1 Previous Year Paper

22nd May 2023 (Shift 3)

Q1. The vapour pressure curve of the mixture of ethanol and acetone is higher than its constituents because:
(a) Weaking of interactions between molecules takes place
(b) Strengthening of interactions between molecules takes place
(c) New hydrogen bonds are formed
(d) Molecules are not able to escape from the solution

Q2. An alkyl halide with molecular formula $C_5H_{11}Br$ on dehydrohalogenation give two isomeric alkenes X and Y with formula C_5H_{10}. On reductive ozonolysis X and Y gave four compounds CH_3CHO, $CH_3-\overset{\overset{O}{\|}}{C}-CH_3$ $(CH_3)_2CHCHO$, HCHO. The alkyl halide is:
(a) 3- Bromopentane
(b) 2- Bromo-3-methylbutane
(c) 2- Bromo-2-me thylbutane
(d) 1-Bromo-2-2-dimethyl propane

Q3. Glucose does not react with:
(a) Conc. HNO_3
(b) Acetic Anhydride
(c) Hydroxylamine
(d) Sodium bisulphite

Q4. Identify 'X' along with oxidation state of halogen in the given reaction:
$3Cl_2 + 6NaOH \longrightarrow 5NaCl + X + 3H_2O$
(hot and conc.)
(a) $NaClO_2$, +3
(b) $NaClO_3$, +5
(c) $NaClO_2$, +7
(d) $NaClO_3$, +1

Q5. Which of the following is **not** an expression of Dalton's law of partial pressures?
(a) $P = P_1 + P_2$
(b) $P = P_1^{\circ} x_1$
(c) $P = P_1^{\circ} + (P_2^{\circ} - P_1^{\circ})x_2$
(d) $P_1 = P - P_2$

Q6. Which of the following defects are shown by KCI Crystal?
(A) Schottky defect
(B) Frenkel defect
(C) Metal excess defect
(D) Metal deficiency defect

Choose the **correct** answer from the options given below:
(a) (A) and (B) only
(b) (A) and (C) only
(c) (B) and (C) only
(d) (B) and (D) only

Q7. A drop of solution (Volume 0.05 mL) contains 3.0×10^{-6} mole of H^+ ions. If the rate constant of disappearance of H^+ is 1.0×10^{-7} mol litre^{-1} sec^{-1}, how long will take H^+ ions to disappear?
(a) $6 \times 10^{-8} s$
(b) $6 \times 10^{-9} s$
(c) $6 \times 10^{-7} s$
(d) $6 \times 10^{-10} s$

Q8. In Freundlich adsorption isotherm, the value of $\frac{1}{n}$ is.
(a) 1 in case of chemisorption
(b) 1 in case of physisorption
(c) between 0 and 1 in all cases
(d) between 2 and 4 in all cases

Q9. The oxoacid of sulphur which has a lone pair of electron on sulphur atom is:
(a) H_2SO_4
(b) H_2SO_3
(c) $H_2S_2O_8$
(d) $H_2S_2O_7$

Q10. The standard reduction potential for Sn^{4+}/Sn^{2+} is +0.15 V and for Cr^{3+}/Cr is -0.74 V. These two half-cells, coupled in their standard states, are connected to make a cell. The galvanic cell can be correctly represented by:
(a) $Sn^{2+}(aq)|Sn^{4+}(aq)||Cr(s)Cr^{3+}(aq)$
(b) $Sn^{4}+(aq)|Sn^{2+}(aq)||Cr^{3+}(aq)|Cr(s)$
(c) $Cr(s)|Cr^{3+}(aq)||Sn^{4+}(aq)|Sn^{2+}(aq)$
(d) $Cr(s)|Cr^{3+}(aq)||Sn^{2+}(aq)|Sn^{4+}(aq)$

Q11. In case of phosphorus, PCl_3 and PCl_5 are possible while nitrogen only forms NCl_3 and not NCl_5. This due to:
(a) Nitrogen is a gas while phosphorus is a solid at room temperature.
(b) Nitrogen does not have vacant d-orbitals in its atom while phosphorus has vacant d-orbitals.
(c) The electronegativity of nitrogen is higher than that of phosphorus.
(d) The atom of nitrogen is smaller in size than phosphorus.

Q12. The hormone which control the processes of burning of fats, proteins and carbohydrates, with liberation of energy in the body is:
(a) Thyroxine
(b) Insulin
(c) Adrenaline
(d) Estradiol

Q13. Which of the following electrolytes will have maximum coagulating value for AgI/ Ag^+ sol?
(a) Na_2S
(b) Na_3PO_4
(c) Na_2SO_4
(d) NaCl

Q14. The half-life of a first order reaction is 25 minutes. Its rate constant is:
(a) 2.27×10^{-2} min^{-1}
(b) 3.2×10^{-3} min^{-1}
(c) 9.2×10^{-2} min^{-1}
(d) 2.8×10^{-2} min^{-1}

Q15. Chemical formula of laughing gas is:
(a) NO
(b) N_2O
(c) N_2O_3
(d) N_2O_4

Q16. Match **List-I** with **List-II**:

List-I		List-II	
(A)	Fuel Cell	(I)	Rechargeable
(B)	Mercury Cell	(II)	Reaction at anode, $Zn \rightarrow Zn^{2+} + 2e^-$
(C)	Lechlanche Cell	(III)	Cell reaction $2H_2 + O_2 \rightarrow 2H_2O$
(D)	Ni-Cd Cell	(IV)	Gives steady potential

Choose the **correct** answer from the options given below:
(a) (A)-(I), (B)-(IV), (C)-(III), (D)-(II)
(b) (A)-(II), (B)-(I), (C)-(IV), (D)-(III)
(c) (A)-(III), (B)-(IV), (C)-(II), (D)-(I)
(d) (A)-(IV), (B)-(I), (C)-(II), (D)-(III)

Q17. Aspartame is most successful artificial sweetener but is only limited to cold food and cold drinks because:
(a) The control of sweetness of food is difficult
(b) Too many calories are released at high temperature
(c) Releases acetic acid when not in cold medium
(d) Unstable at cooking temperature

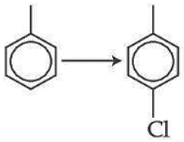
Q18. The cell reaction occurring at anode in the electrolysis of aqueous NaCl solution is:
(a) $H^+(aq) + e^- \rightarrow \frac{1}{2}H_2(g), E^\circ_{cell} = 0.00$ V
(b) $Cl^-(aq) \rightarrow \frac{1}{2}Cl_2(g) + e^-, E^\circ_{cell} = 1.36$ V
(c) $Na^+(aq) + e^- \rightarrow Na(s), E^\circ_{cell} = -2.71$ V
(d) $2H_2O(I) \rightarrow O_2(g) + 4H^+(aq) + 4e^-, E^\circ_{cell} = -1.23$ V

Q19. Arrange the following amines in the order of decreasing basic character in gaseous phase:
(A) NH_3
(B) $(CH)_3N$
(C) $(CH_3)_2NH$
(D) CH_3NH_2

Choose the **correct** answer from the options given below:
(a) $(CH_3)_2NH, CH_3NH_2, (CH_3)_3N, NH_3$
(b) $(CH_3)_3N, (CH_3)_2NH, CH_3NH_2, NH_3$
(c) $(CH_3)_2NH, (CH_3)_3N, CH_3NH_3, NH_3$
(d) $(CH_3)_3N, CH_3NH_2, (CH_3)_2NH, NH_3$

Q20. C_3H_6O does not form a silver mirror with Tollen's reagent but forms an oxime with hydroxylamine. It can give positive:
(a) Iodoform test
(b) Fehling's test
(c) Schiff's test
(d) Carbylamine test

Q21. The appropriate reagent for the following conversion is:



(a) SO_2Cl_2
(b) N-Chlorosuccinamide
(c) $Cl_2/FeCl_3$
(d) $SOCl_2$

Q22. Which of the following statement is correct about catalyst?
(a) Catalyst is required in large quantities to catalyse reactions.
(b) Same reactants may give different product by using different catalysts.
(c) Catalytic activity of catalyst does not depend upon the strength of chemisorption.
(d) A catalyst does not remains the same before and after the reaction

Q23. In the cyanide extraction process of silver the oxidising and reducing agents used are:
(a) O_2 and CO respectively
(b) O_2 and Zn dust respectively
(c) H_2O and Zn dust respectively
(d) H_2O and NaCN respectively

Q24. Which of the following statements is not correct?
(a) La is an element of transition series rather than Lanthanoid series
(b) $La(OH)_3$ is less basic than $Lu(OH)_3$
(c) In Lanthanoid series, ionic radius of Ln^{3+} ion decreases
(d) Atomic radii of Zr and Hf are same because of Lanthanoid contraction

Q25. Match **List-I** with **List-II**:

List-I K_H values/K bar		List-II Gas	
(A)	145	(I)	CO_2
(B)	89	(II)	He
(C)	76.5	(III)	N_2 (at 293 K)
(D)	1.67	(IV)	N_2 (at 303 K)

Choose the **correct** answer from the options given below:
(a) (A)-(II), (B)-(IV), (C)-(III), (D)-(I)
(b) (A)-(I), (B)-(II), (C)-(III), (D)-(IV)
(c) (A)-(II), (B)-(III), (C)-(IV), (D)-(I)
(d) (A)-(I), (B)-(III), (C)-(II), (D)-(IV)

Q26. Match **List-I** with **List-II**:

List-I		List-II	
(A)	Electrolytic reduction	(I)	Iron
(B)	Bessemerization	(II)	Zinc
(C)	Smelting	(III)	Aluminium
(D)	Reduction from oxide	(IV)	Copper

Choose the **correct** answer from the options given below:
(a) (A)-(III), (B)-(I), (C)-(II), (D)-(IV)
(b) (A)-(II), (B)-(III), (C)-(IV), (D)-(I)
(c) (A)-(III), (B)-(IV), (C)-(I), (D)-(II)
(d) (A)-(IV), (B)-(II), (C)-(III), (D)-(I)

Q27. Which of the following is not correct about the order of a reaction?
(a) The order of a reaction is the sum of the powers of molar concentration of the reactants in the rate law expression.
(b) The order of reaction is always equal to the sum of the stoichiometric coefficient of reactants in the balanced chemical equation of a reaction.
(c) The order of a reaction can be a fractional number.
(d) Order of a reaction is experimentally determined quantity.

Q28. The quantity of charge required to obtain 2 mol of Mn^{2+} from MnO_4^- is :
(a) 2 F
(b) 10 F
(c) 5 F
(d) 1 F

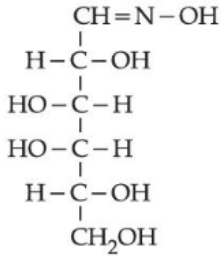
Q29. Amongst the following, identify the condensation polymer/ s :
(A) Bakelite
(B) Teflon
(C) Melamine formaldehyde resin
(D) Nylon-2 nylon-6
(E) Buna-S

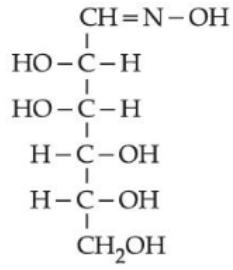
Choose the **correct** answer from the options given below:
(a) (B) and (E) only
(b) (A), (C) and (D) only
(c) (C) and (D) only
(d) (A), (B) and (E) only

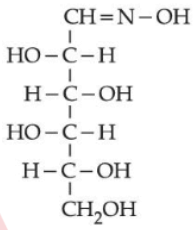
Q30. Which alloy is used for making bullets and lighter flints?
(a) Shell metal
(b) Misch metal
(c) Gun metal
(d) Monel metal

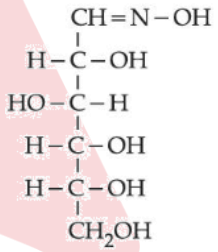
Q31. In amines, the nitrogen atom is A and B hybridised, making geometry of amines as C. Then A, B and C respectively are:
(a) trivalent, sp^2, trigonal
(b) tetravalent, sp^3, tetrahedral
(c) trivalent, sp^3, pyramidal
(d) tetravalent, sp^2, pyramidal

Q32. D(+) Glucose reacts with hydroxylamine and forms oxime. The structure of oxime would be:

(a) 

(b) 

(c) 

(d) 

Q33. Positive carbylamine test is shown by:
(a) N-Methylaniline
(b) N,N-Dimethlaniline
(c) Triethylamine
(d) p-Methylbenzylamine

Q34. Acetaldehyde and benzaldehyde can be best distinguished by:
(a) 2,4 DNP test
(b) Tollens' test
(c) Sodium bicarbonate test
(d) Fehling's test

Q35. A compound forms hexagonal closed packed structure. What is the number of tetrahedral voids in 0.8 mol of it?
(a) 1.5055×10^{23}
(b) 2.4088×10^{23}
(c) 9.635×10^{23}
(d) 3.011×10^{23}

Q36. Ammonia is manufactured by:
$N_2(g) + 3H_2(g)$ f $2NH_3(g) \Delta H_f^\circ = -46.1\ kJ/mol^{-1}$
The various steps involved are:
(A) Condensation of mixture of gases
(B) Passing the gaseous mixture over catalyst
(C) Compression of the mixture of gases
(D) Recirculation of the gaseous mixture

Choose the **correct** answer from the options given below:
(a) (C), (B), (A), (D)
(b) (B), (C), (D), (A)
(c) (A), (D), (C), (B)
(d) (B), (A), (D), (C)

Q37. Which of the following reaction will not produce ketones?
(a) Hydration of alkynes
(b) Ozonolysis of substituted alkenes
(c) Treating nitrite with a Grignard reagent
(d) Stephen's reaction

Q38. The minimum concentration of an electrolyte in millimoles per litre which is required to cause the precipitation of a sol in two hours is called as:
(a) Coagulating value
(b) Gold number
(c) Congorobin number
(d) Flocculation

Q39. The correct IUPAC name of $CH_3-\underset{\underset{C_2H_5}{|}}{CH}-CH_2-Br$ is:
(a) 1-Bromo-2-methylbutane
(b) 2-Bromo-2-ethylpropane
(c) 1-Bromo-2-ethyl-2-methyl ethane
(d) 2-Methyl-1 -bromobutane

Q40. Basic hydrolysis of esters produces:
(a) Carboxylates
(b) Carboxylic acids
(c) Aldehydes
(d) Ketones

Direction for the question 41 to 45: Answer the question on basis of passage given below:
Transition metals form a large number of complexes or coordination compounds in which the metal atoms are bound to a number of anions or neutral molecules. The valence bond theory explain the formation, magnetic behaviour and geometrical shapes while the crystal field theory explains the effect of different crystal fields on the degeneracy of d-orbitals energies of the central metal atom/ ion. This provides for the quantitative estimation of orbital separation energies, magnetic moments and spectral and stability parameters.

Q41. Two complexes of nickel have same geometry but different magnetic behaviour are:
(A) $[Ni(CN)_4]^{2-}$
(B) $[Ni(CO)_4]$
(C) $[NiCl_4]^{2-}$
(D) $[Ni(NH_3)_3]^{2+}$

Choose the **correct** answer from the options given below:
(a) (A) and (B) only
(b) (B) and (D) only
(c) (B) and (C) only
(d) (A) and (D) only

Q42. Which of the following complexes are not correctly matched with hybridisation of their central metal ion?
(a) $[Ni(H_2O)_6]^{2+}$ - sp^3d^2
(b) $[CoF_6]^{3-}$ - sp^3d^2
(c) $[Cu(NH_3)_4]^{2+}$ - dsp^2
(d) $[MnCl_4]^{2-}$ - dsp^2

Q43. Amongst the following ions which should have the highest magnetic moment value?
(a) $[NiCl_4]^{2-}$
(b) $[Mn(CN_6)]^{4-}$
(c) $[Cr(NH_3)_6]^{3+}$
(d) $[CoF_6]^{3-}$

Q44. The compound $[Pt(NH_3)_2Cl_2]$ exhibits:
(a) Geometrical isomerism
(b) Linkage isomerism
(c) Ionisation isomerism
(d) Coordination isomerism

Q45. Match **List-I** (Species/ions) with **List-II** (Colours)

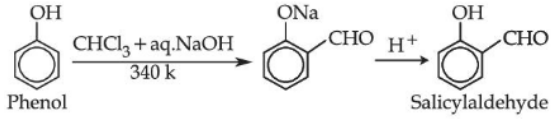
List-I		List-II	
(A)	Mn^{2+}	(I)	Yellow
(B)	Fe^{3+}	(II)	Green
(C)	Ni^{2+}	(III)	Blue
(D)	Cu^{2+}	(IV)	Pink

Choose the **correct** answer from the options given below:
(a) (A)-(II), (B)-(III), (C)-(I), (D)-(IV)
(b) (A)-(IV), (B)-(I), (C)-(II), (D)-(III)
(c) (A)-(II), (B)-(I), (C)-(IV), (D)-(III)
(d) (A)-(III), (B)-(IV), (C)-(I), (D)-(II)

Direction for the question 46 to 50: Answer the question on basis of passage given below:
Alcohols and phenol are formed when a hydrogen atom in a hydrocarbon, aliphatic and aromatic respectively, is replaced by - OH group. The substitution of a hydrogen atom in a hydrocarbon by an alkoxy or aryloxy group forms ethers.
Alcohols and phenol consist of two part, an alkyl/aryl group and a hydroxyl group. The properties of alcohols and phenols are primarily due to the hydroxyl group. The nature of alkyl and aryl groups simply modify these properties. Alcohol react both as nucleophiles and electrophiles whereas in phenols, the reactions that take place on the aromatic ring are electrophilic substitution reactions.

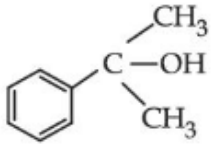
Q46. Aspirin is an acetylation product of:
(a) *o* - Dihydroxybenzoic acid
(b) *o* - Hydroxybenzoic acid
(c) *m* - Hydrxoybenzoic acid
(d) *p* - Dihydroxybenzene

Q47. Name the given reaction:



(a) Williamson's synthesis
(b) Kolbe's reaction
(c) Reimer-Tiemann reaction
(d) Sandmeyer's reaction

Q48. The IUPAC name of the following compound is:

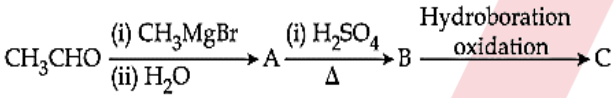


(a) 2-Methyl-2-phenyl ethanol
(b) 1-Methyl-1-phenyl ethanol
(c) 2-Phenylpropan-2-ol
(d) 1, 1-Dimethyl-1-phenyl methanol

Q49. Few compounds are given below (A to D). Arrange them in the increasing order of their boiling points.
(A) Pentan-l-ol
(B) n-Butane
(C) Pentan-l-al
(D) Ethoxyethane

Choose the **correct** answer from the options given below:
(a) (D) < (B) < (C) < (A)
(b) (B) < (C) < (A) < (D)
(c) (B) < (D) < (C) < (A)
(d) (D) < (B) < (A) < (C)

Q50. In the following reaction, compounds A and C are:



(a) identical
(b) positional isomers
(c) functional isomers
(d) optical isomers

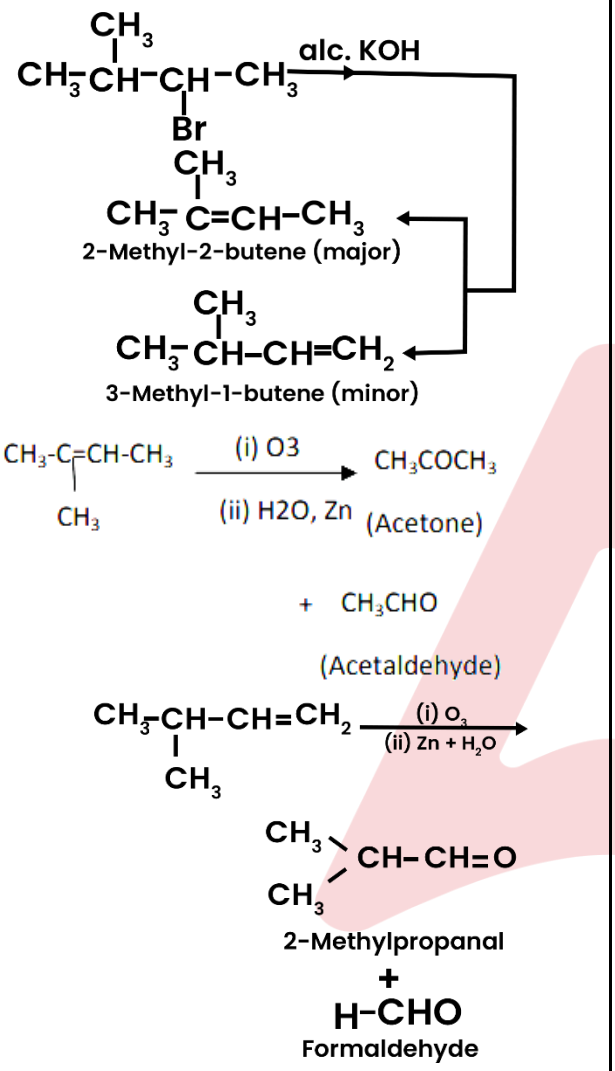
SOLUTIONS

S1. Ans. (a)

Sol. On mixing equal volumes of acetone and ethanol, positive deviation from Raoult's law is expected. The new interactions are weaker than those in the pure components. The observed vapor pressure of each component and the total vapour pressure are greater than predicted by Raoult's law.

S2. Ans. (b)

Sol.



S3. Ans. (d)

Sol. Glucose does not react with $NaHSO_3$ because it is not in a position to cause cleavage of the cyclic ring (δ-oxide ring) in glucose.

S4. Ans. (b)

Sol. In the reaction: $3Cl_2 + 6NaOH \longrightarrow 5NaCl + NaClO_3 + 3H_2O$, Cl_2 acts as an oxidizing agent as well as reducing agent.
The oxidation state of Chlorine in Sodium Chlorate is +5 { 3 × (-2) + (+1) + x =0 , x= +5}.

S5. Ans. (b)

Sol. $P_{total} = x_1p_1^0 + x_2P_2^0$

S6. Ans. (b)

Sol. In case of KCl, the cation and the anion are of comparable size. Hence, KCl is more likely to show Schottky defect.
NaCl and KCl show metal excess defect due to anionic vacancies.

S7. Ans.(b)

Sol. $K = 107\ molL^{-1}\ sec^{-1}$
$[H^+] = 3 \times 10^{-6}/0.05 \times 10^{-3} = 3/5 \times 10^{-1}\ molL^{-1}$
$Ln(A_0/A) = kt$
$t_{99\%} = \ln(A_0/A)/k$
$= \ln(3/5 \times 10^{-1}/(3/5 \times 10^{-3})/10^7$
$= 9.212 \times 10^{-3}$ sec
So,
$v = k[H^+] = 0.6 \times 10^{-1} \times 10^7$
$= 0.6 \times 10^6$
$= 6 \times 10^5\ mol^2L^{-1}s^{-1}$
$t = 6 \times 10^{-9}$ sec

S8. Ans. (c)

Sol. Freundlich adsorption isotherm
$x/m = kp^{1/n}$
at low pressure
$x/m\ \alpha\ p \Rightarrow x/m = kp$
at high pressure $x/m\ \alpha\ p^0$
at intermediated pressure
$x/m\ \alpha\ p^{1/n}$
1/n lies between 0 to 1

S9. Ans. (b)

Sol. The oxyacid of sulphur that contains a lone pair of electrons on sulfur is sulfurous acid H_2SO_3 in wich only 4 of ts valence electrons are involved in bonding remaining 2 electrons are remained as a lone pair sulfur(Sulr has six valence electrons).

S10. Ans. (c)

Sol. A galvanic electrochemical cell can be represented by writing the anode on the left-hand side and cathode on the right-hand side. The anode is represented by the solid phase or the metal first, followed by the electrolyte.
The right-hand electrode is therefore always the cathode, and the half-equation is always written as a reduction.

S11. Ans. (b)

Sol. There is no vacant d-orbital in the outermost orbit of Nitrogen. Thus, nitrogen show valency of only three. There are valence d-orbitals in the outer most orbit of phosphorus and hence it shows variable covalence 3 and 5 in ground state and excited state respectively. Hence nitrogen forms only NCl3 but phosphorus forms PCl3 and PCl5 both.

S12. Ans. (a)

Sol. Thyroxine is a hormone secreted by thyroid gland. This hormone controls various biochemicals reactions involving burning of proteins, carbohydrates, fats to release energy.

S13. Ans. (b)

Sol.

Electrolyte	Anionic part	Charge on anion}
Na_2S	S^{2-}	2
Na_3PO_4	PO_4^{3-}	3
Na_2PO_4	SO_4^{2-}	2
NaCl	Cl^-	1

According to hardy-schulze law, greater the charge on anion greater will be its coagulating power.
So, PO_4^{3-} have highest charge hence highest coagulating power.

S14. Ans. (a)
Sol. $t_{1/2} = 0.693/k$
$k = 0.693/t_{1/2} = 0.693/25 = 2.27 \times 10^{-2}\ min^{-1}$

S15. Ans. (b)
Sol. N_2O (also known as laughing gas) is produced abundantly by biogenic sources such as plants and yeasts.

S16. Ans. (c)
Sol. Hydrogen cell $[H_2–O_2]$ is an example of fuel cell.
Net reaction: $2H_2\ (g) + O_2\ (g) \rightarrow 2H_2O\ (l)$
[B] Mercury cells give a steady potential because, they do not involve the movement of ions.

$$\textbf{anode:}\ Zn \longrightarrow Zn^{2+} + 2e^-$$

[C] $$\textbf{cathode:}\ 2NH_4^+ + 2MnO_2 + 2e^- \longrightarrow Mn_2O_3 + 2NH_3 + H_2O$$

[D] Secondary battery: Secondary battery is rechargeable battery. Example: Nickel Cadmium Battery.
Hence, nickel cadmium battery is rechargeable.

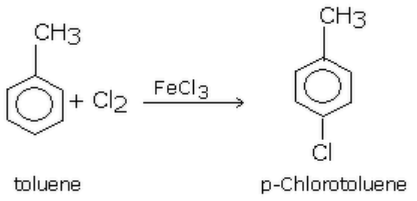
S17. Ans. (d)
Sol. Sugar substitutes are substances that are used in place of sweeteners with sugar (sucrose) or sugar alcohols. They may also be called artificial sweeteners.
Aspartame is the most successful and widely used artificial sweetener. It is roughly 100 times as sweet as cane sugar. It is methyl ester of dipeptide formed from aspartic acid and phenylalanine. Use of aspartame is limited to cold foods and soft drinks because it is unstable at cooking temperature.

S18. Ans. (b)
Sol. In the electrolysis of aqueous sodium chloride solution, chlorine gas is liberated at the anode. This is because Cl^- ions have lower discharge potential than OH^- ions.

S19. Ans. (a)
Sol. +I groups, like R groups, increases the electron density on nitrogen which increases the basicity (electron rich is basic) of amine. Of the given amines, more the number of R groups on nitrogen more is the basic nature of amine. Basicity also depends on the steric hindrance. More is the steric hindrance less is the basicity.
So, the correct order is $(CH_3)_2NH > CH_3NH_2 > (CH_3)_3N > NH_3$

S20. Ans. (a)
Sol. Since it gave an oxime with hydroxylamine it is either a ketone or an aldehyde and it didn't give silver mirror with Tollen's reagent so it is ketone. According to the given molecular formula, its structure is CH3–CO–CH3 and it can give positive iodoform test

S21. Ans. (c)
Sol.



toluene p-Chlorotoluene

S22. Ans. (b)
Sol. The action of a catalyst is highly selective in nature, i.e., a given substance can act as a catalyst only in a particular reaction and not for all the reactions. It means that a substance that acts as a catalyst in one reaction may fail to catalyse another reaction.

S23. Ans. (b)
Sol. In the cyanide extraction process of silver from argentite ore, the oxidising and reducing agents used are O_2 and Zn dust respectively.
Reactions are: $Ag_2S + 2CN^- + O_2 \rightarrow 2[Ag(CN)_2]^- + SO_2$
$Zn + 2[Ag(CN)_2]^- \rightarrow [Zn(CN)_4]^{2-} + 2Ag$

S24. Ans. (b)
Sol. $La(OH)_3$ is more basic than $Lu(OH)_3$. In lanthanides the basic character of hydroxides decreases as the ionic radius decreases.

S25. Ans. (a)
Sol. [A] The value for Henry's constant for helium, hydrogen, nitrogen and oxygen at 293 K are 144.97 kbar, 69.16 kbar, 76.48 kbar and 34.86 kbar respectively.
[D] KH values for $Ar(g), CO_2(g), HCHO(g)$ and $CH_4(g)$ are $40.39, 1.67, 1.83\times10^{-5}$ and 0.413 respectively.

S26. Ans. (c)
Sol. [A] Aluminium is extracted by electrolytic reduction method. In electro-refining method, impure metal is taken as anode and pure metal is made of cathode.
[B] Bessemerisation is a metallurgical process in which the air is blown to the copper matte which is kept in the Bessemer converter. And this blast of air converts a part of copper sulfide to copper (I) oxide. The molten copper formed will be 99% pure copper and it is also called Bessmer copper.
[C] Lead, iron and zinc can be extracted by smelting process.
[D] Reduction of ZnO with carbon on heating gives pure metal and CO gas.

S27. Ans. (b)
Sol. (A) Order of the reaction can be zero, positive and fractional.
(B) Order is an experimentally determined quantity.
(C) Order of reaction is not always equal to sum of stoichiometric coefficients of balanced equation for a reaction. As sometimes it can vary because of being experimentally verified.

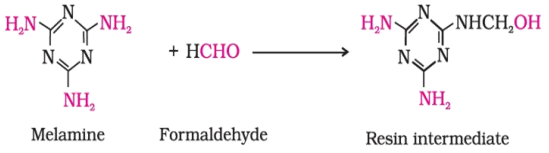
S28. Ans. (b)
Sol. 1F = 96500C is the charge required to change the oxidation number by one unit.
Change in oxidation number= +7 → +2 = 5
Hence, (5 x 2)F = 10 F charge is required for the reduction

S29. Ans. (b)

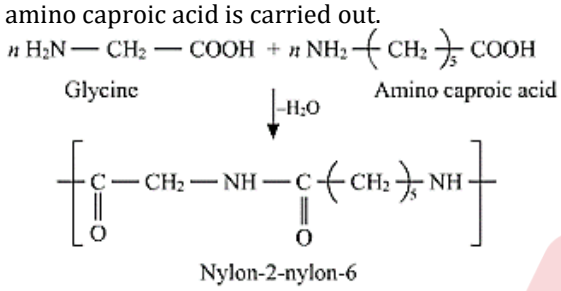
Sol. Condensation polymers are formed by a repeated condensation reaction between two bifunctional or trifunctional units usually with the elimination of small molecules like water, alcohol, ammonia, CO_2, HCl. e.g.,

(i) Bakelite is obtained by polymeristaion of phenol and formaldehyde.

(ii) Melamine- Formaldehyde-resin



[D] To prepare nylon-2-nylon-6 polymer, the condensation polymerization of glycine and amino caproic acid is carried out.



S30. Ans. (b)

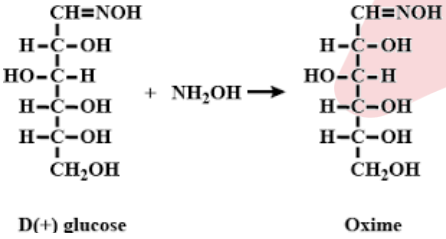
Sol. A well-known alloy misch metal which consists of a lanthanoid metal (95%) and iron (5%) and traces of S, C, Ca and Al. A good deal of misch metal is used in Mg– based alloy to produce bullets, shell and lighter flint.

S31. Ans. (c)

Sol. Like NH_3, N-atom in amines is trivalent and carries an unshared pair of electrons. Thus, nitrogen orbitals in amines are sp^3-hybridised and the geometry of amines is pyramidal.

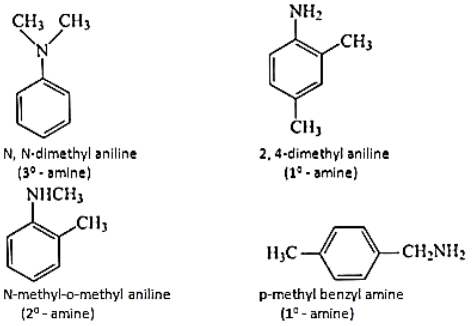
S32. Ans. (d)

Sol.



S33. Ans. (d)

Sol. A positive carbylamine test is given by only primary amines.



S34. Ans. (d)

Sol. Acetaldehyde forms a red color ppt whereas Benzaldehyde does not show any reaction with Fehling's test.

S35. Ans. (c)

Sol. Number of atoms in close packaging = 0.8 mol

1 has 6.022×10^{23} particles

So that

Number of close-packed particles$=0.8\times6.022\times10^{23} = 4.82\times10^{23}$

Number of tetrahedral voids = 2 × number of atoms in close packaging

Plug the values we get

Number of tetrahedral voids $=2\times4.82\times10^{23} =9.64\times10^{23}$

S36. Ans. (a)

Sol. The Haber Process combines nitrogen from the air with hydrogen to form ammonia. The reaction is reversible and the production of ammonia is exothermic. The following reaction takes place in the reactor.

$N_2(g)+H_2(g)\rightleftharpoons2NH_3(g)$

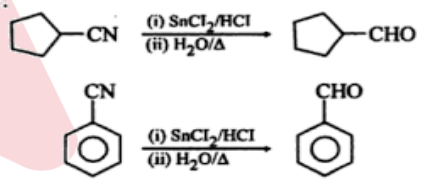
At each pass of the gases through the reactor, only about 15% of the nitrogen and hydrogen converts to ammonia. Gases are cooled and ammonia turns into liquid. Liquid ammonia is separated and rest of the gas is recycled. By continual recycling of the unreacted nitrogen and hydrogen, we get about 98% of ammonia.

S37. Ans. (d)

Sol. Stephen reaction is called as stephen reduction reaction or stephen aldehyde synthesis.

In this reaction, the alkyl nitrile is reduced to its respective imine in the presence of stannous chloride $SnCl_2$ and hydrochloride acid HCl to give aldehyde as the product.

EXAMPLES:

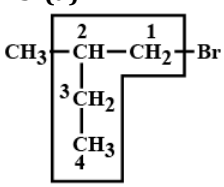


S38. Ans. (a)

Sol. The coagulatoin of a colloidal solution by an electrolyte does not take place until the added electrolyte has certain minimum concentration in the solution. The minimum concentration of an electrolyte in millimoles per litre required to cause precipitation of a sol in two hours is called coagulating value. The smaller the quantity needed, the higher will be the coagulating power of an ion.

S39. Ans. (a)

Sol.



S40. Ans. (a)

Sol. Hydrolysis is a most important reaction of esters. Acidic hydrolysis of an ester gives a carboxylic acid

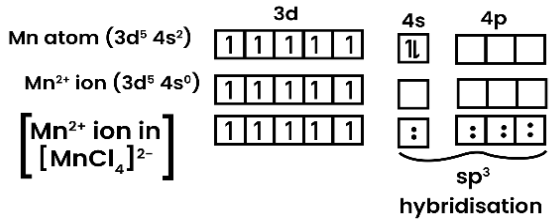
and an alcohol. Basic hydrolysis of an ester gives a carboxylate salt and an alcohol.

S41. Ans. (c)

Sol. $[NiCl_4]^{2-}$, there is Ni^{2+} ion, However, in the presence of weak field Cl^- ligands, NO pairing of d-electrons occurs. Therefore, Ni^{2+} undergoes sp^3 hybridization to make bonds with Cl^- ligands in tetrahedral geometry
$[Ni(CO)^4]$ is also tetrahedral because of sp^3
Though both $[NiCl_4]^{2-}$ and $[Ni(CO)_4]$ are tetrahedral, their magnetic characters are different. This is due to a difference in the nature of ligands. Cl^- is a weak field ligand and it does not cause the pairing of unpaired 3d electrons. Hence, $[NiCl_4]^{2-}$ is paramagnetic.
Since no unpaired electrons are present in this case, $[Ni(CO)_4]$ is diamagnetic.

S42. Ans. (d)

Sol.



S43. Ans. (d)

Sol. [A] The magnetic moment of $[NiCl_4]^{2-}$ is 2.82 BM.

[B] $Mn^{+2} \rightarrow 3d^5 4s^0 4p$
CN^- is strong ligands so creates back paring effect of (n−1)d orbitals configuration
So, unpaired e−=1

$$\mu = \sqrt{n(n+2)}B.M$$

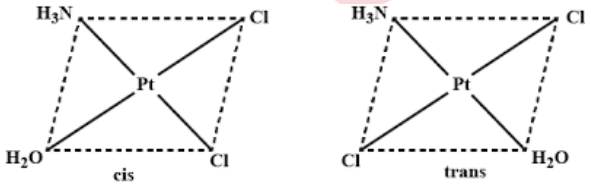
$$\mu = 1.73B.M$$

[C] the spin-only magnetic moments of $[Cr(NH_3)_6]^{3+}$ is 0 BM

[D] $[CoF_6]^{3-}$ and $[Co(NH_3)_6]^{3-}$ have spin-only magnetic moments of 4.8 BM.

S44. Ans. (a)

Sol. The number of geometrical isomers for $[Pt(NH_3)_2Cl_2]$ is two.



S45. Ans. (b)

Sol. [A] A particularly common oxidation state for manganese in aqueous solution is +2, which has a pale pink color.

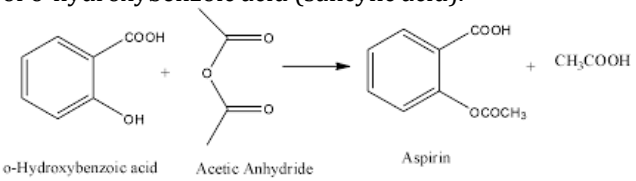
[B] Solutions that are yellow in colour usually contain Fe^{3+} ions.

[C] In Ni^{2+}, when an electron in the lower energy 3d sub-orbital moves up to the higher energy sub-orbital, it absorbs red light, leading thus to the appearance of a green colour.

[D] Aqueous Cu^{+2} ions are blue in color

S46. Ans. (b)

Sol. Aspirin (acetyl salicylic acid) is an acetylation product of o-hydroxybenzoic acid (salicylic acid).

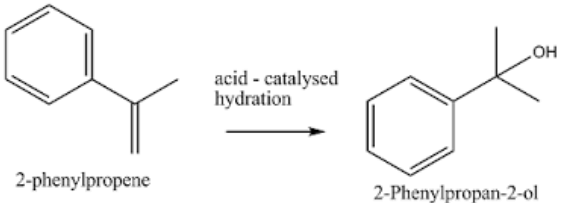


S47. Ans. (c)

Sol. Phenol can be converted into salicylaldehyde by Reimer-Tiemann reaction.

S48. Ans. (c)

Sol.



S49. Ans. (c)

Sol. Boiling points of ethers having molecular mass equal to or less than K-butane (i.e., 58 g mol-1) are higher than those of the corresponding n-alkanes. However, the boiling points of ethers having molecular mass equal to or higher than n-pentane (i.e., 72 g mol-1) are lower than the corresponding n-alkanes. Thus, b.p. of n-butane is lower than that of ethoxyethane. Further, the b.p. of alcohols are much higher than those of alkanes, and ethers of comparable molecular masses due to intermolecular H-bonding. However, boiling points of aldehydes are lower than those of corresponding alcohols due to absence of H-bonding but are still higher than those of alkanes and ethers of comparable molecular masses. Thus, the overall increasing order of boiling point is:
n-butane < ethoxyethane < pentanal < pentan-l-ol.

S50. Ans. (b)

Sol.