Previous Years Paper

5th June 2023 (Shift 1)

Q1. How much calcium will be obtained when 4 Faradays of electricity is passed through molten $CaCl_2$?
(a) 20 g
(b) 40 g
(c) 80 g
(d) 160 g

Q2. 0.01 M aqueous solutions of following salts were prepared. Their conductivity values were measured at 25°C. Which of the following will possess highest conductivity at 25°C?
(a) LiCl
(b) RbCl
(c) NaCl
(d) CsCl

Q3. Which of the following amines can be prepared by Gabriel synthesis?
(A) Isobutyl amine
(B) 2-Phenyl ethylamine
(C) N-Methyl benzyl amine
(D) Aniline
Choose the **correct** answer from the options given below:
(a) (A), (B) only
(b) (C), (D) only
(c) (A), (C) only
(d) (B), (D) only

Q4. The decomposition of H_2O_2 in alkaline medium, in presence of I^- ions occurs as follows:

$$2H_2O_2 \xrightarrow{I^-,\ \text{alkaline mediuim}} 2H_2O + O_2$$

If the reaction occurs in the following two steps:

Step 1: $H_2O_2 + I^- \xrightarrow[\text{Slow}]{} H_2O + IO^-$

Step 2: $H_2O_2 + IO^- \xrightarrow[\text{Fast}]{} H_2O + I^- + O_2$

The correct rate law expression for the reaction is:
(a) $r = k[H_2O_2]^2\,[I^-]$
(b) $r = k[H_2O_2]\,[I^-]$
(c) $r = k[H_2O_2][IO^-]$
(d) $r = k[H_2O_2]^2\,[I^-][OH^-]$

Q5. Identify the given name reaction:

$$R - NH_2 + CHCl_3 + 3KOH \xrightarrow{\text{Heat}} R - NC + 3KCl + 3H_2O$$

(a) Sandmeyer's reaction
(b) Carbylamine reaction
(c) Hoffman's bromamide reaction
(d) Hinsberg's reaction

Q6. A compound is formed by 2 elements P and Q. Atoms of element Q (as anions) makes ccp and those of P (as cations) fill all tertrahedral voids and also occupy half of the octahedral voids. What is the correct formula of this compound?
(a) P_2Q_5
(b) P_5Q_2
(c) P_2Q_3
(d) P_3Q_2

Q7. Arrange the following compounds in the order of their increasing boiling point:
Pentan-1-ol, n-butane, pentanal, ethoxy ethane
(a) n-butane < ethoxy ethane < pentanal < pentan-1-ol
(b) n-butane < pentanal < ethoxy ethane < pentan-1-ol
(c) n-butane < pental-1-ol < ethoxy ethane < pentanal
(d) pentan-1-ol < ethoxy ethane < pentanal < n-butane

Q8. The rate law for a reaction between substance P & Q is given by Rate = $k[P]^x[Q]^y$
If concentration of P is doubled and concentration of Q is halved, the ratio of the new rate to the earlier rate of reaction will be:
(a) $x + y$
(b) $x - y$
(c) $2^x - y$
(d) $\frac{1}{2^{x-y}}$

Q9. For the reactions $5Br^-(aq) + BrO_3^-(aq) + 6H^+(aq) \rightarrow 3Br_2(aq) + 3H_2O(1)$
The rate of the reaction is:
(a) one-fifth of rate of disappearance of Br^- ions
(b) one-fifth of rate of formation of Br_2
(c) one-third of rate of disappearance of BrO_3^- ions
(d) one-fourth of rate of formation of H_2O

Q10. We have four aqueous solution labelled as:
(A) 0.1 M NaCl
(B) 0.01 M NaCl
(C) 0.01 M $BaCl_2$
(D) 0.01 M Sucrose
Choose the **correct** increasing order of Van't Hoff factor from the options given below:
(a) $i_C < i_A < i_B < i_D$
(b) $i_D < i_C < i_B < i_A$
(c) $i_D < i_A = i_B < i_C$
(d) $i_C < i_A = i_B < i_D$

Q11. Match **List – I** with **List – II.**

	List – I		**List - II**
(A)	S_N1 reaction	(I)	Vic-dibromode
(B)	Bromination of alkenes	(II)	Gem-dibromide
(C)	Alkylidene halides	(III)	Racemisation
(D)	Dehydrohalogenation of haloalkanes	(IV)	Saytzeff rule

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

Q12. Which of the following statements about gold (Au) element are correct?
(A) Gold occurs in nature in native state.
(B) Gold dissolves in aqua-regia.
(C) Gold is extracted by leaching the metal with dilute NaCN.
(D) Leaching is followed by replacement reaction.
Choose the correct answer from the options given below:
(a) (B), (C), (D) only
(b) (A), (C), (D) only
(c) (A), (B), (C) only
(d) (A), (B), (C) and (D)

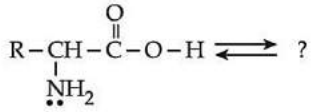
Q13. Methyl bromide reacts with silver nitrite to form:
(a) Nitromethane
(b) Methylnitrite
(c) Ethanenitrite
(d) Grignard reagent

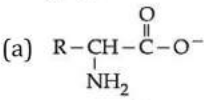
Q14. The volume of mixing (ΔV) is not zero for which of the following solutions?
(a) Chloroethane and Bromoethane
(b) Benzene and Toluene
(c) Ethanol and Acetone
(d) n-Hexane and n-Heptane

Q15. When dilute hydrochloric acid is added to sodium chromate solution the colour changes to:
(a) yellow
(b) colourless
(c) green
(d) organge

Q16. The complex having lowest Δ_O value among the given complexes is:
(a) $[Co(NH_3)_6]^{3+}$
(b) $[Cr(H_2O)_6]^{3+}$
(c) $[Co(CN)_6]^{3-}$
(d) $[CrCl_6]^{3-}$

Q17. Which one is the correct Zwitter ion of the following protein?



(a)


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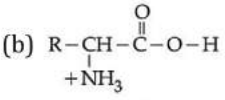

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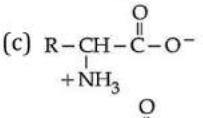
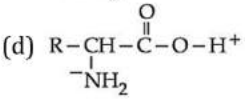


(d)


Q18. The actual density of a crystal of NaCl is observed to be lower than the expected value. It is caused due to the presence of:
(a) Interstitial Defect
(b) Frenkel Defect
(c) Schottky Defect
(d) Impurity Defect

Q19. The pair(s) of co-ordination complexes/ions exhibiting the same kind of isomerism is / are:
(A) $[Cr(NH_3)_5Cl]Cl_2$ and $[Cr(NH_3)_4Cl_2]Cl$
(B) $[Co(NH_3)_4Cl_2]^+$ and $[Pt(NH_3)_2(H_2O)Cl]^+$
(C) $[CoBr_2Cl_2]^{-2}$ and $[PtBr_2Cl_2]^{2-}$
(D) $[Pt(NH_3)_3(NO_3)]Cl$ and $[Pt(NH_3)_3Cl]Br$
Choose the **correct** answer from the options given below:
(a) (A) and (C) only
(b) (B) and (D) only
(c) (A) and (D) only
(d) (C) and (D) only

Q20. Match **List – I** with **List – II.**

	List – I		List - II
(A)	Polyvinyl chloride	(I)	Phenol formaldehyde
(B)	Urea-formaldehyde	(II)	Ethyleneglycol and phthalic acid
(C)	Glyptal	(III))	Vinyl chloride
(D)	Bakelite	(IV)	Urea formaldehyde

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

Q21. 0.01 molal aqueous solutions of strong electrolytes NaCl, KCl, $MgSO_4$ and K_2SO_4 are prepared. Which of the following statements is correct regarding their osmotic pressure? (Assume complete dissociation of solute particles)
(a) All of them exhibit equal osmotic pressure
(b) Osmotic pressure of all of them are different
(c) $MgSO_4$ has highest osmotic pressure
(d) K_2SO_4 has highest osmotic pressure

Q22. In the extraction of metallic Zn from calamine ore ($ZnCO_3$) following steps are involved:
(A) Distillation of impure Zn
(B) Calcination of the ore
(C) Hydraulic washing of ore
(D) Reduction of ZnO using coke
Choose the **correct** order of steps from the options given below:
(a) (C), (D), (B), (A)
(b) (C), (B), (D), (A)
(c) (A), (B), (C), (D)
(d) (A), (C), (B), (D)

Q23. Match **List – I** with **List – II.**

	List – I		List - II
(A)	Glycosidic linkage	(I)	Momomeric units of nucleic acid
(B)	Peptide linkage	(II)	Sugar-heterocyclic base combination
(C)	Nucleotide	(III)	Linkage between two amino acid units

(D)	Nucleoside	(IV)	Linkage between two mono saccharide units

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

Q24. Which property is observed in an emulsion?
(a) Tyndall effect
(b) Brownian motion
(c) Tyndall effect and Brownian motion
(d) Stable in nature

Q25. Which phenomenon occurs when an electric field is applied to a colloidal solution and electrophoresis is prevented?
(A) Reverse osmosis takes place
(B) Electroosmosis takes place
(C) Dispersion medium begins to move in an electric field
(D) Dispersion medium becomes stationary
Choose the **correct** answer from the options given below:
(a) (A), (D) only
(b) (B), (D) only
(c) (A), (C) only
(d) (B), (C) only

Q26. When electric current is passed through acidified water, 448 mL of hydrogen gas at STP is collected at the cathode in 965 seconds. The current passed in amperes is:
(a) 1.0
(b) 2.5
(c) 3.0
(d) 4.0

Q27. A square planar complex is formed by hybridization:
(a) s, p_x, p_y, p_z
(b) s, p_x, p_y, d_z2
(c) s, p_y, p_z, d_{xy}
(d) $s, p_x, p_y, d_{x^2-y^2}$

Q28. The hormone responsible for preparing the uterus for implantation of fertilised egg is:
(a) Progesterone
(b) Testosterone
(c) Epinephrine
(d) Norepinephrine

Q29. Which of the following statement is **incorrect?**
(a) Brownian movement stabilises **sol.**
(b) Both emulsifier and peptising agents stabilises colloids but their actions are different.
(c) Mixing two oppositely charged sols neutralizes their charges and stabilises the colloid.
(d) The stability of lyophobic colloidal particles is due to preferential adsorption of ions on their surface from the solution.

Q30. Which of the following process is responsible for the formation of delta at a place where rivers meet the sea?
(a) Emulsification
(b) Colloid formation
(c) Coagulation
(d) Peptization

Q31. Match **List – I** with **List – II.**

	List – I		**List - II**
(A)	Ethanol and Diethyl ether	(I)	Lucas reagent
(B)	Methanol and Ethanol	(II)	Sodium metal
(C)	n-Butyl alcohol and tert. Butyl alcohol	(III)	Iodoform test
(D)	Phenol and Cyclohexanol	(IV)	Ferric Chloride

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

Q32. o-Nitrophenol is less soluble in water than p-nitrophenol because:
(a) o-Nitrophenol is more steam volatile than p-nitrophenol
(b) o-Nitrophenol shows intramolecular H-bonding
(c) o-Nitrophenol shows intermolecular H-bonding
(d) Melting point of o-Nitrophenol is lower than p-nitrophenol

Q33. In the 3d series of transition elements, the element more likely to exhibit + 1 oxidation state is:
(a) Fe
(b) Mn
(c) Cu
(d) Ag

Q34. An aromatic compound 'A' of molecular formula C_7H_7ON undergoes a series of reaction as:

$$\underset{A}{C_7H_7ON} \xrightarrow{Br_2/\,KOH} B \xrightarrow{NaNO_2+HCl} C \xrightarrow{CH_3CH_2OH} D$$

Identify compound D:
(a) C_7H_5N
(b) C_6H_6O
(c) C_6H_7N
(d) C_6H_6

Q35. The magnetic moment of Cu^{2+}ion (Z = 29) is:
(a) $\sqrt{3}$
(b) $\sqrt{8}$
(c) $\sqrt{2}$
(d) $\sqrt{4}$

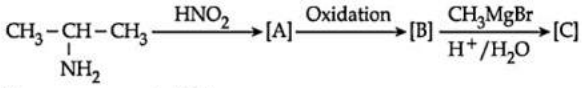
Q36. The correct statements about Cr^{2+} and Mn^{3+} are: (atomic number of Cr = 24 and Mn = 25)
(A) $Cr^{2+}$is a reducing agent
(B) Mn^{3+} is an oxidising agent
(C) Both Cr^{2+} and Mn^{3+} exhibit d^4 electronic configuration
(D) When Cr^{2+} is used as reducing agent chromium ion attains d^5 electronic configuration

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

Q37. The formation of micelle takes place only:
(A) above a particular temperature called kraft temperature
(B) above a particular concentration called critical micelle concentration
(C) when catalyst is added
Choose the **correct** answer from the options given below:
(a) (A), (B) and (C)
(b) (B), (C) Only
(c) (A), (C) Only
(d) (A), (B) Only

Q38. Antiseptics and disinfectants either kill or prevent growth of micro-organism. Identify which of the following statements is **not** true**?**
(A) Disinfectants harm the living tissues.
(B) A 0.2% solution of phenol is an antiseptic while 1% solution acts as disinfectant.
(C) Chlorine and Iodine are used as strong disinfectants.
(D) Dilute solution of boric acid and hydrogen peroxide are antiseptics
(E) Iodoform is also used as an antiseptic for wounds.
Choose the **correct** answer from the options given below:
(a) (C) only
(b) (D) only
(c) (E) only
(d) (A) and (B) only

Q39. In the following sequence of reactions:



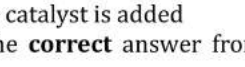
The compound [C] is:
(a) Butan-l-ol
(b) Butan-2-ol
(c) 1, 1-Dimethyl ethanol
(d) 2-methyl propan-2-ol

Q40. An alkyl halide with molecular formula C_6H_{13} Br on dehydrohalogenation gave two isomeric alkenes A and B with molecular formula C_6H_{12}. On reductive ozonolysis, A and B gave four compounds CH_3COCH_3, CH_3CHO, CH_3CH_2CHO and $(CH_3)_2CHCHO$. The alkyl halide is:
(a) 2-Bromohexane
(b) 2,2-Dimethyl-1-bromobutane
(c) 2-Bromo-2,3-dimethylbutane
(d) 3-Bromo-2-methylpentane

Direction (Q41-Q45) Answer the question on the basis of passage given below:
A ketone [A] which undergoes haloform reaction gives compound [B] on reduction. Compound [B] on heating with sulphuric acid gives compound [C] which forms monozonide [D]. The compound [D] on hydrolysis in the presence of zinc dust gives compound [E]. Compound [E] on oxidation gives $C_2H_4O_2$[F]

Q41. Identify Compound [A]
(a) Butan-2-one
(b) 3-methyl Pentan-2-one
(c) Propanone
(d) Acetophenone

Q42. The compound [B] formed can be prepared from reaction of aq.KOH. with:
(a) $CH_3CH_2CH_2 - Cl$

(b) 

(c) 

(d) 

Q43. Compound [E] in presence of dil NaOH gives:
(a) But-2-enal
(b) Methanol
(c) 2-Methyl but-2-enal
(d) Pent-2-enal

Q44. Compound [F]($C_2H_4O_2$) on treatment with chlorine, in the presence of small amount of red phosphorus, gives:
(a) $CH_3CH_2 - Cl$
(b) CH_3COCl
(c) $ClCH_2COOH$
(d) $ClCH_2CH_2 - Cl$

Q45. The boiling point of [A] observed is exceptionally high because of:
(a) Intermolecular-H-bond
(b) Intramolecular-H-bond
(c) Like interaction
(d) Dipole-Dipole interaction

Direction (Q46-Q50) Answer the questions on basis of passage given below:
The noble gases He to Rn have close shell configuration and are monoatomic gases under normal conditions. Though mostly unreactive, but direct reaction of Xe with F_2 leads to a series of compounds with Xe oxidation numbers +2, +4 and +6. When certain compounds like phenol and quinol are crystallised in the presence of noble gas such as Ar, Kr and Xe a category of compound called clathrates are formed. In these the noble gas atoms are trapped in the cavities of the crystal lattices. The compounds which crystallise are known as hosts (H) while the noble gas atoms are called guests (G). The general formula of a clathrate compound is nHmG, where n is the number of host molecules and m is the number of atoms a molecule of guest.

Q46. In what molar ratio must Xe and F_2 be taken to give XeF_4?
(a) 1 : 1
(b) 1 : 2
(c) 2 : 1
(d) 1 : 5

Q47. XeF_4 and XeF_6 are:
(a) reducing agent

(b) oxidising agent
(c) unreactive
(d) strongly basic

Q48. Which force is responsible for holding Ar in its clathrate compound with quinol?
(a) Van der Waal
(b) Hydrogen bond
(c) Ionic bond
(d) Covalent bond

Q49. Match **List – I** with **List – II.**

	List – I		**List - II**
(A)	SF_4	(I)	Bent 'T'
(B)	BrF_3	(II)	Pyramidal
(C)	BrO_3^-	(III)	Seesaw
(D)	$XeOF_4$	(IV)	Square pyramidal

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

Q50. Which factors are responsible for making fluorine the strongest oxidising agent?
(A) Highest electronegativity
(B) High electron gain enthalphy
(C) High bond dissociation enthalphy
(D) Small size of flourine
Choose the **correct** answer from the options given below:
(a) (A), (B) and (D) only
(b) (B), (C) and (D) only
(c) (A), (C) and (D) only
(d) (B) and (C) only

SOLUTIONS

S1. Ans. (d)

Sol. We know that, 1 Faraday charge liberates one gram-equivalent of a metal, hence 4 F charge will liberate = 4 x 40 = 160 g of Calcium

S2. Ans. (d)

Sol. Note that anion Cl^{c-} is same in all the given compounds. So, the conductance value will only depend on the size of cation in aqueous solution.
Since $\Lambda_{mCs\oplus} > \Lambda_{mRb\oplus} > \Lambda_{mNa\oplus} > \Lambda_{mLi\oplus}$
Hence , $\Lambda_{mCsCl} > \Lambda_{mRbCl} > \Lambda_{mNaCl} > \Lambda_{mLiCl}$

S3. Ans. (a)

Sol. Only primary aliphatic amines such as $(CH_3)_2CH_2CH_2NH_2$ (a) and $C_6H_5CH_2CH_2NH_2$ (b) can be prepared by Gabriel synthesis, 2∘ amines, i.e., $C_6H_5CH_2NHCH_3$ (c) and aromatic 1∘ amines, i.e., $C_6H_5NH_2$ (d), however, cannot be prepared.

S4. Ans. (b)

Sol. As step (1) is slow, it is the rate-determining step as it dictates the overall pace of the reaction, hence its Rate $=k[H_2O_2][I^-]$

S5. Ans. (b)

Sol. $RNH_2 + CHCl_3 + 3KOH \longrightarrow RNC + 3KCl + 3H_2O$
This reaction is known as carbylamine reaction.

S6. Ans. (b)

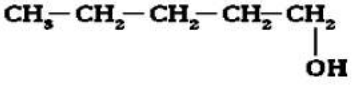
Sol. Given, the compound is formed by two elements p and q Atom Q is in CCP arrangement we know,
Number of atoms in CCP (N) = 4
Atom P occupy tetrahedral void and half octahedral void
Number of tetrahedral void = 2N = 2 x 4 = 8
Number of octahedral voids = N = 4
Thus, atom P = 8 + 4/2 = 10
$P_{10}Q_4$
Thus formula of the compound is P_5Q_2

S7. Ans. (a)

Sol. Factors affecting boiling point

1. Number of carbon atoms:
   As the number of carbon atoms increases in alcohol molecule, the boiling point of alcohol also increases as the molecular mass increases which increases the molecular attraction between molecules.
2. Branching in molecules:
   As the number of branching increases, the boiling point of alcohol decreases because branching in molecules decreases the surface area thereby decreasing the attractive forces between individual molecules.
3. Hydrogen bonding:
   As the extent of hydrogen bonding increases, the boiling point also increases due to increase in the attractive forces between individual molecules.

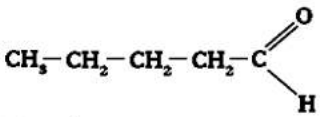
Boiling point order

a: 

Pentan−1−ol

b: $CH_3-CH_2-CH_2-CH_3$

n−butane

c: 

Pentanal

d: $CH_3-CH_2-OCH_2-CH_3$

Ethoxy ethane

If pentan-1-ol and pentanal are compared, both compounds have almost same molecular mass so, similar London forces. Moreover, dipole-dipole interactions are also similar in both the compounds only hydrogen bonding is making a difference as extent of intermolecular hydrogen bonding is greater in case of pentan-1-ol than pentanal. Hence, boiling point of pentan-1-ol is greater than pentanal.
Hence considering all factors, increasing order of boiling point will be:
n-butane < ethoxyethane < pentanal < pentan-1-ol

S8. Ans. (c)

Sol. rate = $k[A]^x[B]^y$
On doubling the concentration of A and making the volume of B half, the new rate becomes $2^x \times (1/2)^y$ = 2-times the earlier rate.
So Ratio is 2^{x-y}

S9. Ans. (a)

Sol. For the given reaction,
$BrO_3^- + 5Br^-(aq) + 6H^+ \rightarrow 3Br_2(l), + 3H_2O(l)$
Rate of reaction in terms of Br_2 and Br^- is,
Rate = $1/3[d[Br_2]/dt = -1/5d[Br^-]/dt$

S10. Ans. (c)

Sol. The extent to which a substance associates or dissociates in a solution is described by the Van't Hoff factor.
i = Total number of moles of particles after association/dissociation / Number of moles of particles before association/dissociation
Both NaCl and $BaCl_2$ are strong electrolytes and completely dissociate in aqueous solution.
$NaCl \rightarrow Na^+ + Cl^-$
i=2/1=2
Thus, value of Van't Hoff factor for NaCl solution with concentrations 0.1M, 0.01M and 0.001M will be same because these concentrations represent dilute solutions.
$BaCl_2 \rightarrow Ba^{2+} + 2Cl^-$
i = 3/1 = 3
Sucrose is neither weak nor strong electrolyte. It's not an electrolyte, it doesn't dissociate or associate in it's aqueous solution. But simply dissolve in water.

S11. Ans. (d)

Sol. A. A mixture containing two enantiomers in equal proportions will have zero optical rotation, such a mixture is known as racemic mixture. The process of conversion of enantiomers into a racemic mixture is known as racemization. If an alkyl

halide follows AN1 mechanism then racemization takes place, while if it

B. In vicinal dihalides, halogens atoms are present on the adjacent carbon atom, bromination of alkenes will give vicinal dihalides.

C. Alkylidene halides are named as Gem-dihalides. In gem-dihalides halogen atoms are present on same carbon atom.

D. Saytzeff's rule
In dehydrohalogenation reactions, the preferred product is that alkene which has a greater number of alkyl groups attached to the doubly bonded carbon atoms. Saytzeff's rule helps to determine the formation of the major alkene in a dehydrohalogenation reaction.

S12. Ans. (c)

Sol. Correct statements:

[A] Gold doesn't react with very many other elements, hence it is often found in its native form in the Earth's crust

[B] Gold is soluble in aqua-regia.

[C] Extraction of gold from its native ore involves leaching the metal ore with dilute solution of NaCN in presence of air.

S13. Ans. (a)

Sol. $CH_2Br \xrightarrow{AgNO_2} CH_2NO_2 + AgBr$

S14. Ans. (c)

Sol. A solution of acetone in ethanol deviates from Raoult's law in a positive way. This is due to the fact that ethanol molecules are strongly hydrogen-bonded. When acetone is added, the hydrogen bonds are broken and ethanol becomes more volatile. As a result, its vapour pressure rises.

S15. Ans. (d)

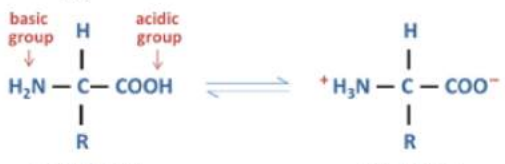
Sol. When dilute hydrochloric acid (Yellow colour) is added to yellow coloured sodium chromate solution then the colour of the solution will changes to orange.

S16. Ans. (d)

Sol. CFSE depends on number of d-electron in metal ion.
Cr - $1s^2\ 2s^2\ 2p6\ 3s^2\ 3p^6\ 3d^4$, so d orbital contains 4 electrons
Co - $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^7\ 4s^2$
CFSE is higher when the complex contains strong field ligand. Thus, crystal field splitting energy increases in the order
Because according to spectrochemical series the order of field strength is
Cl- < H2O < NH3 < CN-

S17. Ans. (c)

Sol.



S18. Ans. (c)

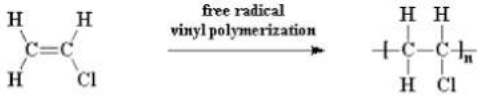
Sol. Schottky defect causes decrease in the density of a crystal. In this defect, equal number of cations and anions are missing from their position in the crystal lattice.
Frenkel defect does not alter the density of a crystal. In this defect, cation or anion occupies an interstitial position.

S19. Ans. (b)

Sol. The pairs of coordination complexes/ions exhibiting the same kind of isomerism are: Octahedral $[Co(NH_3)_4Cl_2]^+$ and square planar $[Pt(NH_3)_2(H_2O)Cl]^+$ which shows geometrical (cis-trans) isomerism.
Square planar $[Pt(NH_3)_3(NO_3)]Cl$ and square planar $[Pt(NH_3)_3\ Cl]Br$ shows ionization isomerism.
The pairs of coordination complexes/ions NOT exhibiting the same kind of isomerism are:
$[Cr(NH_3)_5Cl]Cl_2$ neither shows structural nor stereoisomerism.
$[Cr(NH_3)_4Cl_2]Cl$ shows geometrical (cis trans) isomerism
Tetrahedral $[CoBr_2Cl_2]^{2-}$ and square planar $[PtBr_2Cl_2]^{2-}$ do not show same type of isomerism.

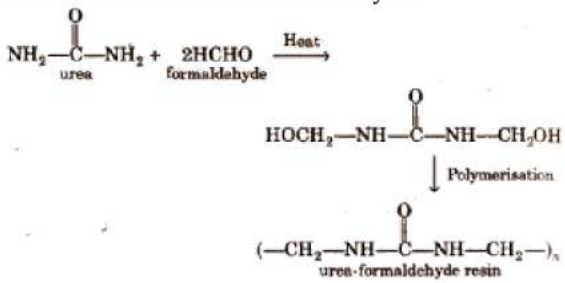
S20. Ans. (a)

Sol. A. PVC is produced from its monomer, vinyl chloride.

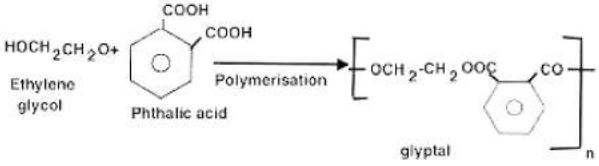


vinyl chloride — poly(vinyl chloride)

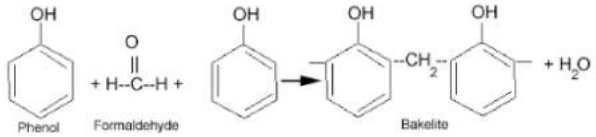
B. It is urea formaldehyde polymer and it's monomers are urea and formaldehyde.



C. The structure of Glyptal is made up of two monomers Ethylene glycol and Phthalic acid



D. Bakelite is a polymer made up of the monomers phenol and formaldehyde.



S21. Ans.(d)

Sol. osmotic pressure (π) = MRTi
π = 0.01 RT i

Only Van't Hoff factor varies for each compound given in the options i.e., $\pi \propto i$

For option (d) only, $K_2SO_4 \rightarrow 2K^+ + SO_4^{2-}$

$i = 3/1 = 3$

S22. Ans. (d)

Sol.
A. Distillation is used for low boiling metals like zinc. The impure metal is evaporated under low pressure to obtain the pure metal as distillate.
C. The powdered ore is washed using an upward stream of flowing water. The heavier ore particles are left after the lighter gangue particles are washed away.
B. Calcination is defined as the process of converting ore into an oxide by heating it strongly. The ore is heated below its melting point either in absence of air or in limited supply.
D. The reaction is as follows: $ZnO(s) + C(g) \xrightarrow{1400^\circ C} Zn(s) + CO(g)$

S23. Ans. (c)

Sol.
A. Glycosidic linkage: Joint monosaccharide units.
B. Peptide linkage: Joint amino acid units.
C. Each nucleotide consists of a heterocyclic base, a pentose sugar (2'-deoxy-d-ribofuranose), and a phosphate group. There are four heterocyclic bases in DNA: adenine (A), guanine (G), cytosine (C) and thymine (T).
D. Nucleosides are monomers of nucleic acids, DNA and RNA.

S24. Ans. (c)

Sol. Both tyndall effect and brownian is observed as milk is also an liquid and every liquid shows brownian motion.

S25. Ans. (d)

Sol. When electrophoresis, i.e, movement of particles is prevented by some suitable means, it is observed that the dispersion medium begins to move in an electric field. This phenomenon is termed electroosmosis.

S26. Ans. (a)

Sol. Step 1: Calculation weight of hydrogen in given volume

At STP, volume of one mole of hydrogen gas is 22.4 L = 22400 mL

Weight of one mole of of H_2 = 2 g

22400 mL of H_2 = 2 g.

448 mL of H2 = 2 x 448/22400 = 0.04 g

Step 2: Calculation for amount of current

$2H^+ + 2e^- \rightarrow H_2$

According to Faraday's law,

nF=1 mole

where, F = Faraday's constant =96500 C

n = number of electrons = 2

∴Charge required to deposit 2g of hydrogen = 2 × 96500

∴Charge required to deposit 0.01g of hydrogen = 2×96500×0.04/2 = 1102.8 C

Current = Charge/time

Current = 1102.8/965

Current = 1.14 ≈ 1

S27. Ans. (d)

Sol. A square planar complex is formed by hybridization of s, p_x, p_y, d_{x2-y2} atomic orbitals. All these orbitals lie in the xy plane. Four ligands also lie in the xy plane. This results in maximum overlap.

S28. Ans. (a)

Sol. Progesterone's presence is critical in maintaining the lining of the endometrium, which is necessary for the implantation and growth of the embryo.

S29. Ans.(c)

Sol. When dispersed phase is added in excess, it forms a separate layer and thus the emulsion gets destabilized.

S30. Ans. (c)

Sol. River water is a colloidal solution containing many solid particles like sand, clay etc.

Sea water contains electrolyte NaCl.

Electrolytes present in sea water coagulate the colloidal solution of the river water.

The place where river meets with sea formation of Delta takes place due to coagulation process in which sea water help river water to coagulate.

S31. Ans. (d)

Sol.
A. A reaction with sodium metal can be used to differentiate between ethanol and diethyl ether. While ether does not react with sodium metal, ethanol will react and release H2 gas.
B. Methanol and ethanol are distinguished by a type of test known as iodoform when ethanol is warmed with iodine in the presence of NaOH, it forms a yellow coloured precipitate but methanol do not react positively to iodoform test.
C. Tert. butyl alcohol reacts immediately with ($ZnCl_2$+HCl) Lucas reagent to form cloudiness, secondary butyl alcohol reacts within 5 minutes while n-butyl alcohol does not react at all room temperature.
D. Phenol gives violet colour with $FeCl_3$ solution but cyclohexanol does not.

S32. Ans. (b)

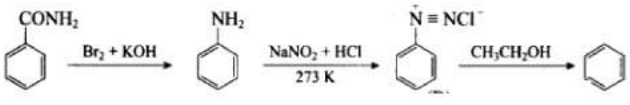
Sol. There is intramolecular H-bonding in o-nitrophenol and thus solubility in water is decreased.

S33. Ans. (c)

Sol. Copper metal (with electronic configuration $[Ar]3d^{10}4s^1$) in the first series of transition metals exhibits +1 oxidation state most frequently as it readily loses one electron (present in 4s orbital) to give stable 3d10 electronic configuration.

S34. Ans. (d)

Sol.



S35. Ans. (a)

Cu_{29} = [Ar] $3d^{10}$ $4s^1$

Cu^{2+} = [Ar] $3d^{10}$ $4s$

Sol.

Cu^{2+} has 1 unpaired electron

$\mu = \sqrt{n(n+2)}BM$

$\mu = \sqrt{1(1+2)} = \sqrt{3}BM$

S36. Ans. (b)

Sol. (A) Cr^{2+} is a reducing agent. It itself loses electrons (and hence acts as a reducing agent) and forms higher oxidation states. In fact, +6 oxidation state of Cr is very stable.
Hence, the option (A) is correct.

(B) Mn^{3+} is an oxidizing agent. It itself gains electrons (and hence acts as an oxidizing agent) to form Mn2+ with 3d5 electronic configuration which is stable as it is half-filled.
Hence, the option (B) is correct.

(C) Cr and Mn have outer ionic configurations of $3d^5$ $4s^1$ and $3d^5$ $4s^2$ respectively.
Hence, both Cr^{2+} and Mn^{3+} exhibit d4 electronic configuration.
Hence, the option (C) is correct.

(D) When Cr^{2+} is used as a reducing agent, the chromium ion attains d3 (as in Cr^{3+}) electronic configuration.

S37. Ans. (d)

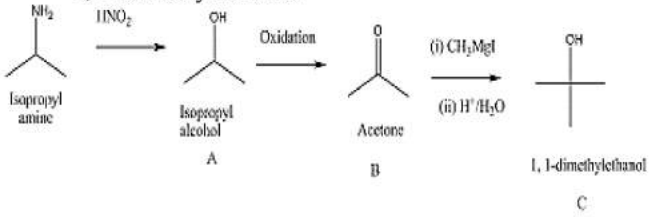
Sol. Associated colloids are substances which at low concentrations behave as normal strong electrolytes, but at higher concentrations exhibit colloidal behaviour due to the formation of aggregates.
The aggregated particles thus formed are called micelles.
The formation of micelles takes place only above a particular temperature called Kraft temperature (Tk) and above a particular concentration called critical micelle concentration (CMC).

S38. Ans. (b)

Sol. A 0.2% solution of phenol is an antiseptic while 1% solution acts as a disinfectant.
Chlorine and Iodine are used as strong disinfectants.
Dilute solution of boric acid is an antiseptic used to wash eyes and hydrogen peroxide is disinfectant.
Disinfectants harm the living tissues.

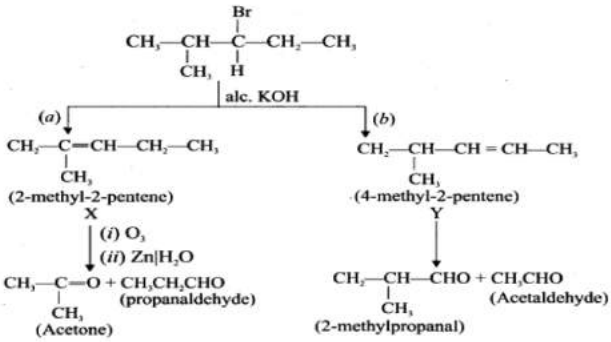
S39. Ans. (c)

Sol. The end product (C) is 1, 1-dimethylethanol.
Isopropyl amine reacts with nitrous acid to form isopropyl alcohol. On oxidation acetone is obtained which then reacts with methyl magnesium iodide (a Grignard reagent) followed by acid hydrolysis to give 1, 1-dimethylethanol..



S40. Ans. (d)

Sol.



S41. Ans.(a)

Sol. A Ketone A(C_4H_8O) undergoes haloform reaction, So the Ketone should have –C=O–CH3 group.
So the structure of A is

$CH_3 - CH_2 - \underset{\underset{O}{\|}}{C} - CH_3$.

S42. Ans. (c)

Sol. $CH_3 - \underset{\underset{Cl}{|}}{CH} - CH_2 - CH_3 \xrightarrow{Aq.KOH} CH_3 - \underset{\underset{OH}{|}}{CH} - CH_2 - CH_3$

S43. Ans. (a)

Sol. $CH_3CHO \xrightarrow{OH^-} CH_3\text{-}CH{=}CH\text{-}CHO$

S44. Ans. (c)

Sol. $CH_3COOH + Cl_2 \xrightarrow{Red\ Phosphorus} Cl\text{-}CH_2COOH$

S45. Ans. (d)

Sol. Boiling points of aldehydes and ketone depend on intermolecular dipole-dipole attraction.

S46. Ans. (d)

Sol. Xenon tetrafluoride (XeF_4) is prepared by heating a mixture of xenon and fluorine in ratio of 1:5 in a nickel vessel at 873 K.

$Xe_{(g)} + 2F_{2(g)} \xrightarrow{873K,7bar} XeF_{4(s)}$

(1:5 ratio)

S47. Ans. (b)

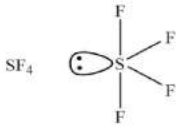
Sol. $6XeF_4 + 12H_2O \rightarrow 4Xe + 2XeO_3 + 24HF + 3O_2$
$XeF_6 + 3H_2O \rightarrow XeO_3 + 6HF$
XeF_4 and XeF_6 are expected to be oxidizing because in both the reactions XeF_4 and XeF_6 both caused the oxidation.

S48. Ans. (d)

Sol. Unlike hydrates, inorganic clathrates have a covalently bonded framework of inorganic atoms with guests typically consisting of alkali or alkaline earth metals.

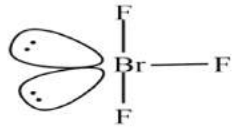
S49. Ans. (c)

Sol. A. SF_4 molecular geometry is see-saw with one pair of valence electrons. The nature of the molecule is polar.

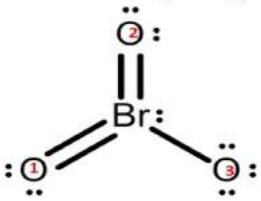


See-saw shape

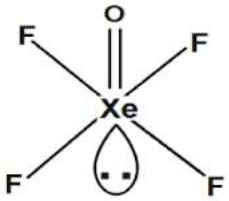
B. BrF_3 molecular geometry is said to be T-shaped or Trigonal Bipyramidal



C. Overall, the shape and expected hybridization of BrO_3^- is trigonal pyramidal



D. Xenon oxyfluoride ($XeOF_4$) molecular geometry is square pyramidal.



S50. Ans. (b)

Sol. Fluorine is a much stronger oxidizing agent than chlorine. The oxidizing power depends on three factors.

1. Bond dissociation energy
2. Electron gain enthalpy
3. Hydration enthalpy

The electron gain enthalpy of chlorine is more negative than that of fluorine. However, the bond dissociation energy of fluorine is much lesser than that of chlorine. Also, because of its small size, the hydration energy of fluorine is much higher than that of chlorine. Therefore, the latter two factors more than compensate for the less negative electron gain enthalpy of fluorine. Thus, fluorine is a much stronger oxidizing agent than chlorine.