

**FINAL JEE–MAIN EXAMINATION – APRIL, 2023**

**(Held On Monday 10<sup>th</sup> April, 2023)**

**TIME : 9 : 00 AM to 12 : 00 NOON**

**SECTION-A**

61. Using column chromatography, mixture of two compounds 'A' and 'B' was separated. 'A' eluted first, this indicates 'B' has

- (1) low  $R_f$ , weaker adsorption
- (2) high  $R_f$ , stronger adsorption
- (3) high  $R_f$ , weaker adsorption
- (4) low  $R_f$ , stronger adsorption

**Official Ans. by NTA (4)**

**Ans. (4)**

**Sol.** If any component eluted second then it means that its  $R_f$  value is low and its adsorption is stronger

$$R_f = \frac{\text{distance covered by substance from base line}}{\text{total distance covered by solvent from base line}}$$

62. Prolonged heating is avoided during the preparation of ferrous ammonium sulphate to

- (1) prevent oxidation
- (2) prevent reduction
- (3) prevent hydrolysis
- (4) prevent breaking

**Official Ans. by NTA (1)**

**Ans. (1)**

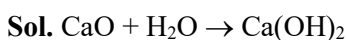
**Sol.** Prolonged heating will cause oxidation of  $Fe^{+2}$  to  $Fe^{+3}$ .

63. Lime reacts exothermally with water to give 'A' which has low solubility in water. Aqueous solution of 'A' is often used for the test of  $CO_2$ , a test in which insoluble B is formed. If B is further reacted with  $CO_2$  then soluble compound is formed 'A' is

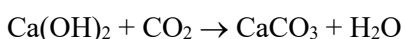
- (1) Quick lime
- (2) Slaked lime
- (3) Lime water
- (4) White lime

**Official Ans. by NTA (2)**

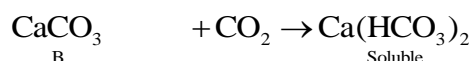
**Ans. (2)**



A (less soluble)



B (insoluble)



64. The pair from the following pairs having both compounds with net non-zero dipole moment is

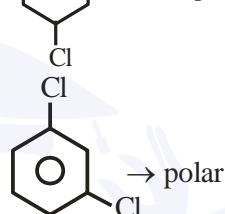
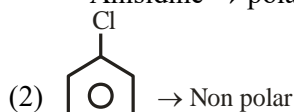
- (1) Benzene, anisidine
- (2) 1,4-Dichlorobenzene, 1,3-Dichlorobenzene
- (3)  $CH_2Cl_2$ ,  $CHCl_3$
- (4) cis-butene, trans-butene

**Official Ans. by NTA (3)**

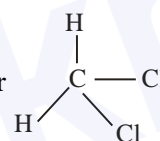
**Ans. (3)**

**Sol.** (1) Benzene  $\rightarrow$  non polar

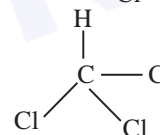
Anisidine  $\rightarrow$  polar





(3)  $CH_2Cl_2$ ,  $\mu_{net} \neq 0$  polar



$CHCl_3$ ,  $\mu_{net} \neq 0$  polar



(4)   $\Rightarrow$  polar

  $\Rightarrow$  non polar

65. Match List-I with List-II

**List-I**

**Industry**

- (A) Steel plants
- (B) Thermal power plants
- (C) Fertilizer industries
- (D) Paper mills

**List-II**

**Waste Generated**

- (I) Gypsum
- (II) Fly ash
- (III) Slag
- (IV) Bio-degradable Wastes

Choose the correct answer from the options given below:

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

**Official Ans. by NTA (1)**

**Ans. (1)**

**Sol.** Steel plant produces slag from blast furnace. Thermal power plant produces fly ash, Fertilizer industries produces gypsum. Paper mills produces bio degradable waste

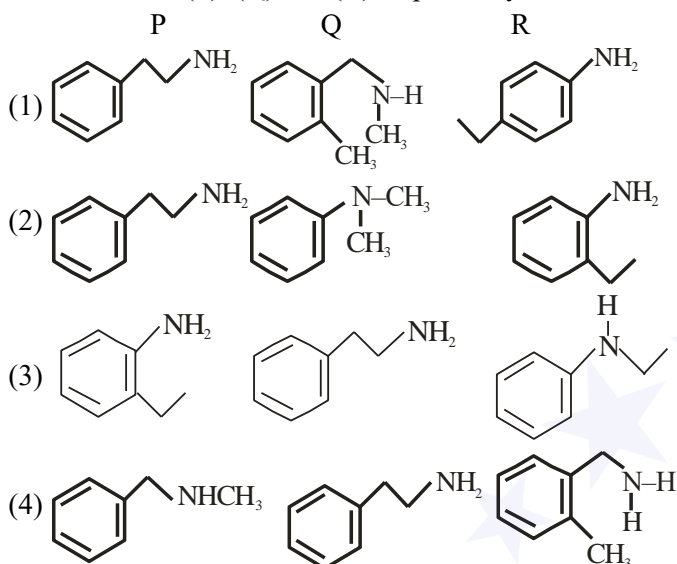
66. Isomeric amines with molecular formula  $C_8H_{11}N$  give the following tests

Isomer (P)  $\Rightarrow$  Can be prepared by Gabriel phthalimide synthesis

Isomer (Q)  $\Rightarrow$  Reacts with Hinsberg's reagent to give solid insoluble in NaOH

Isomer (R)  $\Rightarrow$  Reacts with HONO followed by  $\beta$ -naphthol in NaOH to give red dye.

Isomers (P), (Q) and (R) respectively are



**Official Ans. by NTA (1)**

**Ans. (1)**

**Sol.** (P) Gabriel phthalimide synthesis is used for the preparation of aliphatic primary amines. Aromatic primary amines cannot be prepared by this method.

(Q) 2°-amines reacts with Hinsberg's reagent to give solid insoluble in NaOH

(R) Aromatic primary amine react with nitrous acid at low temperature (273 – 298 K) to form diazonium salts, which form Red dye with  $\beta$ -Naphthol

67. Given below are two statements

Statement I : Aqueous solution of  $K_2Cr_2O_7$  is preferred as a primary standard in volumetric analysis over  $Na_2Cr_2O_7$  aqueous solution

Statement II :  $K_2Cr_2O_7$  has a higher solubility in water than  $Na_2Cr_2O_7$

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

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

**Official Ans. by NTA (3)**

**Ans. (3)**

**Sol. (1)**  $K_2Cr_2O_7$  is used as primary standard. The concentration  $Na_2Cr_2O_7$  changes in aq. solution.

(2) It is less soluble than  $Na_2Cr_2O_7$ .

68. The one that does not stabilize 2° and 3° structures of proteins is

- (1) H-bonding
- (2) –S-S-linkage
- (3) –O-O-linkage
- (4) van der Waals forces

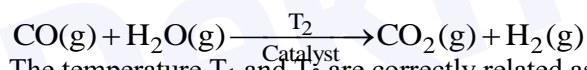
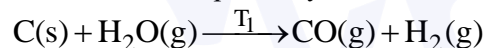
**Official Ans. by NTA (3)**

**Ans. (3)**

**Sol.** 2° and 3° structure of proteins are stabilized by hydrogen bonding, disulphide linkages, Van der Waals force of attraction and electrostatic force of attraction.

69. Given below are two reactions, involved in the commercial production of dihydrogen ( $H_2$ ).

The two reactions are carried out at temperature " $T_1$ " and " $T_2$ " respectively



The temperature  $T_1$  and  $T_2$  are correctly related as

- (1)  $T_1 > T_2$
- (2)  $T_1 = T_2$
- (3)  $T_1 = 100\text{ K}, T_2 = 1270\text{ K}$
- (4)  $T_1 < T_2$

**Official Ans. by NTA (1)**

**Ans. (1)**

**Sol.**  $T_1 = 1270\text{ K}$                        $T_2 = 673\text{ K}$

$T_1 > T_2$  on the basis of data

70. Which of the following statements are correct?

- (A) The  $M^{3+}/M^{2+}$  reduction potential for iron is greater than manganese
- (B) The higher oxidation states of first row d-block elements get stabilized by oxide ion.
- (C) Aqueous solution of  $Cr^{2+}$  can liberate hydrogen from dilute acid.
- (D) Magnetic moment of  $V^{2+}$  is observed between 4.4-5.2 BM

Choose the correct answer from the options given below:

- (1) (B), (C) only                      (C), (D) only
- (2) (A), (B), (D) only              (A), (B) only

**Official Ans. by NTA (1)**

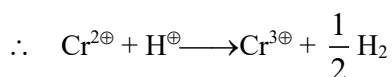
**Ans. (1)**

**Sol.** (A) The  $M^{3+}/M^{2+}$  reduction potential for manganese is greater than iron

(B)  $E^0_{Fe^{3+}/Fe^{2+}} = +0.77$

$E^0_{Mn^{3+}/Mn^{2+}} = +1.57$

(C)  $E^0_{Cr^{3+}/Cr^{2+}} = -0.26$



(D)  $V^{2\oplus} = 3$  unpaired electron

Magnetic Moment = 3.87 B.M

71. Which of the following is used as a stabilizer during the concentration of sulphide ores?

- (1) Pine oils
- (2) Xanthates
- (3) Fatty acids
- (4) Cresols

**Official Ans. by NTA (4)**

**Ans. (4)**

**Sol.** Cresol is used as stabilizer.

72. The octahedral diamagnetic low spin complex among the following is

- (1)  $[NiCl_4]^{2-}$
- (2)  $[CoCl_6]^{3-}$
- (3)  $[CoF_6]^{3-}$
- (4)  $[Co(NH_3)_6]^{3+}$

**Official Ans. by NTA (4)**

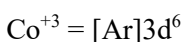
**Ans. (4)**

**Sol. (1)** Paramagnetic, High Spin & Tetrahedral

- (2) Paramagnetic, High Spin & Octahedral
- (3) Paramagnetic, High Spin & Octahedral
- (4) Diamagnetic, Low Spin & Octahedral

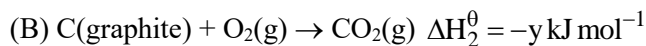
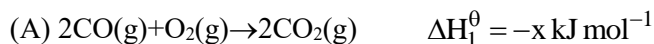


$NH_3 = SFL$

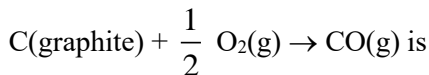


Diamagnetic & Low spin complex

73. Given



The  $\Delta H^0$  for the reaction



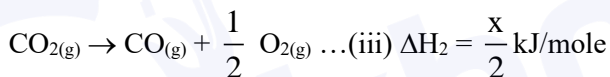
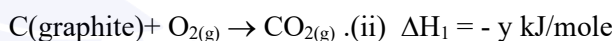
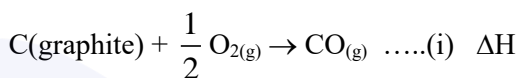
(1)  $\frac{x-2y}{2}$  (3)  $\frac{x+2y}{2}$

(3)  $\frac{2x-y}{2}$  (4)  $2y-x$

**Official Ans. by NTA (1)**

**Ans. (1)**

**Sol.** Target equation



eq. (i) = eq. (ii) + eq. (iii)

$\therefore \Delta H = \frac{x}{2} - y = \frac{x-2y}{2}$

74. The compound which does not exist is

- (1)  $NaO_2$
- (2)  $(NH_4)_2BeF_4$
- (3)  $BeH_2$
- (4)  $PbEt_4$

**Official Ans. by NTA (1)**

**Ans. (1)**

**Sol.** Sodium superoxide is not stable

75. Match List I with List II

List-I	List-II
Polymer	Type/Class

- (A) Nylon-2-Nylon-6 (I) Thermosetting Polymer
- (B) Buna-N (II) Biodegradable polymer
- (C) Urea-formaldehyde (III) Synthetic rubber resin
- (D) Dacron (IV) Polyester

Choose the correct answer from the options given below:

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

Official Ans. by NTA (4)

Ans. (4)

Sol.

- (A) Nylon-2-nylon-6  
Biodegradable polymer and polyamides (II)
- (B) Buna-N  $\rightarrow$  Butadiene acrylonitrile rubber  $\rightarrow$   
synthetic rubber (III)
- (C) Urea-formaldehyde resin  $\rightarrow$  Thermosetting  
polymer (I)
- (D) Dacron  $\rightarrow$  Polyester polymer of ethylene  
glycol and terephthalic acid (IV)

76. The number of molecules and moles in 2.8375 litres of  $O_2$  at STP are respectively

- (1)  $7.527 \times 10^{22}$  and 0.250 mol  
(2)  $1.505 \times 10^{23}$  and 0.250 mol  
(3)  $7.527 \times 10^{23}$  and 0.125 mol  
(4)  $7.527 \times 10^{22}$  and 0.125 mol

Official Ans. by NTA (4)

Ans. (4)

$$\text{Sol. Number of moles of } O_2 = \frac{2.8375}{22.7} = 0.125$$

$$\Rightarrow \text{Number of molecules} = 0.125 N_A \\ = 7.525 \times 10^{22}$$

77. The enthalpy change for the adsorption process and micelle formation respectively are

- (1)  $\Delta H_{\text{ads}} < 0$  and  $\Delta H_{\text{mic}} > 0$   
(2)  $\Delta H_{\text{ads}} < 0$  and  $\Delta H_{\text{mic}} < 0$   
(3)  $\Delta H_{\text{ads}} > 0$  and  $\Delta H_{\text{mic}} < 0$   
(4)  $\Delta H_{\text{ads}} > 0$  and  $\Delta H_{\text{mic}} > 0$

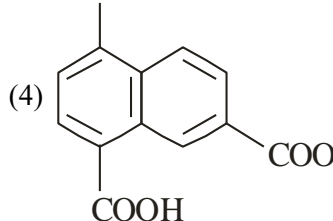
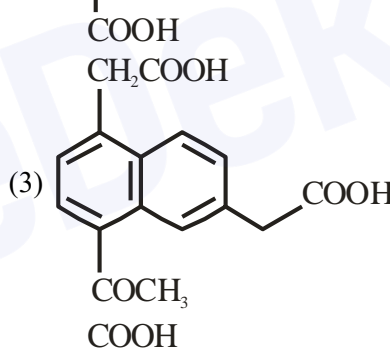
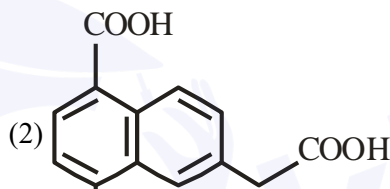
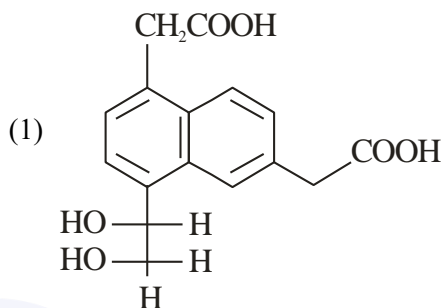
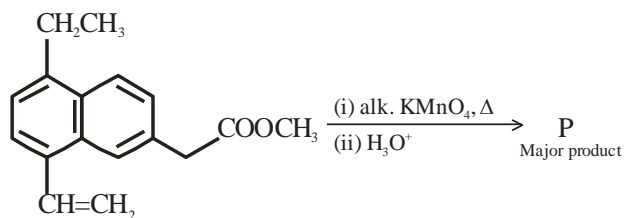
Official Ans. by NTA (1)

Ans. (1)

Sol. Adsorption is exothermic process due to decrease in surface energy

Micelle formation is endothermic

78. The major product 'P' formed in the given reaction is

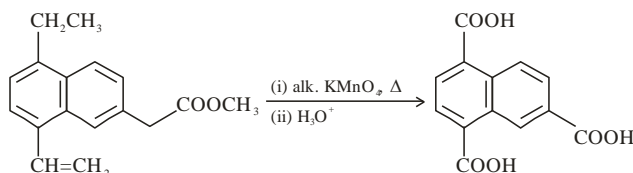


Official Ans. by NTA (4)

Ans. (4)

Sol.

$KMnO_4$  oxidises benzylic carbon containing atleast one  $\alpha$ -hydrogen atom to  $-COOH$ .

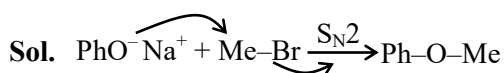


79. Suitable reaction condition for preparation of Methyl phenyl ether is

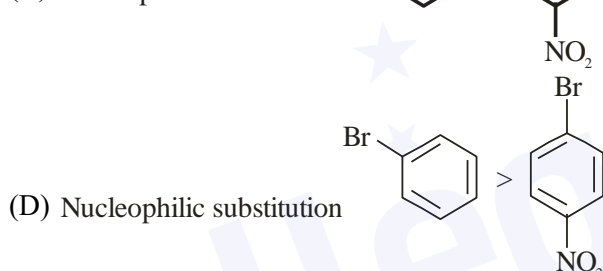
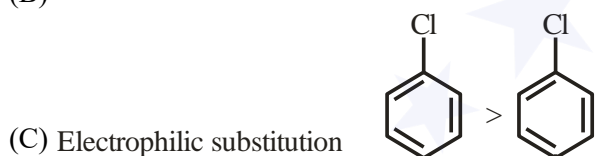
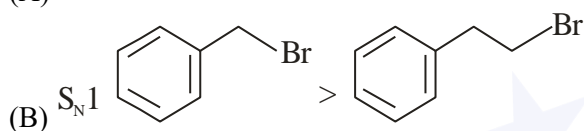
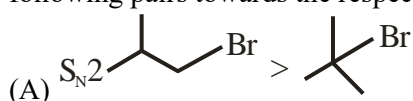
- (1)  $\text{Ph}-\text{Br}, \text{MeO}^-\text{Na}^+$
- (2)  $\text{PhO}^-\text{Na}^+, \text{MeOH}$
- (3)  $\text{PhO}^-\text{Na}^+, \text{MeBr}$
- (4) Benzene,  $\text{MeBr}$

**Official Ans. by NTA (3)**

**Ans. (3)**



80. Identify the correct order of reactivity for the following pairs towards the respective mechanism



Choose the correct answer from the options given below :

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

**Official Ans. by NTA (2)**

**Ans. (2)**

**Sol.**

All are correct

- (A)  $\text{S}_{\text{N}}2$  reaction decreases with increase in steric crowding.
- (B)  $\text{S}_{\text{N}}1$  reaction increases with stability of carbocation.
- (C) EAS reaction decreases with decrease in electron density.
- (D) Presence of electron withdrawing group at ortho and para-position to a halogen in haloarene increase nucleophilic aryl substitution.

## SECTION-B

81. The number of correct statement/s involving equilibria in physical process from the following is

- (A) Equilibrium is possible only in a closed system at a given temperature
- (B) Both the opposing processes occur at the same rate.
- (C) When equilibrium is attained at a given temperature, the value of all its parameters became equal
- (D) For dissolution of solids in liquids, the solubility is constant at a given temperature

**Official Ans. by NTA (3)**

**Ans. (3)**

**Sol.** (A) is correct

(B) for equilibrium  $r_f = r_b$

$\Rightarrow$  (B) is correct

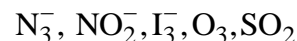
(C) at equilibrium the value of parameters become constant of a given temperature and not equal

$\Rightarrow$  (C) is incorrect

(D) for a given solid solute and a liquid solvent solubility depends upon temperature only

$\Rightarrow$  (D) is correct

82. The number of bent-shaped molecule/s from the following is \_\_\_\_\_



**Official Ans. by NTA (3)**

**Ans. (3)**

**Sol.**  $\text{N}_3^-$  linear

$\text{NO}_2^-$  bent

$\text{I}_3^-$  linear

$\text{O}_3$  bent

$\text{SO}_2$  bent

83. A molecule undergoes two independent first order reactions whose respective half lives are 12 min and 3 min. If both the reactions are occurring then the time taken for the 50% consumption of the reactant is \_\_\_\_\_ min. (Nearest integer)

Official Ans. by NTA (2)

Ans. (2)  
 Sol.  $\frac{1}{t_{1/2}} = \frac{1}{3} + \frac{1}{12} = \frac{4+1}{12} = \frac{5}{12}$   
 $t_{1/2} = \frac{12}{5} \text{ min} = 2.4$

Ans. is 2

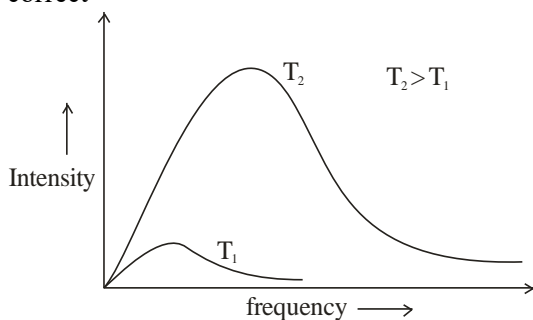
84. The number of incorrect statement/s about the black body from the following is \_\_\_\_\_

- (A) Emit or absorb energy in the form of electromagnetic radiation  
 (B) Frequency distribution of the emitted radiation depends on temperature  
 (C) At a given temperature, intensity vs frequency curve passes through a maximum value  
 (D) The maximum of the intensity vs frequency curve is at a higher frequency at higher temperature compared to that at lower temperature

Official Ans. by NTA (0)

Ans. (0)

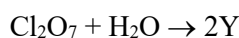
Sol. A blackbody can emit and absorb all the wavelengths in electromagnetic spectrum  $\Rightarrow$  (A) is correct



$\Rightarrow$  (B), (C), (D) correct

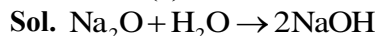
Ans (0)

85. In the following reactions, the total number of oxygen atoms in X and Y is \_\_\_\_\_



Official Ans. by NTA (5)

Ans. (5)



$$1 + 4 = 5$$

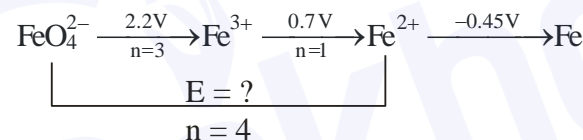
86.  $\text{FeO}_4^{2-} \xrightarrow{+2.2\text{V}} \text{Fe}^{3+} \xrightarrow{+0.70\text{V}} \text{Fe}^{2+} \xrightarrow{-0.45\text{V}} \text{Fe}^0$

$E_{\text{FeO}_4^{2-}/\text{Fe}^{2+}}^\theta$  is  $x \times 10^{-3}$  V. The value of x is \_\_\_\_\_

Official Ans. by NTA (1825)

Ans. (1825)

Sol.



$$4 \times E = 3 \times 2.2 + 1 \times 0.7$$

$$E = \frac{7.3}{4} = 1.825 \text{ V} = 1825 \times 10^{-3} \text{ V}$$

87. If the degree of dissociation of aqueous solution of weak monobasic acid is determined to be 0.3, then the observed freezing point will be \_\_\_\_\_ % higher than the expected/theoretical freezing point. (Nearest integer)

Official Ans. by NTA (30)

Ans. (30)

Sol.  $i = 1 + \alpha$  (for HA)  
 $= 1.3$

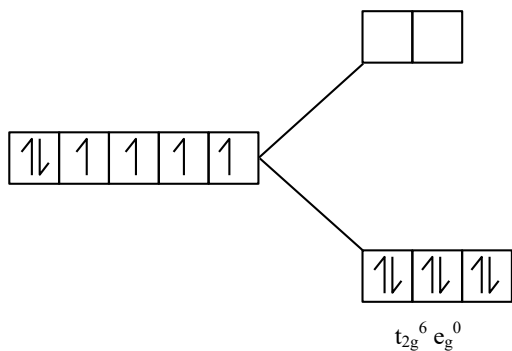
$$\begin{aligned} \% \text{ increase} &= \frac{(\Delta T_f)_{\text{obs}} - (\Delta T_f)_{\text{cal}}}{(\Delta T_f)_{\text{cal}}} \times 100 \\ &= \frac{K_f \times i \times m - K_f \times m}{K_f \times m} \times 100 \\ &= \frac{i-1}{1} \times 100 = 30\% \end{aligned}$$

88. In potassium ferrocyanide, there are \_\_\_\_ pairs of electrons in the  $t_{2g}$  set of orbitals

Official Ans. by NTA (3)

Ans. (3)

Sol.  $K_4[Fe(CN)_6]$



$Fe^{+2} = [Ar]3d^6$

$CN^- = SFL$

$t_{2g}$  contain 6 electron so it become 3 pairs:-

89. At constant temperature a gas is at a pressure of 940.3 mm Hg. The pressure at which its volume decreases by 40% is \_\_\_\_\_ mm Hg.

(Nearest Integer)

Official Ans. by NTA (1567)

Ans. (1567)

Sol.  $P_1V_1 = P_2V_2$

$940.3 \times 100 = P_2 \times 60$

$P_2 = 1567$  mm of Hg

90. The sum of lone pairs present on the central atom of the interhalogen  $IF_5$  and  $IF_7$  is \_\_\_\_\_

Official Ans. by NTA (1)

Ans. (1)

Sol.  $IF_5 = 1$  lone pair

$IF_7 = 0$  lone pair

$1 + 0 = 1$