

JEE (Main)

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

2023

COMPUTER BASED TEST (CBT) Questions & Solutions

Date: 06 April, 2023 (SHIFT-1) | TIME: (9.00 a.m. to 12.00 p.m)

Duration: 3 Hours | Max. Marks: 300

SUBJECT: CHEMISTRY

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PART : CHEMISTR

61. Match List I with List II:

	List I		List II	
(A)	Hell-Volhard-Zelinksly reaction	(I)	NaOH + I ₂	
(B)	lodoform reaction	(II)	(i) CrO ₂ Cl ₂ , CS ₂ (ii) H ₂ O	
(C)	Etard reaction	(III)	II) (i) Br ₂ /red phosphorus (ii) H ₂ O	
(D)	Gatterman-Koch reaction	(IV)	CO, HCI, anhyd. AlCI ₃	

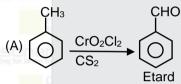
Choose the correct answer from the options given below:

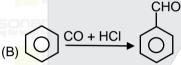
- (1) A III, B I, C II, D IV
- (1) A I, B II, C III, D IV
- (3) A III, B I, C IV, D II
- (4) A III, B II, C I, D IV

NTA - (1) Ans.

Sol

Reso - (1)





Gattermann-Koch reaction

(C)
$$CH_3$$
-COOH $\xrightarrow{X_2 +}$ CH_2 -COOH X

H.V.Z. Reaction

Haloform reaction

62. Given below are two statements, one is labelled as Assertion A and the other is labelled as Reason R. Assertion A: The spin only magnetic moment value for [Fe(CN)₆]³⁻ is 1.74 BM, whereas for [Fe(H₂O)₆]³⁺

is 5.92 BM.

Reason R: In both complexes, Fe is present in +3 oxidation state.

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

- (1) Both A and R are true and R is the correct explanation of A
- (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) A is false but R is true

Ans. NTA - (2)

Reso - (2)

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- Sol. In $[Fe(H_2O)_6]^{+3}$, H_2O is a weak field ligand so configuration of Fe^{+3} is $t_{2\alpha}^{1,1,1}$, $e_{\alpha}^{1,1}$ so number of unpaired electron are 5 and magenetic momentum is 5.92 BM In $[Fe(CN)_6]^{-3}$, CN^- is a strong field ligand so configuration of Fe^{+3} is $t_{2\alpha}^{2,2,1}$, $e_{\alpha}^{0,0}$ so number of unpaired electron are 1 and magenetic momentum is 1.73 BM
- 63. Polymer used in orlon is:
 - (1) Polycarbonate (2) Polyacrylonitrile (3) Polyethene
- (4) Polyamide

NTA - (2) Ans. Reso - (2)

Sol.

$$\begin{array}{ccc}
CN & CN \\
& & & & \\
CH_2=CH & \longrightarrow & -CH_2-CH_-
\end{array}$$

Polyacrylonitrile (PAN = orlon)

- 64. The setting time of Cement is increased by adding
 - (1) Gypsum
- (2) Silica
- (3) Clay
- (4) Limestone

- NTA (1) Ans.
- Reso (1)
- The purpose of adding gypsum is only to slow down the process of setting of the cement so that it gets Sol. sufficiently hardened.
- 65. Match List I with List II:

	List I (Vitamin)		List II (Deficiency disease)		
(A)	Vitamin A	(I)	Beri-Beri		
(B)	Thiamine	(II)	Cheilosis		
(C)	Ascorbic acid	(III)	Xeropthalmia		
(D)	Riboflavin	(IV)	Scury		

- Choose the correct answer from the options given below:
- (1) A IV, B II, C III, D I
- (1) A III, B II, C IV, D I
- (3) A IV, B I, C III, D II
- (4) A III, B I, C IV, D II

- NTA (4)Ans. Reso - (4)
- Sol. Vitamin A
 - → Xeropthalmia
 - Thiamine
- → Beri-Beri → Scurvv
- Ascorbic acid Riboflavin
- → Cheilosis
- 66. Match List I with List II:

	List I (Element detected)	OF and	List II (Reagent used/Product formed)
(A)	Nitrogen	(I)	Na ₂ [Fe(CN) ₅ NO]
(B)	Sulphur solvening for better temperore	(II)	AgNO ₃ Coloration Coloration to be the formation
(C)	Phosphorous	(III)	Fe ₄ [Fe(CN) ₆] ₃
(D)	Halogen	(IV)	(NH ₄) ₂ MoO ₄

- Choose the correct answer from the options given below:
- (1) A IV, B II, C I, D III
- (1) A II, B IV, C I, D III
- (3) A II, B I, C IV, D III
- (4) A III, B I, C IV, D II

NTA - (4) Ans.

Reso - (4)

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- Sol.
- (1) Halogen + AgNO₃ → AgX ppt
- (2) 'S' + Sodium nitro prusside → Violet colour
- (3) 'N' + $[Fe(CN)_6]^{4^-} \rightarrow Blue colour$
- (4) 'P' + $(NH_4)_2 MoO_4 \rightarrow (NH_4)_3 PO_4.12MoO_3 \rightarrow Yellow colour$
- 67.
- and those of element X occupy one third of the tetrahedral voids. What is the formula of the compound? $(1) X_2Y_3$ $(2) X_3Y_2$
 - $(3) X_3Y$

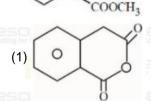
A compound is formed by two elements X and Y. The element Y forms cubic close packed arrangement

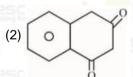
- Ans. NTA - (1)
- Reso (1)
- Effective number of Y atom = 4 (Y forms cubic close packed arrangement) Sol.
 - Effective number of X atom = $\frac{1}{3} \times 8 = \frac{8}{3}$ (X occupy one third of the tetrahedral voids)
 - so formula of compound = $\left(X_{\frac{8}{2}}Y_4\right) \times \frac{3}{4} = X_2Y_3$
- 68. For a concentrated solution of a weak electrolyte (Keq = equilibrium constant) A2B3 of concentration 'c', the degree of dissociation ' α ' is
- (3) $\left(\frac{K_{eq}}{108c^4}\right)^{1/5}$ (4) $\left(\frac{K_{eq}}{25c^2}\right)^{1/5}$

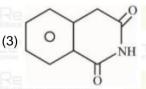
- Ans. NTA - (3)
 - Reso (3)
- Sol.

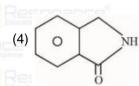
- Initial conc.
- 2Ca 3Са
- $K = \frac{(2C\alpha)^2 (3C\alpha)^3}{(C C\alpha)}$
- $K = \frac{108C^5\alpha^5}{C} = 108C^4\alpha^5$
- $\alpha = \left[\frac{K}{108C^4} \right]^{1/5}$
- 69. The major product formed in the following reaction is









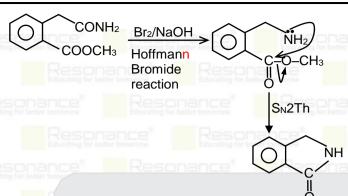


- Ans.
- NTA (4)
- Reso (4)

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- 70. The standard electrode potential of M⁺/M in aqueous solution does not depend on
 - (1) Ionisation of a gaseous metal atom
- (2) Ionisation of a solid metal atom
- (3) Hydration of a gaseous metal ion
- (4) Sublimation of a solid metal

- Ans. NTA - (2) Reso - (2)
- The standard electrode potential of M+/M in aqueous solution depend on Sol.
 - * Ionisation of a gaseous metal atom
 - * Hydration of a gaseous metal ion
 - * Sublimation of a solid metal

$$\mathsf{E}^0_{\mathsf{M}^+/\mathsf{M}}$$
 depends on

$$M(s) \rightarrow M(g)$$
; ΔH_{sub}

$$M(g) \rightarrow M^+(g)$$
; $\Delta H_{I.E.}$

$$M^+(g) + aq \rightarrow M^+(aq)$$
; $\Delta H_{Hydration}$.

71. Given below are two statements, one is labelled as Assertion A and the other is labelled as Reason R.

Assertion A: Loss of electron from hydrogen atom results in nucleus of $\sim 1.5 \times 10^{-3}$ pm size.

Reason R: Proton (H+) always exists in combined form.

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

- (1) A is correct but R is not correct
- (2) A is not correct but R is correct
- (3) Both A and R are correct and R is the correct explanation of A
- (4) Both A and R are correct but R is NOT the correct explanation of A
- Ans. NTA - (4)

Reso - (4)

- Theory based Sol.
- **72.** Match List I with List II:

sona	List I (Oxide)	sonan	List II (Type of bond)
(A)	N ₂ O ₄	(I)	1 N = O bond
(B)	NO ₂	(II)	1 N-O-N bond
(C)	N ₂ O ₅	(III)	1 N-N bond
(D)	N ₂ O	(IV)	1 N=N/N≡N bond

Choose the correct answer from the options given below:

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

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

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

NTA - (1) Ans. Reso - (1)

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Sol.

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- 74. Strong reducing and oxidizing agents among the following, respectively, are:
 - (1) Ce4+ and Tb4+

(2) Ce4+ and Eu2+

(3) Eu2+ and Ce4+

(4) Ce3+ and Ce4+

- NTA (3) Ans.
 - Reso-(3)
- $(E_{Ce^{+4}/Ce^{+3}}^{0})_{RP} = 1.74 \text{ V}$ Sol.
 - Eu⁺² is a strong reducing agent changing to common oxidation state + 3.
 - Most common oxidation no. of Eu & Ce are + 3
- **75.** Match List I with List II:

	List I		List II
g for bette	(Enzymatic reaction)		(Enzyme)
(A)	Sucrose → Glucose and Fructose	(I)	Zymase
(B)	Glucose → ethyl alcohol and CO ₂	(II)	Pepsin
(C)	Starch → Maltose	(III)	Invertase
(D)	Proteins → Amino acids	(IV)	Diastase

Choose the correct answer from the options given below:

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

- Ans. NTA - (1)
 - Reso (1)
- Invertase → Glucose + Fructose Sol. Cane sugar (sucrose) -
 - Zymase ethyl alcohol Glucose -
 - Diastase Maltose Starch
 - Pepsin Amino acid Protein
- 76. The possibility of photochemical smog formation is more at
 - (1) The places with healty vegetation
- (2) Marshy lands

(3) Industrial areas

(4) Himalayan villages in winter

- NTA (3) Ans.
 - Reso-(3)
- Sol. **Fact based**
- 77. The difference between electron gain enthalpies will be maximum between:
- (1) Ne and F
- (2) Ar and F
- (3) Ne and Cl
- (4) Ar and CI

- Ans. NTA - (3)
 - Reso-(3)
- Sol. CI has maximum -ve Δ Heg and Ne has most +ive Δ Heg hence difference will be maximum for Ne and Cl.

Element

∆Heg (KJ/mole)

F

-333

CI

-349

Ne

+48

Ar

+116

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78. Compound P
$$\xrightarrow{\text{HCl}, \Delta}$$
 Filter $\xrightarrow{\text{Residue Q}}$ $\xrightarrow{\text{Filtrate}}$ $\xrightarrow{\text{Filtrate}}$ $\xrightarrow{\text{NaOH}}$ $\xrightarrow{\text{NaOH}}$ $\xrightarrow{\text{Residue Q}}$ Oily Liquid R.

Compound P is neutral, Q gives effervescence with NaHCO₃ while R reacts with Hinsbergs reagent to give solid soluble in NaOH, compound P is

Ans. NTA - (1)

Reso - (1)

$$CH_3 \longrightarrow C-NH \longrightarrow P \xrightarrow{H_3O^+} CH_3 \longrightarrow CH_0 \longrightarrow C-OH(Q) + NH_2 \longrightarrow D$$

79. Which of the following options are correct for the reaction

 $2[Au(CN)_2^-(aq) + Zn(s) \rightarrow 2Au(s) + [Zn(CN)_4]^{2-}(aq)$

(A) Redox reaction

(B) Displacement reaction

(C) Decompositon reaction

(D) Combination reaction

Choose the correct answer from the options given below:

(1) (A) and (B) only

(2) (A) only

(3) (C) and (D) only

(4) (A) and (D) only

Ans. NTA - (1)

Reso - (1)

 $\textbf{Sol.} \hspace{0.5cm} 2[\underline{Au(CN)_2}^-(aq) + Zn(s) \rightarrow 2\underline{Au}(s) + [Zn(CN)_4]^{2-} (aq)$

Above reaction is type of Redox reaction as well as Displacement reaction.

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80. For the reaction

> Acetone RCH₂I + Br RCH₂Br + Imajor

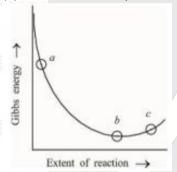
The correct statement is

- (1) The solvent used in the reaction solvates the ions formed in rate determining step.
- (2) Br can act as competing nucleophile.
- (3) The transition state formed in the above reaction is less polar than the localised anion.
- (4) The reaction can occur in acetic acid also.

Ans. NTA - (3)

Reso - (3)

- This is a S_N2 reaction complete by transition state which requires strong nucleophile in nonpolar/polar Sol. aprotic solvent.
- 81. Consider the graph of Gibbs free energy G vs Extent of reaction. The number of statement/s from the following which are true with respect to points (a), (b) and (c) is_
 - (1) Reaction is spontaneous at (a) and (b)
 - (2) Reaction is at equilibrium at point (b) and non-spontaneous at point (c)
 - (3) Reaction is spontaneous at (a) and non-spontaneous at (c)
 - (4) Reaction is non-spontaneous at (a) and (b)



Ans. NTA - (2)

Reso - (2)

- Sol. Reaction is epontaneous in a direction in which Gibb's free energy decreases. Hence 2 statements i.e. B & C are correct.
- 82. In ammonium – phosphomolybdate, the oxidation state of Mo is +

Ans. NTA - (6)

Reso - (6)

- The Oxidation state of Mo in ammonium phosphomolybdate = +6 Sol. (NH₄)₃PO₄.12MoO₃
- Number of ambidentate ligands in a representative metal complex [M(en)(SCN)4] is 83. [en = ethylenediamine]

Ans. NTA - (4)

Reso - (4)

Sol. SCN-is an ambidentate ligand.

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- 84. Number of bromo derivatives obtained on treating ethane with excess of Br2 in diffused sunlight
- NTA (9) Ans. Reso - (9)
- CH₃-CH₃ Br₂/HCl (1) CH₃-CH₂-Br (2) CH₃-CH Br (3) CH₂-CH₂ (4) CH₃-C Br Br Br Br Sol.

 - (9) Br C-CH Br
- 85. Mass of Urea (NH2CONH2) required to be dissolved in 1000 g of water in order to reduce the vapour pressure of water by 25% is_____ g. (Nearest integer) Given: Molar mass of N, C, O and H are 14, 12, 16 and 1 g mol⁻¹ respectively.
- Ans. NTA - (1111)
- Reso (1111) Sol. For a solution

$$\frac{P^0 - P_S}{P_S} = \frac{n}{N}$$

$$\frac{100-75}{75} = \frac{w_{\text{urea}} \times 18}{60 \times 1000}$$

- $W_{urea} = 1111.1 gm$
- If 5 moles of BaCl₂ is mixed with 2 moles of Na₃PO₄, the maximum number of moles of Ba₃(PO₄)₂ formed 86. (Nearest integer)
- NTA (1) Ans. Reso - (1)
- $3BaCl_2 + 2Na_3PO_4 \longrightarrow Ba_3(PO_4)_2 + 6NaCl$ Sol.
 - Initial mole
 - $\frac{5}{3}$ = 1.67 $\frac{2}{2}$ = 1 (L.R. = Na₃PO₄)
 - $\frac{\text{moleNa}_3 \text{PO}_4}{2} = \frac{\text{moleBa}_3 (\text{PO}_4)_2}{1}$
 - maximum number of mole of Ba₃(PO₄)₂ = $\frac{2}{2}$ = 1 mole
- 87. The wavelength of an electron of kinetic energy 4.50 x 10⁻²⁹ J is_ _x10⁻⁵ m. (Nearest integer) Given: mass of electron is 9×10^{-31} kg, $h = 6.6 \times 10^{-34}$ J s
- NTA (7) Ans. Reso - (7)
- Sol. $\lambda = \frac{h}{\sqrt{2m \text{ K.E.}}} = \frac{6.6 \times 10^{-34}}{\sqrt{2 \times 9.1 \times 10^{-31} \times 4.5 \times 10^{-29}}}$

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- 88. For the adsorption of hydrogen on platinum, the activation energy is 30 kJ mol⁻¹ and for the adsorption of hydrogen on nickel, the activation energy is 41.4 kJ mol⁻¹. The logarithm of the ratio of the rates of chemisorption on equal areas of the metals at 300 K is ______ (Nearest integer)

 R = 8.3 J K⁻¹ mol⁻¹
- Ans. NTA (2)

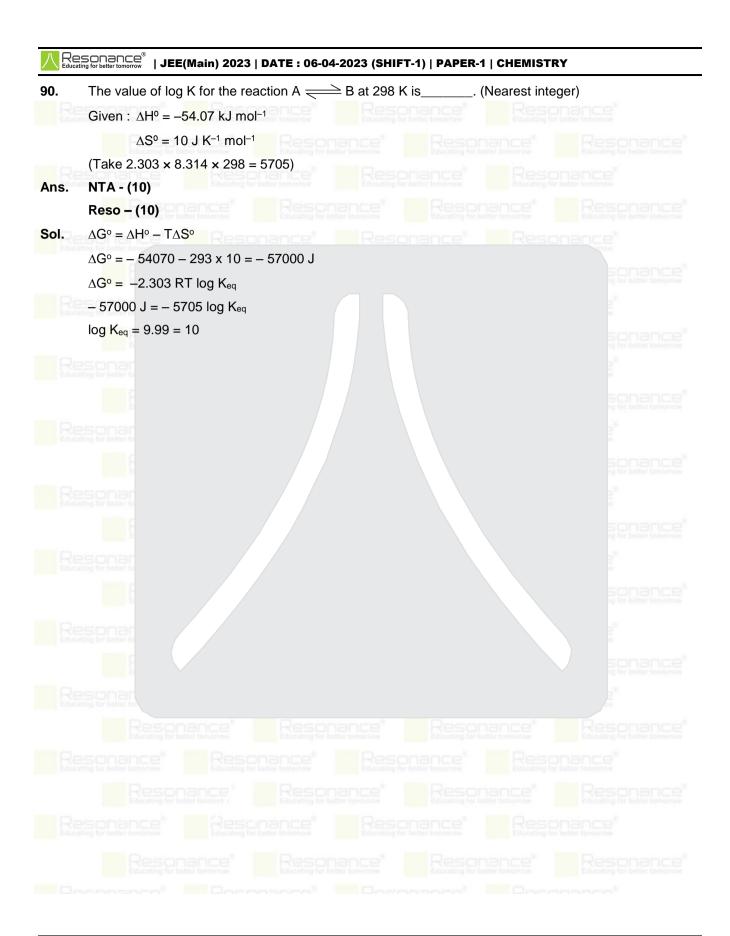
Reso - (2)

- Sol. In $\frac{K_1}{K_2} = \frac{E_{a_1} E_{a_1}}{R.T.}$ In $\frac{K_1}{K_2} = 2$.
- 89. The number of species from the following which have square pyramidal structure is PF₅, BrF₄⁻, IF₅, BrF₅, XeOF₄, ICI₄⁻
- Ans. NTA (3)

Reso - (3)

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