

FINAL JEE-MAIN EXAMINATION – JANUARY, 2023

(Held On Tuesday 31st January, 2023)

TIME : 9 : 00 AM to 12 : 00 NOON

CHEMISTRY

TEST PAPER WITH SOLUTION

SECTION-A

31. $Nd^{2+} =$ _____

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

Official Ans. by NTA (2)

Ans. (2)

Sol $Nd(60) = [Xe] 4f^4 5d^0 6s^2$
 $Nd^{2+} = [Xe] 4f^4 5d^0 5s^0$

32. The methods NOT involved in concentration of ore are

- (A) Liquefaction
 (B) Leaching
 (C) Electrolysis
 (D) Hydraulic washing
 (E) Froth floatation

Choose the correct answer from the options given below :

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

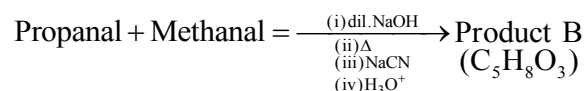
Official Ans. by NTA (3)

Ans. (3)

Sol. Methods involved in concentration of one are

- (i) Hydraulic Washing
 (ii) Froth Flotation
 (iii) Magnetic Separation
 (iv) Leaching

33. Consider the following reaction



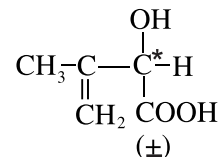
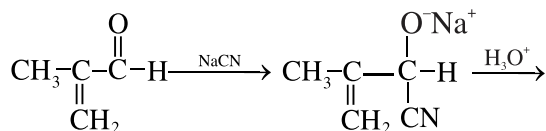
The correct statement for product B is. It is

- (1) optically active and adds one mole of bromine
 (2) racemic mixture and is neutral
 (3) racemic mixture and gives a gas with saturated $NaHCO_3$ solution
 (4) optically active alcohol and is neutrall

Official Ans. by NTA (3)

Ans. (3)

Sol. $CH_3-CH_2-CHO + HCHO \xrightarrow[\Delta]{OH^-}$



Carboxylic acid will give CO_2 gas, with $NaHCO_3$ solution

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

- (1) $V_2O_3 > V_2O_4 > V_2O_5$
 (2) $V_2O_3 > V_2O_5 > V_2O_4$
 (3) $V_2O_5 > V_2O_4 > V_2O_3$
 (4) $V_2O_4 > V_2O_3 > V_2O_5$

Official Ans. by NTA (1)

Ans. (1)

Sol. With increase in % of oxygen acidic nature of oxide of an element increase and basic nature decreases

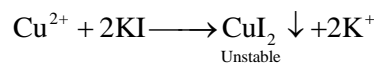
35. When Cu^{2+} ion is treated with KI, a white precipitate, X appears in solution. The solution is titrated with sodium thiosulphate, the compound Y is formed. X and Y respectively are

- (1) $X = Cu_2I_2$ $Y = Na_2S_4O_5$
 (2) $X = Cu_2I_2$ $Y = Na_2S_4O_6$
 (3) $X = CuI_2$ $Y = Na_2S_4O_3$
 (4) $X = CuI_2$ $Y = Na_2S_4O_6$

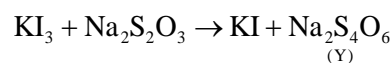
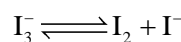
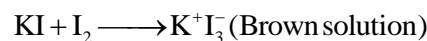
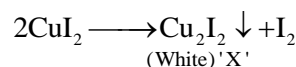
Official Ans. by NTA (2)

Ans. (2)

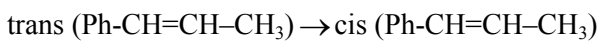
Sol.



I^- is strong R.A it reduces Cu^{2+} to Cu^+



47. Choose the correct set of reagents for the following conversion

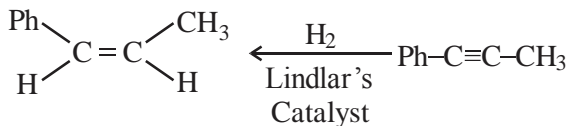
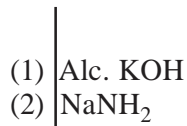
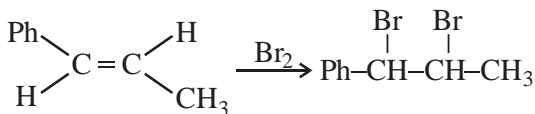


- (1) $\text{Br}_2, \text{alc KOH, NaNH}_2, \text{Na(Liq NH}_3\text{)}$
- (2) $\text{Br}_2, \text{alc KOH, NaNH}_2, \text{H}_2 \text{ Lindlar Catalyst}$
- (3) $\text{Br}_2, \text{aq KOH, NaNH}_2, \text{H}_2 \text{ Lindlar Catalyst}$
- (4) $\text{Br}_2, \text{aq KOH, NaNH}_2, \text{Na(Liq NH}_3\text{)}$

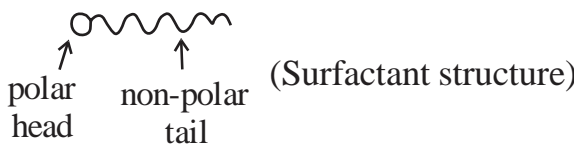
Official Ans. by NTA (2)

Ans. (2)

Sol.



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



- | | | | |
|-----|-------------------|-----|-------------------|
| (a) | Non Polar Solvent | (b) | Non Polar Solvent |
| | | | |
| (c) | Non Polar Solvent | (d) | Non Polar Solvent |
| | | | |

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

Official Ans. by NTA (3)

Ans. (3)

Sol. Non-Polar tail towards non-polar solvent

Ans. 3

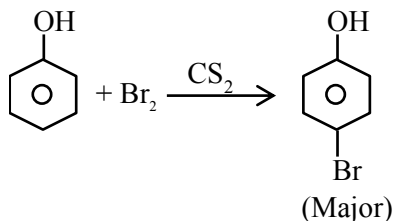
49. An organic compound 'A' with empirical formula $\text{C}_6\text{H}_6\text{O}$ gives sooty flame on burning. Its reaction with bromine solution in low polarity solvent results in high yield of B. B is

- (1)
- (2)
- (3)
- (4)

Official Ans. by NTA (1)

Ans. (1)

Sol. Aromatic compounds burns with sooty flame



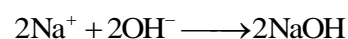
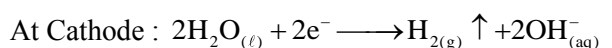
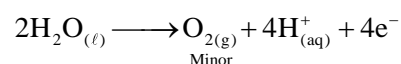
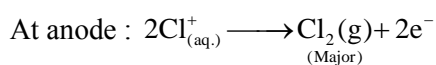
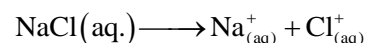
50. Which one of the following statements is correct for electrolysis of brine solution?

- (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

Official Ans. by NTA (4)

Ans. (4)

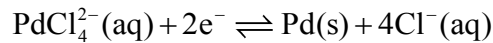
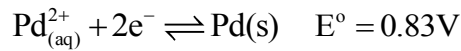
Sol. Electrolysis of brine solution



SECTION-B

51. The logarithm of equilibrium constant for the reaction $\text{Pd}^{2+} + 4\text{Cl}^- \rightleftharpoons \text{PdCl}_4^{2-}$ is _____ (Nearest integer)

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



$E^\circ = 0.65\text{V}$

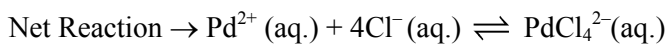
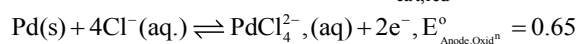
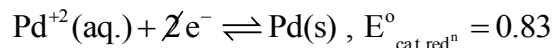
Official Ans. by NTA (6)

Ans. (6)

Sol. $\Delta G^\circ = -RT \ln K$

$-nFE_{\text{cell}}^\circ = -RT \times 2.303(\log_{10} K)$

$\frac{E_{\text{cell}}^\circ}{0.06} \times n = \log K \quad \dots(1)$



$E_{\text{cell}}^\circ = E_{\text{cat, red}}^\circ - E_{\text{Anode, Oxid}}^\circ$

$E_{\text{cell}}^\circ = 0.83 - 0.65$

$E_{\text{cell}}^\circ = 0.18 \quad \dots(2)$

Also $n = 2 \quad \dots(3)$

Using equation (1), (2) & (3)

$\log K = 6$

52. $A \rightarrow B$

The rate constants of the above reaction at 200 K and 300K are 0.03 min^{-1} and 0.05 min^{-1} respectively. The activation energy for the reaction is _____ J (Nearest integer)

(Given : $\ln 10 = 2.3$)

$R = 8.3 \text{ J K}^{-1} \text{ mol}^{-1}$

$\log 5 = 0.70$

$\log 3 = 0.48$

$\log 2 = 0.30$

Official Ans. by NTA (2520)

Ans. (2520)

Sol.

$\log \frac{K_{300}}{K_{200}} = \frac{E_a}{2.3 \times 8.314} \left(\frac{1}{T_1} - \frac{1}{T_2} \right)$

$\log \frac{0.05}{0.03} = \frac{E_a}{2.305 \times 8.314} \times \left[\frac{1}{200} - \frac{1}{300} \right]$

$E_a = 2519.88 \text{ J} \Rightarrow E_a = 2520 \text{ J}$

53. The enthalpy change for the conversion of $\frac{1}{2} \text{Cl}_2(\text{g})$ to $\text{Cl}^-(\text{aq})$ is (-) _____

kJ mol^{-1} (Nearest integer)

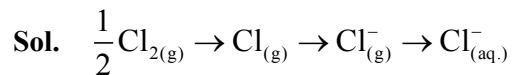
Given : $\Delta_{\text{dis}} H_{\text{Cl}_2(\text{g})}^\circ = 240 \text{ kJ mol}^{-1}$.

$\Delta_{\text{eg}} H_{\text{Cl}(\text{g})}^\circ = -350 \text{ kJ mol}^{-1}$,

$\Delta_{\text{hyd}} H_{\text{Cl}(\text{g})}^\circ = -380 \text{ kJ mol}^{-1}$

Official Ans. by NTA (610)

Ans. (610)



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

$= -610 \text{ ans.}$

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)

Official Ans. by NTA (44)

Ans. (44)

Sol. weight of C in 0.792 gm CO_2

$= \frac{12}{44} \times 0.792 = 0.216$

$\% \text{ of C in compound} = \frac{0.216}{0.492} \times 100$

$= 43.90\%$

Ans : 44

55. At 27°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 _____ g mol^{-1} (Nearest integer)

(Given : $R = 0.083 \text{ L bar K}^{-1} \text{ mol}^{-1}$)

Official Ans. by NTA (62250)

Ans. (62250)

Sol. : $\pi = CRT$

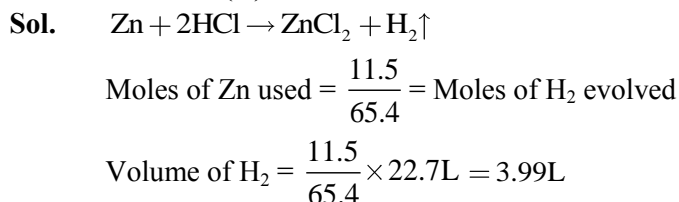
$\frac{400\text{Pa}}{10^5} = \frac{2.5\text{g}}{M_o} \times 0.83 \frac{\text{L} - \text{bar}}{250 / 1000\text{L}} \times 300\text{K}$

$M_o = 62250$

56. 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 65.4g mol⁻¹ and Molar volume of H₂ at STP = 22.7L)

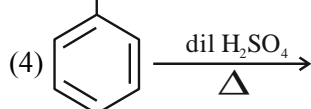
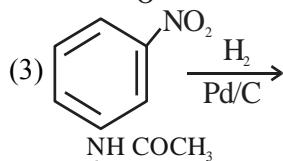
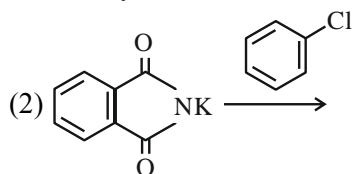
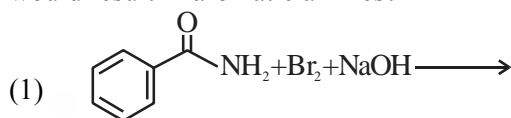
Official Ans. by NTA (4)

Ans. (4)



Ans : 4

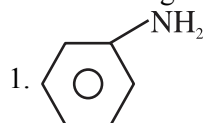
57. How many of the transformation given below would result in aromatic amines?



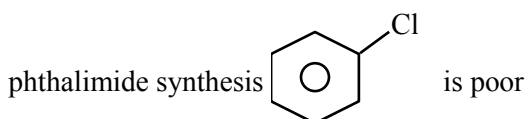
Official Ans. by NTA (3)

Ans. (3)

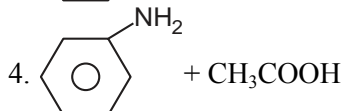
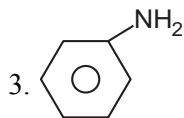
- Sol. Product in the given reactions are as follow-



2. No reactions will be observed as in Gabriel



substrate for SN²



Aromatic amines will be formed in 1, 3 & 4

Ans : 3

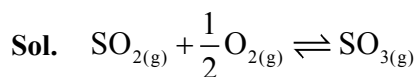
58. For reaction : $SO_2(g) + \frac{1}{2}O_2(g) \rightleftharpoons SO_3(g)$

$K_p = 2 \times 10^{12}$ 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)

Official Ans. by NTA (1)

Ans. (1)



$K_p = 2 \times 10^{12}$ at 300 K

$K_p = K_c \times (RT)^{\Delta n_g}$

$2 \times 10^{12} = K_c \times (0.082 \times 300)^{-1/2}$

$K_c = 9.92 \times 10^{12}$

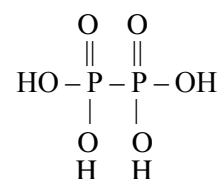
$K_c = 0.992 \times 10^{13}$

Ans. 1

59. The oxidation state of phosphorus in hypophosphoric acid is + _____.

Official Ans. by NTA (4)

Ans. (4)



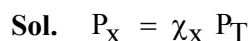
O.S. of P is +4

60. 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)

Official Ans. by NTA (555)

Ans. (555)



$$= \frac{0.6}{\frac{0.6}{20} + \frac{0.45}{45}} \times 740$$

$P_x = 555$ mm Hg