

# JEE Main 2023 (2nd Attempted) (Shift - 01 Chemistry Paper)

10.04.2023

## **CHEMISTRY**

#### **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<sub>f</sub>, weaker adsorption
  - (2) high R<sub>f</sub>, stronger adsorption
  - (3) high R<sub>f</sub>, weaker adsorption
  - (4) low R<sub>f</sub>, stronger adsorption

Official Ans. by NTA (4)

Allen Ans. (4)

**Sol.** If any component eluted second then it means that its R<sub>f</sub> 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 preparation of ferrous ammonium sulphate to
  - (1) prevent oxidation
  - (2) prevent reduction
  - (3) prevent hydrolysis
  - (4) prevent breaking

Official Ans. by NTA (1)

Allen Ans. (1)

**Sol.** Prolonged heating will cause oxidation of Fe<sup>+2</sup> to Fe<sup>+3</sup>.

- 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<sub>2</sub>, a test in which insoluble B is formed. If B is further reacted with CO<sub>2</sub> then soluble compound is formed 'A' is
  - (1) Quick lime

(2) Slaked lime

(3) Lime water

(4) White lime

Official Ans. by NTA (2)

Allen Ans. (2)

**Sol.** CaO +  $H_2O \rightarrow Ca(OH)_2$ 

A (less soluble)

 $Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O$ 

B (insoluble)

 $CaCO_3 + H_2O + CO_2 \rightarrow Ca(HCO_3)_2$ 

## TEST PAPER WITH SOLUTIONS

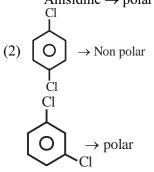
- **64.** The pair from the following pairs having both compounds with net non-zero dipole moment is
  - (1) Benzene, anisidine
  - (2) 1,4-Dichlorobenzene, 1,3-Dichlorobenzene
  - (3) CH<sub>2</sub>Cl<sub>2</sub>, CHCl<sub>3</sub>
  - (4) cis-butene, trans-butene

Official Ans. by NTA (3)

Allen Ans. (3)

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

Anisidine  $\rightarrow$  polar



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

 $C \longrightarrow Cl$ 
 $H$ 
 $CHCl_3$ ,  $\mu_{net} \neq 0$  polar

 $C \longrightarrow Cl$ 
 $Cl$ 
 $Cl$ 
 $Cl$ 
 $Cl$ 
 $Cl$ 
 $Cl$ 

**\** ⇒non polar

Match List-I with List-II **65.** 

List-I List-II **Industry Waste Generated** 

(I) Gypsum

(A) Steel plants

(B) Thermal power plants (II) Fly ash (C) Fertilizer industries

(III) Slag

(D) Paper mils

(IV) Bio-degradable

Wastes

Choose the correct answer from the options given

(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)

Allen 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<sub>8</sub>H<sub>11</sub>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

P Q R
$$NH_{2} \longrightarrow NH_{2} \longrightarrow NH_{2}$$

$$(2) \longrightarrow NH_{2} \longrightarrow NH_{2} \longrightarrow NH_{2}$$

$$NH_{2} \longrightarrow NH_{2} \longrightarrow NH_{2}$$

$$(3) \longrightarrow NHCH_{3} \longrightarrow NH_{2} \longrightarrow NH_{2}$$

$$NH_{2} \longrightarrow NHCH_{3} \longrightarrow NH_{2}$$

$$NH_{2} \longrightarrow NHCH_{3} \longrightarrow NH_{2}$$

## Official Ans. by NTA (1)

Allen 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  $\beta\textsc{-}$  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)

Allen Ans. (3)

- **Sol.** (1) K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> is used as primary standard. The concentration Na<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> changes in aq. solution.
  - (2) It is less soluble than Na<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub>.
- **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)

Allen 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<sub>2</sub>).

The two reactions are carried out at temperature "T<sub>1</sub>" and "T<sub>2</sub>" respectively

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

 $CO(g) + H_2O(g) \xrightarrow{T_2} CO_2(g) + H_2(g)$ 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)

Allen 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 dblock elements get stabilized by oxide ion.
  - (C) Aqueous solution of Cr<sup>2+</sup> 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)

Allen Ans. (1)

**Sol.** (A) The M<sup>3+</sup>/M<sup>2+</sup> 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) 
$$E^0_{Cr^{+3}/Cr^{+2}} = -0.26$$

$$\therefore \quad \mathbf{Cr}^{2\oplus} + \mathbf{H}^{\oplus} \longrightarrow \mathbf{Cr}^{3\oplus} + \frac{1}{2} \mathbf{H}_2$$

(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)

Allen 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)

Allen Ans. (4)

- Sol. (1) Paramagnetic, High Spin & Tetrahedral
- (2) Paramagnetic, High Spin & Octahedral
- (3) Paramagnetic, High Spin & Octahedral
- (4) Diamagnetic, Low Spin & Octahedral

$$[Co(NH_3)_6]^{3+}$$
,  $CN = 6$  (Octahedral)

$$NH_3 = SFL$$

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



Diamagnetic & Low spin complex

- **73.** Given
  - (A)  $2CO(g)+O_2(g) \rightarrow 2CO_2(g)$   $\Delta H_1^{\theta} = -x \text{ kJ mol}^{-1}$
- (B)  $C(graphite) + O_2(g) \rightarrow CO_2(g) \Delta H_2^{\theta} = -y kJ \text{ mol}^{-1}$

The  $\Lambda H^{\theta}$  for the reaction

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

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

## Official Ans. by NTA (1)

Allen Ans. (1)

Sol. Target equation

$$C(graphite) + \frac{1}{2} O_{2(g)} \rightarrow CO_{(g)} \dots (i) \Delta H$$

C(graphite)+ 
$$O_{2(g)} \rightarrow CO_{2(g)}$$
.(ii)  $\Delta H_1 = -y \text{ kJ/mole}$ 

$$CO_{2(g)} \rightarrow CO_{(g)} + \frac{1}{2} \ O_{2(g)} \ldots (iii) \ \Delta H_2 = \frac{x}{2} \ kJ/mole$$

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

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

- 74. The compound which does not exist is
  - (1) NaO<sub>2</sub>
  - $(2) (NH_4)_2 BeF_4$
  - (3) BeH<sub>2</sub>
  - (4) PbEt<sub>4</sub>

## Official Ans. by NTA (1)

Allen 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)

## Allen 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<sub>2</sub> 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)

## Allen Ans. (4)

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

 $\Rightarrow$  Number of molecules = 0.125 N<sub>A</sub>

$$= 7.525 \times 10^{22}$$

- The enthalpy change for the adsorption process 77. 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  $\Delta H_{mic} > 0$

## Official Ans. by NTA (1)

## Allen 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

$$CH_{2}CH_{3}$$

$$COOCH_{3} \xrightarrow{\text{(i) alk. KMnO}_{4}, \Delta} P$$

$$CH=CH_{2}$$

$$COOCH_{3} \xrightarrow{\text{(ii) H}_{3}O^{+}} P$$

$$Major product$$

Official Ans. by NTA (4)

Allen Ans. (4)

## Sol.

KMnO<sub>4</sub> oxidises benzylic carbon containing atleast one α-hydrogen atom to -COOH.

$$\begin{array}{c} \text{CH}_2\text{CH}_3 \\ \\ \text{COOCH}_3 \\ \hline \\ \text{CH=CH}_3 \\ \end{array} \xrightarrow{\text{(i) alk. KMnO}_{\mathfrak{p}} \Delta} \begin{array}{c} \text{COOH} \\ \\ \text{COOH} \\ \end{array}$$

- **79.** Suitable reaction condition for preparation of Methyl phenyl ether is
  - (1) Ph Br,  $MeO^-Na^+$
  - (2) PhO<sup>-</sup>Na<sup>+</sup>, MeOH
  - (3) PhO<sup>-</sup>Na<sup>+</sup>, MeBr
  - (4) Benzene, MeBr

Official Ans. by NTA (3)

Allen Ans. (3)

Sol. 
$$PhO^-Na^+ + Me-Br \xrightarrow{S_N 2} Ph-O-Me$$

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

(C) Electrophilic substitution

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)

Allen Ans. (2)

Sol.

All are correct

- (A)  $S_N 2$  reaction decreases with increase in steric crowding.
- (B)  $S_N 1$  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)

Allen 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

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

Official Ans. by NTA (3)

Allen Ans. (3)

Sol. N<sub>3</sub> linear

NO<sub>2</sub> bent

I<sub>3</sub> linear

O<sub>3</sub> bent

SO<sub>2</sub> 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)

## Allen Ans. (2)

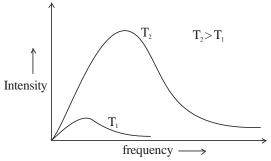
Sol. 
$$\frac{1}{t_{1/2}} = \frac{1}{3} + \frac{1}{12} = \frac{4+1}{12} = \frac{5}{12}$$
  
 $t_{1/2} = \frac{12}{5} \min = 2.4$   
Ans. is 2

- **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)

#### Allen 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

$$Na_2O + H_2O \rightarrow 2X$$

$$Cl_2O_7 + H_2O \rightarrow 2Y$$

## Official Ans. by NTA (5)

Allen Ans. (5)

Sol.  $Na_2O + H_2O \rightarrow 2NaOH$ 

$$Cl_2O_7 + H_2O \rightarrow 2HClO_4$$

$$1 + 4 = 3$$

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

$$E_{FeO_4^{2-}/Fe^{2+}}^{\theta}$$
 is x × 10<sup>-3</sup> V. The value of x is \_\_\_\_\_

## Official Ans. by NTA (1825)

## Allen Ans. (1825)

Sol.

$$FeO_4^{2-} \xrightarrow[n=3]{2.2V} Fe^{3+} \xrightarrow[n=1]{0.7V} Fe^{2+} \xrightarrow{-0.45V} Fe$$

$$E = ?$$

$$n = 4$$

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

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

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)

## Allen Ans. (30)

Sol. 
$$i = 1 + \alpha$$
 (for HA)  
= 1.3  
% increase = 
$$\frac{(\Delta T_f)_{obs} - (\Delta T_f)_{cal}}{(\Delta T_f)_{cal}} \times 100$$

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

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

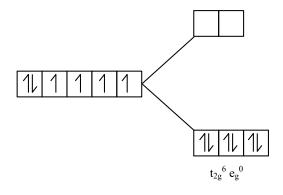
## Final JEE-Main Exam April, 2023/10-04-2023/Morning Session

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

Official Ans. by NTA (3)

Allen Ans. (3)

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



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

 $CN^- = SFL$ 

t<sub>2g</sub> 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)

Allen Ans. (1567)

**Sol.** 
$$P_1V_1 = P_2V_2$$

$$940.3 \times 100 = P_2 \times 60$$

$$P_2 = 1567 \text{ mm of Hg}$$

**90.** The sum of lone pairs present on the central atom of the interhalogen IF<sub>5</sub> and IF<sub>7</sub> is

Official Ans. by NTA (1)

Allen Ans. (1)

**Sol.** 
$$IF_5 = 1$$
 lone pair

$$IF_7 = 0$$
 lone pair

$$1+0=1$$