CUET PG Model Test Paper [Chemistry]

Q1. Which of these is least likely to act as a Lewis base?
(a) NH_3
(b) BH_3
(c) $R - O - H$
(d) R_2O

Q2. The equilibrium constant for the aromatization reaction of acetylene is 8. The aromatization reaction is given below

$$3C_2H_2 \xrightarrow[\text{tube}]{\text{Red hot}} C_6H_6$$

If the equilibrium concentration of acetylene is found to be 0.5 then the equilibrium concentration of benzene (C_6H_6) is
(a) 0.5 mol L^{-1}
(b) 1 mol L^{-1}
(c) 0.25 mol L^{-1}
(d) 2 mol L^{-1}

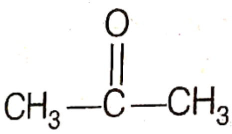
Q3. Enzymes increases the rate of reaction
(a) by increasing activation energy
(b) by decreasing activation energy
(c) by taking part in the reaction
(d) by altering concentration of the reaction

Q4. How many chiral centres are present in 2-methyl butane?
(a) 0
(b) 1
(c) 2
(d) 3

Q5. The acid derivative having maximum reactivity towards nucleophilic addition is
(a) CH_3CONH_2
(b) $(CH_3CO)_2O$
(c) CH_3COCl
(d) CH_3COOR

Q6. Which of the following molecules possesses linear geometry?
(a) XeF_2
(b) XeF_4
(c) $XeOF_4$
(d) XeF_6

Q7. The hybridisation of central atoms in case of diamond and carborundum respectively are
(a) sp^2, sp^3
(b) sp^3, sp^2
(c) sp^2, sp
(d) sp^3, sp^3

Q8. Consider the following reaction sequence
$CH_3Br \xrightarrow[C_2H_5OC_2H_5]{Mg} X \xrightarrow[H^+]{Y} (CH_3)_3C\text{—}OH$
What is Y in the above reaction sequence?
(a) CH_3 CHO
(b)

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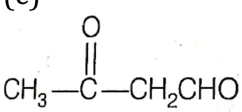
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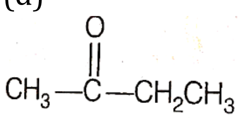

Q9. Compound X having the molecular formula C_8H_{10} forms two isomers Y and Z. Isomer Y when subjected to oxidation gives benzoic acid and isomer Z when subjected to oxidation followed by dehydration gives phthalic anhydride. The structures of the two isomers respectively are
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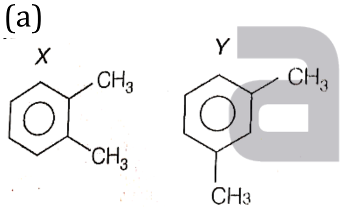
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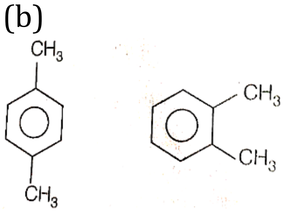
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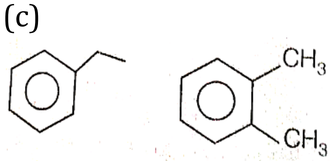
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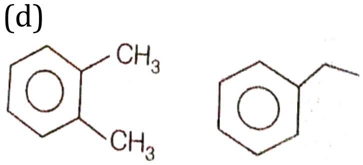


Q10. Which of the following pairs have identical values of e/m?
(a) A proton and a neutron
(b) A proton and a deuterium
(c) Deuterium and an $\alpha -$ particle
(d) An electron and γ - rays

Q11. The diamagnetic molecule among the following is
(a) O_2
(b) N_2
(c) N^-_2
(d) O^-_2

Q12. Which of the following does not react with aqueous solution of $KMnO_4$, acidified with H_2SO_4?
(a) SO_2
(b) Fe^{2+}
(c) NO^-_2
(d) NO^-_3

Q13. $HClO_4 + P_2O_5 \rightarrow$ (A) and (B) A and B are
(a) $HClO_3$, H_3PO_4
(b) Cl_2O_6, HPO_3
(c) ClO_2, H_2PO_4
(d) Cl_2O_7, HPO_3

Q14. Which of the following does not depend upon the concentration of reactants?
(a) zero order reaction
(b) first order reaction
(c) second order reaction
(d) third order reaction

Q15. If time for the completion of 75% of a reaction is 40 min, then 50% of the reaction was completed in
(a) 16 min
(b) 25 min
(c) 18 min
(d) 20 min

Q16. Which of the following is not correctly matched?
(a) ClO^-_3 - sp^2 hybridised
(b) SO_3 - sp^2 hybridised
(c) NH_3 - sp^3 hybridised
(d) PCl_5 - sp^3d hybridised

Q17. The actinoids showing +7 oxidation state are
(a) U, Np
(b) Pu, Am
(c) Np, Pu
(d) Am, Cm

Q18. Basic strength is maximum for
(a) $C_6H_5NH_2$
(b) $C_6H_4(NO_2)$ NH_2
(c) $C_6H_5NHCH_3$
(d) $C_6H_5CH_2NHC_2H_5$

Q19. Which of the following statement is incorrect for o-nitrophenol?
(a) it contains intermolecular H-bonding
(b) its boiling point is lower than that of p-nitrophenol
(c) its boiling point is lower than that of m-nitrophenol
(d) its vapour pressure is higher as compared to p-nitrophenol

Q20. Mark the correct statement.
(a) For a chemical reaction to be feasible, G should be zero
(b) Entropy is a measure of order of a system
(c) For a chemical reaction to be feasible, G increases
(d) The total energy of an isolated system is constant

Q21. K_{sp} for Mg $(OH)_2$ is 0.4 10^{-11}, then the pH value of the solution is
(a) 5
(b) 8.5
(c) 10.3
(d) 12

Q22. Freezing point is minimum for
(a) 0.1 M $Al_2(SO_4)_3$
(b) 0.1 M $BaCl_2$
(c) 0.1 M Urea
(d) 0.1 M NaCl

Q23. Which of the following does not present in the form of minerals?
(a) $SO^{2-}{}_4$
(b) S^{2-}
(c) $NO^{-}{}_3$
(d) Cl^{-}

Q24. The species which acts as a Lewis but not a Bronsted acid is
(a) $NH^{-}{}_2$
(b) O^{2-}
(c) BF_3
(d) OH^{-}

Q25. Which of the following species does not exist?
(a) BF_3
(b) $B(OH)^3{}_{6^-}$
(c) Al_2Cl_6
(d) $AlCl_3$

Q26. The number of peroxide bonds in perxenate ion $[XeO_6]^{4-}$ is
(a) 0
(b) 2
(c) 3
(d) 1

Q27. Anodising can be done by electrolysing dilute sulphuric acid with Al as anode. This result in
(a) the formation of protective oxide layer
(b) the formation of $Al_2(SO_4)_3$ and SO_2 gas
(c) the formation of AlH_3 and SO_2 gas
(d) the formation of Al (HSO_3) and H_2 gas

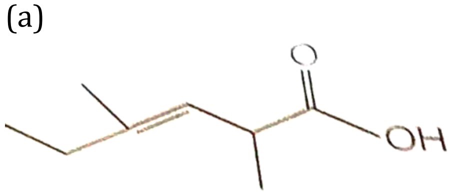
Q28. Cannizaro reaction is given by
(a) CH_3CHO
(b) C_6H_5CHO
(c) CH_3COOH_3
(d) $C_6H_5COCH_3$

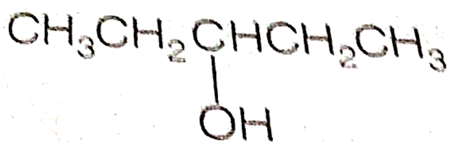
Q29. What is the product of the reaction of $C_6H_5OC_2H_5$ with HI?
(a) $C_6H_5OH + C_2H_5I$
(b) $C_2H_5OH + C_6H_5I$
(c) $C_2H_5.I$ only
(d) $C_6H_5OH + C_6H_5I$

Q30. The correct decreasing order of priority for the functional groups of organic compounds in the IUPAC system of nomenclature is
(a) COOH, SO_3H, $CONH_2$, CHO
(b) SO_3H, COOH, $CONH_2$, CHO
(c) CHO, COOH, SO_3H, $CONH_2$
(d) $CONH_2$, CHO, SO_3H, COOH

Q31. When an acid cell is charged, then
(a) voltage of cell increases
(b) resistance of cell increases
(c) electrolyte of cell dilutes
(d) all of the above

Q32. Which of the following exhibit only optical isomerism?
(a)



(b)

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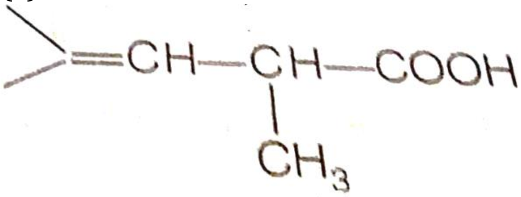

(d) 4–chloroheptane

Q33. In which compound metal cannot be replaced by Zn metal?
(a) $[Mg(NH_3)_6]^{2+}$
(b) $[Ag(CN)_2]^-$
(c) $[Au(CN)_2]^-$
(d) none of the above

Q34. $MnO_4^- + 8H^+ + 5e^- \rightarrow Mn^{2+} + 4H_2O$; E° = 1.51 V
$MnO_2 + 4H^+ + 2e^- \rightarrow M_{n^{2+}} + 2H_2O$; E° = 1.23 V
E° MnO_4^- / MnO_2 is
(a) 1.70 V
(b) 0.91 V
(c) 1.37 V
(d) 0.548 V

Q35. Which of the following equation is not correct?
(a) $\left(p + \frac{an^2}{V^2}\right)(V - b)$ = nRT
(b) $\left(p + \frac{a}{V^2}\right)(V - b)$ = RT
(c) $\left(p + \frac{an^2}{V^2}\right)(V - nb) = nRT$
(d) p = $\frac{RT}{(V-b)} - \frac{a}{V^2}$

Q36. Which of the following relation is incorrect?
(a) ΔG° = – RT In k
(b) k = $e^{\frac{-\Delta G°}{RT}}$
(c) $e^{\frac{-\Delta G°}{2.303\,RT}}$
(d) In K = $\frac{\Delta G°}{RT}$

Q37. For which of the following reactions, $K_p = K_c$?
(a) $PCl_5 \rightleftharpoons PCl_3 + Cl_2$
(b) $2NH_3 \rightleftharpoons N_2 + 3H_2$
(c) $2HI \rightleftharpoons H_2 + I_2$
(d) $SO_2 + O_2 \rightleftharpoons SO_3$

Q38. Nucleophilicity is highest for

(a) NH^{-}_2

(b) CH^{-}_3

(c) Cl^-

(d) ^-OH

Q39. The value of van Hoff's factor for $Hg_2(NO_3)_2$ is

(a) 1

(b) 2

(c) 3

(d) 4

Q40. An antibiotic effective in treatment of pneumonia, bronchitis etc. is

(a) penicillin

(b) patalin

(c) chloromycetin

(d) tetracyline

Q41. Which one of the following is least basic?

(a) NF_3

(b) NCl_3

(c) NBr_3

(d) NI_3

Q42. 10 g of hydrogen and 64 g of oxygen were kept in a steel vessel and exploded. Amount of water produced in this reaction will be

(a) 2 mol

(b) 4 mol

(c) 8 mol

(d) 10 mol

Q43. CO is isoelectronic with

(a) CN^-

(b) N_2^+

(c) N_2^{2-}

(d) NO^-

Q44. Oxidation number of Cr in $Cr_2O_7^{2-}$ is

(a) +2

(b) +4

(c) +6

(d) +7

Q45. Radioactive isotope of hydrogen is
(a) uranium
(b) deuterium
(c) tritium
(d) none of these

Q46. Which one of the following has incomplete octet?
(a) NH_3
(b) BCl_3
(c) CCl_4
(d) PCl_3

Q47. Which one of the following is wrong?
(a) $FeSO_4.(NH_4)_2SO_4.6H_2O$ – Mohr salt
(b) $Na_2CO_3.10H_2O$ – washing soda
(c) $FeSO_4.7H_2O$ – green vitriol
(d) $CaSO_4.2H_2O$ – plaster of Paris

Q48. Which one of the following is most basic?
(a) $Mg(OH)_2$
(b) $Ca(OH)_2$
(c) $Sr(OH)_2$
(d) $Ba(OH)_2$

Q49. Gypsum is added to cement to
(a) decrease the rate of setting of cement
(b) increase the rate of setting of cement
(c) bind the particles of calcium silicate
(d) facilitate the formation of colloidal gel

Q50. The order of osmotic pressure of three equimolar aqueous solutions of $CaCl_2$, NaCl and $C_6H_{12}O_6$ (glucose) is
(a) $CaCl_2 > NaCl > C_6H_{12}O_6$
(b) $NaCl > CaCl_2 > C_6H_{12}O_6$
(c) $C_6H_{12}O_6 > CaCl_2 > NaCl$
(d) $C_6H_{12}O_6 > NaCl > CaCl_2$

Q51. Among water molecules, the type of bond present between H and O is
(a) hydrogen bond
(b) electrovalent bond
(c) coordinate bond
(d) covalent bond

Q52. In aluminothermic process, aluminium acts as
(a) a reducing agent
(b) an oxidising agent
(c) a complex forming agent
(d) a dehydrating agent

Q53. H_3BO_3 is acidic because it
(a) liberates H^+ ions
(b) accepts OH^- ions
(c) Both (a) and (b)
(d) none of these

Q54. Which one of the following statements is wrong?
(a) in homogeneous catalysis, reactants, products and catalyst are in same phase
(b) a catalyst accelerates the rate of reaction by bringing down the energy of activation
(c) a catalyst alters the equilibrium constant
(d) the mass of catalyst remains same after reaction

Q55. Two gases A and B having the same volume diffuse through a porous partition in 20 s and 10 s respectively. The molecular mass of A is 49 u. Molecular mass of B will be
(a) 25.00 u
(b) 50.00 u
(c) 12.25 u
(d) 6.50 u

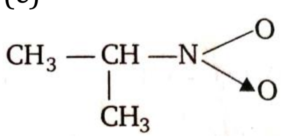
Q56. The heats of neutralisation of four acids A, B, C and D are 13.7, 9.4, 11.2, and 12.4 kcal respectively. The weakest and strongest among these acids are
(a) B and A respectively
(b) A and C respectively
(c) C and D respectively
(d) A and B respectively

Q57. Phosphorus pentachloride dissociates as follows in a closed reaction vessel,
$PCl_5(g) \rightleftharpoons PCl_3(g) + Cl_2(g)$
If total pressure at equilibrium of the reaction mixture is p and degree of dissociation of PCl_5 is x, the partial pressure of PCl_3 will be
(a) $\left(\frac{x}{x+1}\right)p$
(b) $\left(\frac{2x}{1-x}\right)p$
(c) $\left(\frac{x}{x-1}\right)p$
(d) $\left(\frac{x}{1-x}\right)p$

Q58. The equilibrium constant for the reaction, $aA + bB \rightleftharpoons cC + dD$ is K, then the equilibrium constant for the reaction, $naA + nbB \rightleftharpoons ncC + ndD$ will be
(a) K
(b) K^n
(c) $\frac{1}{K^n}$
(d) $\frac{1}{K^{n-1}}$

Q59. Which one of the following does not reduce Benedict's solution?
(a) Glucose
(b) Sucrose
(c) Aldehyde
(d) Fructose

Q60. Nitration of aniline also gives m-nitroaniline in strong acidic medium because
(a) in electrophilic substitution, reaction amino group is meta-directive
(b) in spite of substituents, nitro group always goes to m-position
(c) in strong acidic medium, aniline present as anilinium ion
(d) None of the above

Q61. Which one of the following is not a nitro derivative?
(a) $C_6H_5NO_2$
(b) CH_3CH_2ONO
(c)


(d) $C_6H_4(OH)NO_2$

Q62. An organic compound of molecular formula $C_4H_{10}O$ does not react with sodium. With excess of HI, it gives only one type of alkyl halide. The compound is
(a) ethoxy ethane
(b) 1-butanol
(c) 1-methoxy propane
(d) 2-methoxy propane

Q63. Formic acid and acetic acid are distinguished by
(a) $NaHCO_3$
(b) $FeCl_3$
(c) Victor Meyer test
(d) Tollen's reagent

Q64. Select the detergent that is used to prepare cosmetics
(a) DDBS
(b) polyethylene glycol
(c) cetyltrimethyl ammonium chloride
(d) LAS

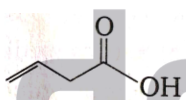
Q65. Of the following which one is classified as polyester polymer?
(a) Nylon - 66
(b) Terylene
(c) Bakelite
(d) Melamine

Q66. Ether on reacting with P_2S_5 form
(a) diethyl sulphide
(b) thioalcohol
(c) thioether
(d) thioaldehyde

Q67. Sodium phenoxide reacts with CO_2 at 400 K and 4.7 atm pressure to give
(a) catechol
(b) salicylaldehyde
(c) sodium salicylate
(d) benzoic acid

Q68. The raw material for Raschig process is
(a) chlorobenzene
(b) phenol
(c) benzene
(d) anisol

Q69. Consider the following carbocations
I. $Cl_3 c^+$ II. Cl_2CH^+
III. $ClCH^+_2$ IV. CH_3
The stability sequence follows the order
(a) IV < I < III < II
(b) I < II < III < IV
(c) II < III < IV < I
(d) III < I < II < IV

Q70. The IUPAC name of  is
(a) but-3-enoic acid
(b) but-1-enoic acid
(c) pent-4-enoic acid
(d) prop-2-enoic acid

Q71. 0.833 mole of a carbohydrate with empirical formula CH_2O, has 10g of hydrogen. Molecular formula of carbohydrate is
(a) $C_3H_5O_3$
(b) $C_6H_{12}O_6$
(c)$C_3H_{10}O_5$
(d) $C_3H_4O_3$

Q72. Toluene by Etard's reaction gives
(a) ortho-cresol
(b) boric acid
(c) benzyl alcohol
(d) benzaldehyde

Q73. Pick out the unsaturated fatty acid from the following
(a) Stearic acid
(b) Lauric acid
(c) Oleic acid
(d) Palmitic acid

Q74. What is the product formed when acetylene reacts with hypochlorous acid?
(a) CH_3COCl
(b) $ClCH_2CHO$
(c) Cl_2CHCHO
(d) $ClCH_2COOH$

Q75. Benzamide on reaction with $POCl_3$ gives
(a) aniline
(b) chlorobenzene
(c) phenylamine
(d) phenyl nitrile

Solution

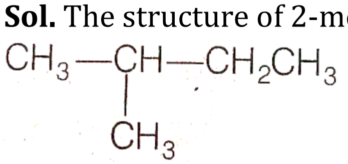
S1. Ans.(b)
Sol. BH_3, being electron deficient, have a tendency of gaining, not losing electrons, so it behaves like a Lewis acid, not like a Lewis base.

S2. Ans.(b)
Sol. For the given reaction, Kc = $\frac{[C6H6]}{\{C2H2\}3}$

$$8 = \frac{[C6H6]}{(0.5)3}$$

$$[C_6H_6] = 8 \times (0.5)^3 = 1$$

S3. Ans.(b)
Sol. Enzymes act as catalysts, thus they increase the rate of a biochemical reaction by providing an alternate pathway of lower activation energy.

S4. Ans.(a)
Sol. The structure of 2-methylbutane is

Thus, it contains no chiral centre i.e., the carbon, all the four valencies of which are satisfied by four different groups.

S5. Ans.(c)
Sol. Cl being an electron withdrawing group decreases the electron density at carbonyl carbon and makes the C = O bond more polar and hence more reactive towards nucleophilic addition reactions.

S6. Ans.(a)

Sol. $XeF_2 \Rightarrow$ 2bp + 4/p Thus, geometry linear

$XeF_4 \Rightarrow$ 4bp + 2/p square planar

$XeOF_4 \Rightarrow$ 5bp + 1/p square pyramid

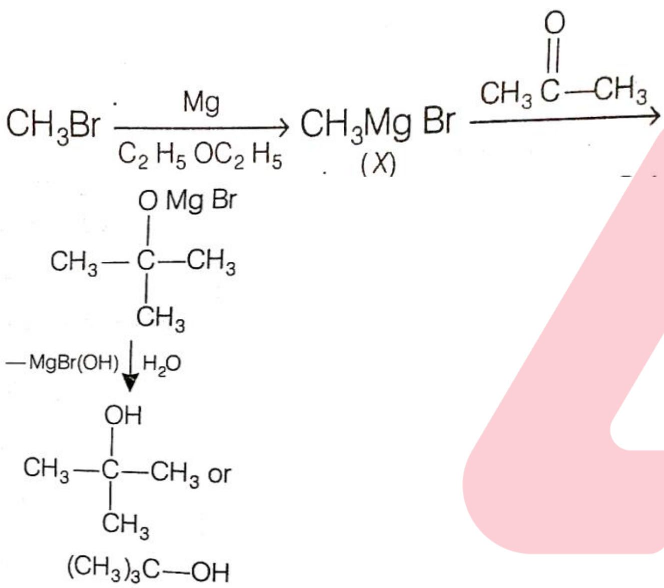
$XeF_6 \Rightarrow$ 6bp + 1/p distorted octahedral

S7. Ans.(d)

Sol. In diamond and carborundum (SiC) both the central atoms are sp^3 hybridised.

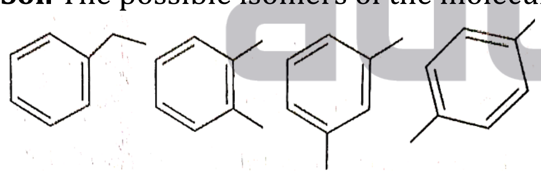
S8. Ans.(b)

Sol.

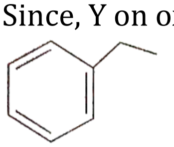


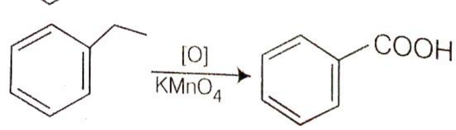
S9. Ans.(c)

Sol. The possible isomers of the molecule with molecular formula C_8H_{10} are

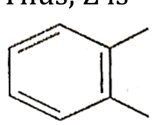


Since, Y on oxidation gives only benzoic acid, it means that it contains only one side chain. Thus, Y is





Since, Z contains side chain at two places, so its oxidation product contains two -COOH groups. Further, formation of phthalic anhydride suggests that both the -COOH groups are present at adjacent positions. Thus, Z is



S10. Ans.(c)

Sol. $\frac{\frac{e}{m_d}}{\frac{2e}{m_\alpha}} = \frac{4m_d}{4m_d} = 1$. Thus, deuterium and an α-particle have identical value of e/m.

S11. Ans.(b)

Sol. Molecules having no unpaired electrons are diamagnetic in nature.

$N_2(14) = \sigma 1s^2,\ \overset{*}{\sigma}1s^2,\ \sigma 2s^2,\ \overset{*}{\sigma}2s^2, \pi 2p_x^2 \approx \pi 2p^2 y, \sigma 2p_z^2$

No unpaired electron is present, so it is a diamagnetic species.

S12. Ans.(d)

Sol. In acidic medium, $KMnO_4$ acts as a good oxidising agent but it cannot oxidise No_3^- ion, as in it N is present in its highest oxidation state (+5), so further increase in oxidation number is not possible.

S13. Ans.(d)

Sol. $2HClO_4 + P_2O_5 \rightarrow Cl_2O_7 + 2HPO_3$

S14. Ans.(a)

Sol. In case of zero order reaction, rate of reaction does not depend upon the concentration of reactants.

S15. Ans.(d)

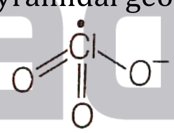
Sol. $t_{75\%} = 2 \times t_{50\%}$

$$t_{50\%} = \frac{t75\%}{2} = \frac{40}{2} = 20 \text{ min}$$

S16. Ans.(a)

Sol. $ClO_3^- \Rightarrow 3\text{bp} + 1/\text{p} \Rightarrow sp^3$ hybridized

= pyramidal geometry



S17. Ans.(c)

Sol. Np and Pu in NpO^+_3 and PuO_3^+ oxocations show +7 oxidation state which are not so stable.

S18. Ans.(d)

Sol. More the number of electron releasing R groups attached directly with N-atom, more is the basic strength. Thus, $C_6H_5CH_2NHC_2H_5$ has maximum basic strength.

S19. Ans.(a)

Sol. o-nitrophenol contains intramolecular H-bonding. All other given statements are true.

S20. Ans.(d)

Sol. For a chemical reaction to be feasible, ΔG should be < 0, i.e., negative.

Further entropy is the measure of randomness of a system.

S21. Ans.(c)

Sol. $Mg(OH)_2$ dissolved in the following manner.

$$\underset{s\ mol/L}{Mg(OH)_2} \rightarrow \underset{s\ mol/L}{Mg^{2+}} + \underset{2s\ mol/L\ (s\ =\ solubility)}{2OH^-}$$

$K_{sp} = [Mg^{2+}]\,[OH^-]^2$

$= (s)\,(2s)^2 = 4s^3$

$4s^3 = 0.4 \times 10^{-11}$

$s^3 = 10^{-12}$

$s = 10^{-4}$

Since 1 mol Mg $(OH)_2$ provides 2 moles of $[OH^-]$,

so $[OH^-] = 2 \times 10^{-4}$

$pOH = -\log[OH^-] = -\log(2 \times 10^{-4}) = 3.7$

$pH = 14 - pOH = 14 - 3.7 = 10.3$

S22. Ans.(a)

Sol. Depression in freezing point is a colligative property i.e., depends upon the number of particles. Thus, as the number of particles increases, freezing point decreases.

Thus 0.1 M $Al_2(SO_4)_3$ shows minimum freezing point.

S23. Ans.(c)

Sol. Since nitrates of almost all salts are soluble in water, so they are never present as minerals.

S24. Ans.(c)

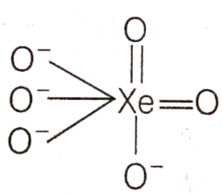
Sol. BF_3 being electron deficient acts as a Lewis acid but it is not a Bronsted acid because of the absence of H atoms.

S25. Ans.(b)

Sol. B, because of the absence of d-orbitals, cannot extend its covalency beyond 4 and hence, $B(OH)_6^{3-}$ does not exist.

S26. Ans.(a)

Sol. Structure of $[XeO_6]^{4-}$ is



Thus, it does not contain any peroxide bond.

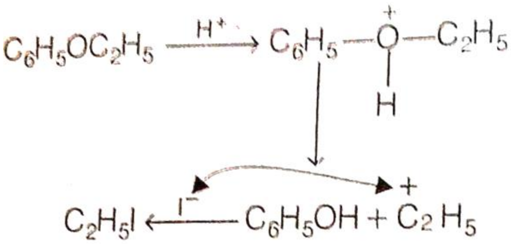
S27. Ans.(a)

Sol. Anodising of Al results in the formation of a protective layer over Al surface.

S28. Ans.(b)

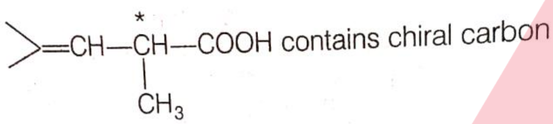
Sol. Cannizaro reaction is given by only those aldehydes which do not contain any α – H atom.

Among the given only C_6H_5CHO (benzaldehyde) has no α – H atom. So, it will give Cannizaro reaction.

S29. Ans.(a)
Sol.

Thus, the products are C_2H_5I and C_6H_5OH.

S30. Ans.(a)
Sol. The correct decreasing order of priority in IUPAC system of nomenclature is
$-COOH$, $-SO_3H$, $-CONH_2$, $-CHO$

S31. Ans.(a)
Sol. Charging results in increase voltage.

S32. Ans.(c)
Sol.

contains chiral carbon atom but has no such double bond to which different groups are attached. Hence, it will exhibit only optical isomerism.

S33. Ans.(a)
Sol. Zn being less reactive than Mg cannot replace Mg from its salts.

S34. Ans.(a)
Sol. For the reaction,
$MnO_4^- + 4H^+ + 3e^- \rightarrow MnO_2 + 2H_2O$
$-E_3 = \frac{-1.51\times5+2\times1.23}{3} = 1.70$ V

S35. Ans.(a)
Sol. Van der Waals' equation is $\left(p+\frac{an^2}{V^2}\right)(V-nb)$ = nRT
For 1 mol, n = 1
$\left(p+\frac{a}{V^2}\right)$ (V – b) = RT
or $\quad p = \frac{RT}{(V-b)} - \frac{a}{V^2}$

S36. Ans.(c)
Sol. $\Delta G° = -RT \ln K$
$\ln k = -\frac{\Delta G°}{RT}$
$k = e^{-\Delta G°}/RT$

S37. Ans.(c)
Sol. For, $2HI \rightleftarrows H_2 + I_2$
$\Delta n_g = 2 - 2 = 0$
$K_p = K_c\ (RT)^{\Delta n_g} = K_c$

S38. Ans.(b)
Sol. A less electronegative atom is more nucleophilic. Thus, nucleophilicity is highest for CH^-_3 among the given.

S39. Ans.(c)
Sol. $Hg_2(NO_3)_2$ ionises as
$$Hg_2\ (NO_3)_2 \rightarrow \underbrace{Hg_2^2 + 2NO_3^-}_{3\ ions}$$
So, van't Hoff factor, i = 3

S40. Ans.(c)
Sol. Chloromycetin is the antibiotic that is effective for treating pneumonia, bronchitis etc.

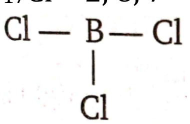
S41. Ans.(a)
Sol. Basic character of trihalides follows following decreasing order
$NI_3 > NBr_3 > NCl_3 > NF_3$
Hence, NF3 is least basic.
Despite the presence of a lone pair of electrons on nitrogen, NF3 does not act as a Lewis base. There is no known compound in which it donates a pair of electrons to other reagents.

S42. Ans.(b)
Sol. $2H2 + O_2\ 2H_2O$
10 g 64 g
5 mol 2 mol
4 mol H_2 + 2mol O_2 4 mol H_2O
(1 mol remaining)
∴Here, O_2 is limiting reagent.

S43. Ans.(a)
Sol. Number of electrons in
CO = 6 + 8 = 14
CN^- = 6 + 7 + 1 = 14
N_2^+ = 7 + 7 – 1 = 13
N_2^{2-} = 7 + 7 + 2 = 16
NO^- = 7 + 8 + 1 = 16
CO is isoelectronic with CN- because both species have same number of electrons.

S44. Ans.(c)
Sol. Let the oxidation number of Cr in $Cr_2O_7^{2-}$ is x.
2x + (7 × –2) = –2
2x = –2 + 14 or x = 12/2 = +6

S45. Ans.(c)
Sol. Tritium is a radioactive isotope of hydrogen.

S46. Ans.(b)
Sol. ${}_{5}B$ = 2, 3
${}_{17}Cl$ = 2, 8, 7

In BCl_3, B has 6 electrons.
Therefore, it has incomplete octet.

S47. Ans.(d)
Sol. $CaSO_4.2H_2O$ – Gypsum;
$CaSO_4.\frac{1}{2}H_2O$ – plaster of Paris.

S48. Ans.(d)
Sol. $Ba(OH)_2$ is the most basic hydroxide because basic strength of hydroxide increase on moving down the group.

S49. Ans.(a)
Sol. Gypsum is added to decrease the rate of setting of cement and it converts fast setting tricalcium aluminate to calcium sulphoaluminate which sets slowly.

S50. Ans.(a)
Sol. Colligative properties depend only on the number of solute particles in the solution. For different solutes of same molar concentration, the colligative properties (osmotic pressure) have greater value for the solution which gives more number of particles on ionisation.
$CaCl_2(aq) \rightleftharpoons Ca^{2+}(aq) + 2Cl^-(aq)$ = 3 ions
$NaCl(aq) \rightleftharpoons Na^+ + Cl^-$ = 2 ions
$C_6H_{12}O_6(aq) \rightarrow$ No ions
Hence, the order of osmotic pressure of equimolar solutions of $CaCl_2$, NaCl and glucose will be
$CaCl_2$ > NaCl > glucose ($C_6H_{12}O_6$)

S51. Ans.(a)
Sol. Oxygen atom of each H_2O molecule is covalently linked with two H-atoms of its own molecule and with another H-atom of adjacent H_2O molecules by H-bonding.

S52. Ans.(a)
Sol. Goldschmidt in 1905 discovered a method for the reduction of haematite (Fe_2O_3) with aluminium metal (aluminothermic process). In this, Fe_2O_3 and Al are taken in 3:1 ratio and this mixture, known as thermite, is ignited to initiate the reaction, when Fe_2O_3 is reduced to molten Fe.
$2Al + Fe_2O_3 \rightarrow Al_2O_3 + 2Fe + 323$ kJ.
molten

S53. Ans.(b)
Sol. H_3BO_3 is a weak acid and ionises mainly as monobasic acid. It does not liberate H^+ ion but it accepts OH- i.e., behaves as Lewis acid.
$H_3BO_3 + H_2O \rightarrow B(OH)_4^- + H^+$

S54. Ans.(c)
Sol. A catalyst does not alter the equilibrium constant. It helps in easy attainment of equilibrium.

S55. Ans.(c)
Sol. $\frac{r_A}{r_B} = \sqrt{\frac{M_B}{M_A}}$ or $\frac{V_A}{t_A} \times \frac{t_B}{t_B} = \sqrt{\frac{M_B}{M_A}}$
∴ $V_A = V_B$ (given in the question)
$\frac{10}{20} = \sqrt{\frac{M_B}{49}}$
$\frac{1}{4} = \frac{M_B}{49}$
$M_B = 49/4 = 12.25u$

S56. Ans.(a)
Sol. Lower the value of heat of neutralisation, weaker is the acid and vice-versa. Hence, B is the weakest and A is the strongest acid in the given options.

S57. Ans.(a)
Sol. $PCl_5(g) \rightleftharpoons PCl_3(g) + Cl_2(g)$
(1-x) x x
Total number of moles at equilibrium
$= (1 - x) + x + x = 1 + x$
$P_{PCl_3} = \left(\frac{x}{1+x}\right) \times P$

S58. Ans.(b)
Sol. $aA + bB \rightleftharpoons cC + dD$
Equilibrium constant $K = \frac{[C]^c\,[D]^d}{[A]^a\,[B]^{nb}}$
$naA + nbB \rightleftharpoons ncC + ndD$
Equilibrium constant, $K^1 = \frac{[C]^{nc}\,[D]^{nd}}{[A]^{na}\,[B]^{nd}}$
$= \left(\frac{[C]^c\,[D]^a}{[A]^a\,[B]^b}\right)^n = K^n$

S59. Ans.(b)
Sol. Sucrose does not reduce Benedict's reagent because it is a non-reducing sugar.

S60. Ans.(b)
Sol. Nitro group goes always to metal position, in aromatic compounds, irrespective to the substituents.

S61. Ans.(b)
Sol. $CH_3CH_2-O-N=O$ is a nitrite derivative, hence it is not a nitro derivative.

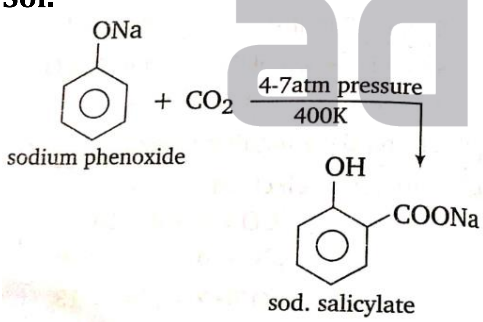
S62. Ans.(a)
Sol. $C_4H_{10}O \xrightarrow{Hl}$ only one type of halide. Therefore, $C_4H_{10}O$ may be a symmetrical ether i.e., ethoxyethane.
$C_2H_5OC_2H_5 + 2HI \rightarrow 2C_2H_5I + H_2O$
ethoxyethane.

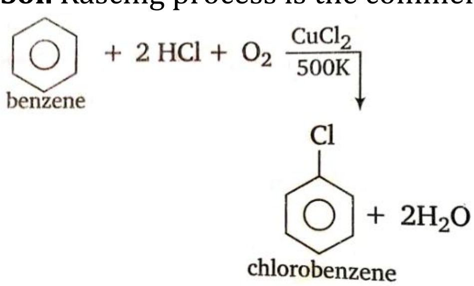
S63. Ans.(d)
Sol. Formic acid has $-\overset{\overset{\displaystyle O}{||}}{C}-H$ (aldehyde) group. It reduces Tollen's reagent to silver mirror lile other aldehyde on the other hand, acetic acid cannot reduce Tollen's reagent.

S64. Ans.(c)
Sol. Cetyltrimethyl ammonium chloride is used to prepare cosmetics because it has germicidal property.

S65. Ans.(b)
Sol. Terylene is a polyester polymer because it is formed by the monomer units terephthalic acid and ethylene glycol.

S66. Ans.(c)
Sol. Ether on reacting with P2S5 form thioether.
$5R-O-R + P_2S_5 \rightarrow 5R-S-R + P_2O_5$

S67. Ans.(c)
Sol.


S68. Ans.(c)
Sol. Raschig process is the commercial method for the preparation of chlorobenzene from benzene.


S69. Ans.(b)

Sol. Electron withdrawing groups like $-NO_2$, $-X$ etc., decrease the stability of carbonium ion. So, the stability order is

$Cl_3C^+ < Cl_2\overset{+}{C}_H < Cl\overset{+}{C}_{H_2} < C\overset{+}{C}_{H_2}$

S70. Ans.(a)

Sol.

$$CH_2{=}CH-CH_2-\overset{\overset{\large O}{\|}}{C}-OH$$

S71. Ans.(b)

Sol. Moles of carbohydrate = 0.833

Weight of hydrogen = 10 g

0.833 moles of carbohydrate has hydrogens = 10g

1 mole of carbohydrate has hydrogen = $\frac{10 \times 1}{0.833}$ = 12 g

Given, empirical formula of carbohydrate = CH_2O

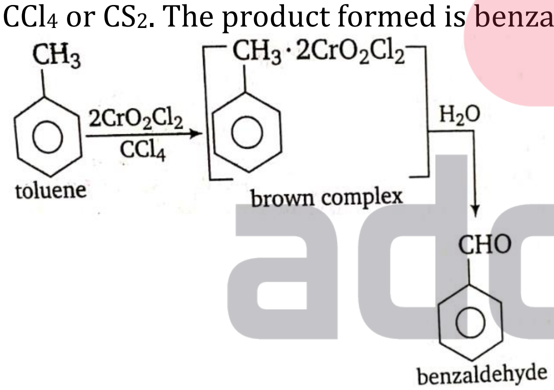
CH_2O contains hydrogen = 2g hydrogen per mole

Molecular formula should contain hydrogen = $\frac{12 \times 2}{2}$ = 12

Molecular formula = $C_6H_{12}O_6$

S72. Ans.(d)

Sol. This reaction involves the partial oxidation of toluene with chromyl chloride (CrO_2Cl_2) solution in CCl_4 or CS_2. The product formed is benzaldehyde.



S73. Ans.(c)

Sol. Oleic acid is 9-octadecanoic acid.

$CH_3\ (CH_2)_7\ CH = CH(CH_2)_7\ COOH$

S74. Ans.(c)

Sol. $\begin{matrix} CH \\ ||| \\ CH \end{matrix} \xrightarrow{HOCl} \begin{matrix} CHOH \\ || \\ CHCl \end{matrix} \xrightarrow{HOCl} \begin{matrix} CH(OH)_2 \\ | \\ CHCl_2 \end{matrix} \longrightarrow \begin{matrix} CHO \\ | \\ CHCl_2 \end{matrix}$

S75. Ans.(d)

Sol. Benzamide undergoes dehydration on reaction with $POCl_3$ and phenyl nitrile is formed.

$$\underset{benzamide}{C_6H_5CO\ NH_2} \xrightarrow[dehydration]{POCl_3} \underset{phenylnitrile}{C_6H_5CN}$$