

Previous Years Paper

11th June 2023 (Shift 3)

Q1. Match List-I with List-II:

List-I		List-II	
(A)	$E_{M^{2+}/M}^{\circ}$ for Zn is negative	(I)	due to almost identical radii
(B)	Cr^{2+} is a reducing agent	(II)	Ionic character decreases as oxidation number of metal increases.
(C)	V_2O_5 has a low melting point	(III)	Zn^{2+} is more stable than Zn.
(D)	Zr and Hf occur together in nature	(IV)	It attains stable half-filled t_{2g} level.

Choose the **correct** answer from the options given below:

- (a) (A)-(III), (B)-(I), (C)-(IV), (D)-(II)
 (b) (A)-(III), (B)-(II), (C)-(IV), (D)-(I)
 (c) (A)-(IV), (B)-(III), (C)-(I), (D)-(II)
 (d) (A)-(III), (B)-(IV), (C)-(II), (D)-(I)

Q2. Oxidation states of which oxides of halogens are not the same?

- (A) ClO_2
 (B) Cl_2O_3
 (C) BrO_2
 (D) I_2O_4
 (E) I_2O_5

Choose the **correct** answer from the options given below:

- (a) (A) and (E) only
 (b) (B) and (E) only
 (c) (C) and (D) only
 (d) (D) and (E) only

Q3. Which of the following processes is responsible for the formation of a Delta when river water meets the sea water?

- (a) Peptization
 (b) Colloid formation
 (c) Coagulation
 (d) Emulsification

Q4. Which of the following statements is **incorrect** with respect to the use of a catalyst in the reversible reaction?

- (a) The catalyst increases the rate of only the forward reaction.
 (b) The catalyst increases the rates of both the forward and the backward reaction.
 (c) The catalyst decreases the activation energy of the overall reaction.
 (d) The catalyst itself does not undergo any chemical change.

Q5. The relative reactivity order of following halides towards S_N1 reaction is:

- (I) $\begin{array}{c} CH_3 \\ | \\ CH_3 - C - Cl \\ | \\ CH_3 \end{array}$
 (II) CH_3-CH_2-Cl
 (III) CH_3Cl
 (IV) Ph_2CHCl

- (a) (IV) > (I) > (II) > (III)
 (b) (II) > (III) > (IV) > (I)
 (c) (I) > (IV) > (II) > (III)
 (d) (III) > (II) > (I) > (IV)

Q6. The substance having the same value of van't Hoff factor as that of $K_4[Fe(CN)_6]$ is:

- (a) $AlCl_3$
 (b) AlN
 (c) AlF_3
 (d) $Al_2(SO_4)_3$

Q7. Which one of the following will show Tyndall effect?

- (a) Aqueous solution of $NaCl$
 (b) Aqueous solution of glucose
 (c) Aqueous solution of soap below critical micelle concentration
 (d) Aqueous solution of soap above critical micelle concentration

Q8. What will be the product for the following reactions?

- $CH_3 - X \xrightarrow{KCN} A$
 $CH_3 - X \xrightarrow{AgNO_2} B$
 (a) A : CH_3CN , B : CH_3NO_2
 (b) A : CH_3NC , B : $CH_3-O-N=O$
 (c) A : CH_3CN , B : $CH_3-O-N=O$
 (d) A : CH_3NC , B : CH_3-NO_2

Q9. Arrange the following in the decreasing order of basic strength in aqueous solution:

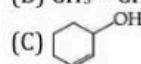
- (A) CH_3NH_2
 (B) $(CH_3)_3N$
 (C) $(CH_3)_2NH$
 (D) NH_3
 (E) $C_6H_5NH_2$

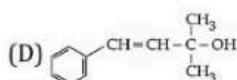
Choose the **correct** answer from the options given below:

- (a) (C) < (A) < (B) < (D) < (E)
 (b) (C) > (A) > (B) > (D) > (E)
 (c) (C) = (A) > (B) > (D) > (E)
 (d) (C) > (A) = (B) > (D) > (E)

Q10. Identify allylic alcohol:

- (A) $CH_2 = CH - CH_2 - OH$
 (B) $CH_3 = CH_2 - CH_2 - OH$





Choose the **correct** answer from the options given below:

- (a) (A), (C), (D)
(b) (A), (B), (C)
(c) (B), (C), (D)
(d) (A), (B), (C), (D)

Q11. Match **List-I** with **List-II**:

List-I (Vitamin)		List-II (Deficiency)	
(A)	Vitamin D	(I)	Slow blood clotting
(B)	Vitamin C	(II)	Night blindness
(C)	Vitamin K	(III)	Rickets
(D)	Vitamin A	(IV)	Scurvy

Choose the **correct** answer from the options given below:

- (a) (A)-(II), (B)-(I), (C)-(IV), (D)-(III)
(b) (A)-(III), (B)-(IV), (C)-(I), (D)-(II)
(c) (A)-(II), (B)-(IV), (C)-(III), (D)-(I)
(d) (A)-(I), (B)-(III), (C)-(IV), (D)-(II)

Q12. Which of the following is a molecular solid?

- (a) ZnS
(b) Diamond
(c) SiC
(d) I₂

Q13. _____ solution of phenol in water acts as a disinfectant.

- (a) 1%
(b) 0.2%
(c) 0.3%
(d) 0.4%

Q14. In Octahedral coordination entities:

- (a) t_{2g} set has lower energy than e_g set.
(b) t_{2g} set has lower energy than e_g set.
(c) e_g set has lower energy than t_{2g} set.
(d) e_g set has lower energy than t_{2g} set,

Q15. For the brown ring test, the correct order of the steps in the experiment is:

- (A) Pour conc. H₂SO₄ very slowly along the side of the test tube, very few drops of the acid should be poured.
(B) Take half spatula of the given salt in a dry test tube.
(C) Add 2 - 3 mL of freshly prepared ferrous sulphate solution to the test tube.
(D) Make a solution of the given salt.

Choose the **correct** answer from the options given below:

- (a) (B), (D), (C), (A)
(b) (B), (A), (C), (D)
(c) (B), (D), (A), (C)
(d) (B), (A), (D), (C)

Q16. Which one of the following is not an application of adsorption?

- (a) Separation of inert gases

- (b) In curing diseases
(c) Homogeneous catalysis
(d) Chromatographic analysis

Q17. When chlorine gas is passed through a hot solution of NaOH, a disproportionation reaction occurs. The zero-oxidation state of chlorine changes to:

- (A) 0 to +5
(B) 0 to -1
(C) 0 to +3
(D) 0 to +1

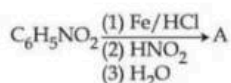
Choose the **correct** answer from the options given below:

- (a) (A), (C) only
(b) (B), (C) only
(c) (A), (B) only
(d) (A), (D) only

Q18. Number of ions produced on electrolysis of [Co(nh₃)₆].Cl₃ which gives 3 mol of AgCl on reacting with AgNO₃, are:

- (a) 1
(b) 2
(c) 3
(d) 4

Q19.



Product 'A' is:

- (a) C₆H₅NO₂
(b) C₆H₅OH
(c) m - NO₂C₆H₅ - NH₂
(d) C₆H₅NH₂

Q20. The manufacture of sulphuric acid involves the following steps. Identify X₁, X₂, X₃ and X₄ in the reactions involved:

- (i) X₁ + O₂(g) → SO₂(g)
(ii) 2SO₂(g) + O₂ $\xrightarrow{X_2}$ 2X₃
(iii) X₃ + H₂SO₄ → X₄

	X ₁	X ₂	X ₃	X ₄
(a)	S	V ₂ O ₅	SO ₃	H ₂ S ₂ O ₇
(b)	SO ₃	V ₂ O ₃	S	H ₂ SO ₅
(c)	H ₂ S	VO ₂	SO ₃	H ₂ SO ₅
(d)	S	V ₂ O ₃	SO ₃	H ₂ S ₂ O ₇

Q21. Match List - 1 with List - 11.

List-I Reaction of		List-II Products	
(A)	+ H ₃ PO ₂	(I)	
(B)	$\xrightarrow{\text{KI}}$	(II)	
(C)	$\xrightarrow{\text{H}_2\text{O}}$	(III)	
(D)	$\xrightarrow{\text{C}_6\text{H}_5\text{NH}_2}$	(IV)	

Choose the **correct** answer from the options given below:

- (a) (A)-(IV), (B)-(III), (C)-(II), (D)-(I)
 (b) (A)-(IV), (B)-(I), (C)-(II), (D)-(III)
 (c) (A)-(IV), (B)-(I), (C)-(III), (D)-(II)
 (d) (A)-(I), (B)-(II), (C)-(III), (D)-(IV)

Q22. Glucose does not give reaction with which of the following?

- (a) $\text{NH}_2 - \text{OH}$
 (b) HCN
 (c) $(\text{CH}_3\text{CO})_2\text{O}$
 (d) NaHSO_3

Q23. Amylose and amylopectin are the two components of starch. Which of the following statement is true?

- (a) Amylose is water soluble and amylopectin is water insoluble.
 (b) Both components are water insoluble.
 (c) Both components are water soluble.
 (d) Amylopectin is water soluble and amylose is water insoluble.

Q24. Which of the pair(s) are correctly matched?

	Colloid type	:	Example
(A)	Liquid in solids	:	Gem stones
(B)	Solid in liquid	:	Cell fluids
(C)	Solid in Gas	:	Mist
(D)	Gas in liquid	:	Pumice stone
(E)	Liquid in Solid	:	Butter

Choose the **correct** answer from the options given below:

- (a) (C) and (D) only
 (b) (B) and (E) only
 (c) (B) and (D) only
 (d) (A) and (C) only

Q25. In Kolbe's reaction, phenol undergoes:

- (a) Electrophilic addition
 (b) Electrophilic substitution
 (c) Nucleophilic addition
 (d) Nucleophilic substitution

Q26. For the following oxo acids, choose the increasing order of their acidity:

- (A) $\text{HClO} < \text{HClO}_2 < \text{HClO}_4 < \text{HClO}_3$
 (B) $\text{HClO}_4 < \text{HClO}_2 < \text{HClO}_3 < \text{HClO}$
 (C) $\text{HClO}_3 < \text{HClO}_4 < \text{HClO}_2 < \text{HClO}$
 (D) $\text{HClO} < \text{HClO}_2 < \text{HClO}_3 < \text{HClO}_4$

Choose the correct answer from the options given below:

- (a) (A)
 (b) (D)
 (c) (C)
 (d) (B)

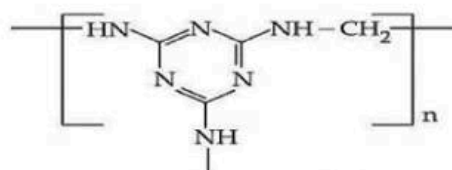
Q27. The IUPAC name of the complex

$[\text{Pt}(\text{NH}_3)_2\text{Cl}(\text{NH}_2\text{CH}_3)]\text{Cl}$ is:

- (a) Diaminechloromethylamineplatinum (II) chloride
 (b) Diaminechloridomethylamineplatinum (III) chloride
 (c) Diamminechloridomethylamineplatinum (II) chloride

- (d) Diamminechloridomethaneamineplatinum (II) chloride

Q28.



(A)

(A) is used in the manufacture of unbreakable crockery. Polymer (A) is:

- (a) Melamine
 (b) Bakelite
 (c) Novolac
 (d) Buna-S

Q29. The desalination of sea water plant stops working due to which of the following reasons?

- (a) The pressure applied on the saline water was less than osmotic pressure.
 (b) The pressure applied on the saline water was greater than osmotic pressure.
 (c) The osmotic pressure application has no significance.
 (d) Salinity of water decreased and osmotic pressure was more than pressure applied.

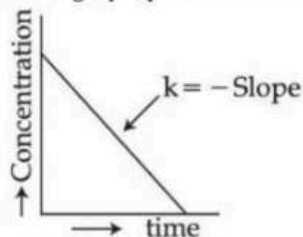
Q30. Neutral or weakly alkaline KMnO_4 solution will oxidise iodide ion into:

- (a) iodate ion.
 (b) periodate ion.
 (c) iodite ion.
 (d) hypoiodite ion.

Q31. Which of the following statements is incorrect with respect to the plot of molar conductivity (Λ_m) versus square root of concentration ($c^{\frac{1}{2}}$) for electrolytes in solution?

- (a) For strong electrolytes, a straight line with extrapolatable intercept of limiting molar conductivity (Λ_m°) is obtained.
 (b) For strong electrolytes, a straight line with negative slope is obtained.
 (c) For strong electrolytes, a straight line with positive slope is obtained.
 (d) For weak electrolytes, a straight line is not obtained.

Q32. From graph, predict the order of the reaction:



- (a) First order reaction
 (b) Second order reaction

- (c) Zero order reaction
- (d) Order can not be predicted from given graph.

Q33. In inorganic salt analysis, for the indicative test of Cl^- , conc. H_2SO_4 is used. This is because:

- (a) Conc. H_2SO_4 is a strong oxidising agent and Cl_2 is produced.
- (b) Conc. H_2SO_4 is a strong reducing agent and HCl is produced.
- (c) Conc. H_2SO_4 is a strong dehydrating agent and Cl_2 is produced.
- (d) Conc. H_2SO_4 has lower volatility than HCl .

Q34. $\text{CH}_3\text{CH}_2\text{OH} \xrightarrow[413\text{K}]{\text{H}_2\text{SO}_4}$ A. Identify "A" and mention the name of mechanism through which it is formed?

- (a) $\text{CH}_2=\text{CH}_2$, Elimination
- (b) $\text{C}_2\text{H}_5-\text{O}-\text{C}_2\text{H}_5$, $\text{S}_{\text{N}}2$
- (c) $\text{C}_2\text{H}_5-\text{O}-\text{C}_2\text{H}_5$, $\text{S}_{\text{N}}1$
- (d) CH_3COOH , Oxidation

Q35. Which of the following pairs of transition metal ions is the strongest oxidizing agent?

- (a) Fe^{2+} and Mn^{2+}
- (b) Cu^{2+} and Ti^{2+}
- (c) Ni^{2+} and Cr^{3+}
- (d) Mn^{3+} and Fe^{3+}

Q36. When silver or gold is leached as follows, $4\text{M} + 8\text{CN}^- + 2\text{H}_2\text{O} + \text{O}_2 \rightarrow$ _____, the product is:

(M = Ag or Au)

- (a) $[\text{M}(\text{CN})_2]^-$
- (b) M_2O
- (c) $[\text{M}(\text{CN})_4]^{3-}$
- (d) M_2O_3

Q37. Gabriel phthalimide synthesis is used for the preparation of:

- (a) Primary aliphatic amines
- (b) Secondary aliphatic amines
- (c) Primary aromatic amines
- (d) Secondary aromatic amines

Q38. Transition metal ions having zero unpaired electrons are:

- (A) Sc^{3+}
- (B) Ti^{3+}
- (C) Cu^{2+}
- (D) Zn^{2+}
- (E) Mn^{2+}

Choose the **correct** answer from the options given below:

- (a) (A) and (B) only
- (b) (C) and (D) only
- (c) (A) and (D) only
- (d) (D) and (E) only

Q39. False statement about Frenkel defect is:

- (a) It is a combination of vacancy defect and interstitial defect.
- (b) Density remains unchanged.
- (c) Non-ionic solids show this defect.
- (d) Shown by solids with large difference in size of cations and anions.

Q40. From the following, choose the one which are not secondary haloalkanes:

- (A) 2-Bromopentane
- (B) 1-Bromo-3-methylbutane
- (C) 3-Bromopentane
- (D) 2-Bromo-2-methylbutane
- (E) 2-Bromo-3-methylbutane

Choose the **correct** answer from the options given below:

- (a) (B) and (D) only
- (b) (A) and (C) only
- (c) (C) and (D) only
- (d) (D) and (E) only

Direction for the question 41 to 45: **Read the following passage given below and answer the question.**

Production of electricity by thermal plants is not very efficient method. It is now possible to make cells in which reactants are fed continuously to the electrodes and products are also removed continuously. One of the most successful fuel cells is hydrogen fuel cell.

Q41. Which is not true for the fuel cell?

- (a) Efficient
- (b) Not cost effective
- (c) Pollution free
- (d) Can be used by astronauts

Q42. Hydrogen fuel cell is an:

- (a) electrochemical cell.
- (b) electrolytic cell.
- (c) can be both electrochemical and electrolytic cell.
- (d) neither electrochemical nor electrolytic cell.

Q43. In Hydrogen fuel cell, which gas is undergoing oxidation?

- (a) Only hydrogen
- (b) Only oxygen
- (c) Both hydrogen and oxygen
- (d) Neither hydrogen nor oxygen

Q44. Which of the following statement is **correct** regarding hydrogen fuel cells?

- (a) This cell uses the reaction between hydrogen and nitrogen to form ammonia.
- (b) Catalysts such as finely divided platinum on palladium metal do not have any effect on the rate of electrode reactions.
- (c) The electricity production in fuel cells is higher than that in thermal plants.
- (d) The cell can run even when reactant supply stops.

Q45. In hydrogen fuel cell, the reactants are bubbled through which electrodes?

- (a) Saturated Calomel electrode
- (b) Silver electrodes
- (c) Platinum electrodes
- (d) Porous carbon electrodes

Direction for the question 46 to 50: **Read the following passage given below and answer the question.**

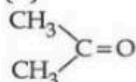
Aldehydes and ketones undergo nucleophilic addition reactions. A nucleophile attacks the electrophilic carbon atom of polar carbonyl group from perpendicular to plane

of sp^2 hybridised orbitals of carbonyl carbon. The hybridisation of carbon changes from sp^2 to sp^3 and a tetrahedral alkoxide intermediate is formed. This captures H^+ to give neutral product. In carboxylic acids, carbonyl carbon is less electrophilic than carbonyl carbon in aldehydes and ketones.

Q46. The correct order of reactivity for addition reaction of following carbonyl compounds with C_2H_5MgI

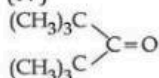
(I) $HCHO$

(II)



(III) CH_3CHO

(IV)



(A) (I) > (III) > (II) > (IV)

(B) (IV) > (III) > (II) > (I)

(C) (I) > (II) > (IV) > (III)

(D) (III) > (II) > (I) > (IV)

Choose the **correct** answer from the options given below:

(a) (C)

(b) (D)

(c) (A)

(d) (B)

Q47. How will you convert acetaldehyde to lactic acid?

(a) treating with HCN followed by hydrolysis

(b) treating with CH_3OH molecules twice

(c) treating with sodium bisulphite and then hydrolysing

(d) treating with CH_3MgBr followed by hydrolysis

Q48. The optimum pH for carrying out the reaction of aldehyde with hydroxylamine to form oxime is:

(a) $pH = 1$

(b) $pH = 4-5$

(c) $pH = 12$

(d) Any pH

Q49. An organic compound C_3H_6O does not give a precipitate with 2,4-dinitrophenylhydrazine and also does not react with metallic sodium. It could be

(a) CH_3CH_2CHO

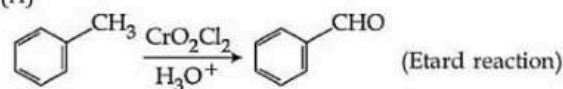
(b) $CH_2=CH-CH_2OH$

(c) CH_3COCH_3

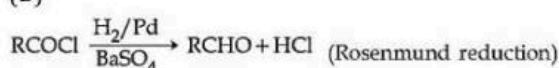
(d) $CH_2=CH-O-CH_3$

Q50. Choose the correct answer from the options given below:

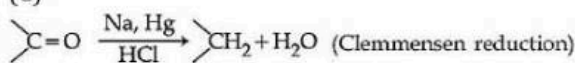
(A)



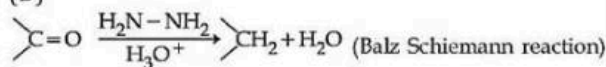
(B)



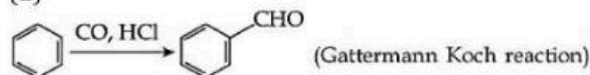
(C)



(D)



(E)



Choose the **correct** answer from the options given below:

(a) (A), (B), (C), (D) only

(b) (B), (C), (D), (E) only

(c) (E), (A), (D) only

(d) (A), (B), (C), (E) only

SOLUTIONS

S1. Ans. (d)

Sol. [A] Electronic configuration of Zn = [Ar]3d¹⁰4s²
Electronic configuration of Zn²⁺ = [Ar]3d¹⁰4s⁰
Mn and Zn readily lose two electrons to attain half-filled and fully filled stable configurations respectively, thus they readily get oxidized and have more negative E⁰ values.

[B] Cr²⁺ has the configuration 3d⁴. It can lose electron to form 3d³ which has stable configuration (as it has half-filled t_{2g} level). Hence, it is reducing.

[C] In covalent compounds the force of attraction among covalent molecules are weak. Therefore, they have low melting point.

[D] In case of Zr and Hf the lanthanoid contraction takes place which accounts for the similar atomic size and because of similar size they are found together

S2. Ans. (b)

Sol. Oxidation state of Cl₂O₃ is:

$$2(x) + 3(-2) = 0$$

$$x = 3$$

Oxidation state of I₂O₅ is:

$$3(x) + 5(-2) = 0$$

$$x = 5$$

S3. Ans. (c)

Sol. The process which is responsible for the formation of Delta at a place where rivers meet the sea is coagulation. Water present in the river is a colloidal solution consisting of clay and sea. Sea water contains various electrolytes that coagulate the colloidal particles.

S4. Ans. (a)

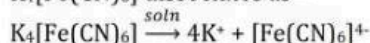
Sol. A catalyst increases the rate of reaction in both forward and backward directions by providing an alternate pathway with lower activation energy. If the activation energy is reduced, more reactants can cross the energy barrier easily. So, the rate of reaction increases.

S5. Ans. (a)

Sol. Primary alkyl halide is less reactive towards SN₁ reaction than secondary alkyl halide. Secondary alkyl halide is less reactive than tertiary alkyl halides towards SN₁ reaction. In (IV), the carbocation generated is stabilised due to resonance. Hence, (IV) is most reactive towards SN₁ reaction.

S6. Ans. (d)

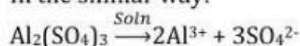
Sol. K₄[Fe(CN)₆] dissociates as –



Von't Hoff factor (i) = 5

One molecule of K₄[Fe(CN)₆] dissociates into five particles.

In the similar way:



Al₂(SO₄)₃ also gives five particles per molecule.

S7. Ans. (d)

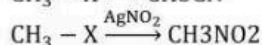
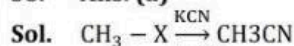
Sol. In associated colloids, the formation of micelles takes place only above a particular temperature called Kraft temperature (T_k) and above a particular concentration called critical micelle concentration (CMC).

Below CMC a soap doesn't act as a colloid.

The Tyndall effect is the scattering of light as a light beam passes through a colloid. It can be seen only in colloids.

An aqueous solution of sugar and sodium chloride are true solutions. Here, option D is the only solution which is a colloid and hence shows a Tyndall effect.

S8. Ans. (a)



S9. Ans. (b)

Sol. Ammonia is more basic than aniline as in aniline, the lone pair of electrons of N atom is in resonance with benzene ring. Hence, it cannot be donated easily.

Ethyl amine is more basic than ammonia because in ethyl amine, the +I effect of ethyl group increases the electron density on N.

Diethylamine is most basic due to +I effect of two ethyl groups.

Hence the decreasing order of basic strength is: (C₂H₅)₂NH > C₂H₅NH₂ > (CH₃)₃N > NH₃ > C₆H₅NH₂

S10. Ans. (a)

Sol. Allylic alcohol has CH=CH-CH₂-OH group.

A compound where the hydroxy group is attached to a saturated carbon atom adjacent to a double bond carbon

S11. Ans. (b)

Sol. [A] Rickets is the softening and weakening of bones in children, usually because of an extreme and prolonged vitamin D deficiency.

[B] Scurvy is a disease caused by a serious vitamin C deficiency.

[C] Vitamin K deficiency bleeding or VKDB, occurs when babies cannot stop bleeding because their blood does not have enough Vitamin K to form a clot.

[D] Night blindness is one of the first signs of vitamin A deficiency.

S12. Ans. (d)

Sol. I₂ is a molecular solid. Each iodine molecule is made up of 2 iodine atoms, held together by a strong covalent bond. Each iodine molecule is held to another by weak Van Der Waal's forces.

S13. Ans. (a)

Sol. Same substances can act as an antiseptic as well as a disinfectant by varying the concentration.

0.2% solution of phenol is an antiseptic while its 1% solution is disinfectant.

S14. Ans. (b)

Sol. the repulsions in octahedral coordination compound yield two energy levels:
 t_{2g} – set of three orbitals (d_{xy} , d_{yz} and d_{zx}) with lower energy
 e_g – set of two orbitals ($d_{x^2-y^2}$ and d_{z^2}) with higher energy

S15. Ans. (b)

Sol. Brown ring test experiment for nitrate ions can be performed by using the following steps –

- Take a sample in which you suspect nitrate is present in a test tube.
- Prepare fresh iron sulphate solution.
- Now mix freshly prepared iron sulphate solution in the sample.

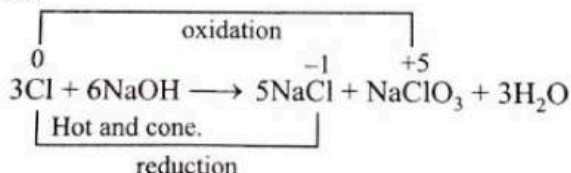
Add concentrated sulphuric acid solution along the side to the bottom of the test tube with the test tube tilted, which contains the mixture of sample and freshly prepared iron sulphate solution. Concentrated sulphuric acid is added in such a way that it forms a layer below the aqueous solution.

S16. Ans. (c)

Sol. Adsorption theory is applicable for heterogeneous catalysis.

S17. Ans. (c)

Sol.

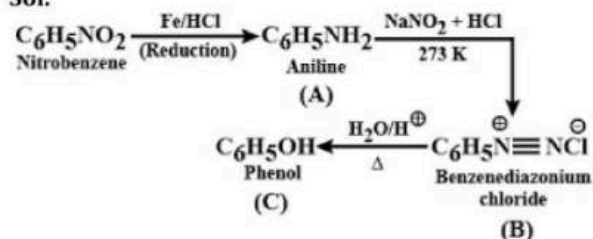


S18. Ans. (d)

Sol. $[\text{Co}(\text{NH}_3)_6]\text{Cl}_3 \rightleftharpoons [\text{Co}(\text{NH}_3)_6]^+ + 3\text{Cl}^-$
Hence 4 ions per molecule are produced.

S19. Ans. (b)

Sol.



S20. Ans. (a)

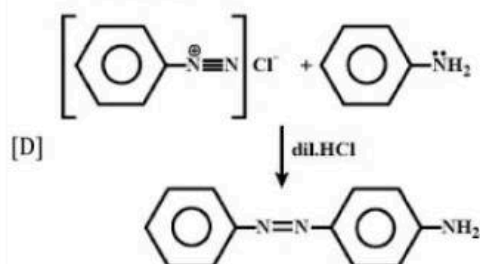
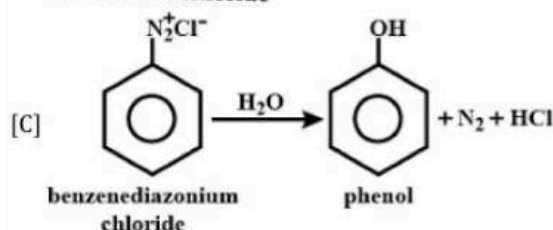
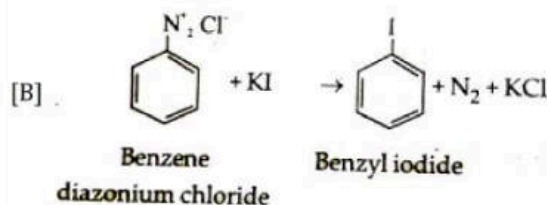
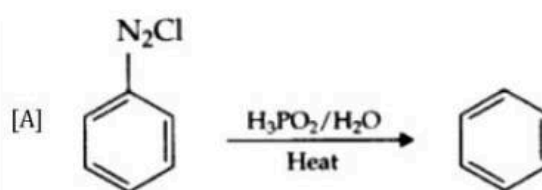
Sol. $\text{S} + \text{O}_2 \rightarrow \text{SO}_2$

The reaction $2\text{SO}_2 + \text{O}_2 \rightarrow 2\text{SO}_3$ occurs in the presence of V_2O_5 .

$\text{SO}_3 + \text{H}_2\text{SO}_4 \rightarrow \text{H}_2\text{S}_2\text{O}_7$

S21. Ans. (c)

Sol.



S22. Ans. (d)

Sol. Glucose does not react with 2,4-DNP, Schiff's reagent or NaHSO_3 . This is because the aldehyde group in glucose is involved in hemiacetal formation and thus is not free.

S23. Ans. (a)

Sol. Amylose is water soluble component which constitutes about 15-20% of starch.
Amylopectin is insoluble in water and constitutes about 80-85% of starch.

S24. Ans. (b)

Sol. [B] Paints and cell fluids, for instance, both have colloids present that are referred to as **sol**.

[E] Butter is an example of a class of colloids called emulsions. An emulsion is a colloidal dispersion of a liquid in either a liquid or a solid. A stable emulsion requires an emulsifying agent to be present. Butter is an example of liquid in solid emulsion.

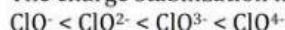
S25. Ans. (b)

Sol. When phenol is treated with sodium hydroxide, phenoxide ion is generated. The phenoxide ion generated is more reactive than phenol towards electrophilic aromatic substitution reaction. Hence, it undergoes an electrophilic substitution reaction with carbon dioxide, which is a weak electrophile.

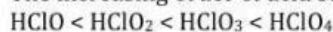
S26. Ans. (b)

Sol. With increase in oxidation number of a particular halogen atom, the acidic character of corresponding oxoacid increases.

The charge stabilization increases in the order:



The increasing order of acid strength is:



S27. Ans. (d)

Sol. Diamminechlorido (methanamine) platinum(II)chloride

Oxidation state of Pt is

$$x + 2(0) + 1(-1) + 1 \times (0) = +1$$

$$x - 1 = +1$$

$$x = 2$$

Oxidation state Platinum is II

Name: Diamminechlorido (methanamine)platinum (II) chloride

S28. Ans. (a)

Sol. Melamine-formaldehyde polymer is used for making unbreakable crockery.

Bakelite is used for making combs, electrical switches, handles of utensils and computer discs.

Teflon is used in making oil seals and gaskets and also used for non-stick surface coated utensils.

S29. Ans. (a)

Sol.

S30. Ans. (a)



S31. Ans. (c)

Sol. When a graph between molar conductivity Λ_m versus $\sqrt{C}$ the slope of the graph is obtained as K . Its a negative slope. Slope = $\tan \theta = dy/dx$. When we plot a graph between Λ_m and $\sqrt{C}$ we observe a small increase in the molar conductivity of strong electrolytes with dilution.

S32. Ans. (c)

Sol. For $A \rightarrow B$ the given graph shows a zero-order reaction.

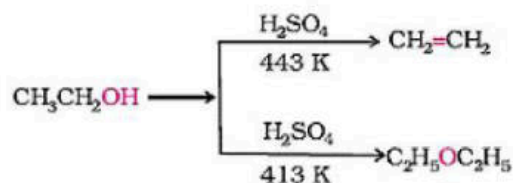
Mathematically represented as $[R] = kt + [R]^0$ which is the equation of straight line. Hence, the reaction is a zero order.

S33. Ans. (d)

Sol. Sulphuric acid is less volatile acid in comparison to nitric acid and hydrochloric acid or you can say it is non-volatile acid with higher boiling point. Sulphuric acid displaces the volatile acid from its salt as: $\text{NaCl} + \text{H}_2\text{SO}_4 \xrightarrow{200^\circ\text{C}} \text{NaHSO}_4 + \text{HCl}$.

S34. Ans. (b)

Sol.



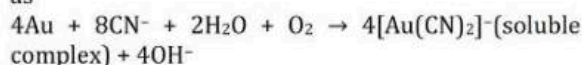
The formation of ether is a nucleophilic bimolecular ($\text{S}_\text{N}2$) reaction involving the attack of alcohol molecule on a protonated alcohol.

S35. Ans. (d)

Sol. Mn^{3+} is the strongest oxidising agent as it requires only one electron to half fill its 3d orbital Fe^{+3} is easily reduced than Fe^{+2} . Therefore, among all the four, Fe^{+3} is the stronger oxidizing agent.

S36. Ans. (a)

Sol. Least reactive metals like silver and gold are obtained by the cyanide process. In this process, the impure metal is treated with NaCN (solution) and the air is passed. Metal is converted into the soluble complex as

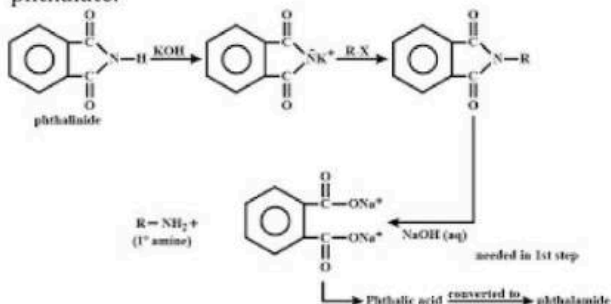


S37. Ans. (a)

Sol. Gabriel phthalimide reaction is used to prepare primary amines from phthalimide the reaction steps are shown as below;

Step 1: Potassium Phthalimide when treated with a primary alkyl halide gives N-alkylphthalimide.

Step 2: N-alkylphthalimide with aqueous sodium hydroxide gives primary amine and sodium phthalate.



S38. Ans. (c)

Sol. [A] All the electrons are paired in Sc^{3+} ion.

Therefore, there are 0 unpaired electrons in the ground state of Sc^{3+} ion.

[B] Ti^{3+} - Electronic configuration $[\text{Ar}]3d^1$

So, the number of unpaired electrons in Ti^{3+} is equal to 1.

[C] There is one unpaired electron in Cu^{2+} .

[D] Zn^{2+} - $[\text{Ar}]3d^{10}4s^0$ so there are no unpaired electrons. All the electrons present in the ion are paired.

[E] Therefore the electronic configuration of Mn^{2+} is $[\text{Ar}]3d^5$:

There are five unpaired electrons

S39. Ans. (c)

Sol. Frenkel defect: This defect is shown by ionic solids. The smaller ion (usually cation) is dislocated from its normal site to an interstitial site.

S40. Ans. (a)

Sol. [A] 2-Bromopentane is a secondary Halide.

[B] 1-Bromo-3-methylbutane is primary

[C] The IUPAC name of this formula is 3-Bromopentane. It is a secondary alkyl halide

because the carbon atom "with which bromine is attached" is directly attached to two other carbon atoms which make it secondary halide.

[D] 2-Bromo-2-methyl-butane is a tertiary Halide.

[E] 2-Bromo-3-methylbutane. And it is secondary alkyl halide.

S41. Ans. (b)

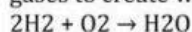
Sol. Precious metals such as platinum and iridium are typically required as catalysts in fuel cells and some types of water electrolyser, which means that the initial cost of fuel cells (and electrolyzers) can be high. This high cost has deterred some from investing in hydrogen fuel cell technology

S42. Ans. (a)

Sol. A fuel cell is an electrochemical cell that converts the chemical energy of a fuel (often hydrogen) and an oxidizing agent (often oxygen) into electricity through a pair of redox reactions.

S43. Ans. (a)

Sol. A hydrogen-oxygen fuel cell is a type of voltaic cell. It is based on the following balanced redox reaction equation, which consumes hydrogen and oxygen gases to create water:



It involves the oxidation of hydrogen-to-hydrogen ion at the anode and the reduction of oxygen to water at the cathode. The balanced half-reaction equations are:

Anode, oxidation: $2\text{H}_2 \rightarrow 4\text{H}^+ + 4\text{e}^-$; Cathode, reduction: $\text{O}_2 + 4\text{H}^+ + 4\text{e}^- \rightarrow 2\text{H}_2\text{O}$

S44. Ans. (c)

Sol. A conventional-based power plant typically generates electricity at efficiencies of 33 to 35%, while fuel cell systems can generate electricity at efficiencies up to 60%.

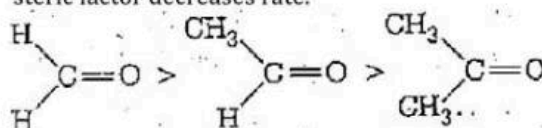
S45. Ans. (d)

Sol. In the cell, hydrogen and oxygen are bubbled through porous carbon electrodes into concentrated aqueous sodium hydroxide solution.

S46. Ans. (c)

Sol. The nucleophilic addition reaction is the characteristic addition of carbonyl compounds. Reactivity order of carbonyl compounds in the order. This is due to increase in the intensity of charge on carbon of carbonyl group due to +I-effect of alkyl groups.

Aldehydes are more reactive than ketones and also steric factor decreases rate.



S47. Ans. (a)

Sol. Acetaldehyde reacts with hydrogen cyanide to form a cyanohydrin which on acid hydrolysis forms lactic acid. $\text{CH}_3\text{CHO} + \text{HCN} = \text{CH}_3\text{CH}(\text{OH})\text{CN}$ (cyanohydrin).

S48. Ans. (b)

Sol. For the formation of oximes and hydrazones, a pH of ca. 4.5 is typically advantageous.

S49. Ans. (d)

Sol. No ppt with 2,4-DNP is not carbonyl compound and no reaction with Na is not an alcohol (or) acid

S50. Ans. (d)

Sol.

