JEE MAIN 2023

Paper with Solution

CHEMISTRY | 29th Jan 2023 _ Shift-2

Umeed Rank Ki Ho Ya Selection Ki, JEET NISCHIT HAI!

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JEE MAIN+ADVANCED

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Nation's Best SELECTION
Percentage (%) Ratio

Student Qualified in NEET

(2022)
4837/5356 = 90.31%
(2021)
3276/3411 = 93.12%

Student Qualified in JEE ADVANCED

(2022)
1756/4818 = 36.45%
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1256/2994 = 41.95%

Student Qualified in JEE MAIN

(2022)
4818/6653 = 72.41%
(2021)
2994/4087 = 73.25%

NITIN VIIJAY (NV Sir)
Founder & CEO

SECTION - A

31. According to MO theory the bond orders for O_2^{2-}, CO and NO^+ respectively, are

(1) 1, 2 and 3 (2) 1,3 and 2 (3) 2,3 and 3 (4) 1, 3 and 3

Sol. **4**

Molecules	Total No. of e^-	Bond order
O_2^{-2}	18	1
CO	14	3
NO^+	14	3

32. A doctor prescribed the drug Equanil to a patient. The patient was likely to have symptoms of which disease?

(1) Hyperacidity (2) Anxiety and stress

(3) Depression and hypertension (4) Stomach ulcers

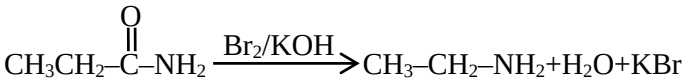
Sol. **3**

Equanil is a tranquiliger, used for treatment of depression and hypertension.

33. Reaction of propanamide with $Br_2/KOH(aq)$ produces :

(1) Propylamine (2) Ethylnitrile (3) Propanenitrile (4) Ethylamine

Sol. **4**



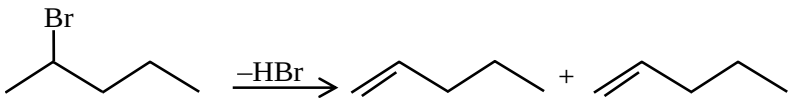
Hoffmann's bromamide reaction

34. The one giving maximum number of isomeric alkenes on dehydrohalogenation reaction is (excluding rearrangement)

(1) 2-Bromopropane (2) 2-Bromo-3,3-dimethylpentane

(3) 1-Bromo-2-methylbutane (4) 2-Bromopentane

Sol. **4**



2–bromo pentane (Cis+trons)

35. An indicator ' X ' is used for studying the effect of variation in concentration of iodide : on the rate of reaction of iodide ion with H_2O_2 at room temp. The indicator ' X ' forms blue colored complex with compound ' A ' present in the solution. The indicator ' X ' and compound 'A' respectively are

(1) Methyl orange and H_2O_2

(2) Starch and iodine

(3) Starch and H_2O_2

(4) Methyl orange and iodine

Sol. **2**

$$I^- + H_2O_2 \longrightarrow \underset{(A)}{I_2} + H_2O$$

$$I_2 + \underset{(Indicator)}{Starch} \longrightarrow Blue$$

36. The major component of which of the following ore is sulphide based mineral?

(1) Siderite (2) Sphalerite (3) Malachite (4) Calamine

Sol. **2**

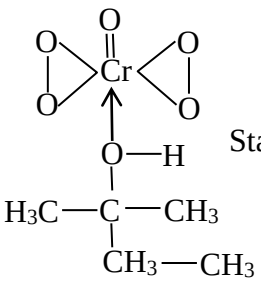
Zinc blade	Sphalerite	→	Zns
	Siderite	→	$feCO_3$
	Malachite	→	$CuCO_3 \cdot CuCOHl_2$
	Calamine	→	$ZnCO_3$

37. A solution of C_rO_5 in amyl alcohol has a _____ colour.

(1) Green (2) Orange-Red (3) Yellow (4) Blue

Sol. **4**

Blue



Stablize by L.P.

38. The set of correct statements is :

(i) Manganese exhibits +7 oxidation state in its oxide.

(ii) Ruthenium and Osmium exhibit +8 oxidation in their oxides.

(iii) Sc shows +4 oxidation state which is oxidizing in nature.

(iv) Cr shows oxidising nature in +6 oxidation state.

(1) (ii) and (iii) (2) (i), (ii) and (iv) (3) (ii), (iii) and (iv) (4) (i) and (iii)

Sol. **2**

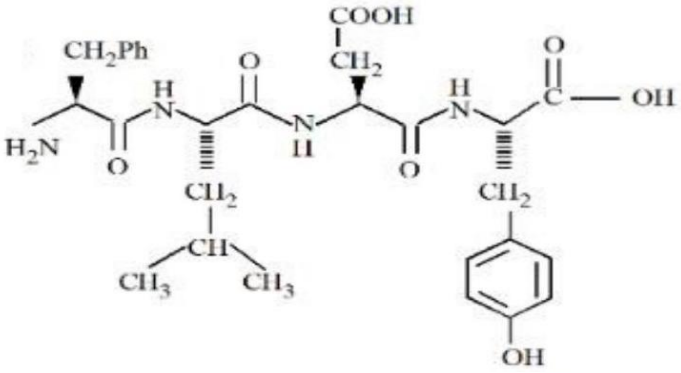
(i) Mn_2O_7

(ii) RuO_4 & OsO_4

(iii) Sc (+4) oxidation state not possible in oxidizing nature

(iv) Cr show oxidizing nature in +6 oxidation state

39. Following tetrapeptide can be represented as

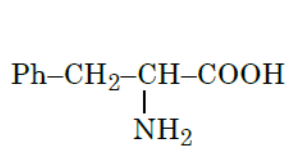


(F, L, D, Y, I, Q, P are one letter codes for amino acids)

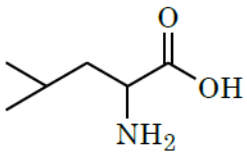
(1) PLDY (2) FIQY (3) YQLF (4) FLDY

Sol. **4**

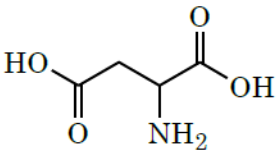
Hydrolysis of the given tetrapeptide will give the following:



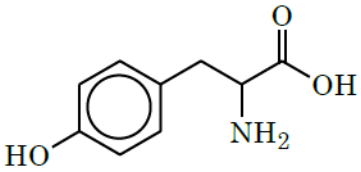
(F)
(Phenylalanine)



(L)
(Leucine)

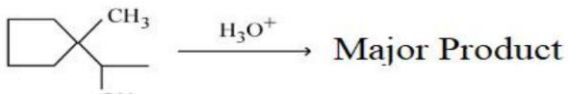


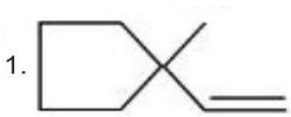
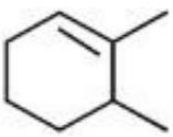
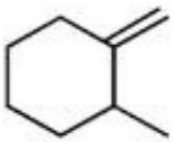
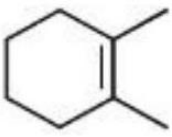
(D)
(Aspartic acid)



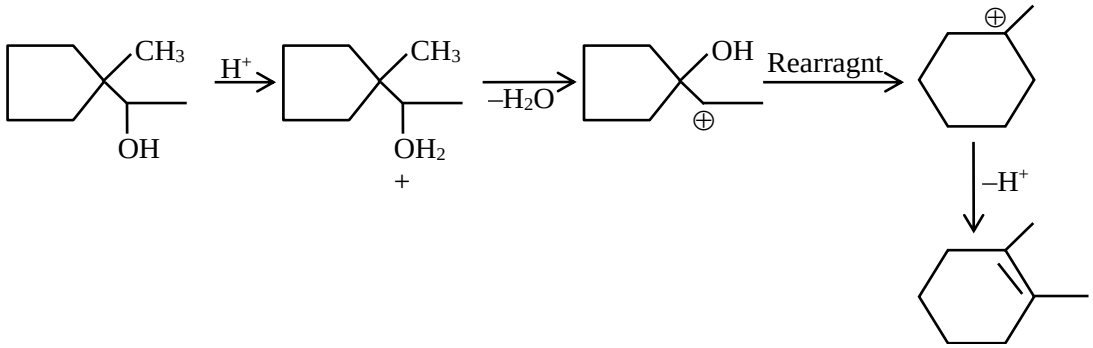
(Y)
(Tyrosine)

40. Find out the major product for the following reaction.



1. 
2. 
3. 
4. 

Sol. **4**



41.

List I	List II
A. van't Hoff factor, i	I. Cryoscopic constant
B. k_f	II. Isotonic solutions
C. Solution with same with same osmotic pressure	III. $\frac{\text{Normal molar mass}}{\text{Abnormal molar mass}}$
D. Azeotropes	IV. Solutions with same composition of vapour above it

Choose the correct answer from the options given below :

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

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

Sol. **3**

(A) van't Hoff factor, i

$$i = \frac{\text{Normal molar mass}}{\text{Abnormal molar mass}}$$

(B) k_f = Cryoscopic constant

(C) Solutions with same osmotic pressure are known as isotonic solutions.

(D) Solutions with same composition of vapour over them are called Azeotrope.'

42. Correct order of spin only magnetic moment of the following complex ions is:

(Given At.no. Fe: 26, Co:27)

(1) $[FeF_6]^{3-} > [Co(C_2O_4)_3]^{3-} > [CoF_6]^{3-}$ (2) $[FeF_6]^{3-} > [CoF_6]^{3-} > [Co(C_2O_4)_3]^{3-}$

(3) $[Co(C_2O_4)_3]^{3-} > [CoF_6]^{3-} > [FeF_6]^{3-}$ (4) $[CoF_6]^{3-} > [FeF_6]^{3-} > [Co(C_2O_4)_3]^{3-}$

Sol. **2**

Complex	Central Metal E.C.	No. Of unpaired e^-	$\mu = \sqrt{n(n+2)}$ B.M.
(i) $[Fef_6]^{-3}$	$Fe^{+3} \rightarrow 3d^5 \rightarrow t_2g^{1,1,1}, eg^{1,1}$	5	$\sqrt{35}$ Br
(ii) $[Cof_6]^{-3}$	$CO^{+3} \rightarrow 3d^6 \rightarrow t_2g^{2,1,1}, eg^{1,1}$	4	$\sqrt{24}$ Br
(iii) $[Co(C_2O_4)_3]^{-3}$	$CO^{+3} \rightarrow 3d^6 \rightarrow t_2g^{2,2,2}, eg^{0,0}$	0	0 Br

43. Match List I with List II

List I	List II
A. Elastomeric polymer	I. Urea formaldehyde resin
B. Fibre Polymer	II. Polystyrene
C. Thermosetting Polymer	III. Polyester
D. Thermoplastic Polymer	IV. Neoprene

Choose the correct answer from the options given below :

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

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

Sol. **2**

Neoprene : Elastomer

Polyester Fibre

Polstyrene : THermolastic

Urea–Formaldhyde Resin: Thermosetting polymer

44. The concentration of dissolved Oxygen in water for growth of fish should be more than $\underline{X}$ppm and Biochemical Oxygen Demand in clean water should be less than $\underline{Y}$ ppm. X and Y in ppm are, respectively.

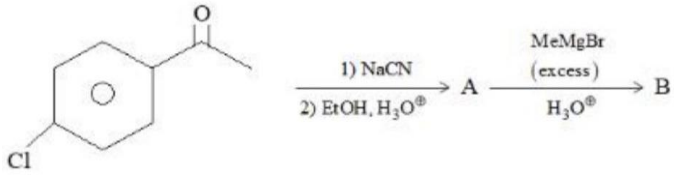
1. X Y
   4 8
2. X Y
   6 5
3. X Y
   4 15
4. X Y
   6 12

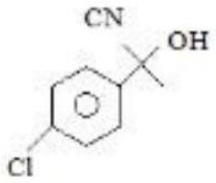
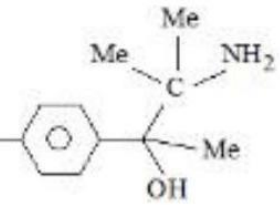
Sol. **2**

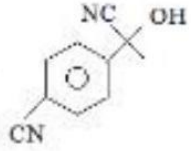
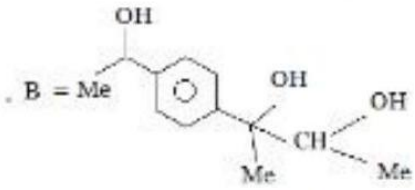
→ BOD value of water of water is in the range –3–5 (Less than 5)

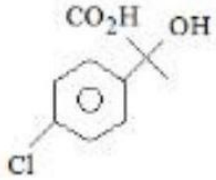
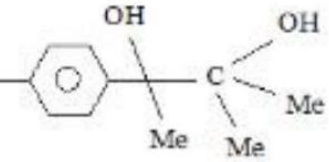
→ dissolve oxygen in water for growth of wish → Less than (6)

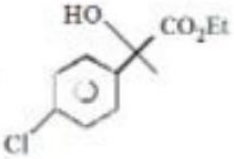
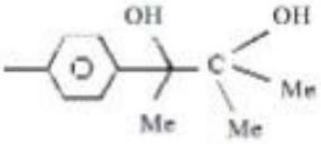
45. Find out the major products from the following reaction sequence.



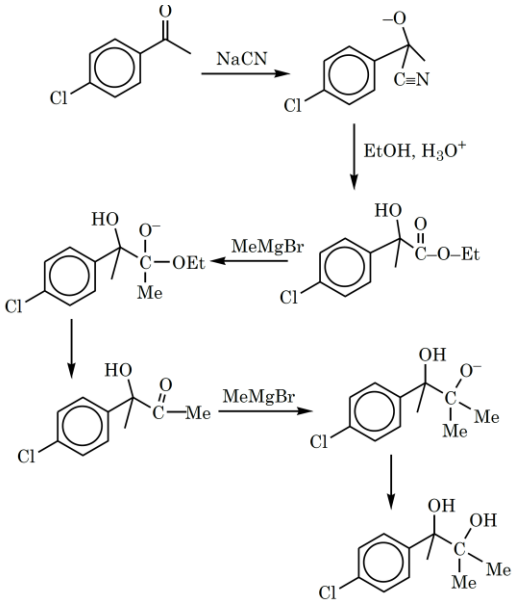
1. A =  , B = Cl 

2. A =  , B = Me 

3. A =  , B = Cl 

4. A =  , B = Cl 

Sol. **4**



46. When a hydrocarbon A undergoes combustion in the presence of air, it requirs 9.5 equivalents of oxygen and produces 3 equivalents of water. What is the molecular formula of A ?

(1) C_9H_9 (2) C_8H_6 (3) C_9H_6 (4) C_6H_6

Sol. **2**

$$C_xH_y + \left(x + \frac{y}{4}\right)O_2 \longrightarrow xCO_2 + \frac{y}{2}H_2O$$

Number of equivalents of O_2 = Number of equivalents of H_2O

Number of equivalents of H_2O = $\frac{y}{2} = 3$

y = 6

Number of equivalents of O_2 = x + $\frac{y}{4} = 9.5$

$x + \frac{6}{4} = 9.5$

x = 9.5 – 1.5 = 8

$C_xH_y = C_8H_6$

47. Given below are two statements:

Statement I : Nickel is being used as the catalyst for producing syn gas and edible fats.

Statement II : Silicon forms both electron rich and electron deficient hydrides.

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

(1) Statement I is correct but statement II is incorrect

(2) Both the statements I and II are incorrect

(3) Statement I is incorrect but statement II is correct

(4) Both the statements I and II are correct

Sol. **1**

(i) $\underset{(g)}{CH_4} + \underset{(g)}{H_2O} \xrightarrow[Ni]{1270K} CO + 3H_2(g)$

Ni used as a catalyst

(ii) Si neither formed e– deficient hydride nor electron rich species.

48. Which of the following relations are correct?

(A) $\Delta U = q + p\Delta V$ (B) $\Delta G = \Delta H - T\Delta S$ (C) $\Delta S = \frac{q_{rev}}{T}$ (D) $\Delta H = \Delta U - \Delta nRT$

Choose the most appropriate answer from the options given below:

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

(3) B and C Only (4) C and D Only

Sol. **3**

Only (B) and (C) are correct.

(B) $G = H - TS$

At constant T

$\Delta G = \Delta H - T\Delta S$

(A) First law is given by

$\Delta U = Q + W$

If we apply constant P and reversible work.

$\Delta U = Q - P\Delta V$

(C) By definition of entropy change

$$dS = \frac{q_{rev}}{T}$$

At constant T

$$\Delta S = \frac{q_{rev}}{T}$$

(D) $H = U + PV$

For ideal gas

$H = U + nRT$

At constant T

$\Delta H = \Delta U + \Delta nRT$

49. Given below are two statements :

Statement I : The decrease in first ionization enthalpy from B to Al is much larger than that from Al to Ga.

Statement II : The d orbitals in Ga are completely filled.

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

(1) Statement I is incorrect but statement II is correct

(2) Both the statements I and II are correct

(3) Both the statements I and II are incorrect

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

Sol. **1**

$$B > Tl > Ga > Al > I$$

Ionisation enthalpy $\rightarrow$ $\downarrow \quad \downarrow \quad \downarrow \quad \downarrow \quad \downarrow$

$801 \quad 589 \quad 579 \quad 577 \quad 558$

$\rightarrow {}_{31}Ga \rightarrow [Ar]4s^2, 3d^{10}, 4p^1$

$Ga \rightarrow$ completely filled d orbital.

50. Match List I and List II

List I	List II
A. Osmosis	I. Solvent molecules pass through semi permeable membrane towards solvent side.
B. Reverse osmosis	II. Movement of charged colloidal particles under the influence of applied electric potential towards oppositely charged electrodes.
C. Electro osmosis	III. Solvent molecules pass through semi permeable membrane towards solution side.
D. Electrophoresis	IV. Dispersion medium moves in an electric field.

Choose the correct answer from the options given below :

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

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

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

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

Sol. **2**

(i) Electro osmosis: When movement of colloidal particles is prevented by some suitable means (porous diaphragm or semi permeable membranes), it is observed that the D.M. begins to move in an electric field. This phenomenon is termed electrosmosis.

(ii) Solvent molecules pass through semi-permeable membrane towards solvent side is termed as reverse osmosis.

(iii) When an electric potential is applied across two platinum electrodes dipping in a colloidal solution, the colloidal particles move towards move towards one or the other electrode. The movement of colloidal particles under an applied electric potential is called electrophoresis.

(iv) Solvent molecules pass through semipermeable membrane towards the solution side is termed as osmosis.

51. Assume that the radius of the first Bohr orbit of hydrogen atom is 0.6Å. The radius of the third Bohr orbit of $He^+$is _____ picometer. (Nearest Integer)

Sol. **(270)**

$$r \propto \frac{n^2}{Z}$$

$$r_{He^+} = r_H \times \frac{n^2}{Z}$$

$$r_{He^+} = 0.6 \times \frac{(3)^2}{2}$$

$$= 2.7 \text{ Å}$$

$$r_{He^+} = 270 \text{ pm}$$

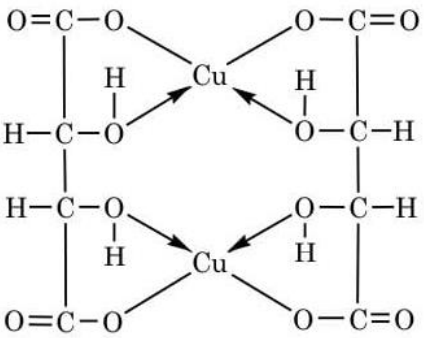
52. Total number of acidic oxides among
$N_2O_3, NO_2, N_2O, Cl_2O_7, SO_2, CO, CaO, Na_2O$ and NO is _____

Sol. **4**

Acidic oxide $\rightarrow N_2O_3, NO_2, Cl_2O_7, SO_2$

53. The denticity of the ligand present in the Fehling's reagent is _____

Sol. **4**



Copper tartrate complex

Denticity = 2

54. The equilibrium constant for the reaction
$Zn(s) + Sn^{2+}(aq) \rightleftharpoons Zn^{2+}(aq) + Sn(s)$ is 1×10^{20} at 298 K. The magnitude of standard electrode potential of Sn/Sn^{2+} if $E^\circ_{Zn^{2+}/Zn} = -0.76V$ is _____ $\times 10^{-2}$ V (Nearest integer).

Given : $\frac{2.303RT}{F} = 0.059$ V

Sol. **17**

Given

$Zn(s) + Sn^{2+}(aq.) \rightleftharpoons Zn^{2+}(aq.) + Sn(s)$

$K_C = 1 \times 10^{20}$

$E^\circ_{Zn^{2+}/Zn} = -0.76V$

$E_{cell} = E^\circ_{cell} - \frac{0.059}{n}\log_{10}K_c$

$0 = E^\circ_{cell} - \frac{0.059}{2} \times 20$

$E^\circ_{cell} = 0.59$

$E^\circ_{cell} = E^\circ_{\underset{(RP)}{Cathode}} - E^\circ_{\underset{(RP)}{Anode}}$

$0.59 - E^\circ_{Sn^{2+}/Sn} - E^\circ_{Zn^{2+}/Zn}$

$0.59 = E^\circ_{Sn^{Z+}/Sn} - (-0.76)$

$E^\circ_{Sn^{2+}/Sn} = 0.17$

$E^\circ_{Sn/Sn^{2+}} = 17 \times 10^{-2}$

55. The volume of HCl, containing 73 g L^{-1}, required to completely neutralise NaOH obtained by reacting 0.69 g of metallic sodium with water, is _____ mL. (Nearest Integer)

(Given : molar Masses of Na, Cl, O, H, are 23,35.5,16 and 1 g mol^{-1} respectively)

Sol. **15**

Mole of Na = $\frac{0.69}{23} = 3\times10^{-2}$

$Na + H_2O \longrightarrow NaOH + \frac{1}{2}H_2$

By using POAC

Moles of NaOH = 3×10^{-2}

NaOH reacts with HCl

No. of equivalent of NaOH = No. of equivalent of HCl

$3\times10^{-2}\times1 = \frac{73}{36.5}\times V(\text{in L})\times1$

$V = 1.5 \times 10^{-2}$ L

Volume of HCl = 15 ml.

56. For conversion of compound A → B, the rate constant of the reaction was found to be 4.6×10^{-5} L mol^{-1} s^{-1}. The order of the reaction is _____.

Sol. **2**

As unit of rate constant is $(conc.)^{1-n}$ $time^{-1}$

Put n = 2

then L mol^{-1} s^{-1}

So order of the reaction is 2.

57. On heating, $LiNO_3$ gives how many compounds among the following? _____

$Li_2O, N_2, O_2, LiNO_2, NO_2$

Sol. **3**

$4LiNO_3 \longrightarrow 2Li_2O + 4NO_2 + O_2$

58. When 0.01 mol of an organic compound containing 60% carbon was burnt completely, 4.4 g of CO_2 was produced. The molar mass of compound is _____ $gmol^{-1}$ (Nearest integer).

Sol. **200**

Let M is the molar mass of the compound (g/mol)

mass of compound = 0.01 M gm

mass of carbon = $0.01\ M \times \frac{60}{100}$

mass of carbon = $\frac{0.01M}{12} \times \frac{60}{100}$

moles of CO_2 from combustion = $\frac{4.4}{44}$ = moles of carbon

$$\frac{0.01M}{12} \times \frac{60}{100} = \frac{4.4}{44}$$

$$M = \frac{4.4}{44} \times \frac{100}{60} \times \frac{12}{0.01} = 200 \text{ gm/mol}$$

59. At 298 K

$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g), K_1 = 4 \times 10^5$

$N_2(g) + O_2(g) \rightleftharpoons 2NO(g), K_2 = 1.6 \times 10^{12}$

$H_2(g) + \frac{1}{2}O_2(g) \rightleftharpoons H_2O(g), K_3 = 1.0 \times 10^{-13}$

Based on above equilibria, the equilibrium constant of the reaction,

$2NH_3(g) + \frac{5}{2}O_2(g) \rightleftharpoons 2NO(g) + 3H_2O(g)$ is _____ $\times 10^{-33}$ (Nearest integer).

Sol. **4**

Reverse equation (1) So $K_1^1 = \frac{1}{K_1}$ … (a)

+

Add equation …. (2) $K_1^1 = K_2$ ….(b)

+

Multiply equation (3) by (3) $K_3^1 = k_3^3$ ….(c)

Add (a), (b) & (c)

$$K_c^1 = \frac{K_2 \times K_3^3}{K_1} = \frac{1.6 \times 10^{12} \times 1 \times 10^{-39}}{4 \times 10^5}$$

$\Rightarrow 4 \times 10^{-33}$

60. A metal *M* forms hexagonal close-packed structure. The total number of voids in 0.02 mol of it is _____ $\times 10^{21}$ (Nearest integer).(Given $N_A = 6.02 \times 10^{23}$)

Sol. **(36)**

One unit cell of hcp contains = 18 voids

No. of voids in 0.02 mol of hcp

$\frac{18}{6} \times 6.02 \times 10^{23} \times 0.02$

$\approx 3.6 \times 10^{22}$

$\approx 36 \times 10^{21}$

मोशन है, तो भरोसा है।

#RankBhiSelectionBhi

ADMISSION ANNOUNCEMENT

Session 2023-24 (English & हिन्दी Medium)

Target: JEE/NEET 2025
Nurture & प्रयास Batch
Class 10th to 11th Moving

Target: JEE/NEET 2024
Enthuse & प्रयास Batch
Class 11th to 12th Moving

Target: JEE/NEET 2024
Dropper & प्रयास Batch
Class 12th to 13th Moving

Target: PRE FOUNDATION
SIP, Evening & Tapasya Batch
Class 6th to 10th Students

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