JEE MAIN 2023
Paper with Solution

CHEMISTRY | 31th Jan 2023 Shift-1

MOTION

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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%
(2021)
1256/2994 = 41.95%

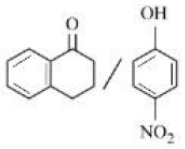
Student Qualified in JEE MAIN

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

NITIN VIIJAY (NV Sir)
Founder & CEO

SECTION - A

31. Match items of column I and II

Column I (Mixture of compounds)	Column II (Separation Technique)
A. H_2O/CH_2Cl_2	i. Crystallization
B. 	ii. Differential solvent extraction
C. Kerosene /Naphthalene	iii. Column chromatography
D. $C_6H_{12}O_6/NaCl$	iv. Fractional Distillation

Correct match is

(1) A-(ii), B-(iii), C-(iv), D-(i)
(2) A-(i), B-(iii), C-(ii), D-(iv)
(3) A-(ii), B-(iv), C-(i), D-(iii)
(4) A-(iii), B-(iv), C-(ii), D-(i)

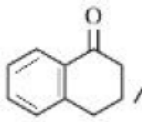
Sol. **1**

A-(ii),

Density of CH_2Cl_2 > Density of H2O

(Can separated by differential solvent extraction

B-(iii),

Having intermolecular H–Bond so can be separated from  through column chromatography

C-(iv),

Due to difference in B.P. of kerosene and Naphthalene, it can be separated by fractional distillation

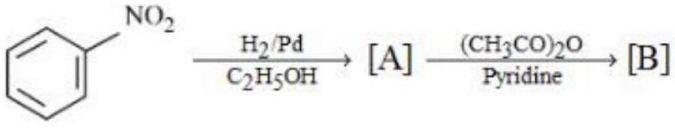
D-(i)

NaCl → ionic compound

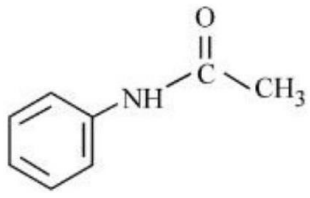
$C_6H_{12}O_6$ → Non ionic compound

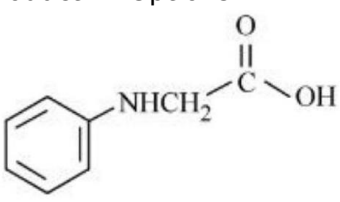
so NaCl can by crystallized.

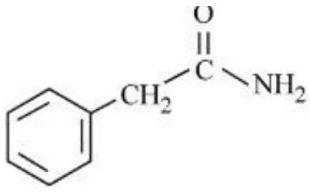
32.

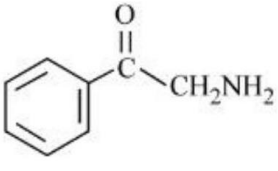


Consider the above reaction and identify the product B. Options

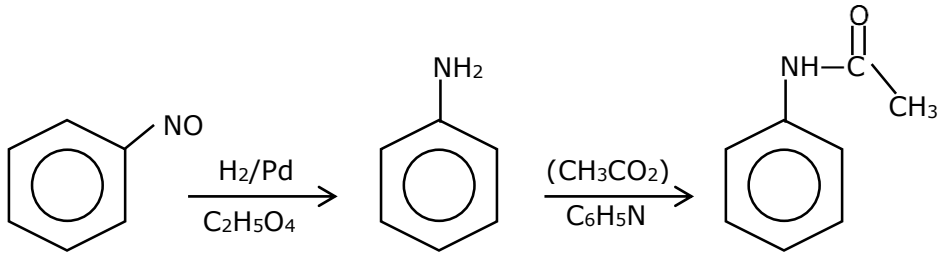
(1) 

(2) 

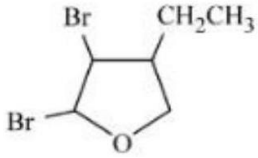
(2) 

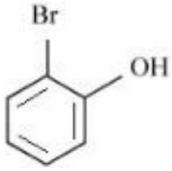
(4) 

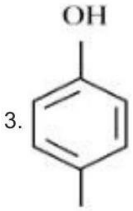
Sol. **1**

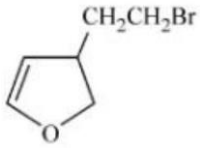


33. An organic compound 'A' with emperical formula C_6H_6O gives sooty flame on burning. Its reaction with bromine solution in low polarity solvent results in high yield of $B.B$ is

(1) 

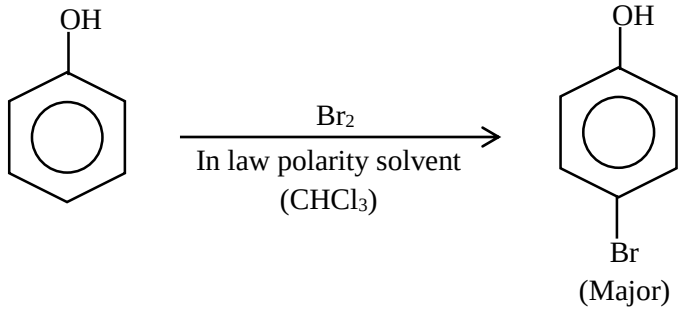
(2) 

(3) 

(4) 

Sol. **3**

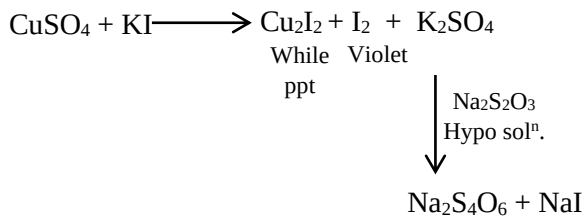
Phenol will give sooty flame while burning (aromatic compound)



34. When Cu^{2+} ion is treated with KI, a white precipitate, X appears in solution. The solution is titrated with sodium thiosulphate, the compound Y is formed. X and Y respectively are

(1) $X = CuI_2$ $Y = Na_2\ S_4O_6$
(2) $X = CuI_2$ $Y = Na_2\ S_2O_3$
(3) $X = Cu_2I_2$ $Y = Na_2\ S_4O_5$
(4) $X = Cu_2I_2$ $Y = Na_2\ S_4O_6$

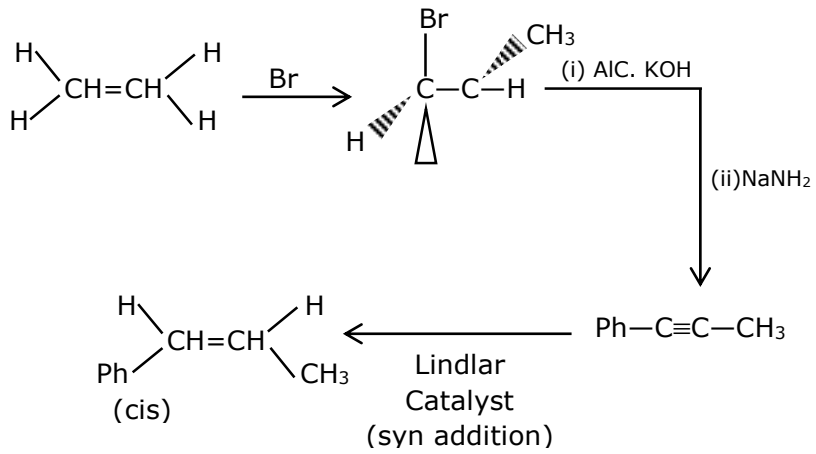
Sol. **4**



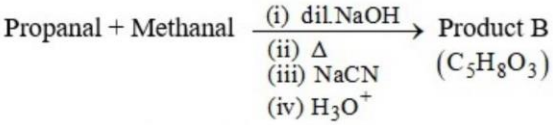
'M' Electrolysis & liquation is method of purification where as hydraulic washing, leading, froth flotation are method of can conbration.

35. Choose the correct set of reagents for the following conversion.
$\text{trans}(Ph-CH=CH-CH_3) \rightarrow \text{cis}(Ph-CH=CH-CH_3)$
(1) $Br_2, aq \cdot KOH, NaNH_2, Na(LiqNH_3)$
(2) Br_2, alc $\cdot KOH, NaNH_2, H_2$ Lindlar Catalyst
(3) $Br_2, aq \cdot KOH, NaNH_2, H_2$ Lindlar Catalyst
(4) Br_2, alc $\cdot KOH, NaNH_2, Na(LiqNH_3)$

Sol. **2**

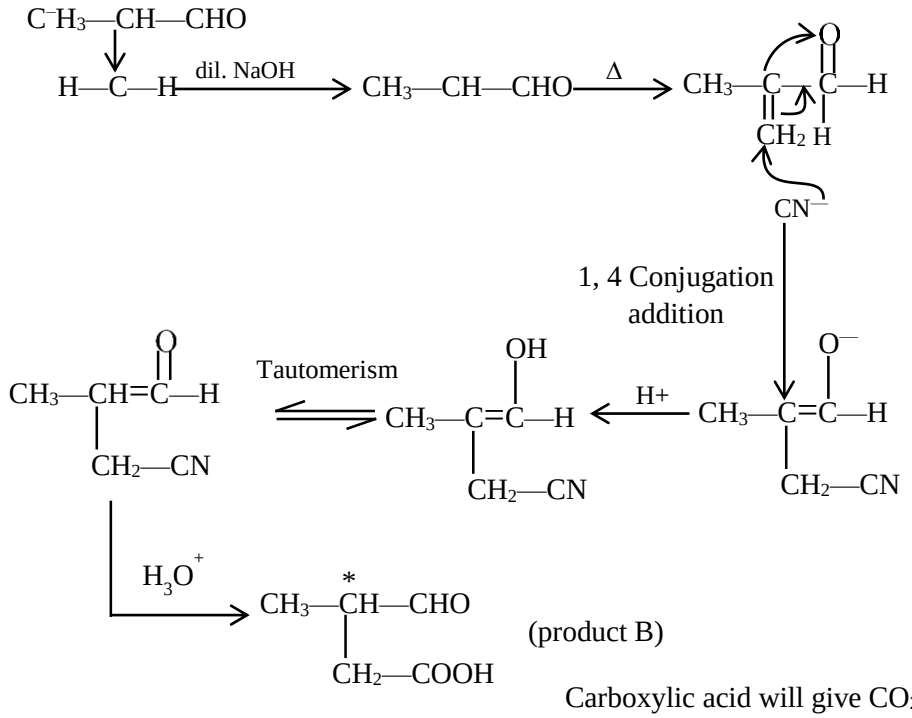


36. Consider the following reaction



The correct statement for product B is. It is
(1) optically active alcohol and is neutral
(2) racemic mixture and gives a gas with saturated $NaHCO_3$ solution
(3) optically active and adds one mole of bromine
(4) racemic mixture and is neutral

Sol. **2**



Carboxylic acid will give CO_2 gas with $NaHCO_3$ solutions

37. The methods NOT involved in concentration of ore are

A. Liquation B. Leaching C. Electrolysis D. Hydraulic washing

E. Froth floatation

Choose the correct answer from the options given below :

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

Sol. **3**

Methods involved in concentration of one are

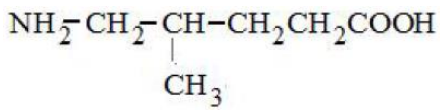
(i) Hydraulic Washing

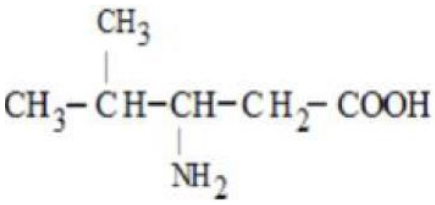
(ii) Froth Flotation

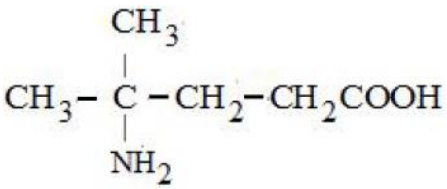
(iii) Magnetic Separation

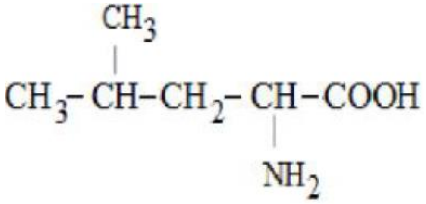
(iv) Leaching

38. A protein 'X' with molecular weight of 70,000u, on hydrolysis gives amino acids. One of these amino acid is

(1) 

(2) 

(3) 

(4) 

Sol. **4**

From protein, only $\propto$–Amino acid is possible so answer is (4).

39. Nd^{2+} =

(1) $4f^3$ (2) $4f^4 6\ s^2$ (3) $4f^4$ (4) $4f^2 6\ s^2$

Sol. **3**

Na = $4f^4\ 5d^0\ 6s^2$

Na^{+2} = $4f^4\ 5d^0\ 6s^0$

40. Match List I with List II

List I	List II
A. XeF_4	I. See-saw
B. SF_4	II. Square planar
C. NH_4^+	III. Bent T-shaped
D. BrF_3	IV. Tetrahedral

Choose the correct answer from the options given below :

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

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

Sol. **4**

XeF_4	Sq. planar
SF_4	see saw
NH_4^+	Tetrahedral
BrF_3	Bent 'T' shaped.

41. Identify X, Y and Z in the following reaction. (Equation not balanced)

$$ClO + NO_2 \rightarrow \underline{X} \xrightarrow{H_2O} \underline{Y} + \underline{Z}$$

(1) $X = ClONO_2, Y = HOCl, Z = HNO_3$

(2) $X = ClONO_2, Y = HOCl, Z = NO_2$

(3) $X = ClNO_2, Y = HCl, Z = HNO_3$

(4) $X = ClNO_3, Y = Cl_2, Z = NO_2$

Sol. **1**

$$\overset{\circ}{Cl}O + NO_2 \longrightarrow \underset{(x)}{ClO.NO_2} \xrightarrow{H_2O} \underset{(y)}{HOCl} + \underset{(z)}{HNO_3}$$

42. The correct increasing order of the ionic radii is

(1) $S^{2-} < Cl^- < Ca^{2+} < K^+$ (2) $K^+ < S^{2-} < Ca^{2+} < Cl^-$

(3) $Ca^{2+} < K^+ < Cl^- < S^{2-}$ (4) $Cl^- < Ca^{2+} < K^+ < S^{2-}$

Sol. **3**

For isoelectronic species size $\propto \frac{1}{z}$

$Ca^{+2} < K^+ < Cl^- < S^{-2}$: size

Z : 20 19 17 18

43. Cobalt chloride when dissolved in water forms pink colored complex $\underline{X}$ which has octahedral geometry. This solution on treating with conc HCl forms deep blue complex, $\underline{Y}$ which has a $\underline{Z}$ geometry. X, Y and Z, respectively, are

(1) $X = [Co(H_2O)_6]^{2+}, Y = [CoCl_4]^{2-}, Z =$ Tetrahedral

(2) $X = [Co(H_2O)_6]^{2+}, Y = [CoCl_6]^{3-}, Z =$ Octahedral

(3) $X = [Co(H_2O)_4Cl_2]^{+}, Y = [CoCl_4]^{2-}, Z =$ Tetrahedral

(4) $X = [Co(H_2O)_6]^{3+}, Y = [CoCl_6]^{3-}, Z =$ Octahedral

Sol. **1**

$$CoCl_2 + H_2O \longrightarrow \underset{\text{Pink}}{[Co(H_2O)_6]^{2+}} \xrightarrow{\text{conc. HCl}} \underset{\text{Blue Tetrahderal}}{[CoCl_4]^{2-}}$$

44. H_2O_2 acts as a reducing agent in

(1) $2NaOCl + H_2O_2 \rightarrow 2NaCl + H_2O + O_2$ (2) $Na_2S + 4H_2O_2 \rightarrow Na_2SO_4 + 4H_2O$

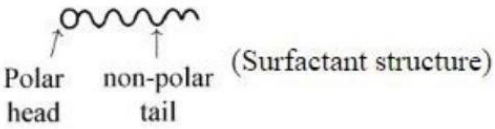
(3) $2Fe^{2+} + 2H^+ + H_2O_2 \rightarrow 2Fe^{3+} + 2H_2O$ (4) $Mn^{2+} + 2H_2O_2 \rightarrow MnO_2 + 2H_2O$

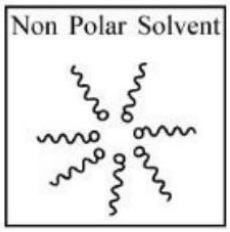
Sol. **1**

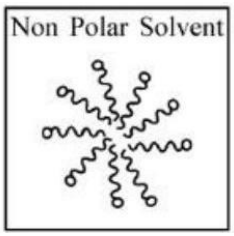
$$2NaO\overset{+1}{Cl} + H_2O_2 \longrightarrow 2Na\overset{-1}{Cl} + H_2O + O_2$$

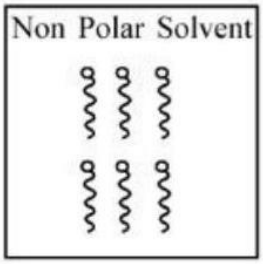
H_2O_2 acts as reducing agent.

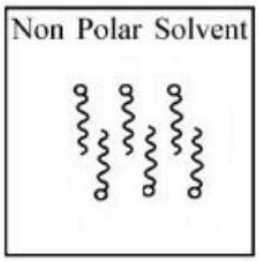
45. Adding surfactants in non polar solvent, the micelles structure will look like



(a) 

(b) 

(c) 

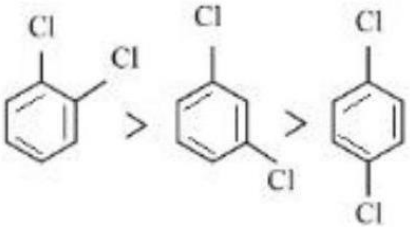
(d) 

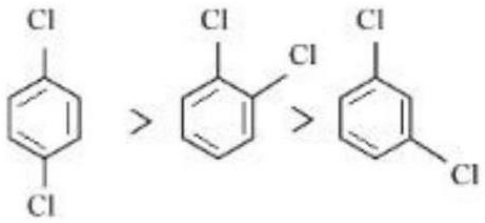
(1) a (2) d (3) b (4) c

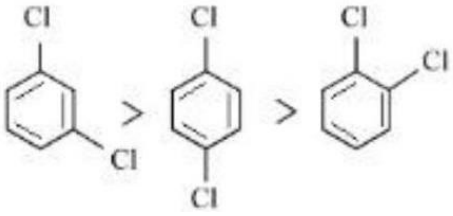
Sol. **1**

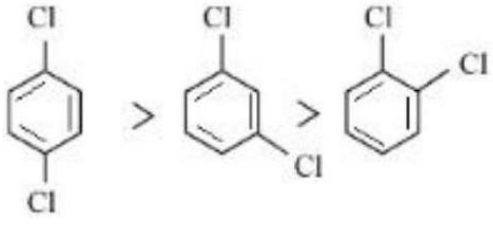
Non polar end will be towards non polar solvent

46. The correct order of melting points of dichlorobenzenes is

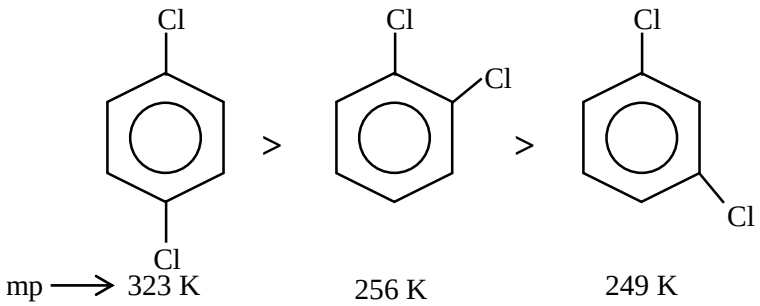
(1) 

(2) 

(3) 

(4) 

Sol. **2**



47. The correct order of basicity of oxides of vanadium is

(1) $V_2O_5 > V_2O_4 > V_2O_3$ (2) $V_2O_4 > V_2O_3 > V_2O_5$

(3) $V_2O_3 > V_2O_5 > V_2O_4$ (4) $V_2O_3 > V_2O_4 > V_2O_5$

Sol. **4**

Leaser is charge on canter atom more will be the basicity.

48. Which of the following artificial sweeteners has the highest sweetness value in comparison to cane sugar ?

(1) Sucralose (2) Aspartame (3) Alitame (4) Saccharin

Sol. **3**

Alitame has 2000 has times more sweetner as compare to cane sugar.

49. Which one of the following statements is correct for electrolysis of brine solution?

(1) Cl_2 is formed at cathode (2) O_2 is formed at cathode

(3) H_2 is formed at anode (4) $OH^-$is formed at cathode

Sol. **4**

Brine sol^n gives H_2/OH^- at cathode & Cl_2 at anode.

50. Which transition in the hydrogen spectrum would have the same wavelength as the Balmer type transition from $n = 4$ to $n = 2$ of He^+spectrum

(1) $n = 2$ to $n = 1$ (2) $n = 1$ to $n = 2$ (3) $n = 3$ to $n = 4$ (4) $n = 1$ to $n = 3$

Sol. **1**

$$\lambda_H = \lambda_{He^+}$$

$$R_H \times (1)^2\left(\frac{1}{n_1^2}-\frac{1}{n_2^2}\right) = R_H \times (2)^2\left(\frac{1}{(2)^2}-\frac{1}{(4)^2}\right)$$

$$\left(\frac{1}{n_1^2}-\frac{1}{n_2^2}\right) = \left(\frac{4}{4}\right)-\left(\frac{4}{16}\right)$$

$$\frac{1}{n_1^2}-\frac{1}{n_2^2} = \frac{1}{1}-\frac{1}{4}$$

$n_1 = 1 : n_2 = 2$ for H-atom

SECTION B

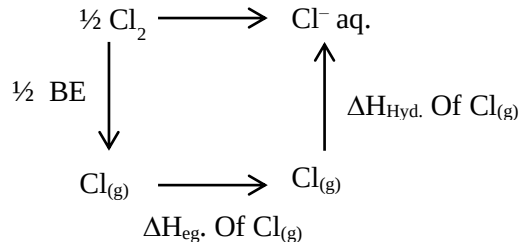
51. The oxidation state of phosphorus in hypophosphoric acid is +

Sol. Hypophosphoric acid is $H_4P_2O_6$ oxidation state of P is +4.

52. The enthalpy change for the conversion of $\frac{1}{2}Cl_2(g)$ to $Cl^-(aq)$ is (-) $kJmol^{-1}$ (Nearest integer)

Given : $\Delta_{dis}H^{\ominus}_{Cl_2(g)} = 240\ kJ\ mol^{-1}, \Delta_{eg}H^{\ominus}_{Cl(g)} = -350\ kJ\ mol^{-1}$, $\Delta_{hyd}H^{\ominus}_{Cl^-_{(g)}} = -380\ kJ\ mol^{-1}$

Sol. **610**



$$\Delta H_{\gamma}^{\circ} = \frac{1}{2} \times BE + \Delta H_{eg} + \Delta H_{Hyd}$$

$$= \frac{1}{2} \times 240 + (-350) + (-380)$$

$\Rightarrow$ 120 – 350 – 380

$\Rightarrow$ –610

53. The logarithm of equilibrium constant for the reaction $Pd^{2+} + 4Cl^- \rightleftharpoons PdCl_4^{2-}$ is (Nearest integer)

Given : $\frac{2.303RT}{F} = 0.06\ V$

$Pd^{2+}_{(aq)} + 2e^- \rightleftharpoons Pd(s)\ E^{\ominus} = 0.83\ V$

$PdCl_4^{2-}(aq) + 2e^- \rightleftharpoons Pd(s) + 4Cl^-(aq)\ E^{\theta} = 0.65\ V$

Sol. **6**

$\Delta G° = -RT\ell nK$

$-nFE°_{cell} = -RT \times 2.303\ (\log_{10}K)$ ....(1)

Net reaction $\rightarrow Pd^{2+}$ (aq.) + $4Cl^-$ (aq.) $\rightleftharpoons PdCl_4^{2-}$ (aq.)

$E°_{cell} = E°_{cathod} - E°_{anode}$

$E°_{cell}$ = 0.83 – 0.65

From equation (1)

Also n = 2

logK = 6

54. On complete combustion, 0.492 g of an organic compound gave 0.792 g of CO_2.
The % of carbon in the organic compound is (Nearest integer)

Sol. **44**

44 gm of CO_2 contains 12 g carbon.

0.792 gm of CO_2 contains $\frac{0.792 \times 12}{44}$ g of carbon

% of carbon = $\frac{0.216}{0.492} \times 100$

= 43.9% = 44%

55. Zinc reacts with hydrochloric acid to give hydrogen and zinc chloride. The volume of hydrogen gas produced at STP from the reaction of 11.5 g of zinc with excess HCl is L (Nearest integer)
(Given : Molar mass of Zn is 65.4 g mol^{-1} and Molar volume of H_2 at STP = 22.7 L)

Sol. **4**

$$Zn + 2HCl \longrightarrow ZnCl_2 + H_{2.}$$

No. of moles of Zn = $\frac{11.5}{65.3}$ = No. of moles of H_2

No. of H_2 liberated = 0.176 × 22.7 Lt.

= 3.99 L = 4 Lt.

56. $A \rightarrow B$

The rate constants of the above reaction at $200\ K$ and $300\ K$ are $0.03\ min^{-1}$ and $0.05\ min^{-1}$ respectively. The activation energy for the reaction is J (Nearest integer) (Given : $\ln 10 = 2.3$
$R = 8.3\ J\ K^{-1}\ mol^{-1}$
$\log 5 = 0.70$
$\log 3 = 0.48$
$\log 2 = 0.30$)

Sol. 2520

$$\text{In}\left(\frac{K_2}{K_1}\right) = \frac{Ea}{R}\left[\frac{1}{T_1} - \frac{1}{T_2}\right]$$

$$\text{Log}\left(\frac{0.05}{0.03}\right) = \frac{Ea}{2.3\times 8.3}\left[\frac{1}{200} - \frac{1}{300}\right]$$

$$[0.70 - 0.48] = \frac{Ea}{2.3\times 8.3}\left[\frac{300-200}{300\times 200}\right]$$

$$0.22 = \frac{Ea}{2.3\times 8.3}\left[\frac{1}{600}\right]$$

Ea = 0.22 × 2.3 × 8.3 × 600
= 2519.88 J
≈ 2520

57. For reaction: $SO_2(g) + \frac{1}{2}O_2(g) \rightleftharpoons SO_3(g)$

$K_p = 2 \times 10^{12}$ at $27°C$ and 1 atm pressure. The K_c for the same reaction is $\times 10^{13}$. (Nearest integer)
(Given $R = 0.082\ L\ atm\ K^{-1}\ mol^{-1}$)

Sol. **1**

$K_C = 1 \times 10^{13}$

$SO_2(g) + \frac{1}{2}O_2 \rightleftharpoons SO_3(g)$

$\Delta n = \frac{-1}{2}$ $\qquad$ $K_P = 2 \times 10^{12}$

$K_P = K_C (RT)^{\Delta ng}$ $\qquad$ P = 1 atm

$2 \times 10^{12} = K_C (0.082 \times 300)^{-1/2}$ $\qquad$ T = 27°C

$K_C = 1 \times 10^{13}$

58. The total pressure of a mixture of non-reacting gases $X(0.6\ g)$ and $Y(0.45\ g)$ in a vessel is $740\ mm$ of Hg. The partial pressure of the gas X is mm of Hg.
(Nearest Integer)
(Given : molar mass $X = 20$ and $Y = 45\ g\ mol^{-1}$)

Sol. **555**

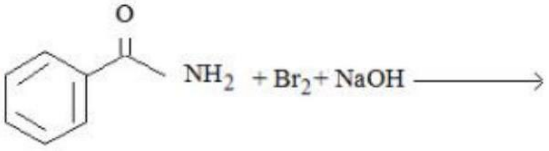
Number of moles of gas $X = \frac{0.6}{20} = 0.03$

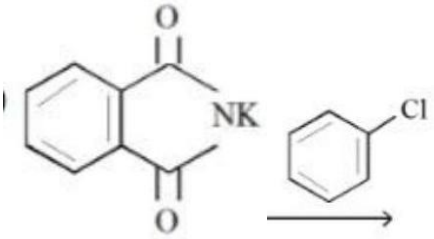
Number of moles of gas $Y = \frac{0.45}{45} = 0.01$

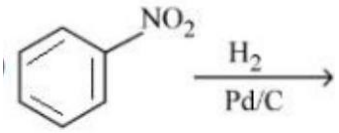
Total number of moles = 0.03 + 0.01 = 0.04 mole
Partial pressure of gas X = Mole fraction × Total pressure

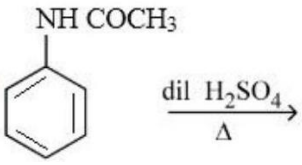
$$= \frac{0.03}{0.04} \times 740 = 555$$

59. How many of the transformations given below would result in aromatic amines ?

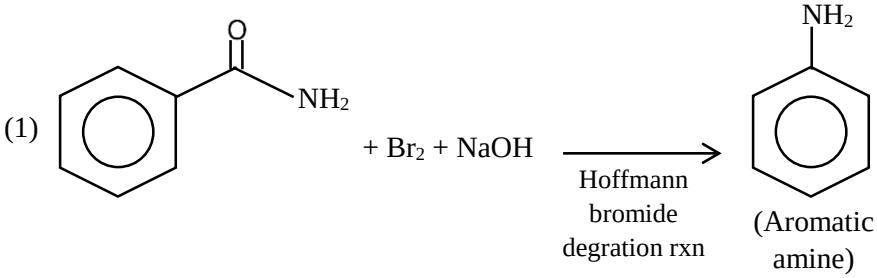
(1) 

(2) 

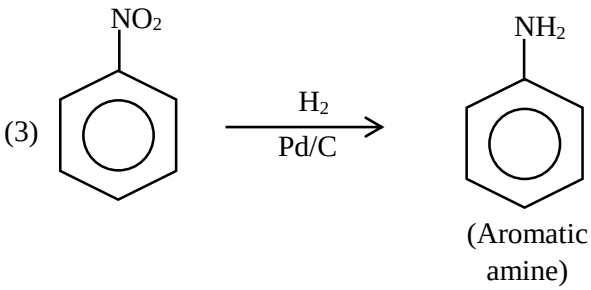
(3) 

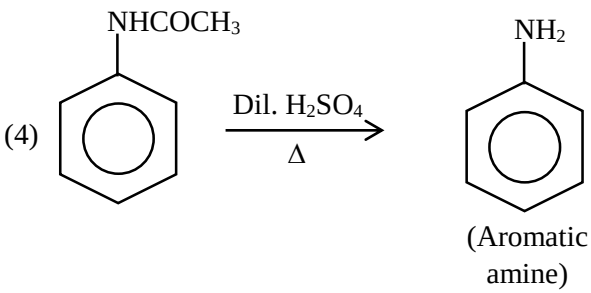
(4) 

Sol. **3**

(1) 

(2) In Gabriel phthalimide synthesis chloro-benzene is poor substrok for S_{N_2} , Hence reaction will not observed.

(3) 

(4) 

60. At $27^{\circ}C$, a solution containing 2.5 g of solute in 250.0 mL of solution exerts an osmotic pressure of 400 Pa. The molar mass of the solute is $gmol^{-1}$ (Nearest integer)
(Given : $R = 0.083\ L_{bar}\ K^{-1}\ mol^{-1}$)

Sol. **62250**

π = CRT

$$\frac{400\text{Pa}}{10^5} = \frac{\frac{2.5\text{g}}{\text{M}_\circ}}{250/1000} \times 0.083 \frac{\text{L} - \text{bar}}{\text{Kmol}} \times 300\,\text{K}$$

$M_\circ$ = 62250

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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
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