

Previous Years Paper

2nd June 2023 (Shift 3)

- Q1.** Identify the incorrect statement
- Bakelite and urea-formaldehyde resins are elastomers
 - Polyamides like nylon 6, nylon 6,6 are the examples of fibers.
 - Polystyrene polyvinylchloride and polythene are thermoplastic polymers.
 - Thermoplastic polymers have intermolecular force between elastomers and fibers.

Choose the most appropriate answer from the options given below:

- B and C only
- D and A only
- A only
- C and D only

- Q2.** Match List I with List II

List - I		List - II	
A.	Mg in solid state	I.	p-type Semiconductor
B.	MgCl ₂ in molten state	II.	n-type Semiconductor
C.	Silicon with phosphorus	III.	Electrolytic Conductor
D.	Germanium with boron	IV.	Electronic Conductor

- A-I, B-II, C-III, D-IV
- A-II, B-III, C-IV, D-I
- A-III, B-II, C-I, D-IV
- A-IV, B-III, C-II, D-I

- Q3.** Chlorine containing antibiotic by soil microorganisms which is effective for the treatment of typhoid fever is:

- Chloroquine
- Chloramphenicol
- Halothane
- Tetra chloromethane

- Q4.** Which of the following statements are not correct?

- Phenol is used to prepare analgesic drugs.
- Solubility of phenol in water is more than that of chlorobenzene.
- Phenol is neutralised by sodium carbonate.
- Boiling point of *o*-nitrophenol is lower than that of *p*-nitrophenol.

Choose the most appropriate answer from the options given below:

- A & B only
- C only
- B & D only
- C & D only

- Q5.** According to the Raoult's law, vapour pressure of a solution is directly proportional to:

- Mole fraction
- Part per million
- Mass percentage
- Molality

- Q6.** 20 g of binary electrolyte (Molecular mass = 100) are dissolved in 500 g of water. The freezing point of the solution is -0.74°C and k_f is $1.86 \text{ K kg mol}^{-1}$. The degree of ionisation of electrolyte is:

- 0.5
- 0.75
- 1.0
- 0.0

- Q7.** The edge lengths of the unit cells in terms of the radius of spheres constituting fcc, bcc & simple cubic unit cells respectively are:

- $2\sqrt{2}r, \frac{4r}{\sqrt{3}}, 2r$
- $\frac{4r}{\sqrt{3}}, 2\sqrt{2}r, 2r$
- $2r, 2\sqrt{2}r, \frac{4r}{\sqrt{3}}$
- $2r, \frac{4r}{\sqrt{3}}, 2\sqrt{2}r$

- Q8.** Which among the following is not a broad spectrum antibiotic?

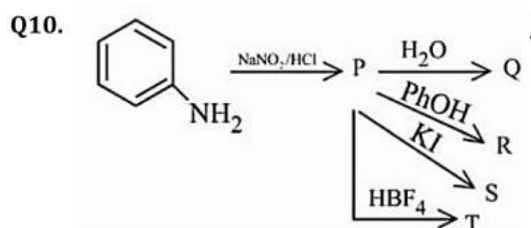
- Ofloxacin
- Vancomycin
- Penicillin
- Chloramphenicol

- Q9.** Match List I with List II

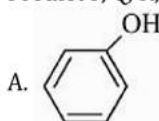
List - I		List - II	
A.	Soda Water	I.	A solution of gas in gas
B.	Sugar Solution	II.	A solution of solid in solid
C.	German Silver	III.	A solution of solid in liquid
D.	Air	IV.	A solution of gas in liquid

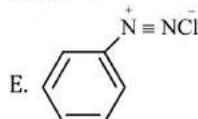
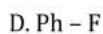
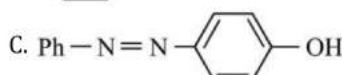
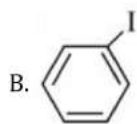
Choose the correct answer from the options given below:

- A-I, B-II, C-III, D-IV
- A-II, B-III, C-IV, D-I
- A-IV, B-III, C-II, D-I
- A-III, B-II, C-I, D-IV



Predict P, Q, R, S and T in a correct sequence:

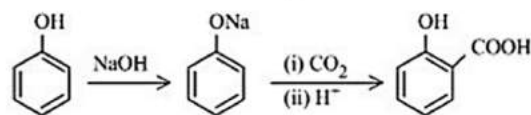




Choose the correct answer from the options given below:

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

Q11. Given reaction is the example of -



- (a) Kolbe's reaction
(b) Reimer-Tiemann reaction
(c) Williamson Synthesis
(d) Friedel Craft reaction

Q12. Fog is a colloidal solution of

- (a) Solid in gas
(b) Gas in gas
(c) Liquid in gas
(d) Gas in liquid

Q13. $[\text{Cu}(\text{en})_2]^{2+}$ is more stable than $[\text{Cu}(\text{NH}_3)_4]^{2+}$

- (a) It is a heteroleptic complex
(b) Ethylene diamine has an alkyl group
(c) Copper in +2 oxidation state is more stable
(d) Ligand is didentate and form chelate complex

Q14. Match List I with List II

	List - I		List - II
A.	Artificial Sweetner	I.	Furacine
B.	Antihistamines	II.	Non-narcotic
C.	Aspirin	III.	Alitame
D.	Antiseptics	IV.	Terfenadine

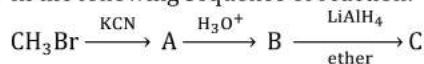
Choose the correct answer from the options given below:

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

Q15. Choose the incorrect statement.

- (a) In endothermic reaction reactant molecules have lower energy than product molecules
(b) Energy of activated complex is higher than the energy of reactants
(c) Energy of activation of a reaction is different from energy of activation with catalyst for the same reaction
(d) Rate of reaction decreases with rise in temperature

Q16. In the following sequence of reaction:



The end product (C) is

- (a) Acetone
(b) Methane
(c) Acetaldehyde
(d) Ethyl alcohol

Q17. Select the incorrect statement(s)

- A. Surface active agents like soaps and synthetic detergents form micelles in water.
B. Soaps are emulsifying agents.
C. $\text{C}_{17}\text{H}_{35}$ (hydrocarbon) and $-\text{COO}^-$ (Carboxylate) part of stearate ion ($\text{C}_{17}\text{H}_{35}\text{COO}^-$) both are hydrophobic.
D. Surfactants are basic in nature.

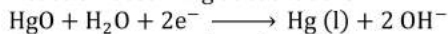
Choose the most appropriate answer from the options given below:

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

Q18. Process of zone refining is used in the purification of

- (a) Al
(b) Cu
(c) Ge
(d) Ag

Q19. Reaction occurring at cathode is



Above reaction is found in:

- (a) Leclanche cell
(b) Mercury cell
(c) Fuel cell
(d) Ni-Cd-cell

Q20. The pair in which both the species have the same magnetic moment (spin only value) is:

- (a) $[\text{Cr}(\text{H}_2\text{O})_6]^{2+}$, $[\text{CoCl}_4]^{2-}$
(b) $[\text{Cr}(\text{H}_2\text{O})_6]^{2+}$, $[\text{Fe}(\text{H}_2\text{O})_6]^{2+}$
(c) $[\text{Mn}(\text{H}_2\text{O})_6]^{2+}$, $[\text{Cr}(\text{H}_2\text{O})_6]^{2+}$
(d) $[\text{CoCl}_4]^{2-}$, $[\text{Fe}(\text{H}_2\text{O})_6]^{2+}$

Q21. Mohr's salt is _____ is colour

- (a) Yellow
(b) Blue
(c) Green
(d) Colourless

Q22. Insulin is the example of

- (a) Peptide Hormones
(b) Amino acid derived hormones
(c) Steroidal hormones
(d) Adrenal Cortical hormones

Q23. Match List I with List II

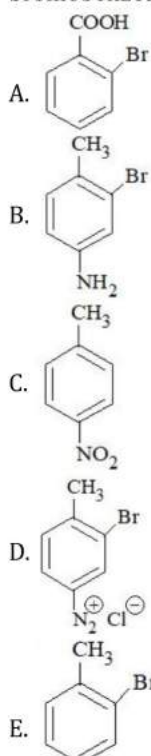
	List - I		List - II
A.	Cr^{3+}	I.	d^3 configuration
B.	Mn^{4+}	II.	d^{10} configuration
C.	Cu^+	III.	Paramagnetic
D.	Ti^{4+}	IV.	Diamagnetic

Choose the correct answer from the options given below:

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

- Q24.** Alum helps in purifying water by:
 A. Coagulation of mud particles
 B. Sedimentation of mud particles.
 C. Dialysis
 D. Forming true solution with water
 (a) A & C only
 (b) A & D only
 (c) B & C only
 (d) A & B only

- Q25.** Correct sequence of conversion of 4-nitrotoluene to 2-bromobenzoic acid is



Choose the correct answer from the options given below:

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

- Q26.** Match List I with List II

	List - I		List - II
A.	Lanthanum	I.	+3, +4
B.	Praseodymium	II.	+3
C.	Neodymium	III.	+2, +3, +4
D.	Samarium	IV.	+2, +3

Choose the correct answer from the options given below:

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

- Q27.** The electrochemical cells $\text{Zn}|\text{Zn}^{2+}||\text{Cu}^{2+}|\text{Cu}$ and $\text{Fe}|\text{Fe}^{2+}||\text{Cu}^{2+}|\text{Cu}$ are connected in series, What will be the net emf of the cell at 25°C?

Given: E° of $\text{Zn}^{2+}|\text{Zn} = -0.76\text{V}$
 E° of $\text{Cu}^{2+}|\text{Cu} = +0.34\text{V}$
 E° of $\text{Fe}^{2+}|\text{Fe} = -0.41\text{V}$

- (a) +1.85 V
 (b) -1.85 V
 (c) +0.83 V
 (d) -0.83 V

- Q28.** In a thermite process, the reducing agent is
 (a) C
 (b) Zn
 (c) Na
 (d) Al

- Q29.** Which of the following compounds can be used as antifreeze in automobile radiators?
 (a) Methyl Alcohol
 (b) Glycol
 (c) Nitrophenol
 (d) Ethyl Alcohol

- Q30.** The isotope ${}_{19}\text{K}^{42}$ has a half life of about 12 hours. What fraction of the initial concentration of ${}_{19}\text{K}^{42}$ remains after 48 hours.
 (a) $\frac{1}{4}$
 (b) $\frac{1}{8}$
 (c) $\frac{1}{12}$
 (d) $\frac{1}{16}$

- Q31.** Yellow colour in NaCl is due to
 (a) Schottky defect
 (b) Metal excess defect due to anionic vacancies
 (c) Frenkel defect
 (d) Metal deficiency defect

- Q32.** Butanone is less reactive than propanal towards nucleophilic addition reaction because:
 (a) more +I effect found in butanone
 (b) less +I effect found in butanone
 (c) more +I effect found in propanal
 (d) less +ve charge found on carbonyl group of propanal

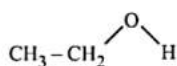
- Q33.** Match List I with List II

	List - I		List - II
A.	Vitamin A	I.	Rickets
B.	Vitamin C	II.	Xerophthalmia
C.	Vitamin B ₁	III.	Scurvy
D.	Vitamin D	IV.	Beri-Beri

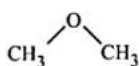
Choose the correct answer from the options give below:

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

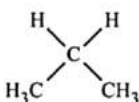
- Q34.** Arrange the following in decreasing order of their boiling point



(I)



(II)



(III)

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

Q35. *p*-Hydroxyazobenzene is also called as

- (a) Yellow dye
(b) Red dye
(c) Orange dye
(d) Violet dye

Q36. Which is not the limitation of valence bond theory involving coordination compound.

- (a) It involves a number of assumptions
(b) It does not give quantitative interpretation of magnetic data
(c) It does not distinguish between weak & strong ligands
(d) It does not explain the formation of coordination compounds

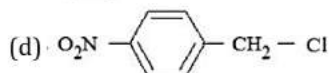
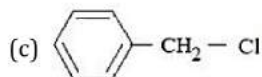
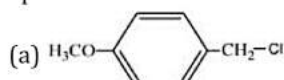
Q37. A solution of CuSO_4 is electrolysed for 10 minutes using a current of 1.5 amperes. (1 mol of Cu = 63 g). How much copper is deposited at cathode. $1\text{F} = 96487 \text{ C mol}^{-1}$

- (a) 0.2938 g
(b) 2.938 g
(c) 29.38 g
(d) 0.02938 g

Q38. What is the order of hydrolysis of methyl acetate in acidic medium?

- (a) Zero order
(b) Pseudo First order
(c) First order
(d) Second order

Q39. Which of the following compounds undergo predominantly $\text{S}_\text{N}2$ reaction with NaOH in a polar aprotic solvent?



Choose the most most appropriate answer from the options given below:

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

Q40. Which of the following ion is colourless?

- (a) Zn^{2+}

- (b) Ti^{3+}
(c) Mn^{3+}
(d) Cr^{3+}

Answer the question on the basis of passage given below: (Q41 to Q45)

There are some deposits of nitrates and phosphates in the earth's crust. Nitrates are more soluble in water. Nitrates are difficult to reduce under laboratory conditions, but microbes do it easily. Ammonia, forms a large number of complexes with transition metals. Hybridisation easily explains the ease of sigma donation capability of NH_3 and PH_3 .

Phosphine is an inflammable gas, it is prepared from white phosphorus

Q41. Which of the following is the correct statement?

- (a) Phosphates have no biological significance in humans.
(b) Between nitrates and phosphates, phosphates are less abundant in the earth's crust.
(c) Between nitrates and phosphates, nitrates are less abundant in the earth's crust
(d) Oxidation of nitrates is possible in soil.

Q42. Among the following the correct statement is

- A. Between NH_3 and PH_3 , NH_3 is a better electron donor because the lone pair of electrons occupy spherical 's' orbital and is less directional.
B. Between NH_3 and PH_3 , NH_3 is a better electron donor because the lone pair of electrons occupies sp^3 orbital and is more directional.
C. Between NH_3 & PH_3 , PH_3 is a better electron donor because the lone pair of electrons occupies sp^3 orbital and is more directional.
D. Between NH_3 & PH_3 , PH_3 is a better electron donor because the lone pair of electrons occupies 's' orbital and is less directional.

Choose the most appropriate answer from the options given below:

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

Q43. White phosphorus on reacting with NaOH gives NaH_2PO_2 and PH_3 as products. This is an example of.

- (a) Dimerisation reaction
(b) Disproportionation reaction
(c) Condensation reaction
(d) Precipitation reaction

Q44. PH_3 is a better reducing agent than NH_3 because:

- (a) PH_3 can give its lone pair of electron easily
(b) Bond dissociation enthalpy of P-H is low
(c) Bond dissociation enthalpy of P-H is high
(d) PH_3 is tetrahedral in shape

Q45. NH_3 is a stronger base than PH_3

- (a) Phosphorus is smaller in size than nitrogen
(b) Nitrogen is smaller in size than phosphorus
(c) PH_3 does not have lone pair of electron
(d) NH_3 does not have lone pair of electron

Answer the question on the basis of passage given below: (Q46 to Q50)

Aldehydes and ketones are two important classes of organic compounds which are widely used in the synthesis of a

variety of other organic compounds. Due to the polarity of the carbonyl group, they undergo nucleophilic addition reactions. Broadly speaking, these addition reactions are of two types—one in which simply the addition of the nucleophilic reagent occurs across $>C=O$ bond and the other in which addition is followed by the elimination of a molecule of water. A number of ammonia derivatives such as hydroxylamine, hydrazine, phenylhydrazine, 2, 4-dinitrophenylhydrazine and semicarbazide belong to the second category of reactions. These derivatives are used for identification and characterization of aldehydes/ketones. Both types of nucleophilic addition reactions are influenced by steric and electronic factors. In general, aliphatic aldehydes are more reactive than aromatic aldehydes. The aliphatic aldehydes reduce both Fehling's solution and Tollen's reagent but aromatic aldehydes reduce only Tollen's reagent. Like aldehydes, aromatic ketones are less reactive than aliphatic ketones towards nucleophilic addition reactions.

Phenols and carboxylic acids are acidic in nature. Both dissolve in NaOH solution and turn blue litmus red. However carboxylic acids are much stronger acids than phenols and decompose $NaHCO_3$ with the evolution of CO_2 but phenols do not. Both electron-donating and electron-withdrawing substituents influence the acid strength of aliphatic as well as aromatic acids. Unlike all other aliphatic acids, formic acid has reducing properties and also does not show reactions of the alkyl group.

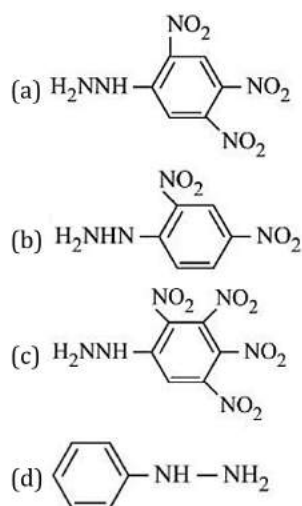
Q46. Which of the following statement/s is/ are correct?

- A. Aldehydes give positive test with Tollen's reagent.
- B. Ketones give positive test with Fehling's solution
- C. Ketones do not react with Fehling's solution.
- D. Aldehydes with Schiff's reagent restore pink colour
- E. Ketones with Schiff's reagent restore pink colour.

Choose the correct answer from the options given below:

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

Q47. Structure of Brady's reagent is _____



Q48. Which of the following compound most readily undergoes nucleophilic addition reaction?

- (a) Formaldehyde
- (b) Acetone
- (c) Acetaldehyde
- (d) Di-tert-butyl ketone

Q49. Carboxylic acid do not give the characteristic reaction of carbonyl group because:

- (a) the oxygen atom of the OH group does not contain lone pair of electrons
- (b) carbonyl carbon of carboxyl group is more electrophilic
- (c) carbonyl carbon of carboxyl group is more nucleophilic
- (d) carbonyl carbon of carboxyl group is less electrophilic

Q50. Fehling Solution A and B respectively, are:

- (a) Alkaline solution of sodium potassium tartrate and alcoholic copper sulphate
- (b) Aqueous copper sulphate and alkaline solution of Rochelle salt
- (c) Alkaline potassium citrate and aqueous solution of copper sulphate
- (d) Alkaline solution of Rochelle salt and aqueous copper sulphate

SOLUTIONS

S1. Ans. (c)

Sol. Bakelite and urea-formaldehyde resins are the example of thermosetting polymers. These are not elastomers.

S2. Ans. (d)

Sol. Option (A)

Mg is a metal that has free electrons. So, it conducts electricity in the solid state and is known as an electronic conductor.

Hence, (A) $\rightarrow$ (iv)

Option (B)

MgCl₂ shows electrolytic conductivity in the molten state due to its behaviour as an electrolyte (i.e., mobile ions Mg²⁺ and Cl⁻ ions help in the flow of current). Thus, MgCl₂ is an electrolytic conductor.

Hence, (B) $\rightarrow$ (iii)

Option (C)

When silicon (group 14) is doped with phosphorus (group 15), which contains five valence electrons, four out of the five valence electrons form covalent bonds with the four neighbouring silicon atoms. The fifth electron is extra and is delocalized. These delocalized electrons increase the conductivity due to the negatively charged electrons. Hence silicon doped with phosphorus (electron-rich impurity) is called an n-type semiconductor.

Hence, (C) $\rightarrow$ (ii)

Option (D)

When germanium (group 14) is doped with boron (group 13), which contains three valence electrons, the three valence electrons form covalent bonds with the four neighbouring silicon atoms. The place where the fourth valence electron is missing is called the electron-hole or electron vacancy. An electron from the nearby atom can occupy the vacancy, but in doing so, it would leave a vacancy in its original position.

Thus, it would seem as if the electron-hole is moving in the direction opposite to the electron that first occupied the vacant site. Under the influence of an electric field, the electrons move towards the positively charged plate whilst the electron-hole moves towards the negatively charged plate, as if the electron-hole were positive. Hence germanium doped with boron (electron-deficient impurity) is called a p-type semiconductor.

Hence,

(D) $\rightarrow$ (i)

S3. Ans. (b)

Sol. Chloramphenicol: C₁₁H₁₂Cl₂N₂O₅

The antibiotic used for the treatment of typhoid is Chloramphenicol.

S4. Ans. (c)

Sol. Phenol is a weak acid and cannot be neutralized by sodium carbonate.

S5. Ans. (a)

Sol. According to Raoult's law the partial vapors pressure of each component in the solution is directly proportional to its mole fraction.

S6. Ans. (d)

Sol. $\Delta T_f = k_f \times m \times i$

$$m \text{ (Molality)} = n_B/W_A(\text{kg}) = (20/100)/(500/1000) = 2/5 = 0.4$$

$$\Delta T_f = 0 - (-0.744) = 0.744 \text{ } ^\circ\text{C}$$

$$K_f = 1.86 \text{ km}^{-1}$$

$$= 0.744 = 1.86 \times 0.4 \times i$$

$$i = 1, \text{ for dissociation, } \alpha = 1 - 1/n - 1$$

$$= 1 - 1/2 - 1 = 0$$

S7. Ans. (a)

Sol. As atoms in FCC lattice touch each other along the face diagonal

$$\Rightarrow r + 2r + r = \text{length of face diagonal}$$

$$\Rightarrow a\sqrt{2} = 4r$$

$$\Rightarrow a = 2\sqrt{2}r$$

As atoms in BCC lattice touch each other along the body diagonal

$$\Rightarrow r + 2r + r = \text{length of body diagonal}$$

$$\Rightarrow a\sqrt{3} = 4r$$

$$\Rightarrow a = 4r/\sqrt{3}$$

As atoms in simple cubic lattice touch each other along the edge

$$\Rightarrow r + r = \text{length of edge}$$

$$\Rightarrow a = 2r$$

S8. Ans. (c)

Sol. Antibiotics which kill or inhibit a wide range of gram positive and gram-negative bacteria are called broad spectrum antibiotics. Among the given options, penicillin is not a broad-spectrum antibiotic. It is a narrow spectrum antibiotic i.e., it is effective mainly against specific families of bacteria.

S9. Ans. (c)

Sol. Part (A)

Soda water contains dissolved carbon dioxide in water. Thus, soda water is a solution of gas in liquid.

Hence,

(A) $\rightarrow$ (iv)

Part (B)

Sugar solution contains dissolved sugar particles in water. Thus, sugar solution is a solution of solid in liquid. Hence, (B) $\rightarrow$ (iii)

Part (C)

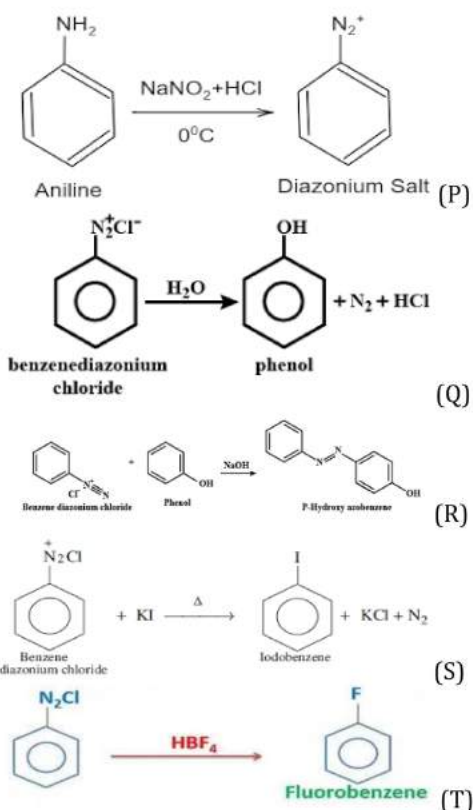
German silver is an alloy of Cu, Zn and Ni. Thus, German silver is a solution of solid in solid.

Hence, (C) $\rightarrow$ (ii)

Part (D)

Air is a mixture of nitrogen gas, oxygen gas and some other gases. Thus, air is a solution of gas in gas. Hence, (D) $\rightarrow$ (i)

S10. Ans. (c)



S11. Ans. (a)

Sol. Kolbe's reaction: When phenol reacts with sodium hydroxide, reactive phenoxide ion is formed. So, electrophilic aromatic substitution takes place with CO₂ under a pressure of 4-7 atm followed by acidification and ortho hydroxybenzoic acid (Salicylic acid) is formed. This is called Kolbe's reaction.

S12. Ans. (c)

Sol. Fog is an example of a colloid in which the dispersed phase is a liquid and the dispersion medium is a gas. Fog has tiny water droplets suspended in air. These kind of colloids are also called aerosols.

S13. Ans. (d)

Sol. [Co(en)₃]³⁺ is more stable than [Co(NH₃)₆]³⁺ as [Co(en)₃]³⁺ is a metal chelate due to presence of bidentate ligand ethylene diamine ligand. Metal chelates are more stable than complexes containing only monodentate ligands.

S14. Ans.(b)

Sol. A. Artificial sweetener: A sugar substitute is an ingredient added to food that has a similar sweet flavour to sugar but much fewer calories than sugar-based sweeteners, making it a zero-calorie or low-calorie sweetener. Alitame is an artificial sweetener.

B. Antihistamines interfere with the natural action of histamine by competing with histamine for binding sites of receptor where histamine exerts its effect. Synthetic drugs, brompheniramine (Dimetapp) and terfenadine (Seldane), act as antihistamines.

C. Non-narcotic (non-addictive) analgesics

Aspirin and paracetamol are the most common drugs in this case.

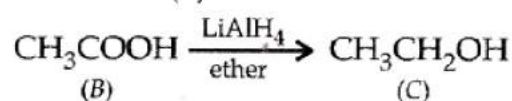
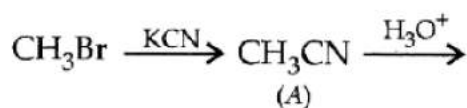
D. Antiseptics are the chemical drugs which either kill or prevent the growth of microorganisms. They are applied selectively to living tissues such as wounds, cuts, ulcers, and diseased skin surfaces. Examples are : -Furacin and soframycin are antiseptics.

S15. Ans. (d)

Sol. An increase temperature increases the reaction rate. When temperature is increased, the kinetic energy of the molecules also increase. Because of higher kinetic energy, the number of particles that possess the minimum energy also increases thereby more particles will collide and react.

S16. Ans. (d)

Sol.



Methyl bromide reacts with KCN to form acetonitrile. Br atom is replaced with CN group. Hydrolysis of cyano group gives carboxylic group. Reduction of carboxylic group gives hydroxyl group.

S17. Ans. (b)

Sol. Option (b) is incorrect because C₁₇H₃₅ is hydrophobic, whereas COO⁻ of stearate ion (C₁₇H₃₅COO⁻) is hydrophilic. This owes to the polarity of ions and hydrocarbons.

S18. Ans. (c)

Sol. Zone refining process is used in the purification of germanium.

S19. Ans. (b)

Sol. Mercury cell: It consists of zinc mercury amalgam as anode, a paste of HgO and Carbon black is used as cathode. The electrolyte is a paste of KOH and ZnO.
At anode: Zn (amalgam) + 2OH⁻ → ZnO(s) + H₂O(l) + 2e⁻
At cathode: HgO(s) + H₂O + 2e⁻ → Hg(l) + 2OH⁻

S20. Ans. (b)

Sol. [Cr(H₂O)₆]²⁺ and [Fe(H₂O)₆]²⁺ have same magnetic moment as both Cr²⁺ and Fe²⁺ have same number of unpaired electrons.

S21. Ans.(c)

Sol. Ferrous Ammonium Sulphate is also called Mohr's salt a light green color sand like crystalline solid

S22. Ans.(a)

Sol. Insulin is a peptide hormone (51 amino acids arranged in two peptide chains linked by two disulphide bonds, molecular weight 5807Da), which is secreted by the β-Cells of the islets of Langerhans in the pancreas.

S23. Ans.(c)

Sol. A. For the electronic configuration of the Cr³⁺ ion, we

will remove three electrons from the Cr (one from the 4s1 and two from the 3d5), leaving us with $1s^2 2s^2 2p^6 3s^2 3p^6 3d^3$ or $[\text{Ar}]3d^3$.

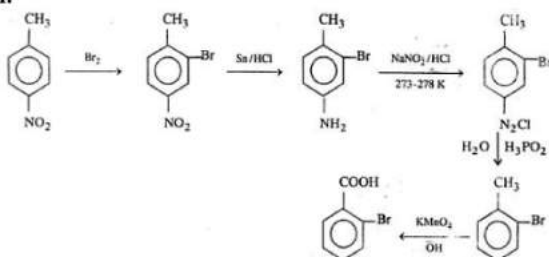
- B. The manganese (IV) oxide is the second most strongly attracted compound, and is paramagnetic.
- C. Cu^{+1} compound are diamagnetic in nature. the outer configuration is $3d^{10}$ and therefore it has all paired electrons in Cu^{+1} oxidation state.
- D. Electronic configuration of ${}_{22}\text{Ti}^{4+}$ is $[\text{Ar}]183d^0 4s^0$. So all electrons are paired and thus its all complexes are diamagnetic.

S24. Ans. (d)

Sol. Alum, also known as aluminium sulfate is added to water in order to destabilize the mud particles suspended in it. This process is known as coagulation. Alum helps in purifying water by aluminium which coagulates the mud particles. Because of the high charge on the aluminium ion (Al^{+3}), it helps the small particles of suspended solids to group together until they are of such size that they sink and can be removed.

S25. Ans. (a)

Sol.



S26. Ans. (c)

- A. In compounds, lanthanum exhibits only one oxidation state, +3.
- B. Like most rare-earth elements, praseodymium most readily forms the +3 oxidation state, which is the only stable state in aqueous solution, although the +4 oxidation state is known in some solid compounds.
- C. We know that, +3 oxidation is common in all series. Stable of +3 O.S. depends upon high hydration energy, high lattice energy and high I.P.
 Nd^{2+} - has configuration $4f^4$
 Nd^{4+} - has configuration $4f^2$
Hence +2, +4 oxidation states are unstable in Nd in aqueous solution.
- D. Samarium is a chemical element with symbol Sm and atomic number 62. It is a moderately hard silvery metal that slowly oxidizes in air. Being a typical member of the lanthanide series, samarium usually has the oxidation state +3.

S27. Ans. (a)

Sol. Emf of the cell, $\text{Zn (s)}|\text{Zn}^{2+}(\text{aq})||\text{Cu}^{2+}(\text{aq})|\text{Cu (s)}$ is:

$$E^0_{\text{Cu}^{2+}/\text{Cu}} - E^0_{\text{Zn}^{2+}/\text{Zn}} = +0.34 - (-0.76)$$

$$= 1.10\text{V}$$

Emf of the cell, $\text{Fe (s)}|\text{Fe}^{2+}(\text{aq})||\text{Cu}^{2+}(\text{aq})|\text{Cu (s)}$ is:

$$E^0_{\text{Cu}^{2+}/\text{Cu}} - E^0_{\text{Fe}^{2+}/\text{Fe}} = +0.34 - (0.41) = 0.75\text{V}$$

Since the two electrodes are connected in series, the net emf of the cell is:

$$= 1.10 + 0.75 = 1.85\text{V}$$

S28. Ans. (d)

Sol. The Thermite Process or Goldschmidt Process is the method of obtaining liquid metal by reduction of the oxide with aluminium powder, when ignited with magnesium ribbon it reacts by producing iron and aluminium oxide at an intensely high temperature approaching 3000°C . The reducing agent is aluminium.

S29. Ans. (b)

Sol. Due to its high boiling point and miscibility with H_2O , glycol is used as an antifreeze in automobile radiators.

S30. Ans. (d)

Sol. Half-life period is 12 hours. Hence, the amount of ${}^{19}\text{K}^{42}$ becomes half in $t_{1/2}$. After 48 h, it becomes $1/16$ th.

S31. Ans. (b)

Sol. In metal excess defect due to anion vacancies, negative ion is missing from its site by leaving a negative hole and this is occupied by electron. The anionic site occupied by electron is called F-centre. This imparts yellow colour to the NaCl while heating.

S32. Ans. (a)

Sol. The electron density at the carbonyl carbon increases with the increase in the +I effect. As a result, the chances of attack by a nucleophile decrease. Hence, the increasing order of the reactivities of the given carbonyl compounds in nucleophilic addition reactions is: Butanone < Propanal

S33. Ans. (a)

- Sol.**
- A. Xerophthalmia is a serious eye disorder associated with vitamin A deficiency.
- B. Vitamin C deficiency, also known as scurvy, is a disease primarily associated with socioeconomic status and access to food.
- C. Beriberi is a disease in which the body does not have enough thiamine (vitamin B_1).
- D. Severe vitamin D deficiency can also lead to other diseases: In children, it can cause rickets. Rickets is a rare disease that causes the bones to become soft and bend.

S34. Ans. (a)

Sol. As the intermolecular force increases, boiling point increases. Strength of intermolecular force is as follows:

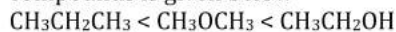
$\text{H-bonding} > \text{dipole-dipole} > \text{Dispersion force}$

Alcohol has the highest boiling point due to more extensive intermolecular H-bonding

Aldehyde is more polar than ether. So, ethanal has higher boiling point than methoxy methane.

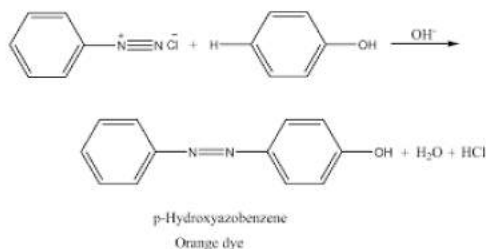
Alkane has the lowest boiling point due to complete non-polar nature (it has only London dispersion force).

Hence, increasing order of boiling points of compounds is given below-



S35. Ans. (c)

Sol.



S36. Ans. (a)

Sol. Limitations of Valence bond theory:

It does not give explain magnetic properties/data.

It does not explain the color indicated by coordination compounds.

It does not give an explanation of the thermodynamic/kinetic stabilities of coordination complexes.

It does not differentiate between weak/strong ligands.

S37. Ans. (a)

Sol. The reaction is, $\text{Cu}^{2+} + 2\text{e}^- \rightarrow \text{Cu}$

$I = 1.5$ ampere

$t = 10 \times 60$

$= 600\text{s}$

$Q = It$

$= 1.5 \times 600 = 900\text{ C}$

The reaction states that, $2 \times 96500\text{ C}$ required to deposit 63.5 g Cu at cathode

900 C will deposit,

$= 63.5 \times 900 / (2 \times 96500) \times 900 = 0.296\text{ g Cu}$ at cathode.

S38. Ans. (b)

Sol. $\text{CH}_3\text{COOCH}_3 + \text{H}_2\text{O} (\text{excess}) \rightarrow \text{CH}_3\text{COOH} + \text{CH}_3\text{OH}$

In this reaction, H_2O taken in excess therefore is known as first order pseudo reaction.

S39. Ans. (d)

Sol. Rate of $\text{S}_\text{N}2$ reaction $\propto -\text{M}$, -1 power.

S40. Ans. (a)

Sol. The ion will show colour if it has unpaired electrons in its electronic configuration, In Zn^{+2} there are no unpaired electrons due to fully filled d orbital. Hence, will be colourless.

S41. Ans. (c)

Sol. Due to greater solubility and nature to be prone to microbial action, nitrates are less abundant in earth's crust.

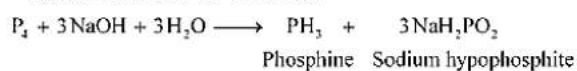
S42. Ans. (b)

Sol. In NH_3 lone pair on N is present in sp^3 hybridized orbital and hence is more directional.

Whereas in PH_3 lone pair is present mainly in 3s orbital also the bond angle in PH_3 is almost 90° and such compounds are regarded as drago compounds. So NH_3 is more basic than PH_3

S43. Ans. (b)

Sol. Here Phosphorus atom changes its ON from 0 to +1 in NaH_2PO_2 and 0 to -3 in PH_3



S44. Ans. (a)

Sol. Just because it easily loses electrons, so when it combines with any other element in order to form a compound it gives its electron to that element and reduce it. That's why it is a strong reducing agent.

S45. Ans.(b)

Sol. NH_3 is a stronger base than PH_3 . This is because the lone pair of electrons on N atom in NH_3 is directed and not diffused as it is in PH_3 due to large size of phosphorus and hence more available for donation.

S46. Ans. (c)

Sol. A. Tollen's test gives positive results in the presence of aldehyde and α -hydroxyketone.

C. Aldehydes result in a positive Tollen's test, but ketones do not, Because of their structure, ketones do not react with Fehling's or Tollens' reagents. The H atom is not directly linked to the carbonyl group in a ketone. Thus, ketones are not readily oxidized whereas aldehydes are.

D. Schiff's reagent gives pink colour with formic acid and aldehydes such as acetaldehyde. It does not give pink colour with other carboxylic acids, esters and ketones.

S47. Ans. (b)

Sol. The chemical formula of this compound is $\text{C}_6\text{H}_3(\text{NO}_2)_2\text{NHNH}_2$. It is formed by a substitution reaction on hydrazine. The structure of this compound comprises a benzene ring with one hydrazine group and the ortho and para positions occupied by nitro groups.



S48. Ans. (a)

Sol. Formaldehyde is most reactive towards addition reaction of hydrogen cyanide to form corresponding cyanohydrin. Carbonyl C atom in formaldehyde is most electrophilic. In aldehydes and ketones, +I effect of alkyl groups decreases electrophilic character of carbonyl C atom. Lower is the electrophilic character, lower is the reactivity towards addition reaction of hydrogen cyanide to form corresponding cyanohydrin.

S49. Ans. (d)

Sol. Carboxylic acids do not give characteristic reaction of carbonyl group. This is because the lone pairs on oxygen atom attached to hydrogen atom in the $-\text{COOH}$ group are involved in resonance thereby making the carbon atom less electrophilic. Hence, carboxylic acids do not give characteristic reaction of carbonyl group.

S50. Ans. (b)

Sol. Solution A: CuSO_4 solution.

Solution B: Rochelle salt (sodium potassium tartrate) + sodium hydroxide