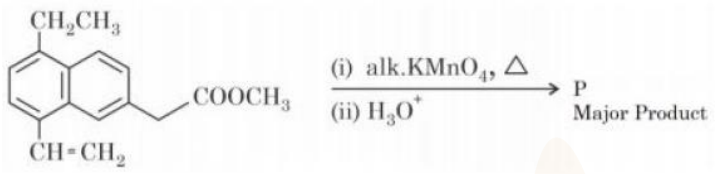
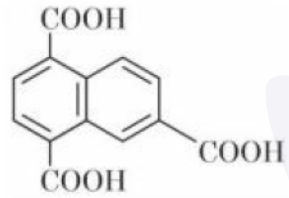
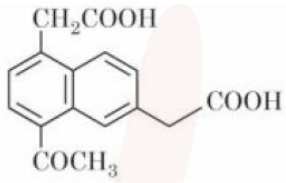
FINAL JEE–MAIN EXAMINATION – April, 2023
Held On Monday 10th April, 2023
TIME : 09:00 AM to 12:00 PM

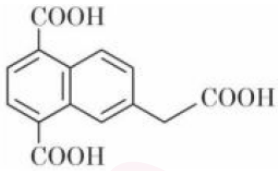
SECTION - A

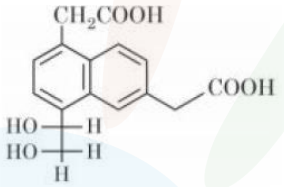
Q.61 The major product 'P' formed in the given reaction is



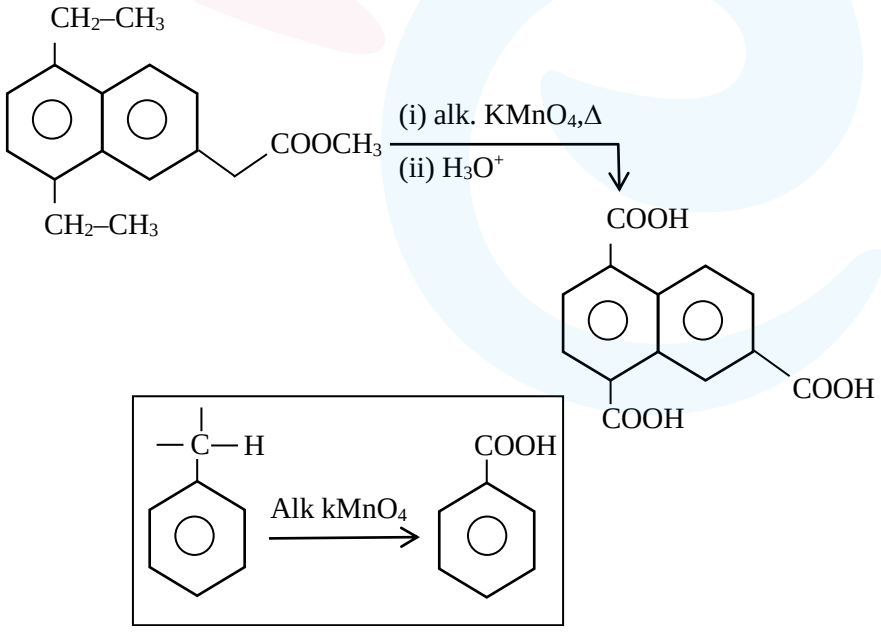
(1) 

(2) 

(3) 

(4) 

Sol. **(1)**



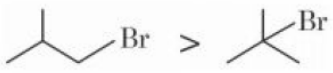
Q.62 Prolonged heating is avoided during the preparation of ferrous ammonium sulphate to

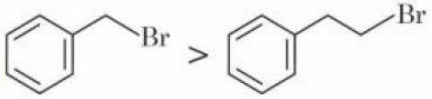
(1) prevent hydrolysis (2) prevent reduction (3) prevent breaking (4) prevent oxidation

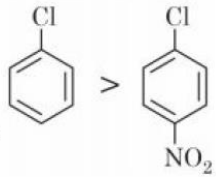
Sol. **(4)**

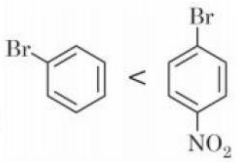
It may oxidise ferrous ion to ferric ions.

Q.63 Identify the correct order of reactivity for the following pairs towards the respective mechanism

(A) S_N2 

(B) S_N1 

(C) Electrophilic substitution 

(D) Nucleophilic substitution 

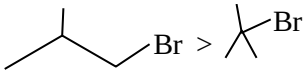
Choose the correct answer from the options given below:

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

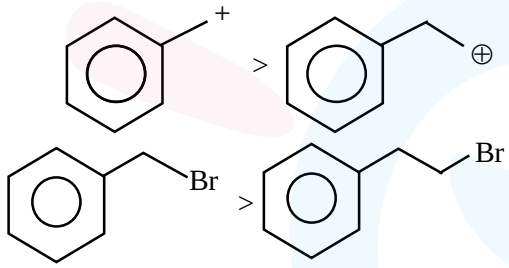
(3) (B), (C) and (D) only (4) (A), (B), (C) and (D)

Sol. **(4)**

(A) $S_N2 \rightarrow$ for S_N2 Reaction $1^o > 2^o > 3^o$



(B) $S_N1 \rightarrow$ reactivity × Stability of Carbocation formed

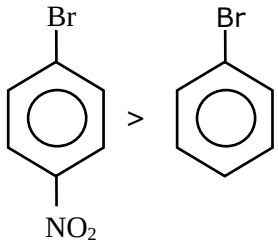


So,

(C) Electrophilic Substitution reaction

$$\text{rate} \times \frac{1}{\text{EWG}}$$

(D) Nucleophilic substitution :- rate × no. of EWG atloched at benzons



Q.64 Given

(A) $2CO(g)+O_2(g) \rightarrow 2CO_2(g)$ $\Delta H_1^o = -x$ KJ mol^{-1}

(B) $C(\text{graphite})+O_2(g) \rightarrow CO_2(g)$ $\Delta H_2^o = -y$ KJ mol^{-1}

The ΔH^o for the reaction

$C(\text{graphite})+ \frac{1}{2}O_2(g) \rightarrow CO(g)$ is

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

Sol. **(1)**

$2CO(g) + O_2(g) \rightarrow 2CO_2(g) \quad \Delta H_1^o = y \text{ kJ/mol} \quad \ldots\ldots\ldots(1)$

$C(\text{graphite}) + O_2(g) \rightarrow CO_2(g) \quad \Delta H_2^o = -y \text{ kJ/mol} \quad \ldots\ldots\ldots(2)$

$C(\text{graphite}) + \frac{1}{2}O_2(g) \rightarrow CO(g) \quad \Delta H_3^o = ?$

$$\Delta H_3^o = H_2^o - \frac{H_1^o}{2} = -y - \frac{-x}{2}$$

$$\Delta H_3^o = \frac{x}{2} - y = \frac{x-2y}{2}$$

Q.65 Using column chromatography mixture of two compounds 'A' and 'B' was separated. 'A' eluted first, this indicates 'B' has

(1) high R_f, weaker adsorption (2) high R_f, stronger adsorption

(3) low R_f, stronger adsorption (4) low R_f, weaker adsorption

Sol. **(3)**

More Polar the compound, the more it will adhere to the adsorbent and the smaller the distance it will travel from baseline, and Lower its R_f value.

B has Low R_f value and strong Adsoption

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

Q.66 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) White lime (4) Lime water

Sol. **(2)**

$$CaO + H_2O \rightarrow \underset{A(\text{less soluble})}{Ca(OH)_2}$$

$$Ca(OH)_2 + CO_2 \rightarrow \underset{B(\text{insoluble})}{CaCO_3} + H_2O$$

$$\underset{B}{CaCO_3} + H_2O + CO_2 \rightarrow \underset{\text{Soluble}}{Ca(HCO_3)_2}$$

Q.67 Match list I with list II

List I Industry		List II Waste Generated	
(A)	Steel plants	(I)	Gypsum
(B)	Thermal power plants	(II)	Fly ash
(C)	Fertilizer industries	(III)	Slag
(D)	Paper mills	(IV)	Bio-degradable wastes

Choose the correct answer from the options given below

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

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

Sol. **(4)**

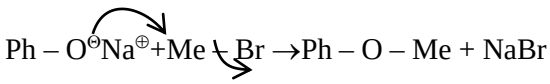
Steel plant produces slag from blast furnace. Thermal power plant produces fly ash, Fertilizer industries produces gypsum. Paper mills produces bio degradable waste

Q.68 Suitable reaction condition for preparation of Methyl phenyl ether is

(1) Benzene, MeBr (2) $PhO^{\ominus}Na^{\oplus}$, MeOH (3) Ph–Br,$MeO^{\ominus}Na^{\oplus}$ (4) $PhO^{\ominus}Na^{\oplus}$, MeBr

Sol. **(4)**

Williamson;s synthasis :-



$Ph - O^{\ominus}Na^{\oplus} + Me - Br \rightarrow Ph - O - Me + NaBr$

Q.69 The one that does not stabilize 2° and 3° structures of proteins is

(1) H-bonding (2) –S–S–linkage

(3) van der waals forces (4) –O–O–linkage

Sol. **(4)**

Fact

The main forces which stabilize the secondary and tertiary structure of proteins are

→ Hydrogen bonds

→ S – S Linkages

→ vanderwaals force

→ electrostatic force of attraction

Q.70 The compound which does not exist is

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

Sol. **(3)**

Sodium superoxide is not stable

Q.71 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

$C(s)+H_2O(g) \xrightarrow{T_1} CO(g)+H_2(g)$

$CO(g)+H_2O(g) \xrightarrow[\text{catalyst}]{T_2} CO_2(g)+H_2(g)$

The temperatures T_1 and T_2 are correctly related as

(1) $T_1 = T_2$ (2) $T_1 < T_2$ (3) $T_1 > T_2$ (4) $T_1 = 100$ K, $T_2 = 1270$ K

Sol. **(3)**

$T_1 = 1270$ K $T_2 = 673$ K

$T_1 > T_2$ on the basis of data

Q.72 The enthalpy change for the adsorption process and micelle formation respectively are

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

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

Sol. **(3)**

Adsorption → Exothermic $(\Delta H_{ads} = -ve)$

Micelle formation → Endothermic $(\Delta H_{mic} = +ve)$

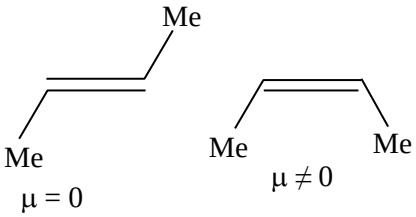
$\Delta H_{ads} < O$ and $\Delta H_{mic} > O$

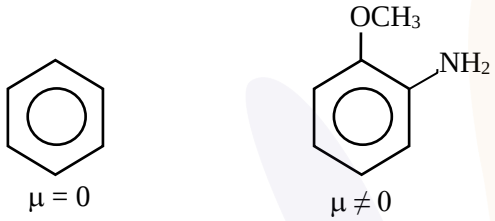
Q.73 The pair from the following pairs having both compounds with net non-zero dipole moment is

(1) cis-butene, trans-butene (2) Benzene, anisidine

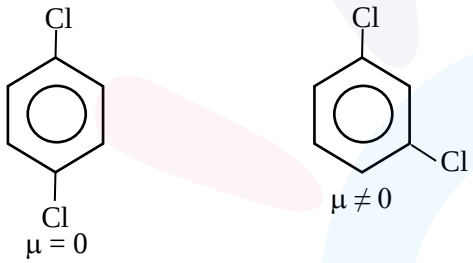
(3) CH_2Cl_2, $CHCl_3$ (4) 1,4-Dichlorohenzene, 1,3-Dichlorobenzene

Sol. **(3)**

(1) 

(2) 

(3) CH_2Cl_2 $\mu \neq 0$ $CHCl_3$ $\mu \neq 0$

(4) 

Q.74 Which of the following is used as a stabilizer during the concentration of sulphide ores?
(1) Xanthates (2) Fatty acids (3) Pine oils (4) Cresols

Sol. **4**
Cresol is used as stabilizer

Q.75 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) (C), (D) only (B) (B), (C) only (C) (A), (B), (D) only (D) (A), (B) only

Sol. **2**
(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) $E^0_{Cr^{+3}/Cr^{+2}} = -0.26$
$\therefore \quad Cr^{2\oplus} + H^{\oplus} \longrightarrow Cr^{3\oplus} + \frac{1}{2}H_2$
(D) $V^{2\oplus}$ = 3 unpaired electron
Magnetic Moment = 3.87 B.M

Q.76 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) Statement I is false but Statement II is true
(2) Statement I is true but Statement II is false
(3) Both Statement I and Statement II are true
(4) Both Statement I and Statement II are false

Sol. **(2)**
(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 $Na_2Cr_2O_7$

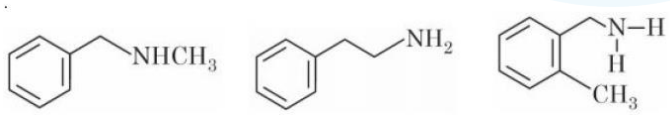
Q.77 The octahedral diamagnetic low spin complex among the following is
(1) $[CoF_6]^{3-}$ (2) $[CoCl_6]^{3-}$ (3) $[Co(NH_3)_6]^{3+}$ (4) $[NiCl_4]^{2-}$

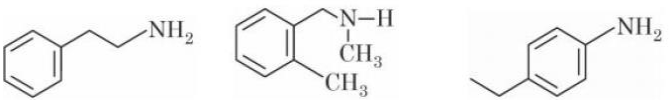
Sol. **(3)**
(1) Paramagnetic, High Spin & Tetrahedral
(2) Paramagnetic, High Spin & Octahedral
(3) Paramagnetic, High Spin & Octahedral
(4) Diamagnetic, Low Spin & Octahedral
$[Co(NH_3)_6]^{3+}, CN = 6$ CN = 6 (Octahedral)
$NH_3 = SFL$
$Co^{+3} = [Ar]3d^6$

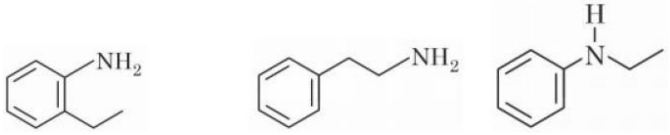
Diamagnetic & Low spin complex

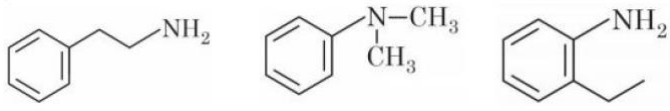
Q.78 Isomeric amines with molecular formula $C_8H_{11}N$ given the following tests
Isomer (P) ⇒ Can be prepared by Gabriel phthalimide synthesis
Isomer (Q) ⇒ Reacts with Hinsberg's reagent to give solid insoluble in NaOH
Isomer (R) ⇒ Reacts with HONO followed by β-naphthol in NaOH to given red dye.
Isomer (P), (Q) and (R) respectively are

(P) (Q) (R)

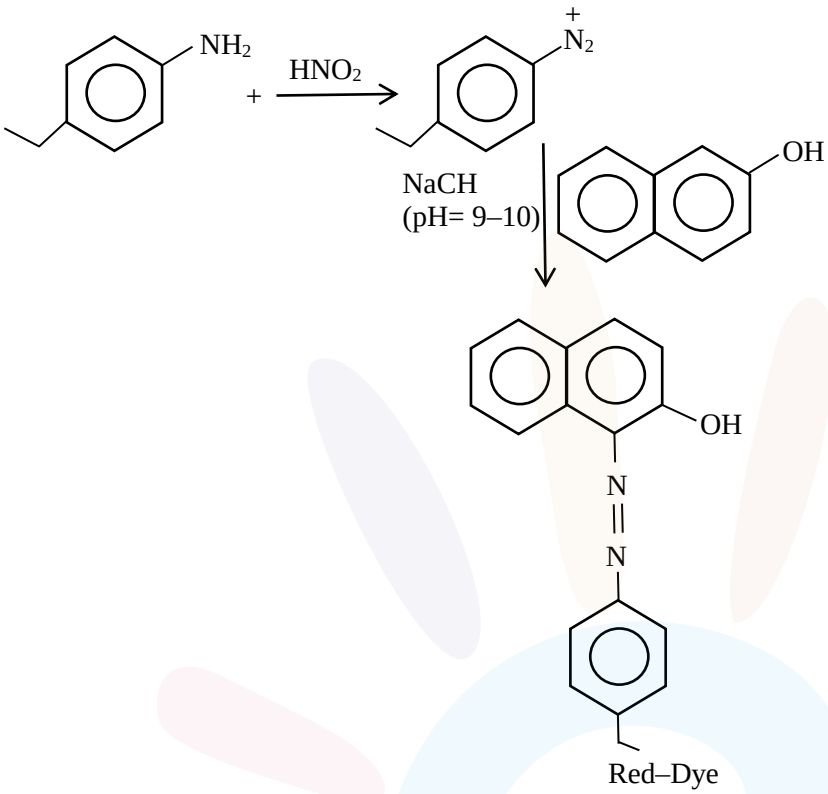
(1) 

(2) 

(3) 

(4) 

Sol. **(2)**
P = Can be prepased by Gabriel phthalimide synthesis it should be i-amine
Q = React with Hinsberg's reagent and insoluble in NaOH it should be 2°–amine
R = React with HNO_2 followed by B–Napthol in NaOH it give red dye it must be Aromatic Amine



Q.79 The number of molecules and moles in 2.8375 litres of O_2 at STP are respectively

(1) 7.527×10^{22} and 0.125 mol (2) 1.505×10^{23} and 0.250 mol

(3) 7.527×10^{23} and 0.125 mol (4) 7.527×10^{22} and 0.250 mol

Sol. **(1)**

$$\text{Moles of } O_2\left(n_{O_2}\right)=\frac{\text{Volume of } O_2}{22.7}=0.125\,\text{moles}$$

$$\text{Molecules of } O_2=\text{moles}\times N_A$$

$= 0.125 \times 6.022 \times 10^{23}$

$= 7.527 \times 10^{22}$ molecules

Ans (1) 7.527×10^{22} and 0.125 mole

Q.80 Match list I with List II

	List I polymer		**List II Type/Class**
(A)	Nylon-2-Nylon-6	(I)	Thermosetting polymer
(B)	Buna-N	(II)	Biodegradable polymer
(C)	Urea-Formaldehyde resin	(III)	Synthetic rubber
(D)	Dacron	(IV)	Polyester

Choose the correct answer from the options given below:

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

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

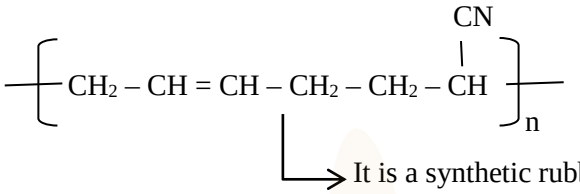
(3) (A)-(IV), (B)-(I), (C)-(III), (D)-(II)

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

Sol. **(4)**

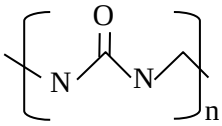
Fact Base

(A) Nylon–2–Nylon–6 →It is α Biodegradable polymer

(B) Buna – N → 

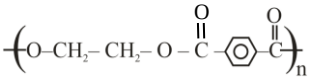
It is a synthetic rubber

(C) Urea – formaldehyde resin



It is a thermos setting polymer

(D) Dacron



It is a polyester.

SECTION - B

Q.81 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)

Sol. **30**

For mono basic acid → n = 2

$i = 1 + (n-1)\alpha = 1 + (2-1)0.3$

i = 1.3

$$\%\text{increase} = \frac{(\Delta T_f)_{obs} - (\Delta T_f)_{cal}}{(\Delta T_f)_{cal}} \times 100$$

$$= \frac{K_f \times i \times m - K_f \times m}{K_f \times m} \times 100$$

$$= \frac{i-1}{1} \times 100 = 30\%$$

Q.82 In the following reactions, the total number of oxygen atoms in X and Y is_____

$Na_2O + H_2O \rightarrow 2X$

$Cl_2O_7 + H_2O \rightarrow 2Y$

Sol. **5**

$Na_2O + H_2O \rightarrow 2NaOH$

$Cl_2O_7 + H_2O \rightarrow 2HClO_4$

1 + 4 = 5

Q.83 The sum of lone pairs present on the central atom of the interhalogen IF_5 and IF_7 is_____

Sol. **1**

IF_5 = 1 lone pair

IF_7 = 0 lone pair

1 + 0 = 1

Q.84 The number of bent-shaped molecule/s from the following is_____

$N_3^-, NO_2^-, I_3^-, O_3, SO_2$

Sol. **3**

N_3^- linear

NO_2^- bent

I_3^- linear

O_3 bent

SO_2 bent

Q.85 The number of correct statement/s involving equilibria in physical from the following is_____

(1) Equilibrium is possible only in a closed system at a given temperature.

(2) Both the opposing processes occur at the same rate.

(3) When equilibrium is attained at a given temperature, the value of all its parameters

(4) For dissolution of solids in liquids, the solubility is constant at a given temperature.

Sol. **3**

(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

Q.86 At constant temperature, a gas is at pressure of 940.3 mm Hg. The pressure at which its volume decreases by 40% is_____ mm Hg. (Nearest integer)

Sol. **1567**

$P_{initial}$ = 940.3 mm Hg Vinitial = 100 (Assume)

P_{final} =?

$P_iV_i = P_fV_f$

$940.3 \times 100 = P_f \times 60$

P_f = 1567.16 mm of Hg

P_f = 1567

Q.87 $FeO_4^{2-} \xrightarrow{+2.2V} Fe^{3+} \xrightarrow{+0.70V} Fe^{2+} \xrightarrow{-0.45V} Fe^{o}$

$E^o_{FeO_4^{2-}/Fe^{2+}}$ is $x\times10^{-3}$ V. The value of x is_____

Sol. **1825**

$FeO_4^{2-} + 3e^{\Theta} \rightarrow Fe^{+3} \quad \Delta G_1$

$Fe^{+3} + e^{\Theta} \rightarrow Fe^{+2} \quad \Delta G_2$

$FeO_4^{-2} + 4e^{\Theta} \rightarrow Fo^{+2} \Delta G_3$

$\Delta G_3 = \Delta G_1 + \Delta G_2$

$(-)4E_3^oF = (-)3\times2.2\times F + (-)1\times0.7\times f$

$4E_3^o = 6.6 + 0.7 = 7.3$

$E_3^o = \frac{7.3}{4} = 1.825 = 1825\times10^{-3}$

Q.88 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)

Sol. **2**

$$k_{eff} = k_1 + k_2$$

$$\frac{\ell n^2}{t_{eff}} = \frac{\ell n^2}{t_1} + \frac{\ell n^2}{t_2}$$

$$\frac{1}{t_{eff}} = \frac{1}{12} + \frac{1}{3} = \frac{1+4}{12} = 5/12$$

$$t_{eff} = \frac{12}{5} = 2.4 = 2$$

Q.89 The number of incorrect statement/s about the black body from the following is_____

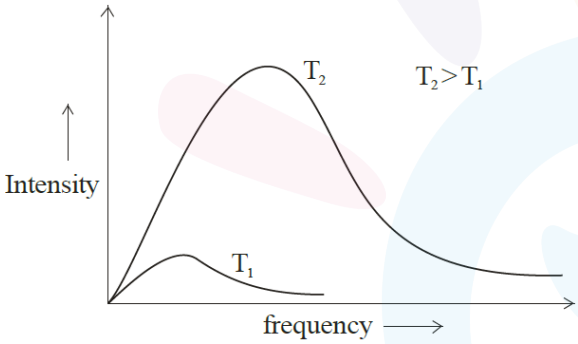
(1) Emit or absorb energy in the form of electromagnetic radiation.

(2) Frequency distribution of the emitted radiation depends on temperature.

(3) At a given temperature, intensity vs frequency curve passes through a maximum value.

(4) The maximum of the intensity vs frequency curve is at a higher frequency at higher temperature compared to that at lower temperature.

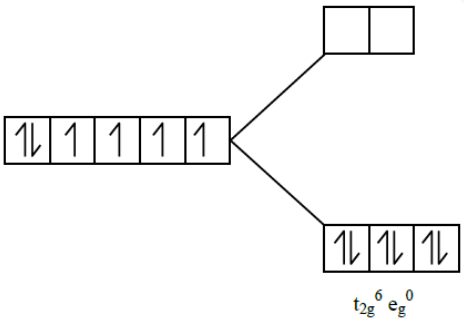
Sol. **0**



Q.90 In potassium ferrocyanide, there are_____ pairs of electrons in the t_{2g} set of orbitals.

Sol. **3**

$K_4[Fe(CN)_6]$



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

$CN^- = SFL$

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