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JEE (Main)

PAPER-1 (B.E./B. TECH.)

2023

COMPUTER BASED TEST (CBT)

Questions & Solutions

Date: 10 April, 2023 (SHIFT-2) | TIME : (3.00 p.m. to 6.00 p.m)

Duration: 3 Hours | Max. Marks: 300

SUBJECT: CHEMISTRY

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PART : CHEMISTRY

61. Incorrect method of preparation for alcohols from the following is:

(1) Hydroboration-oxidation of alkene.

(2) Reaction of Ketone with RMgBr followed by hydrolysis.

(3) Reaction of alkyl halide with aqueous NaOH.

(4) Ozonolysis of alkene.

Ans. **NTA : (4)**

Sol. In ozonolysis of alkene reaction aldehyde or ketones are formed as product.

62. 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 < B < D < C

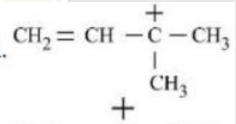
(3) E < A < D < C < B (4) A < E < C < B < D

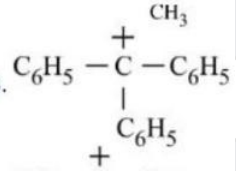
Ans. **NTA : (3)**

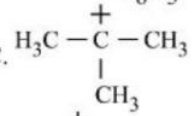
Reso : (3)

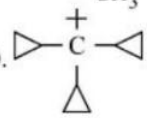
Sol. $E \longrightarrow n = 0$, $A \longrightarrow n = 1$, $D \longrightarrow n = 3$, $C \longrightarrow n = 4$, $B \longrightarrow n = 5$

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

A. 

B. 

C. 

D. 

Choose the correct answer from the options given below:

(1) C, A, D, B

(2) A, C, D, B

(3) C, A, B, D

(4) A, C, B, D

Ans. **NTA : (3)**

Reso : (3)

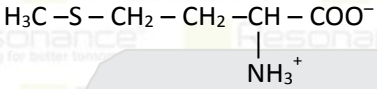
Sol. Greater the hydride affinity, lesser the stability of carbocation.

64. 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) A nucleotide (2) Chioroxylenol (3) Methionine (4) Cytosine

Ans. **NTA : (3)**

Sol. Methionine has 'S', and 'S' with fuming HNO_3 get oxidised to SO_4^{2-} ion, which gives while ppt with $BaCl_2$.



Methionine

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

(1) reduction reaction (2) an addition reaction

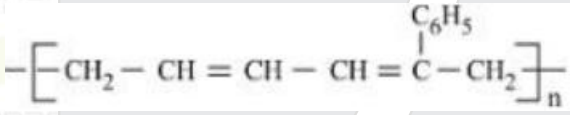
(3) alkaline hydrolysis reaction (4) an oxidation reaction

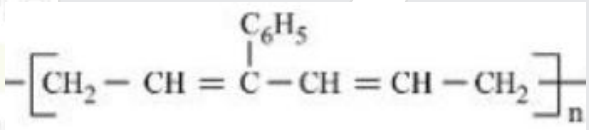
Ans. **NTA : (3)**

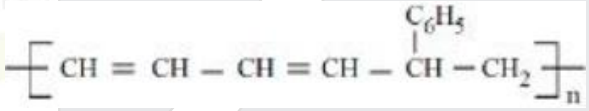
Reso : (3)

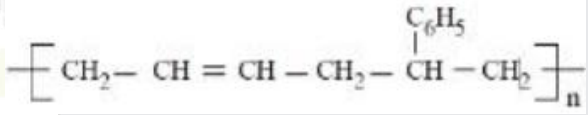
Sol. Formation of soap by the alkaline hydrolysis of fat is called saponification.

66. Buna-S can be represented as:

(1) 

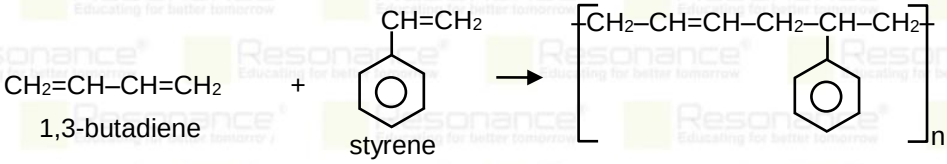
(2) 

(3) 

(4) 

Ans. **NTA : (4)**

Reso : (4)

Sol. 

1,3-butadiene styrene

67. The correct order of metallic character is

(1) Be > Ca > K (2) Ca > K > Be (3) K > Ca > Be (4) K > Be > Ca

Ans. **NTA : (3)**

Reso : (3)

Sol.

Li	Be
Na	Mg
K	Ca
Rb	Sr
Cs	Ba
Fr	Ra

↓ Metallic character increases

← Metallic character increases

68. 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-III, D-I (2) A-IV, B-I, C-II, D-III (3) A-II, B-IV, C-I, D-III (4) A-IV, B-I, C-III, D-II

Ans. **NTA : (2)**

Reso : (2)

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

ON of Ti = +2

$Ti^{+2} = 3d^2$ ($t_{2g}^{1,1,0}$, $e_g^{0,0}$)

C.F.S.E = - 0.8 Δ_o

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

ON of V = +2

$V^{+2} = 3d^3$ ($t_{2g}^{1,1,1}$, $e_g^{0,0}$)

C.F.S.E = - 1.2 Δ_o

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

ON of Mn = +3

$Mn^{+3} = 3d^4$ (W.F.L)

$t_{2g}^{1,1,1}$, $e_g^{0,0}$

C.F.S.E = (- 1.2 + 0.6) Δ_o

= - 0.6 Δ_o

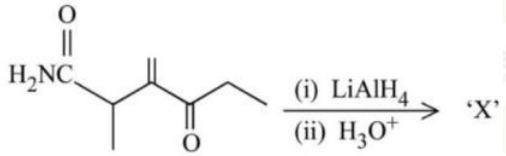
$[Fe(H_2O)_6]^{3+}$

ON of Fe = +3 (W.F.L) $\Rightarrow 3d^5$

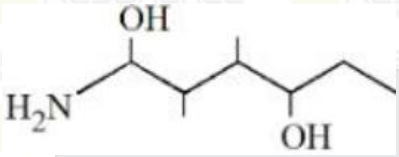
$t_{2g}^{1,1,1}$, $e_g^{1,1}$

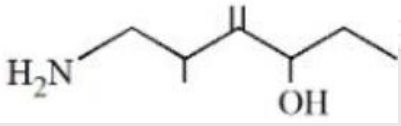
C.F.S.E = 0

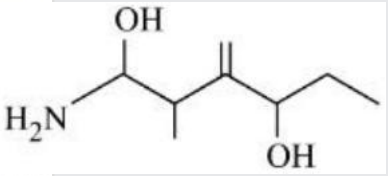
69. In the reaction given below :

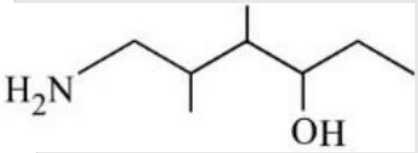


The Product 'X' is:

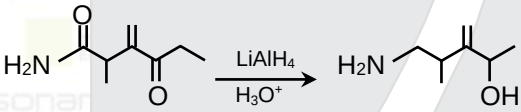
(1) 

(2) 

(3) 

(4) 

Ans. **NTA : (2)**
Reso : (2)

Sol. 

$LiAlH_4$ reduced amide to amine and ketone to alcohol.

70. 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, choose the correct answer from the options given below
(1) **A** is false but **R** is true
(2) Both **A** and **R** are true but **R** is NOT the correct explanation of **A**
(3) Both **A** and **R** are true and **R** is the correct explanation of **A**
(4) **A** is true but **R** is false

Ans. **NTA : (3)**

Sol. $H_2C_2O_4.2H_2O$

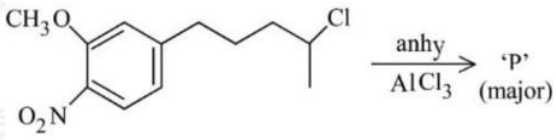
$$M = \frac{3.15/126}{250/1000} = 0.1\ M$$

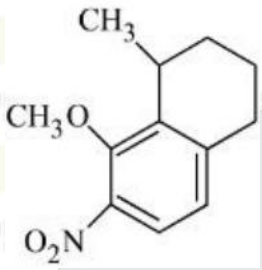
71. Number of water molecules in washing soda and soda ash respectively are :
(1) 1 and 10 (2)1 and 0 (3) 10 and 1 (4) 10 and 0

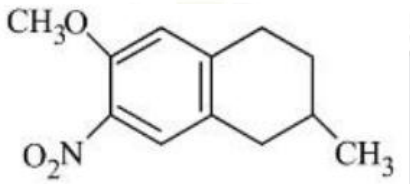
Ans. **NTA : (4)**
Reso : (4)

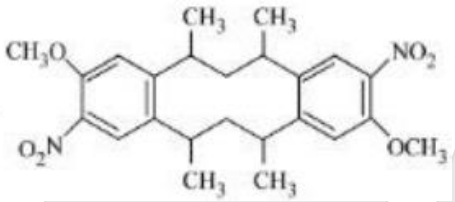
Sol. Soda ash $\rightarrow Na_2CO_3$
Washing Soda $\rightarrow Na_2CO_3 . 10H_2O$

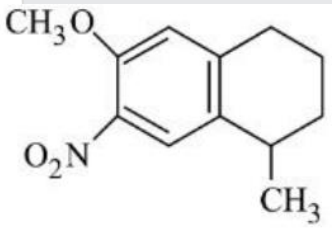
72. The major product 'P' formed in the given reaction is:



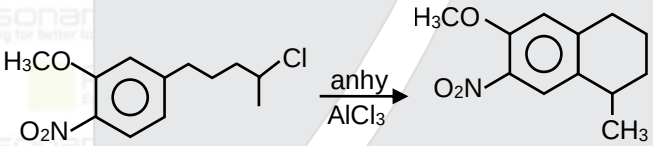
(1)


(2)


(3)


(4)


Ans. **NTA : (4)**
Reso : (4)

Sol.


73. 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) **A** is true but **R** is false
(2) **A** is false but **R** is true
(3) Both **A** and **R** are true and **R** is the correct explanation of **A**
(4) Both **A** and **R** are true but **R** is **NOT** the correct explanation of **A**

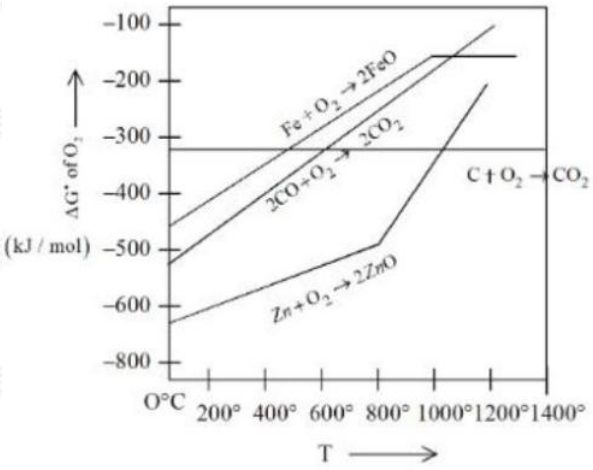
Ans. **NTA : (3)**
Reso : (3)

Sol. $Mg \xrightarrow{IE_1} Mg^{+}$

$Mg \xrightarrow{IE_1} Mg^{+} \xrightarrow{IE_2} Mg^{+2}$

The second ionization enthalpy will be higher than that of first ionization enthalpy. Due to it's small size, it has more effective nuclear charge

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



For the given diagram, the correct statement is -

(1) At 600 °C, CO cannot reduce FeO (2) At 600°C, C can reduce FeO

(3) At 600 °C, C can reduce ZnO (4) At 600 °C, CO can reduce ZnO

Ans. **NTA : (2)**

Reso : (2)

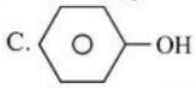
Sol. At 600°C

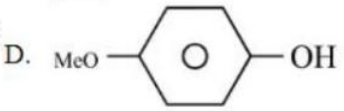
$FeO + C \longrightarrow Fe + CO_2$

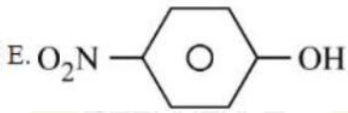
75. The correct order for acidity of the following hydroxyl compound is:

A. CH_3OH

B. $(CH_3)_3COH$

C. 

D. 

E. 

Choose the correct answer from the options given below:

(1) C > E > D > B > A (2) D > E > C > A > B (3) E > D > C > B > A (4) E > C > D > A > B

Ans. **NTA : (4)**

Reso : (4)

Sol. Greater the stability of conjugate base, greater the acidity. For phenols, –M group ($–NO_2$) present at para position stabilize the conjugate base, whereas hyperconjugation of $–CH_3$ decreases the stability.

76. Match List I with List II

List I		List II	
A.	16 g of CH_4 (g)	I.	Weight 28g
B.	1 g of H_2 (g)	II.	60.2×10^{23} electrons
C.	1 mole of N_2 (g)	III.	Weighs 32 g
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-II, B-IV, C-III, D-I (2) A-I, B-III, C-II, D-IV (3) A-II, B-III, C-IV, D-I (4) A-II, B-IV, C-I, D-III

Ans. **NTA : (3)**
Reso : (3)

Sol. (A) 16 g or 1 mol CH_4 or $6.02 \times 10^{23} \times 10$ electrons
(B) 1 g H_2 or ½ mol H_2 or 11.35 L volume at STP
(C) 1 mol N_2 = 28 g N_2
(D) 0.5 mol SO_2 = 32g SO_2

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

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

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

Ans. **NTA : (1)**
Reso : (1)

Sol. F.C.C. $a\sqrt{2} = 4r$ for BCC $\sqrt{3}\,a = 4r$ $a = \dfrac{4r}{\sqrt{2}} = 2\sqrt{2}r$

78. 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 R: Mass difference between isotopes of hydrogen is very large.
In the light of the above statements, choose the ***correct*** answer from the options given below:
(1) **A** is false but **R** is true
(2) Both **A** and **R** are true but **R** is **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**

Ans. **NTA : (4)**
Reso : (4)

Sol. Isotopes of hydrogen differ in physical properties due to their large mass difference.

79. Ferric chloride is applied to stop bleeding because -
(1) Fe^{3+} ions coagulate blood which is a negatively charged sol.
(2) $FeCl_3$ reacts with the constituents of blood which is a positively charged sol.
(3) Blood absorbs $FeCl_3$ and forms a complex.
(4) Cl^- ions cause coagulation of blood.

Ans. **NTA : (1)**
Reso : (1)

Sol. Blood is a negative charge colloid hence cation of $FeCl_3$ is Fe^{+3} will act as coagulation agent

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

(1) Burning of Coal (2) Burning of petroleum

(3) Deforestation (4) Respiration

Ans. **NTA : (4)**

Reso : (4)

Sol. It is fact (Respiration is a natural phenomenon).

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)

Ans. **NTA : 3**

Reso : 3

Sol.

	$A(g) \rightleftharpoons$	$2B(g)$	$+ C(g)$
t = 0	450	0	0
t = t	450-x	2x	x

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

or $x = 135$

$$\frac{135}{450} = 0.3 = 3 \times 10^{-1}$$

82. 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} L s^{-1} respectively

Ans. **NTA : (1)**

Reso : (1)

Sol. (C) $\longrightarrow$ incorrect, order can be fractional but molecularity cannot

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

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

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

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

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

E. Dissolution of ammonium chloride in water

Ans. **NTA : (4)**

Reso : (4)

Sol. except D

84. 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}

Ans. **NTA : 66**
Reso : 66

Sol. $\wedge_m = \frac{1000 \times K}{C_M} = \frac{1000 \times 5 \times 10^{-5}}{0.0025} = 20$ S cm^2 mol^{-1}

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

$K_a = \frac{C\alpha^2}{1-\alpha^2} = 66 \times 10^{-7}$

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

Ans. **NTA : 4**
Reso : 4

Sol. $\sqrt{n(n+2)} = 4.9$

Upon solving we get n = 4

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}

Ans. **NTA : 40535**
Reso : 40535

Sol. $\pi = \frac{W/M}{V}RT$

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

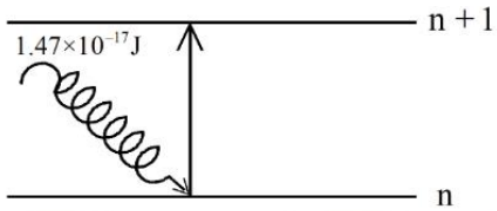
or M = 40535 g/mol

87. 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 _____

Ans. **NTA : 2**
Reso :2

Sol. $\overset{4}{\underline{Xe}}F_4 + H_2O \longrightarrow \overset{6}{\underline{Xe}}O_3 + Xe + HF + O_2$

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 diagrarn). The value of n is _____

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

Ans. **NTA : 1**

Reso : 1

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

or

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

on solving n = 1

89. 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

Ans. **NTA : (4)**

Reso : (4)

Sol. H_2O, CO, N_2, XeF_4

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

Ans. **NTA : (3)**

Reso : (3)

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