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JEE (Main)

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

2023

COMPUTER BASED TEST (CBT)

Questions & Solutions

Date: 06 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. The volume of 0.02 M aqueous HBr required to neutralize 10.0 mL of 0.01 M aqueous $Ba(OH)_2$ is (Assume complete neutralization)

(1) 2.5 mL (2) 5.0 mL (1) 10.0 mL (1) 7.5 mL

Ans. **NTA - (3)**
RESO - (3)

Sol. $Ba(OH)_2 + 2HBr \rightarrow BaBr_2 + 2H_2O$

mmol 0.1

required mmol of HBr = $0.2 = 0.02 \times V_{ml}$

$V_{ml} = 10$

62. The product, which is not obtained during the electrolysis of brine solution is :

(1) HCl (2) H_2 (3) NaOH (4) Cl_2

Ans. **NTA - (1)**
RESO - (1)

Sol. $NaCl \rightarrow Na^+ + Cl^-$

$H_2O \rightleftharpoons H^+ + OH^-$

At Cathode: $2H^+ + 2e^- \rightarrow H_2$

At Anode: $2Cl^- \rightarrow Cl_2 + 2e^-$

NaOH will be formed in solution

HCl is not obtained.

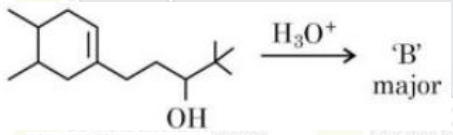
63. The group of chemicals used as pesticide is :

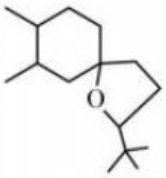
(1) Sodium chlorate, DDT, PAN
(2) Aldrin, Sodium chlorate, Sodium arsinite
(3) DDT, Aldrin
(4) Dieldrin, Sodium arsinite, Tetrachloroethene

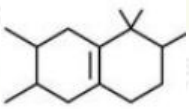
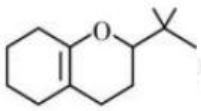
Ans. **NTA - (3)**
RESO – (3)

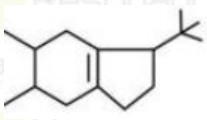
Sol. As insect resistance of DDT increased, other organic toxins such as Aldrin and Dieldrin were introduced in the market by pesticide industry.

64. In the following reaction, 'B' is



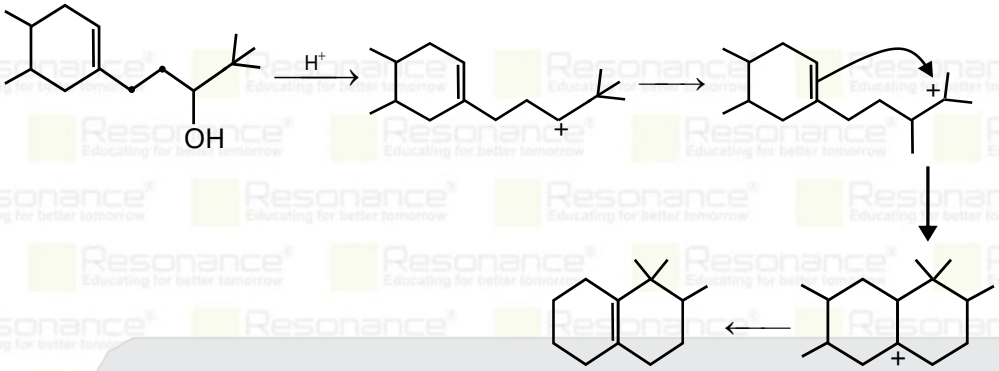
(1) 

(2) 
(3) 

(4) 

Ans. **NTA - (2)**
RESO – (2)

Sol.



65. During the reaction of permanganate with thiosulphate, the change in oxidation of manganese occurs by value of 3. Identify which of the below medium will favour the reaction.

(1) Both aqueous acidic and neutral (2) Both aqueous acidic and faintly alkaline

(3) aqueous acidic (4) aqueous neutral

Ans. **NTA - (4)**

Sol. In neutral or Faintly alkaline solution

$$\overset{+7}{MnO_4^-} \longrightarrow \overset{+4}{MnO_2} + 2H_2O$$

66. Element not present in Nessler's reagent is

(1) I (2) N (3) Hg (4) K

Ans. **NTA - (2)**

RESO – (2)

Sol. Nessler's reagent $\Rightarrow$ alkaline solution of $K_2[HgI_4]$

67. Which one of the following elements will remain as liquid inside pure boiling water ?

(1) Br (2) Li (3) Ga (4) Cs

Ans. **NTA - (3)**

RESO – (3)

Sol. Boiling point of Br is 60°C, so it vaporise in Boiling water while Ga does not react with boiling water upto 100°C.

68. Match List I with List II

	List I (Natural Amino acid)		**List II (One Letter Code)**
(A)	Arginine	(I)	D
(B)	Aspartic acid	(II)	N
(C)	Asparagine	(III)	A
(D)	Alanine	(IV)	R

Choose the correct answer from the options given below :

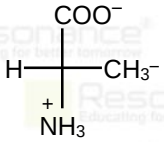
(1) A – I, B – III, C – IV , D – II (2) A – III, B – I, C – II , D – IV

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

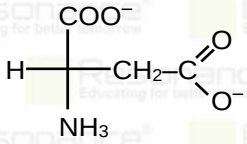
Ans. **NTA - (4)**

RESO – (4)

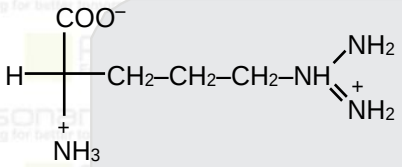
Sol. Based on facts



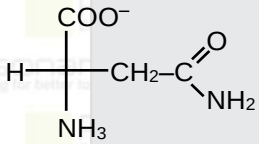
Alanine Ala A



Aspartic acid Asp D



Arginine Arg R



Asparagine Asn N

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

Assertion A : In the complex $Ni(CO)_4$ and $Fe(CO)_5$, the metals have zero oxidation state.

Reason R : Low oxidation states are found when a complex has ligands capable of π-donor character in addition to the σ-bonding.

In the light of the above statements, choose the most appropriate answer from the options given below :

(1) Both A and R are correct and R is the correct explanation of A

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

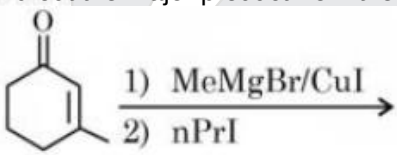
(3) A is not correct but R is correct

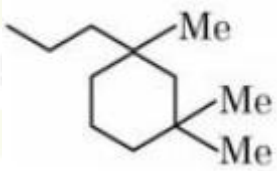
(4) A is correct but R is not correct

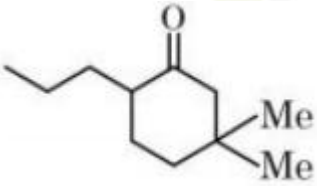
Ans. **NTA - (4)**

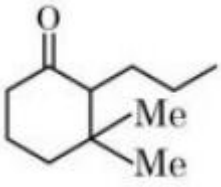
Sol. CO is not a π donar ligand rather it is σ donar & π acceptor ligand.

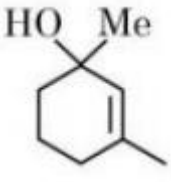
70. Find out the major product from the following reaction.



(1) 

(2) 

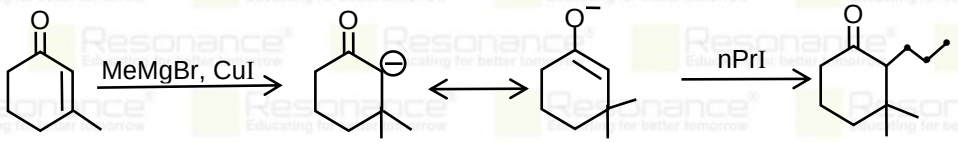
(3) 

(4) 

Ans. **NTA - (3)**

RESO – (3)

Sol.



71. Structures of $BeCl_2$ in solid state, vapour phase and at very high temperature respectively are :

(1) Polymeric, Dimeric, Monomeric

(2) Dimeric, Polymeric, Monomeric

(3) Polymeric, Monomeric, Dimeric

(4) Monomeric, Dimeric, Polymeric

Ans. **NTA - (1)**

RESO – (1)

Sol. $BeCl_2$ in solid state exist as polymeric structure while in vapour state exist as dimeric molecule and in at high temperature It exist as linear monomer molecule.

72. From the figure of column chromatography given below, identify incorrect statements.

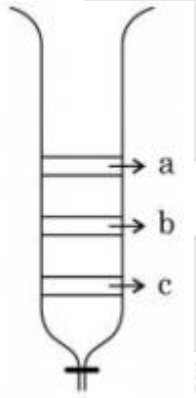
(A) Compound 'c' is more polar than 'a' and 'b'

(B) Compound 'a' is least polar

(C) Compound 'b' comes out of the column below 'c' and after 'a'

(D) Compound 'a' spends more time in the column

Choose the correct answer from the options given below :



(1) B and D only

(2) B, C and D only

(3) A, B and C only

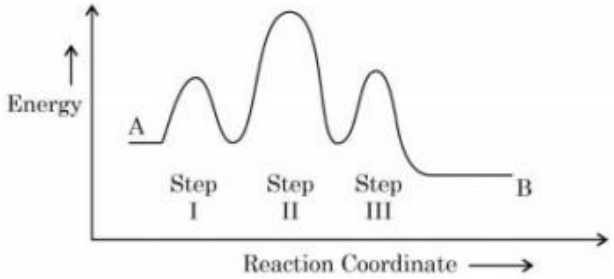
(4) A, B and D only

Ans. **NTA - (3)**

RESO – (3)

Sol. More polar compound has more rate of adsorption so polarity is = c > b > a.

73. Consider the following reaction that goes from A to B in three steps as shown below :
Choose the correct option



	Number of intermediates	Number of activated complexes	Rate determining step
(1)	2	3	II
(2)	3	2	II
(3)	2	3	III
(4)	2	3	I

Ans. **NTA - (1)**
RESO – (1)

Sol. No. of intermediate = 2
No. of Activated Complex = 3
Rate determining Step = II

74. If the radius of the first orbit of hydrogen atom is a_0, then de Broglie's wavelength of electron in 3rd orbit is

(1) $3\pi r_0$ (2) $\frac{\pi a_0}{6}$ (3) $\frac{\pi a_0}{3}$ (4) $6\pi r_0$

Ans. **NTA - (4)**

Sol. $r_3 = 9\alpha_0$
$2\pi r_3 = 3\lambda_3$
$2\pi \times 9\alpha_0 = 3\lambda_3$
$\lambda_3 = 6\pi\alpha_0$

75. Formation of which complex, among the following, is not a confirmatory test of Pb^{2+} ions
(1) lead iodide (2) lead nitrate (3) lead sulphate (4) lead chromate

Ans. **NTA - (2)**

Sol. Lead nitrate is soluble salt & colourless.

76. The IUPAC name of $K_3[Co(C_2O_4)_3]$ is :
(1) Potassium tris(oxalato)cobalt(III)
(2) Potassium tris(oxalato)cobaltate(III)
(3) Potassium trioxalatocobalt(III)
(4) Potassium trioxalatocobaltate(III)

Ans. **NTA - (4)**

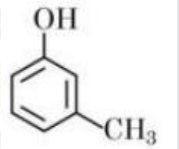
Sol. Theory Based

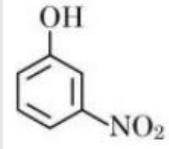
77. Given below are two statements :
Statement I : Morphine is a narcotic analgesic. It helps in relieving pain without producing sleep.
Statement II : Morphine and its derivatives are obtained from opium poppy.
In the light of the above statements, choose the correct answer from the options given below
(1) Both Statement I and Statement II are false
(2) Statement I is false but Statement II is true
(3) Both Statement I and Statement II are true
(4) Statement I is true and Statement II is false

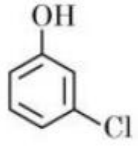
Ans. **NTA - (2)**
RESO – (2)

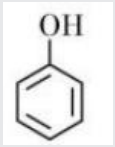
Sol. Morphine is analgesic and narcotic inducing sleep. It is obtained from opium poppy.

78. The strongest acid from the following is :

(1) 

(2) 

(3) 

(4) 

The strongest acid from the following is :

Ans. **NTA - (2)**
RESO – (2)

Sol. Strong - I of $-NO_2$ group present at meta position
increases the stability of phenoxide ion than –Cl and $-CH_3$

79. Group-13 elements react with O_2 in amorphous form to form oxides of type M_2O_3 (M = element). Which among the following is the most basic oxide ?
(1) B_2O_3 (2) Al_2O_3 (3) Tl_2O_3 (4) Ga_2O_3

Ans. **NTA - (3)**
RESO – (3)

Sol.
B_2O_3
Al_2O_3
Ga_2O_3
Tl_2O_3
(Basic Character) ↑ ↓

80. Ion having highest hydration enthalpy among the given alkaline earth metal ions is :
(1) Ba^{2+} (2) Sr^{2+} (3) Be^{2+} (4) Ca^{2+}

Ans. **NTA - (3)**
RESO – (3)

Sol. Hydration enthalpy $\alpha \frac{1}{\text{Size of ion}}$

81. The standard reduction potentials at 298 K for the following half cells are given below :

$NO_3^- + 4H^+ + 3e^- \rightarrow NO(g) + 2H_2O$ $E^- = 0.97$ V
$V^{2+}(aq) + 2e^- \rightarrow V$ $E^- = -1.19$ V
$Fe^{3+}(aq) + 3e^- \rightarrow Fe$ $E^- = -0.04$ V
$Ag^+(aq) + e^- \rightarrow Ag(s)$ $E^- = 0.80$ V
$Au^{3+}(aq) + 3e^- \rightarrow Au(s)$ $E^- = 1.40$ V

The number of metal(s) which will be oxidized by NO_3^- in aqueous solution is_____.

Ans. **NTA - (3)**

Sol. NO_3^- can oxidise V, Fe & Ag.

82. Among the following, the number of compounds which will give positive iodoform reaction is_____

(a) 1-Phenylbutan-2-one (b) 2-Methylbutan-2-ol
(c) 3-Mcthylbutan-2-ol (d) 1-Phenylethanol
(e) 3,3-dimethylbutan-2-one (f) 1-Phenylpropan-2-ol

Ans. **NTA - (4)**
RESO – (4)

Sol. (C), (D), (E), (F) will give positive iodoform reaction.

83. The equilibrium composition for the reaction $PCl_3 + Cl_2 \rightleftharpoons PCl_5$ at 298 K is given below :
$[PCl_3]_{eq} = 0.2$ mol L^{-1}, $[C_2]_{eq} = 0.1$ mol L^{-1}, $[PCl_5]_{eq} = 0.40$ mol L^{-1}
If 0.2 mol of Cl_2 is added at the same temperature, the equilibrium concentrations of PCl_5 is_____ $\times 10^{-2}$ mol L^{-1}
Given: K_C for the reaction at 298 K is 20

Ans. **NTA - (48)**

Sol. $PCl_3(g) + Cl_2(g) \rightleftharpoons PCl_5(g)$

At equilibrium $0.2\ \frac{Mole}{Lit}$ $0.1\ \frac{Mole}{Lit}$ 0.4 Mole/Lit

New equilibrium (0.1 - x) (0.3 - x) (0.4 + x)

$$K_C = \left(\frac{0.4}{0.2\times 0.1}\right) = \left(\frac{0.4+x}{(0.1-x)(0.3-x)}\right)$$

$$= 20 = \frac{0.4+x}{(0.1-x)(0.3-x)}$$

$(2 - 20\ x)\ (6 - 20\ x) = 0.4 + x$
$12 - 120\ x - 40\ x + 40x^2 = (0.4 + x)$
$40x^2 - 159x + 11.6 = 0$
$x = 0.48$

84. Consider the following pairs of solution which will be isotonic at the same temperature. The number of pairs of solutions is/are_____

(A) 1 M aq. NaCl and 2 M aq. urea
(B) 1 M aq. $CaCl_2$ and 1.5 M aq. KCl
(C) 1.5 M aq. $AlCl_3$ and 2 M aq. Na_2SO_4
(D) 2.5 M aq. KCl and 1 M aq. $Al_2(SO_4)_3$

Ans. **NTA - (4)**

Sol. For isotonic solution $i_1c_1 = i_2c_2$

Solution	i_1c_1	i_2c_2
I	0.2	0.2
II	0.2	0.1
III	0.5	0.5
IV	0.8	0.8

85. The number of colloidal systems from the following, which will have 'liquid' as the dispersion medium, is _____

Gem stones, paints. smoke, cheese, milk, hair cream, insecticide sprays, froth, soap lather

Ans. **NTA - (5)**

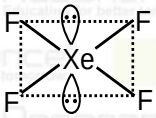
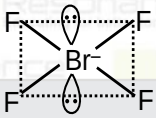
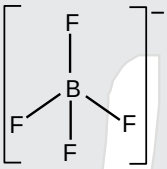
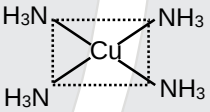
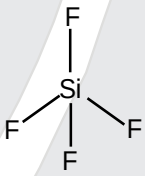
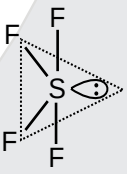
Sol. Paints, Milk, hair cream, froth, soap lather have liquid dispersion medium.

86. The number of species having a square planar shape from the following is _____

XeF_4, SF_4, SiF_4, BF_4^-, BrF_4^-, $[Cu(NH_3)_4]^{2+}$, $[FeCl_4]^{2-}$, $[PtCl_4]^{2-}$

Ans. **NTA - (4)**

Sol.

	Compound	Structure	Shape
(i)	XeF_4		Square Planar
(ii)	$[BrF_4]^-$		Square Planar
(iii)	$[BF_4]^{\ominus}$		Tetrahedral
(iv)	$[Cu(NH_3)_4]^{2+}$		Square Planar
(v)	SiF_4		Tetrahedral
(vi)	SF_4		Sea Saw
(vii)	$[FeCl_4]^{2-}$	$Fe^{2+} = 3d^6$, $eg^{2,1}$ $t_2g^{1,1,1}$	Tetrahedral
(viii)	$[PtCl_4]^{2-}$	$Pt^{+2} = [Xe]4f^{14}5d^8 = dsp^2$	Square Planar

87. Consider the following data

Heat of combustion of $H_2(g)$ = – 241.8 kJ mol^{-1}

Heat of combustion of C(s) = – 393.5 kJ mol^{-1}

Heat of combustion of $C_2H_5OH(l)$ = – 1234.7 kJ mol^{-1}

The heat of formation of $C_2H_5OH(l)$ is (–)_____ kJ mol^{-1} (Nearest integer)

Ans. **NTA - (278)**

Sol. $2C(s) + 3H_2(g) + \frac{1}{2}O_2(g) \longrightarrow C_2H_5OH \qquad \Delta H = ?$

given (i) $C(s) + O_2(g) \longrightarrow CO_2(g) \qquad \Delta H_1 = -393.5$ KJ/Mole

(ii) $H_2(g) + \frac{1}{2}O_2(g) \longrightarrow H_2O(l) \qquad \Delta H_2 = -241.8$ KJ/Mole

(iii) $C_2H_5OH + 3O_2(g) \longrightarrow 2CO_2(g) + 3H_2O \qquad \Delta H = -1234.7$ KJ/Mole

Target eq. = 2 x eq. I + 3 eq. II – eq. III

= 2 (-393.5) + 3 (-241.8) – (-1234.7)

= 278 KJ/Mole

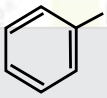
88. Number of isomeric aromatic amines with molecular formula $C_8H_{11}N$, which can be synthesized by Gabriel Phthalimide synthesis is_____

Ans. **NTA - (5)**

RESO – (6)

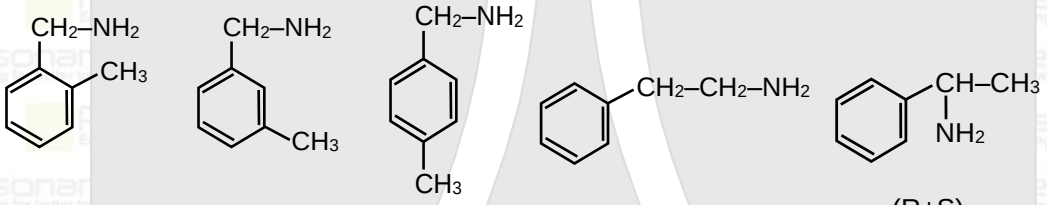
Sol. $C_8H_{11}N$

DU = 4

Aromatic = 

Formed by

Gabriel pthallimided = Only primary aliphatic amine.



(R+S)

89. Number of crystal systems from the following where body centred unit cell can be found, is_____

Cubic, tetragonal, orthorhombic, hexagonal, Rhombohedral, monoclinic, triclinic

Ans. **NTA - (3)**

Sol. Cubic, Tetragonal & Orthorhombic crystal system have body centered unit cell.

90. In an ice crystal, each water molecule is hydrogen bonded to_____ neighbouring molecules.

Ans. **NTA - (4)**

Sol. Theory based