates of these reactions at 10.10 am are same. The value of $-\frac{\Delta[Br^-]}{\Delta t}$ at 10.10 am is 2×10^{-4} mol L^{-1} min^{-1}. The concentration of A at 10.10 am is 10^{-2} mol L^{-1}.

What is the first order rate constant (in min^{-1}) of reaction I ?

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(1) 10^{-3} (2) 2×10^{-3} (3) 4×10^{-3} (4) 10^{-2}

Ans. Official answer NTA (3)

Sol. At 10

$10 : 10am \quad \frac{-\Delta[Br^-]}{\Delta t} = 2\times10^{-4}\,molL^{-1}\,min^{-1}$

$Rate = \frac{-1}{5}\frac{\Delta[Br^-]}{\Delta t} = \frac{2\times10^{-4}}{5}molL^{-1}\,min^{-1}$

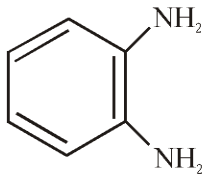
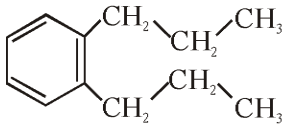
At 10 : 10am, rate of both reactions is same, so : for reaction I : Rate = k[A]

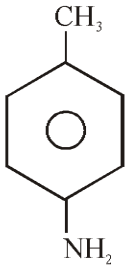
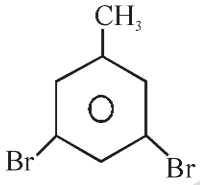
$\frac{2\times10^{-4}}{5} = k\times10^{-2}$

$k = \frac{2\times10^{-2}}{5} = 4\times10^{-3}\,min^{-1}$

Question ID : 444792517

70. Given below are two statements :

Statement I :  can be synthesized from  using simpler reagents in the order (i) Acidic $KMnO_4$, (ii) Ammonia, (iii) Bromine and alkali

Statement II :  can be converted into  using reagents in the order (i) Bromine–H_2O (ii) $NaNO_2$/HCl (0 – 5°C) (iii) Aq. H_3PO_2.

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

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(1) Both statement I and Statement II are true

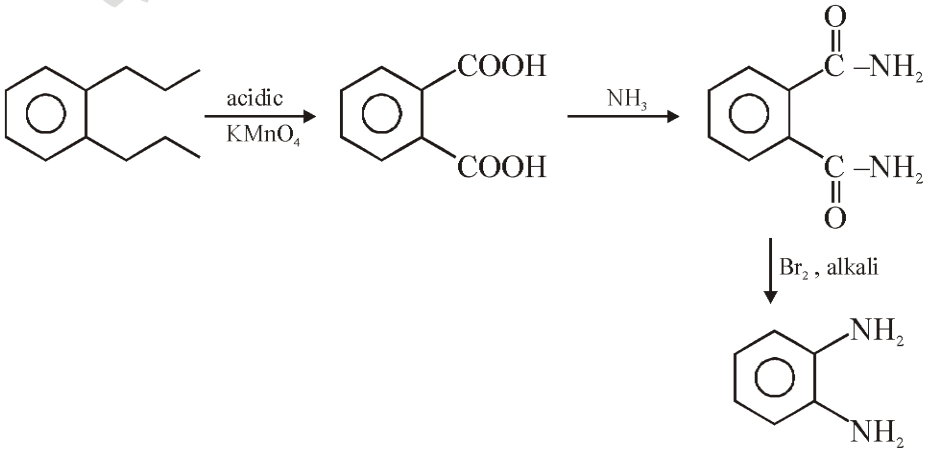
(2) Statement I is true but Statement II is false.

(3) Statement I is false but Statement II is true.

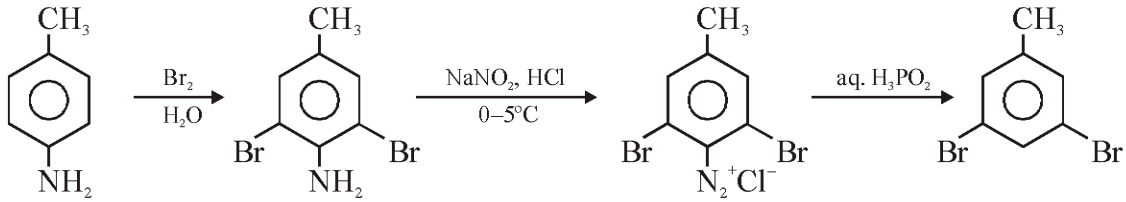
(4) Both statement I and statement II are false.

Ans. Official answer NTA (1)

Sol. Statement-I : correct



Statement-II : correct



SECTION – B

Question ID : 444792523

71. 200 cc of $x \times 10^{-3}$ M potassium dichromate is required to oxidise 750 cc of 0.6 M Mohr's salt solution in acidic medium.

Here x = _____ .

क

Ans. Official answer NTA (375)

Sol. Mohr's salt : $(NH_4)_2SO_4FeSO_4,6H_2O$

Volume = 750 ml, molarity = 0.6 M

moles of Mohr's salt = 750× 0.6 m moles = moles of Fe^{2+}

Reaction involed :

$$Cr_2O_7^{2-} + 14H^+ + 6Fe^{2+} \rightarrow 6Fe^{3+} + 2Cr^{3+} + 7H_2O$$

from reaction,

6 moles of Fe^{2+} react with = 1 mole of $Cr_2O_7^{2-}$

So, 750×0.6 m moles of Fe^{2+} will react with

$$= \frac{1}{6} \times 750 \times 0.6 = 75\text{m moles of} Cr_2O_7^{2-}$$

Moles of $Cr_2O_7^{2-}$ = 75 m moles = volume × molarity

$$\text{molarity} = \frac{75\text{ mmoles}}{200\text{ml}} = \frac{75}{200}\text{mol / L} = 0.375\text{mol / L}$$

$x \times 10^{-3} = 0.375$

$x = 375$

Question ID : 444792525

72. Two liquids A and B form an ideal solution. At 320 K, the vapour pressure for the solution, containing 3 mol of A and 1 mol of B is 500 mm Hg. At the same temperature, if 1 mol of A is further added to this solution, vapour pressure of the solution increases by 20 mm Hg. Vapour pressure (in mm Hg) of B in pure state is _____ . (Nearest integer)

क

Ans. Official answer NTA (200)

Sol. At 320 K,

Initially, moles of A, $n_A = 3$ moles

moles of B, $n_B = 1$ moles

mole fraction : $x_A = \frac{3}{4}, \ x_B = \frac{1}{4}$

Total pressure, 500 mm of Hg = $x_A P_A^0 + x_B P_B^0$

$$\frac{3P_A^0}{4} + \frac{P_B^0}{4} = 500\text{mm of Hg}$$

$$3P_A^0 + P_B^0 = 2000\text{mm of Hg} \quad ...(1)$$

On adding 1 mole of a : $n'_A = 4; n'_B = 1$

$$x'_A = \frac{4}{5}; x'_B = \frac{1}{5}$$

Total pressure, $520 = \frac{4}{5}P_A^0 + \frac{P_B^0}{5}$

$$4P_A^0 + P_B^0 = 2600\text{mm of Hg} \quad ...(2)$$

Subtracting (1) from (2), we get

$P_A^0 = 600\text{mm of Hg}$

as $3P_A^0 + P_B^0 = 2000$

So, $1800 + P_B^0 = 2000$

$P_B^0 = 200$ mm of Hg

Question ID : 444792521

73. Total number of unpaired electrons present in the central metal atoms/ions of $[Ni(CO)_4]$, $[NiCl_4]^{2-}$, $[PtCl_2(NH_3)_2]$, $[Ni(CN)_4]^{2-}$ and $[Pt(CN)_4]^{2-}$ is _____ .

क

Ans. Official answer NTA (2)

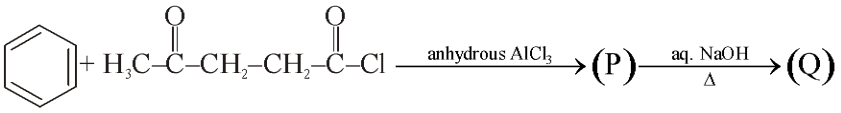
Sol.

	$[Ni(CO)_4]$ $sp^3 \rightarrow 3d^{10}$	$[NiCl_4]^{2-}$ $sp^3 \rightarrow 3d^8$	$[PtCl_2(NH_3)_2]$ $dsp^2 \rightarrow 5d^8$	$[Ni(CN)_4]^{2-}$ $dsp^2 \rightarrow 3d^8$	$[Pt(CN)_4]^{2-}$ $dsp^2 \rightarrow 5d^8$
Number of unpaired electrons	0	2	0	0	0

Total unpaired electrons = 2

Question ID : 444792522

74. Consider the following reaction of benzene.

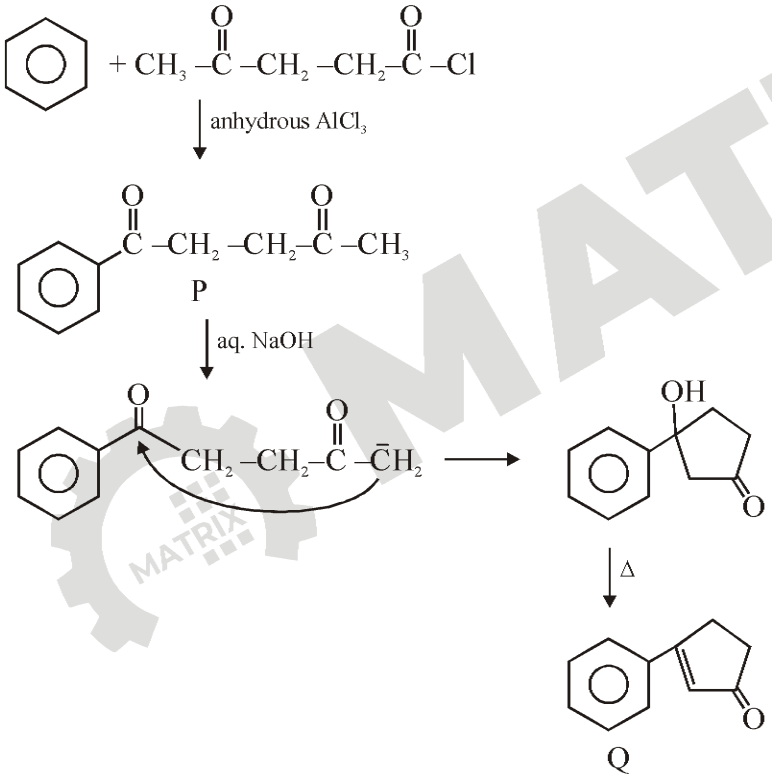


In compound (Q), the percentage of oxygen is _____ %. (Nearest integer)

क

Ans. Official answer NTA (10)

Sol.



$$\%\text{ of oxygen} = \frac{\text{mass of oxygen}}{\text{Total mass}} \times 100 = \frac{16}{158} \times 100 = 10.13\% \approx 10\%$$

Question ID : 444792524

75. $X_2(g)+Y_2(g) \rightleftharpoons 2Z(g)$

$X_2(g)$ and $Y_2(g)$ are adeed to a 1 L flask and it is found that the system attains the above equilibrium at T(K) with the number of moles of $X_2(g)$, $Y_2(g)$ and Z(g) being 3, 3 and 9 mol respectively (equilibrium moles). Under this condition of equilibrium, 10 mol of Z(g) is added to the flask and the temperature is maintained at T(K). Then the number of moles of Z(g) in the flask when the new equilibrium is established is _____. (Nearest integer)

क

Ans. Official answer NTA (15)

Sol. $X_2(g)+Y_2(g) \rightleftharpoons 2Z(g)$ Volume = 1L

at equilibium concentration 3M 3M 9M

$$K_C = \frac{[Z]^2}{[X_2][Y_2]} = \frac{9^2}{3\times 3} = 9$$

New concentration when 10 mol Z is added

$X_2(g)+Y_2(g) \rightleftharpoons 2Z(g)$

3M 3M 19M

$Q_C = \frac{(19)^2}{3\times 3} = 40.11 > K_C$. So, reaction moves backward

At new equilibirum

$X_2(g)+Y_2(g) \rightleftharpoons 2Z(g)$

at equilibrium 3+a 3+a 19-2a

$$K_C = 9 = \frac{(19-2a)^2}{(3+a)(3+a)}$$

$$\left(\frac{19-2a}{3+a}\right)^2 = 9$$

$$\frac{19-2a}{3+a} = 3 \Rightarrow 19 - 2a = 9 + 3a$$

$5a = 10$

$a = 2$

New concentration of Z(g) = $19 - 2a = 19 - 4 = 15$ mol/L

moles = $15\ molL^{-1} \times 1L = 15$ moles