JEE Main 2023 (2nd Attempted)
(Shift - 02 Chemistry Paper) 10.04.2023

CHEMISTRY | **TEST PAPER WITH SOLUTION**

SECTION-A

61. Incorrect method of preparation for alcohols from the following is:
(1) Ozonolysis of alkene.
(2) Reaction of Ketone with RMgBr followed by hydrolysis.
(3) Hydroboration–oxidation of alkene.
(4) Reaction of alkyl halide with aqueous NaOH.
Official Ans. by NTA (1)
Allen Ans. (1)

Sol. Ozonolysis of alkene, gives aldehyde, ketone & carboxylic acid.

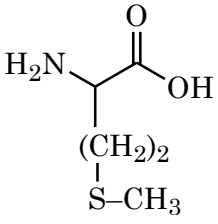
62. Given below are two statements: one is labelled as **Assertion A** and the other is labelled as **Reason R.**
Assertion A: The energy required to form Mg^{2+} from Mg is much higher than that required to produce Mg^{+}.
Reason R: Mg^{2+} is small ion and carry more charge than Mg^{+}.
In the light of the above statements, choose the **correct** answer from the options given below:
(1) Both A and R are true but R is NOT the correct explanation of A.
(2) A is true but R is false.
(3) A is false but R is true.
(4) Both A and R are true and R is the correct explanation of A.
Official Ans. by NTA (4)
Allen Ans. (4)

Sol. Assertion & Reason are correct and Reason is correct explanation.
$\because$ Successive I.E. always increases.

63. In Carius tube, an organic compound 'X' is treated with sodium peroxide to form a mineral acid 'Y'. The solution of $BaCl_2$ is added to 'Y' to form a precipitate 'Z'. 'Z' is used for the quantitative estimation of an extra element. 'X' could be:
(1) Cytosine (2) Chloroxylenol
(3) A nucleotide (4) Methionine
Official Ans. by NTA (4)
Allen Ans. (4)

Sol. $X \xrightarrow{Na_2O_2} Y \xrightarrow{BaCl_2} \underset{[BaSO_4]}{Z}$

Methionine: $C_5H_{11}NO_2S$



64. Given below are two statements: one is labelled as **Assertion A** and the other is labelled as **Reason R.**
Assertion A: 3.1500g of hydrated oxalic acid dissolved in water to make 250.0 mL solution will result in 0.1 M oxalic acid solution.
Reason R: Molar mass of hydrated oxalic acid is 126 g mol^{-1}.
In the light of the above statements, chose the correct answer from the options given below:
(1) Both A and R are true but R is NOT the correct explanation of A.
(2) A is false but R is true.
(3) A is true but R is false.
(4) Both A and R are true and R is the correct explanation of A.
Official Ans. by NTA (4)
Allen Ans. (4)

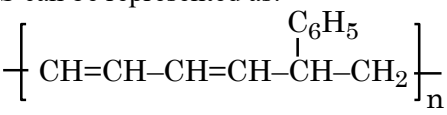
Sol. Assertion is correct.
$H_2C_2O_4.2H_2O$

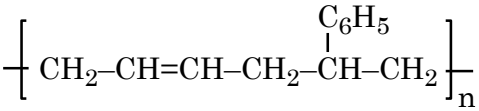
$$M = \frac{3.15 \times 1000}{126 \times 250}$$

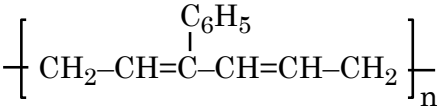
$$= \frac{12.6}{126} = 0.1$$

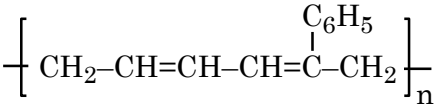
Reason is correct. It is used as a fact in explanation of assertion.

65. Buna–S can be represented as:

(1) 

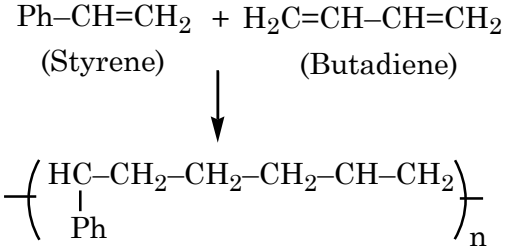
(2) 

(3) 

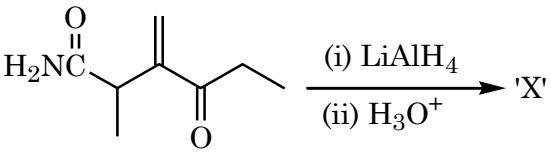
(4) 

Official Ans. by NTA (2)
Allen Ans. (2)

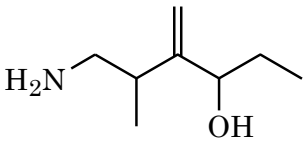
Sol.

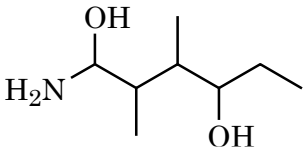


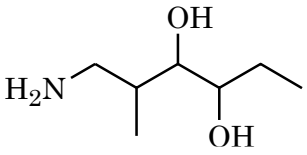
66. In the reaction give below:

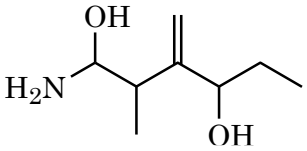


The product 'X' is:

(1) 

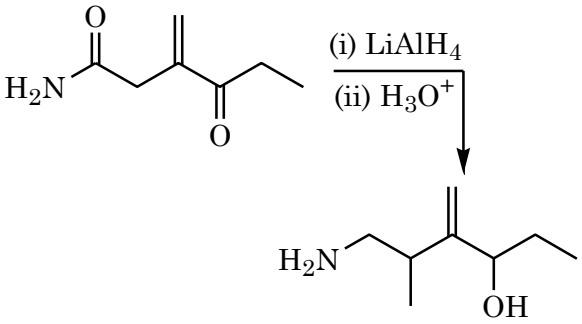
(2) 

(3) 

(4) 

Official Ans. by NTA (1)

Allen Ans. (1)

Sol. 

67. Ferric chloride is applied to stop bleeding because:

(1) Cl^- ions cause coagulation of blood.

(2) Blood absorbs $FeCl_3$ and forms a complex.

(3) Fe^{3+} ions coagulate blood which is a negatively charged sol.

(4) $FeCl_3$ reacts with the constituents of blood which is a positively charged sol.

Official Ans. by NTA (3)

Allen Ans. (3)

Sol. Fe^{3+} coagulation negatively charged sol blood.

68. The reaction used for preparation of soap from fat is:

(1) reduction reaction

(2) alkaline hydrolysis reaction

(3) an addition reaction

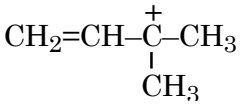
(4) an oxidation reaction

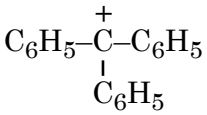
Official Ans. by NTA (2)

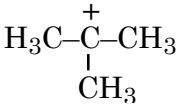
Allen Ans. (2)

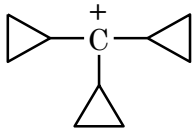
Sol. Saponification: Alkaline hydrolysis.

69. The decreasing order of hydride affinity for following carbocations is:

A. 

B. 

C. 

D. 

Choose the correct answer from the options given below:

(1) A, C, B, D

(2) C, A, B, D

(3) C, A, D, B

(4) A, C, D, B

Official Ans. by NTA (2)

Allen Ans. (2)

Sol. Stability order of cations is : C < A < B < D

70. The correct relationship between unit cell edge length 'a' and radius of sphere 'r' for face–centred and body centred cubic structures respectively are:

(1) $r = 2\sqrt{2}a$ and $\sqrt{3}r = 4a$

(2) $r = 2\sqrt{2}a$ and $4r = \sqrt{3}a$

(3) $2\sqrt{2}r = a$ and $4r = \sqrt{3}a$

(4) $2\sqrt{2}r = a$ and $\sqrt{3}r = 4a$

Official Ans. by NTA (3)

Allen Ans. (3)

Sol. FCC.

$a\sqrt{2} = 4r$

$r = \frac{a\sqrt{2}}{4}$

$\Rightarrow a = 2\sqrt{2}r$

BCC

$4r = a\sqrt{3}$

71. Number of water molecules in washing soda and soda ash respectively are:

(1) 10 and 1

(2) 1 and 10

(3) 1 and 0

(4) 10 and 0

Official Ans. by NTA (4)

Allen Ans. (4)

Sol. Washing soda: $Na_2CO_3.10H_2O$

Soda ash : Na_2CO_3

72. The delicate balance of CO_2 and O_2 is NOT disturbed by:

(1) Burning of Coal (2) Deforestation

(3) Burning of petroleum (4) Respiration

Official Ans. by NTA (4)

Allen Ans. (4)

Sol. Respiration, is a natural process, So balance of CO_2 and O_2 not disturbed by respiration.

73. The correct order of the number of unpaired electrons in the given complexes is

A. $[Fe(CN)_6]^{3-}$

B. $[FeF_6]^{3-}$

C. $[CoF_6]^{3-}$

D. $[Cr(oxalate)_3]^{3-}$

E. $[Ni(CO)_4]$

Choose the correct answer from the options given below:

(1) A < E < D < C < B (2) E < A < D < C < B

(3) E < A < B < D < C (4) A < E < C < B < D

Official Ans. by NTA (2)

Allen Ans. (2)

Sol. A. $[Fe(CN)_6]^{3-}$ n = 1

B. $[FeF_6]^{3-}$ n = 5

C. $[CoF_6]^{3-}$ n = 4

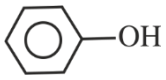
D. $[Cr(oxalate)_3]^{3-}$ n = 3

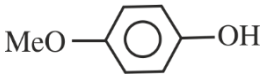
E. $[Ni(CO)_4]$ n = 0

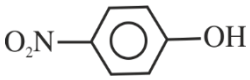
74. The correct order for acidity of the following hydroxyl compound is:

A. CH_3OH

B. $(CH_3)_3COH$

C. 

D. 

E. 

Choose the correct answer from the options given below:

(1) E > C > D > A > B (2) D > E > C > A > B

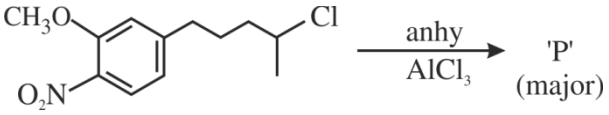
(3) C > E > D > B > A (4) E > D > C > B > A

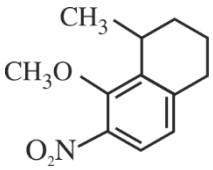
Official Ans. by NTA (1)

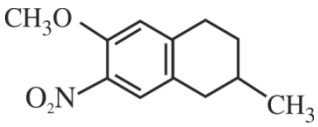
Allen Ans. (1)

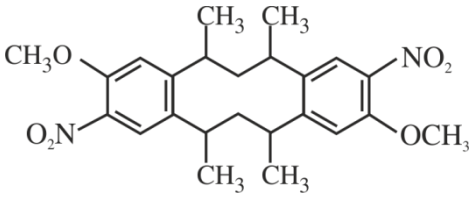
Sol. E > C > D > A > B

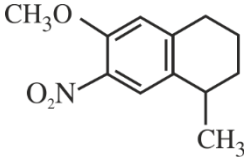
75. The major product 'P' formed in the given reaction is:



(1) 

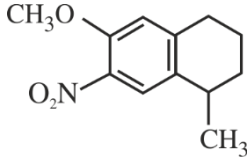
(2) 

(3) 

(4) 

Official Ans. by NTA (4)

Allen Ans. (4)

Sol. 

76. Match List I with List II

List I Complex		List II Crystal Field splitting energy (Δ_0)	
A.	$[Ti(H_2O)_6]^{2+}$	I.	–1.2
B.	$[V(H_2O)_6]^{2+}$	II.	–0.6
C.	$[Mn(H_2O)_6]^{3+}$	III.	0
D.	$[Fe(H_2O)_6]^{3+}$	IV	–0.8

Choose the correct answer from the options given below:

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

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

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

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

Official Ans. by NTA (2)

Allen Ans. (2)

Sol. A-IV, B-I, C-II, D-III

(A) $[Ti(H_2O)_6]^{2+}$

$Ti^{2+} \Rightarrow 3d^2\, 4s^0$

$t_{2g}\, e^- = 2$

$e_g\, e^- = 0$

$CFSE = [-0.4 \times 2 + 0.6 \times 0]\Delta_0$

$= -0.8\ \Delta$

(B) $[V(H_2O)_6]^{2+}$

$V^{2+} \Rightarrow 3d^3\, 4s^0$

$t_{2g}\, e^- = 3$

$e_g\, e^- = 0$

$CFSE = [-0.4 \times 3 + 0.6 \times 0]\ \Delta_0$

$= -1.2\ \Delta_0$

(C) $[Mn(H_2O)_6]^{3+}$

$Mn^{3+} \Rightarrow 3d^4\, 4s^0$

$t_{2g}\, e^- = 3$

$e_g\, e^- = 1$

$CFSE = [-0.4 \times 3 + 0.6 \times 1]\ \Delta_0$

$= -0.6\ \Delta_0$

(D) $[Fe(H_2O)_6]^{3+}$

$Fe^{3+} \Rightarrow 3d^5\, 4s^0$

$t_{2g}\, e^- = 3 \quad e_g = 2$

$CFSE = [-0.4 \times 3 + 0.6 \times 2]\ \Delta_0$

$= 0\ \Delta_0$

77. Given below are two statements: one is labelled as **Assertion A** and the other is labelled as **Reason R**.

Assertion A: Physical properties of isotopes of hydrogen are different.

Reason: Mass difference between isotopes of hydrogen is very large.

In the light of the above statements, chose the correct answer from the options given below:

(1) A is false but R is true.

(2) Both A and R are true and R is the NOT the correct explanation of A.

(3) A is true but R is false.

(4) Both A and R are true and R is the correct explanation of A.

Official Ans. by NTA (4)

Allen Ans. (4)

Sol. Both A and R are true and R is the correct explanation of A.

Due to mass difference in isotopes of hydrogen, these have different physical property.

78. Match List–I with List–II.

	List – I		List –II
A.	16g of $CH_4(g)$	I.	Weighs 28 g
B.	1g of $H_2(g)$	II.	60.2×10^{23} electrons
C.	1 mole of $N_2(g)$	III.	Weighs 32g
D.	0.5 mol of $SO_2(g)$	IV.	Occupies 11.4 L volume at STP

Choose the correct answer from the options given below:

(1) A–I, B–III, C–II, D–IV

(2) A–II, B–III, C–IV, D–I

(3) A–II, B–IV, C–III, D–I

(4) A–II, B–IV, C–I, D–III

Official Ans. by NTA (4)

Allen Ans. (4)

Sol. 16g CH_4 = 1 mole CH_4 contains $10 \times 6.02 \times 10^{23}$ electrons

$= 60.2 \times 10^{23}$

1g H_2 = 0.5 mole H_2 gas occupy 11.35 litre volume at STP

1 mole of N_2 = 28g

0.5 mole of SO_2 = 32g

79. The correct order of metallic character is:

(1) Be > Ca > K (2) Ca > K > Be

(3) K > Ca > Be (4) K > Be > Ca

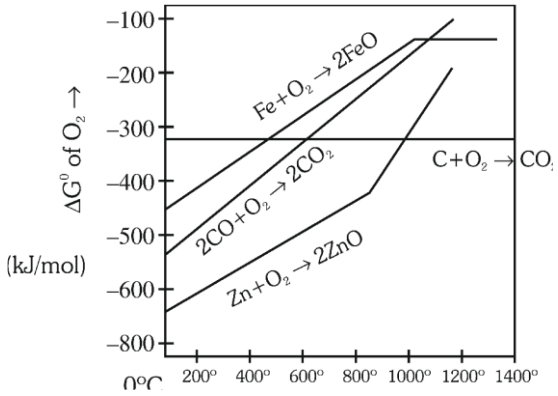
Official Ans. by NTA (3)

Allen Ans. (3)

Sol. On moving from top to bottom metallic character increases while on moving from left to right metallic decreases.

K > Ca > Be.

80. Gibbs energy vs T plot for the formation of oxides is given below:



For the given diagram, the correct statement is-

(1) At 600 ºC, C can reduce ZnO

(2) At 600 ºC, C can reduce FeO

(3) At 600 ºC, CO cannot reduce FeO

(4) At 600 ºC, CO can reduce ZnO

Official Ans. by NTA (2)

Allen Ans. (2)

Sol. at 600ºC,

$$FeO + C \longrightarrow Fe + CO_2$$

SECTION-B

81. $A(g) \rightleftharpoons 2B(g) + C(g)$

For the given reaction, if the initial pressure is 450 mm Hg and the pressure at time t is 720 mm Hg at a constant temperature T and constant volume V. The fraction of A(g) decomposed under these conditions is $x \times 10^{-1}$. The value of x is _____ (nearest integer)

Official Ans. by NTA (3)

Allen Ans. (3)

Sol.

$$A_{(g)} \rightleftharpoons 2B_{(g)} + C_{(g)}$$

t = 0	450		
time t	450 - x	2x	x

$P_T = P_A + P_B + P_C$

$720 = 450 - x + 2x + x$

$2x = 270$

$x = 135$

Fraction of A decomposed = $\frac{135}{450} = 0.3 = 3 \times 10^{-1}$

So, x = 3

82. In alkaline medium, the reduction of permanganate anion involves a gain of _____ electrons.

Official Ans. by NTA (3)

Allen Ans. (3)

Sol. In faintly alkaline medium,

$$MnO_4^- + 3e^- + 2H_2O \longrightarrow MnO_2 + 4OH^-$$

No. of electrons gained = 3

83. The number of endothermic process/es from the following is _____

A. $I_2(g) \rightarrow 2I(g)$

B. $HCl(g) \rightarrow H(g) + Cl(g)$

C. $H_2O(l) \rightarrow H_2O(g)$

D. $C(s) + O_2(g) \rightarrow CO_2(g)$

E. Dissolution of ammonium chloride in water

Official Ans. by NTA (4)

Allen Ans. (4)

Sol. A → Endothermic (Atomisation)

B → Endothermic (Atomisation)

C → Endothermic (Vapourisation)

D → Exothermic (Combustion)

E → Endothermic (Dissolution)

84. The number of molecules from the following which contain only two lone pair of electrons is _____

H_2O, N_2, CO, XeF_4, NH_3, NO, CO_2, F_2

Official Ans. by NTA (4)

Allen Ans. (4)

Sol. H_2O, CO, N_2, NO, has two lone pair of electrons.

85. The difference in the oxidation state of Xe between the oxidised product of Xe formed on complete hydrolysis of XeF_4 and XeF_4 is _____

Official Ans. by NTA (2)

Allen Ans. (2)

Sol. $6XeF_4 + 12H_2O \longrightarrow 2XeO_3 + 4Xe + 24HF + 3O_2$

in XeO_3 , Oxidation state of Xe = +6

in XeF_4 , Oxidation state of Xe = +4

So difference in oxidation state = 2

86. An aqueous solution of volume 300 cm^3 contains 0.63 g of protein. The osmotic pressure of the solution at 300 K is 1.29 mbar. The molar mass of the protein is _____ $g\ mol^{-1}$

Given : R = 0.083 L bar $K^{-1}mol^{-1}$

Official Ans. by NTA (40535)

Allen Ans. (40535)

Sol. $\because\ \pi = CRT$

$$\pi = \frac{n}{V}RT$$

$$\pi = \frac{\omega}{V}\frac{RT}{M}$$

$$M = \frac{\omega RT}{\pi \times V}$$

$$M = \frac{0.63 \times 0.083 \times 300}{1.29 \times 10^{-3} \times 300 \times 10^{-3}}$$

M = 40535 gm/moL

87. For a metal ion, the calculated magnetic moment is 4.90 BM. This metal ion has _____ number of unpaired electons.

Official Ans. by NTA (4)

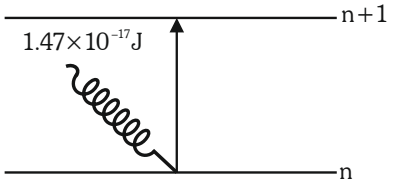
Allen Ans. (4)

Sol. $\mu = \sqrt{n(n+2)}BM$

$$4.90 = \sqrt{n(n+2)}$$

n = 4

88.



The electron in the n^{th} orbit of Li^{2+} is excited to (n + 1) orbit using the radiation of energy 1.47×10^{-17}J (as shown in the diagram). The value of n is _____ .

Given $R_H = 2.18 \times 10^{-18}$J

Official Ans. by NTA (1)

Allen Ans. (1)

Sol. $$\Delta E = R_H Z^2\left(\frac{1}{n_1^2} - \frac{1}{n_2^2}\right)$$

$$1.47 \times 10^{-17} = 2.18 \times 10^{-18} \times 9\left(\frac{1}{n^2} - \frac{1}{(n+1)^2}\right)$$

$$\frac{1.47}{1.96} = \frac{3}{4} = \frac{1}{n^2} - \frac{1}{(n+1)^2}$$

So, n = 1

89. The specific conductance of 0.0025 M acetic acid is 5×10^{-5} S cm^{-1} at a certain temperature. The dissociation constant of acetic acid is _____ $\times 10^{-7}$. (Nearest integer)

Consider limiting molar conductivity of CH_3COOH as 400 S cm^2 mol^{-1}

Official Ans. by NTA (66)

Allen Ans. (66)

Sol. $$\wedge_m = \frac{k}{C} \times 1000$$

Given $k = 5 \times 10^{-5}$ S cm^{-1}

C = 0.0025 M

$$\wedge_m = \frac{5 \times 10^{-5} \times 10^3}{0.0025} = \frac{5 \times 10^{-2}}{2.5 \times 10^{-3}}$$

$= 20$ S cm^2 mol^{-1}

$$\alpha = \frac{20}{400} = \frac{1}{20}$$

$$K_a = \frac{C\alpha^2}{1-\alpha} = \frac{0.0025 \times \frac{1}{20} \times \frac{1}{20}}{\frac{19}{20}}$$

$$= \frac{0.0025}{19 \times 20} = 6.6 \times 10^{-6}$$

$= 66 \times 10^{-7}$

90. The number of incorrect statement/s from the following is _____

A. The successive half lives of zero order reactions decreases with time.

B. A substance appearing as reactant in the chemical equation may not affect the rate of reaction

C. Order and molecularity of a chemical reaction can be a fractional number

D. The rate constant units of zero and second order reaction are mol L^{-1} s^{-1} and mol^{-1} Ls^{-1} respectively

Official Ans. by NTA (1)

Allen Ans. (1)

Sol. (A) For zero order $t_{1/2} = \frac{[A]_0}{2K}$ as concentration decreases half life decreases (Correct statement)

(B) If order w.r.t. that reactant is zero then it will not affect rate of reaction. (Correct statement)

(C) Order can be fractional but molecularity can not be (Incorrect statement)

(D) For zero order reaction unit is mol $L^{-1}s^{-1}$ and for second order reaction unit is $mol^{-1}Ls^{-1}$ (Correct statement)