# Previous Years Paper

**13 June 2023 (Shift – 3)**

**Q1.** Which of the following statements is not applicable to chemisorption?
(A) It is independent of temperature
(B) It is highly specific
(C) It is slow
(D) It is irreversible
Choose the **correct** answer from the options given below:
(a) (B) only
(b) (C) only
(c) (D) only
(d) (A) only

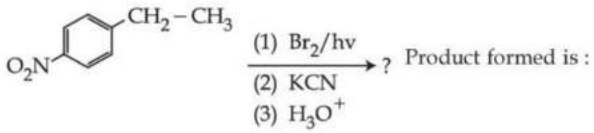
**Q2.** Which isomerism is shown by the following pairs?
$CH_3CH_2CH_2OH$ and $CH_3CH_2OCH_3$
(a) Position isomerism
(b) Functional isomerism
(c) Structural isomerism
(d) Chain isomerism

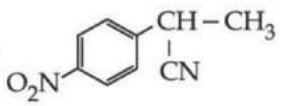
**Q3.** Which will form the most stable complex?
(a) NCS
(b) $CN^-$
(c) $H_2O$
(d) $C_2O_4^{2-}$

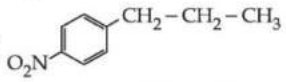
**Q4.** How many Cr-O bonds in dichromate ions are of the Same bond length and are in resonance?
(a) 8
(b) 6
(c) 3
(d) 4

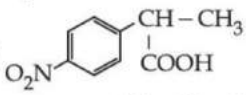
**Q5.** If time taken for a first order reaction to get 90% complete is 24 min, its $t_{99.9\%}$ will be:
(a) 240 min
(b) 48 min
(c) 120 min
(d) 72 min

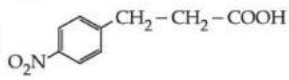
**Q6.**



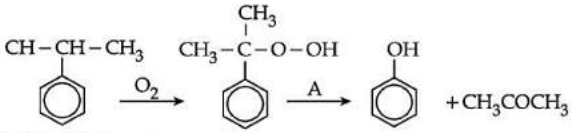

(a) 


(b) 


(c) 


(d) 


**Q7.** 'A' in the following reaction is:




(a) NaOH (aq.)
(b) NaOH (alcoholic)
(c) $KMnO_4$ alkaline
(d) $H_3O^+$

**Q8.** In process of froth floatation, which is used for the removing gangue from sulphide ones. Depressant used is:
(a) Xanthates
(b) Cresols
(c) NaCN
(d) Aniline

**Q9.** Zeolite can be used to soften hard water when:
(a) $Ca^{2+}$ or $Mg^{2+}$ ion in zeolite are replaced by $Na^+$ ions in hard water
(b) $Ca^{2+}$ ions in zeolite are replaced by $Mg^{2+}$ ions in hard water
(c) $Na^+$ ions in zeolite are replaced by $Ca^{2+}$ and $Mg^{2+}$ ions in hard water
(d) None is correct

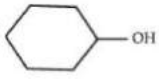
**Q10.** Indium is mainly refined by:
(a) Vapour phase refining
(b) Distillation
(c) Zone refining
(d) Liquation

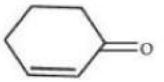
**Q11.** Match the Items **List-I** and **List-II**:

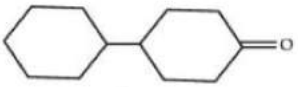
| **List-I** | | **List-II** | |
|---|---|---|---|
| (A) | Instantaneous Rate | (I) | rate constant |
| (B) | Average Rate | (II) | rate law |
| (C) | Mathematical expression for rate of reaction in terms of concentration of reactants | (III) | Short interval of time |
| (D) | Rate of reaction for zero order reaction is equal to | (IV) | long direction of time |

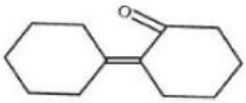
Choose the **correct** answer from the options given below:
(a) (A)-(IV), (B)-(II), (C)-(I), (D)-(III)
(b) (A)-(I), (B)-(II), (C)-(III), (D)-(IV)
(c) (A)-(II), (B)-(I), (C)-(IV), (D)-(III)
(d) (A)-(III), (B)-(IV), (C)-(II), (D)-(I)

**Q12.** What will be the product formed when cyclohexanone undergoes Aldol condensation?

(a) 

(b) 

(c) 

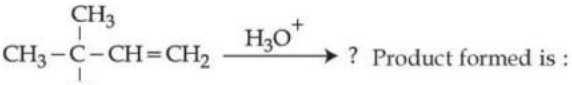
(d) 

**Q13.** In corrosion:
(A) A metal is oxidised by loss of electrons to oxygen
(B) It is an Electrochemical phenomenon
(C) The object under corrosion behaves as anode
(D) Coating the metal with Zn can save iron object from corrosion

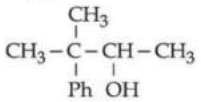
Choose the **correct** answer from the options given below:
(a) (A), (B) only
(b) (A), (B), (C) only
(c) (A), (B), (C), (D) only
(d) (B), (C), (D) only

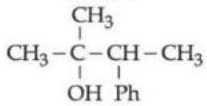
**Q14.** Excess of Lead from human body can be removed by using which of the following chelating agents?
(a) D -Penicillamine
(b) DMG
(c) Desferrioxime B
(d) EDTA

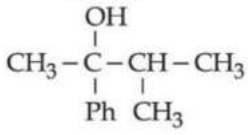
**Q15.**

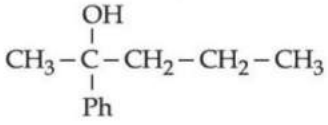


? Product formed is :

(a) 

(b) 

(c) 

(d) 

**Q16.** Vapour pressure of an aqueous solution of non-volatile solute which boils at 101.56°C at 25°C will be (V.P. of pure water at 25°C is 200 $mmH_g$ and $K_b$ for water is 0.52 kg $mol^{-1}$)
(a) 198.98 mmHg
(b) 189.8 mmHg
(c) 179.6 mmHg
(d) 184.7 mmHg

**Q17.** In a reaction A and B reacts to form product. The initial rate of reaction ($r_0$) was determined using different initial concentration of A and B.

| | | | |
|---|---|---|---|
| A/mol $L^{-1}$ | 0.10 | 0.10 | 0.20 |
| B/mol $L^{-1}$ | 0.30 | 0.10 | 0.30 |
| $R_0$/mol $L^{-1}s^{-1}$ | $6.81\times10^{-4}$ | $2.27\times10^{-4}$ | $13.62\times10^{-4}$ |

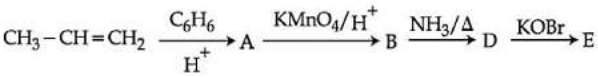
What is the initial rate of reaction ($r_0$) when critical concentration of A and B is 0.50 mol/L and 0.50 mol/L respectively.
(a) $56.75 \times 10^{-4}$ mol $L^{-1}s^{-1}$
(b) $5.675 \times 10^{-4}$ mol $L^{-1}s^{-1}$
(c) $21.67 \times 10^{-4}$ mol $L^{-1}s^{-1}$
(d) $2.167 \times 10^{-4}$ mol $L^{-1}s^{-1}$

**Q18.** The electronic conductance depends on.
(A) The nature and structure of the metal
(B) Composition of metallic conductor
(C) The number of valence electrons per atom
(D) Temperature
(E) Number of ions
Choose the **correct** answer from the options given below:
(a) (A), (B) and (C) only
(b) (A), (C) and (D) only
(c) (C), (D) and (E) only
(d) (A), (B) and (E) only

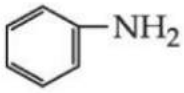
**Q19.** In which of the following actinoid elements 6d subshell is vacant?
(a) Pa, Protactinium
(b) Np, Neptunium
(c) Lr, Lawrencium
(d) Pu, Plutonium

**Q20.** Identify the correct relation between the molar mass of solute and Ebullioscopic constant.
(a) $M_2 = \frac{1000\times w_2\times w_1}{\Delta T_b\times K_b}$
(b) $\Delta T_b = \frac{1000\times w_2\times K_b\times M_2}{w_1}$
(c) $M_2 = \frac{1000\times w_2\times K_b}{\Delta T_b\times w_1}$
(d) $M_2 = \frac{1000\times w_1\times K_b}{\Delta T_b\times w_2}$

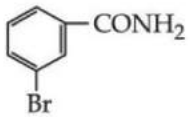
**Q21.**

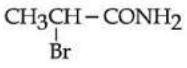


Product E is:

(a) 

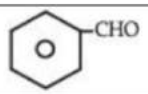
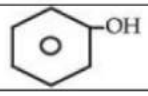
(b) $CH_3CH_2 - NH_2$

(c) 

(d) 

**Q22.** Match **List-I** with **List-II**:

| List-I | | List-II | |
|---|---|---|---|
| (A) | $CH_3COCH_3$ | (I) | $NaCHO_3$ test |
| (B) | $CH_3COOH$ | (II) | Tollen's test |

| | | | |
|---|---|---|---|
| (C) |  | (III) | Iodoform test |
| (D) |  | (IV) | $F_eCl_3$ test |

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

**Q23.** Which of the following is not the characteristics of enzymes?
(a) Non - specific
(b) Active at optimum pH
(c) Affected by inhibitors
(d) Highly efficient

**Q24.** Match **List-I** with **List-II**:

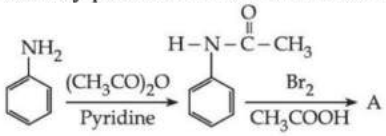
| List-I | | List-II | |
|---|---|---|---|
| (A) | $CH_3CH_2Br$ + alc. KOH → | (I) | $CH_3CH_2NO_2$ |
| (B) | $CH_3CH_2Br$ + aq. KOH → | (II) | $CH_2 = CH_2$ |
| (C) | $CH_3CH_2Br + KNO_2$ → | (III) | $CH_3CH_2ONO$ |
| (D) | $CH_3CH_2Br + AgNO_2$ → | (IV) | $CH_3CH_2OH$ |

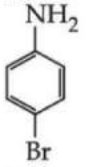
Choose the **correct** answer from the options given below:
(a) (A)-(IV), (B)-(II), (C)-(I), (D)-(III)
(b) (A)-(IV), (B)-(II), (C)-(III), (D)-(I)
(c) (A)-(II), (B)-(IV), (C)-(III), (D)-(I)
(d) (A)-(II), (B)-(IV), (C)-(I), (D)-(III)

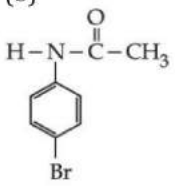
**Q25.** Correct order of intermolecular forces of attractions in the following solids is:
(A) NaC1
(B) $I_2$
(C) Ice
(D) Iron
(E) Rubber
Choose the **correct** answer from the options given below:
(a) (B), (D), (C), (E), (A)
(b) (D), (B), (C), (E), (A)
(c) (E), (B), (C), (D), (A)
(d) (E), (C), (B), (A), (A)

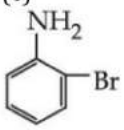
**Q26.** Which of the following statement is/ are correct for complex $[Nicl_4]^{2-}$
(A) Ni has oxidation state + 2
(B) Clis a weak field ligand
(C) Compound is paramagnetic
(D) $dsp^2$ hybridisation
(E) Low spin complex
Choose the **correct** answer from the options given below:
(a) (A), (B) and (C) only
(b) (D), and (E) only
(c) (A), (B), (C) and (D) only
(d) (A) only

**Q27.** Identify product i A' in the reaction shown below:




(a)



(b)



(c)
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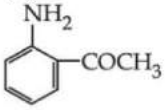
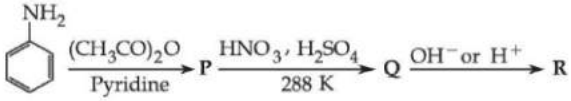
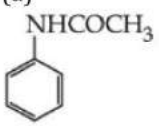
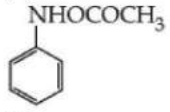



**Q28.** Correct order of boiling points in the following is:
(A) $CH_3CHO$
(B) $CH_3COOH$
(C) $CH_3CH_2OH$
(D) $CH_3CH_3$
(E) $CH_3CH_2C1$
Choose the **correct** answer from the options given below:
(a) (C), (B), (A), (D), (E)
(b) (C), (A), (B), (E), (D)
(c) (B), (C), (E), (A), (D)
(d) (B), (C), (A), (E), (D)

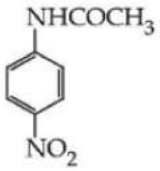
**Q29.** Identify P,Q and R in the correct sequence of reactions shown below.




(a)



(b)



(c)



(d)

(e)

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

**Q30.** Which of the following alkyl halide will undergo SNI reaction most readily:
(a) $(CH_3)_3C$-F
(b) $(CH_3)_3C$-Cl
(c) $(CH_3)_3C$-Br
(d) $(CH_3)_3C$-I

**Q31.** Which of the properties are shown by d block elements?
(A) Complex formation
(B) Chelating agents
(C) Bleaching agents
(D) Catalytic properties
(E) Alloy formation
Choose the **correct** answer from the options given below:
(a) (C), (D), (E) only
(b) (A), (B), (C) only
(c) (B), (C), (D) only
(d) (A), (D), (E) only

**Q32.** Match **List-I** with **List-II**:

| **List-I** | | **List-II** | |
|---|---|---|---|
| (A) | Impurity defect | (I) | NaCl with anionic sites called F centres |
| (B) | Metal excess defect | (II) | FeO with $Fe^{3+}$ |
| (C) | Metal deficiency defect | (III) | Non-ionic solids and density of solid decreases |
| (D) | Simple vacancy defect | (IV) | NaCl with $Sr^{2+}$ and cationic sites vacant |

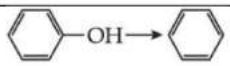
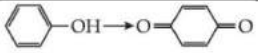
Choose the **correct** answer from the options given below:
(a) (A)-(III), (B)-(II), (C)-(I), (D)-(IV)
(b) (A)-(IV), (B)-(I), (C)-(II), (D)-(III)
(c) (A)-(II), (B)-(I), (C)-(II), (D)-(IV)
(d) (A)-(I), (B)-(II), (C)-(IV), (D)-(III)

**Q33.** Name the reagent required to convert cyclohexene into hexane —1, 6—dioic acid.
(a) $KMnO_4/H_2SO_4, \Delta$
(b) Tollen's reagent
(c) Grignard reagent
(d) KCN

**Q34.** Which of the statements are true?
(A) The coagulation of lyophobic sols can be done by electrophoresis
(B) Principal emulsifying agent for W/O emulsions are proteins, soaps, gums etc.
(C) Alum is used for cleaning muddy water
(D) Gelatin is added to ice cream to act as emulsifier

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

**Q35.** Match the chemical conversion in **List-I** to the appropriate reagent in **List-II**.

| **List-I** | | **List-II** | |
|---|---|---|---|
| (A) |  | (I) | $Na_2Cr_2O_7$ in presence of $H_2SO_4$ |
| (B) | $CH_3CH_2OH \rightarrow C_2H_5OC_2H_5$ | (II) | $H_2SO_4$ at 443 K |
| (C) |  | (III) | Zn |
| (D) | $CH_3CH_2OH \rightarrow CH_2 = CH_2$ | (IV) | $H_2SO_4$ at 413 k |

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

**Q36.** Write the IUPAC name of the following compound $C_6H_5O(CH_2)_6 - CH_3$
(a) 2 - Methoxy heptane
(b) 1 - Phenoxy heptane
(c) 1 - Benzoyl heptane
(d) Methyl benzyl ether

**Q37.** Tertiary amino group is found in:
(a) Novocain
(b) Ephedrine
(c) Benadryl
(d) Adrenaline

**Q38.** Which of the following shows both, Frenkel and Schottky defect?
(a) KCl
(b) AgCl
(c) AgBr
(d) NaCl

**Q39.** The role of a catalyst is to change:
(a) Gibbs energy of reaction

(b) Enthalpy of reaction
(c) Activation energy of reaction
(d) Equilibrium constant

**Q40.** Which of the following reaction occurs at anode during discharging of lead storage battery?

(a) $PbO_2 + SO_4^{2-}(aq) + H^+(aq) + 2e^- \rightarrow PbSO_4(s) + 2H_2O(I)$

(b) $Pb(s) + SO_4^{2-}(aq) \rightarrow PbSO_4(s) + 2e^-$

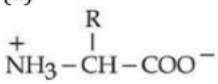
(c) $PbSO_4 + 2e^- \rightarrow Pb(s) + SO_4^{2-}(aq)$

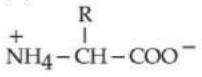
(d) $PbSO_4(s) + 2H_2O(l) \rightarrow Pb(s) + 2H_2SO_4 + SO_4^{2-}(aq) + H^+(aq) + 2e^-$

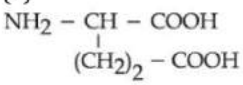
Direction for the question 41 to 45: **Answer the question on basis of passage given below:**
In zwitter ionic form, amino acids show amphoteric behaviour as they react both with acids and bases. Except glycine, all other naturally occurring α - amino acids are optically active, since the α - carbon atom is asymmetric. These exist both in 'D' and 'L' forms. Most naturally occurring amino acids have L-configuration. L-Aminoacids are represented by writing the $-NH_2$ group on left hand side.

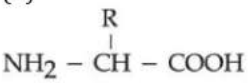
**Q41.** Which of the following amino acid is essential?
(a) Glycine
(b) Glutamic acid
(c) Alanine
(d) Valine

**Q42.** Which of the following Zwitter ion form is correct?

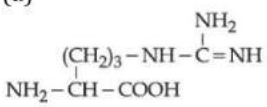
(a)


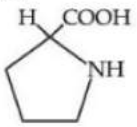
(b)


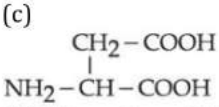
(c)


(d)


**Q43.** Identify the amino acid which is amphoteric in nature.

(a)


(b)


(c)


(d) $NH_2 - CJ_2 - COOH$

**Q44.** Optically inactive amino acid from the following is:
(a) Valine
(b) Glycine
(c) Alanine
(d) Proline

**Q45.** β-D-Deoxyribose and ß-D-ribose differs from each other in configuration at:
(a) C-5
(b) C-3
(c) C-4
(d) C-2

Direction for the question 46 to 50: **Answer the question on basis of passage given below:**
P block elements are placed in groups 13 to 18 of the periodic table. Their valence shell electronic configuration is $ns^2\ np^{1-6}$. Group 16 of the p block elements are known as the group of chalcogens having $ns^2\ np^4$ as their general electronic configuration. They exhibit number of oxidation states but the stability of —2 oxidation state decreases down the group. They are sometimes also known as group of chalcogens as the name is derived from the Greek word for brass and points to the association of sulphur and its congeners with copper. Their ionisation enthalpy decreases down the group. Oxygen shows anomalous behaviour due to its small size and high electronegativity.

**Q46.** Which one is the correct electronic configuration of sulphur?
(a) [Nel $3s^2\ 3p^2$
(b) [He] $2s^2\ 2p^4$
(c) [Ne] $3s^2\ 3p^4$
(d) [Ne] $3s^2\ 3p^6$

**Q47.** Identify the epsom salt out of the following salts:
(a) Pbs
(b) ZnS
(c) $CuFeS_2$
(d) $MgSO_4\ 7H_2O$

**Q48.** Match the oxidation state of phosphorous in the following compounds to their counter parts in **List II**.

| **List-I** | | **List-II** | |
|---|---|---|---|
| (A) | $H_3PO_2$ | (I) | +3 |
| (B) | $H_4P_2O_6$ | (II) | +5 |
| (C) | $H_3PO_3$ | (III) | +1 |
| (D) | $H_3PO_4$ | (IV) | +4 |

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

**Q49.** What will be the products formed in the following equation?
$U(S) + 3ClF_3(1) \longrightarrow$ _____ + _____.
(a) $UF_4$ (g) and 3UCI (g)
(b) $UF_6$ (g) and 3CIF (g)
(c) $UF_4$ (g) and 3 CIF (g)
(d) $UF_6$ (g) and 3 UCI (g)

**Q50.** Given below are the Hydrides formed by group 15 elements. Choose the correct decreasing order of basicity of the following hydrides

(A) $AsH_3$
(B) $PH_3$
(C) $NH_3$
(D) $BiH_3$
(E) $SbH_3$

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

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

# SOLUTIONS

**S1. Ans.(d)**

**Sol.** Chemisorption first increases and then decreases with temperature.

**S2. Ans. (b)**

**Sol.** $CH_3CH_2OCH_3$ and $CH_3CH_2CH_2OH$ have different functional groups, hence, they are functional isomers.

**S3. Ans. (d)**

**Sol.** As $C_2O_4^{2-}$ is a bidentate chelating ligand, it forms rings and hence $C_2O_4^{2-}$ will form the most stable complex.

**S4. Ans. (b)**

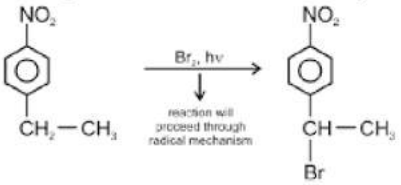
**Sol.** In Cr2O72- ion, 6(Cr-O) bonds have the same bond length 163 pm because of the resonance and 2(Cr-O) bonds have a bond length of 179 pm.

**S5. Ans. (d)**

**Sol.** t 90 = 2.303/k log(100/10)
k = 0.09595
t99.9 = 2.303/0.09595 log(100/0.1) = 72.00 min

**S6. Ans. (c)**

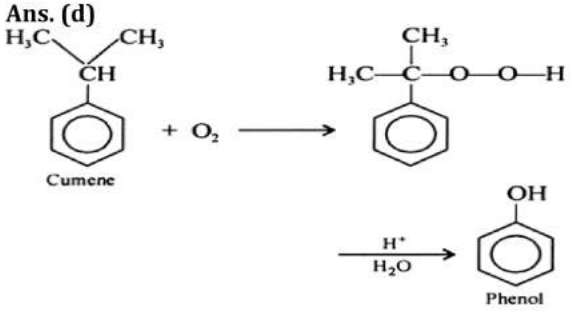
**Sol.** In the presence of light, side chain (free radical) halogenation occurs at the benzylic hydrogen.




If $Br/FeBr_3$ was given than bromination at benzene ring has occurred.

**S7. Ans. (d)**

**Sol.**




**S8. Ans. (c)**

**Sol.** It uses NaCN as a depressant in the mixture of ZnS and PbS, where ZnS forms soluble complex and PbS form froth.

**S9. Ans. (a)**

**Sol.** The Zeolites which consist of sodium in their pores when filled with hard water in their columns can easily trap salts of calcium and magnesium and release sodium ions.

**S10. Ans. (c)**

**Sol.** Ga, In, Si, Ge are refined by zone refining or vacuum refining. This method is very useful for producing semiconductor and other metals of very high purity.

**S11. Ans. (d)**

**Sol.** [A] The instantaneous rate is the rate of a reaction at a period of time that is so short that the concentrations of reactants and products change by a negligible amount.

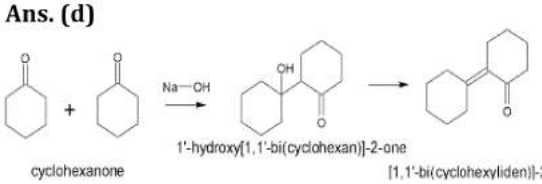
[B] Average rate: the average rate of a reaction is defined as a rate of change of consideration of reactant (or of a product) over a specific measurable period of time.

[C] The mathematical expression which describes the reaction rate in terms of molar concentrations of the reactants as determined experimentally is called rate law

[D] For a zero-order reaction, the rate law is rate = k, where k is the rate constant.

**S12. Ans. (d)**

**Sol.**




**S13. Ans. (c)**

**Sol.** [A] In corrosion, a metal is oxidized by loss of electrons to oxygen and the formation of oxides

[B] Corrosion is a process of conversion of a metal into its compounds by continuous interaction with atmospheric air and water vapour. This is an electrochemical reaction in which metals lose electrons and oxygen accepts them.03-Jul-2022

[C] Corrosion occurs at the anode

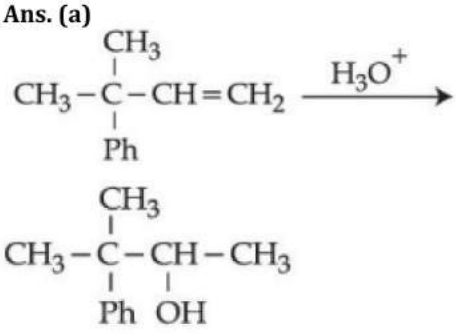
[D] Galvanization is the process of applying a protective zinc coating to steel or iron, to prevent rusting.

**S14. Ans. (d)**

**Sol.** Health care providers treat adults with lead levels greater than 45 mcg/dL of blood and children who can't tolerate the drug used in conventional chelation therapy most commonly with a chemical called calcium disodium ethylenediaminetetraacetic acid (EDTA).

**S15. Ans. (a)**

**Sol.**




**S16. Ans. (b)**

**Sol.**

**S17. Ans. (a)**

**S18. Ans. (b)**

**Sol.** Electrical conductance through movement of electrons is called electronic conductance. Electronic conductance depends upon:

(i) The nature and structure of the metal.

(ii) Number of valence electrons per atom.

(iii) Temperature.

**S19. Ans. (d)**

**Sol.** $Pu(Z-94) = [Rn]5f^{6}7s^{2}$

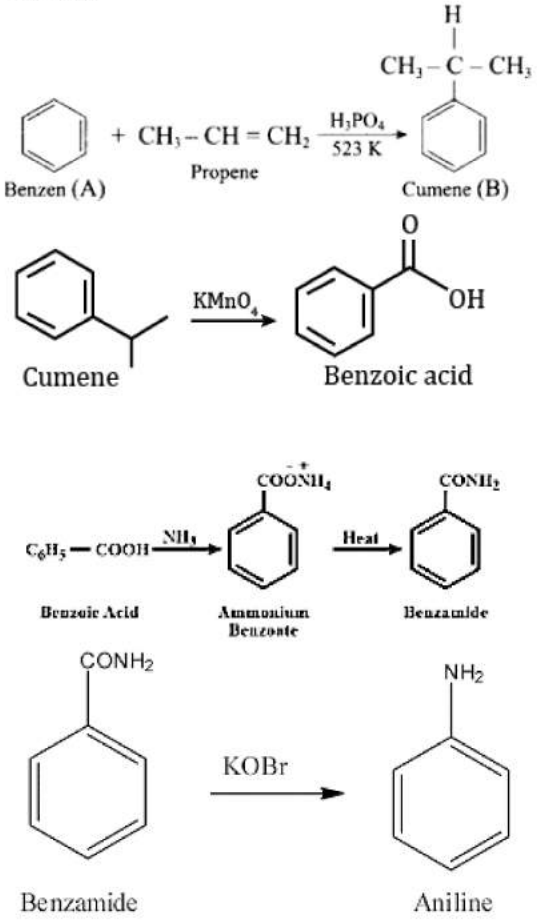
**S20. Ans. (c)**

**Sol.** The ebullioscopic constant is also called the molal elevation constant. It is defined as the elevation in boiling point when one mole of non-volatile solute is added to one kilogram of solvent. It is denoted by Kb.

$\Delta T_b = K_b \times \frac{w_2 \times 1000}{w_1 \times M_2}$

**S21. Ans. (a)**

**Sol.**




**S22. Ans. (d)**

**Sol.** [A] $CH_3COCH_3$ will have alpha-hydrogen and give iodoform test.

[B] The above given reaction,
$CH_3COOH\ (aq) + NaHCO_3\ (s) \rightarrow CH_3COONa\ (aq) + H_2O\ (l) + CO_2\ (g) \uparrow$

[C] Fehling solution, Schiff's reagent, tollen's reagent test is given by aldehydes only.

[D] Compounds with a phenol group will form a blue, violet, purple, green, or red-brown color upon addition of aqueous ferric chloride

**S23. Ans. (a)**

**Sol.** 1. Speed up chemical reactions.
2. They are required in minute amounts.
3. They are highly specific in their action.
4. They are affected by temperature.
5. They are affected by pH.
6. Some catalyze reversible reactions.
7. Some require coenzymes.
8. They are inhibited by inhibitors.

**S24. Ans. (c)**

$CH_3CH_2Br + KOH_{(aq)} \rightarrow CH_3CH_2OH + KBr$
Bromoethane — Ethanol

**Sol.**

$CH_3CH_2Br + KOH_{(alc)} \rightarrow CH_2{=}CH_2 + KBr + H_2O$
Bromoethane — Ethene

$R{-}X + K^{+}O{-}N{=}O \xrightarrow{Heat} R{-}O{-}N{=}O + KX$
Potassium nitrite — Alkyl nitrite

$CH_3CH_2Br + KNO_2 \xrightarrow{Heat} CH_3CH_2{-}O{-}N{=}O + KBr$
Ethyl nitrite

$CH_3CH_2Br + AgNO_2 \rightarrow CH_3CH_2NO_2$

**S25. Ans. (c)**

**Sol.** For sodium chloride, the $Na^+$ ion becomes surrounded by the negative side of multiple water molecules and the $Cl^-$ ions are surrounded by the positive side of multiple water molecules. This interaction is called an ion-dipole intermolecular force, which is considered one of the strongest

[B] Molecular iodine is completely non-polar. As such, the only intermolecular force between molecules of iodine is the London dispersion force.

[C] On freezing of water molecule, it converted to ice that maximizes the number of hydrogen bonds. This indicates the presence of hydrogen bonding in ice that is responsible for its solid structure. Hence, the hydrogen bonding intermolecular forces hold the ice together
Hydrogen bonds are stronger than London dispersion

[D] Iron has strongest intermolecular forces of attraction so it is hardest element.

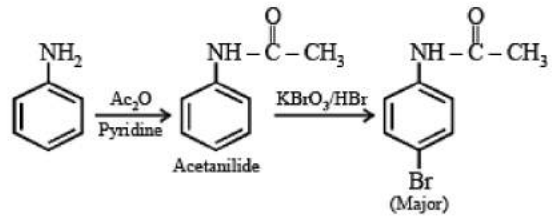
[E] Rubber is a natural polymer and possesses elastic properties. It is also termed as an elastomer.
Elastomers have the weakest intermolecular forces

**S26. Ans. (a)**

**Sol.** $Cl^-$ is a weak field ligand (i.e., it induces high spin complexes). Therefore, electrons fill all orbitals before being paired
Nickel (Ni) in the complex $[NiCl_4]^{2-}$ is in a +2 oxidation state.
In $[NiCl_4]^{2-}$ , Ni is in +2 oxidation state with the configuration $3d^8\ 4s^0$. $Cl^-$ ion being weak ligand it cannot pair up the electrons in 3dorbitals.Hence it is paramagnetic
$[NiCl_4]^{2-}$ is a tetrahedral complex with sp3 hybridization
As there are unpaired electrons in the d-orbitals, $NiCl_4^{2-}$ is paramagnetic and is referred to as a high spin outer orbital complex

**S27. Ans. (b)**

**Sol.**

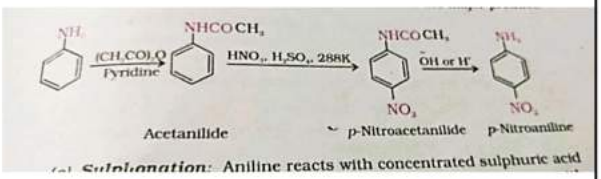



**S28. Ans. (d)**

**Sol.** Carboxylic acids tend to have higher boiling points when compared to ethers, alcohols, aldehydes, or ketones with a similar molecular weight.
Basically, the aldehyde/ketone moiety does provide for stronger intermolecular bonds than individual halogen atoms, so all else equal, the former molecules will have higher boiling points.

**S29. Ans. (d)**

**Sol.**




**S30. Ans. (d)**

**Sol.** All the given compounds are tertiary alkyl halides but the bond formed between carbon and iodine (C-l) bond is the weakest bond due to large difference in the size of carbon and iodine. So, (CH3)3 C-l gives $S_N1$ reaction most readily.

**S31. Ans. (d)**

**Sol.** [A] The d-block elements being smaller in size and have high electropositive density and they consists of (n-1)d free orbitals to accepts the free electrons from the ligand and it forms complexes easily.

[D] Transition elements or d-block elements exhibit catalytic behaviour primarily for the following reasons: They have unoccupied d-orbitals. They are capable of displaying a range of valencies. They have a proclivity for forming complicated chemicals.

[E] D block elements are used to make alloys with other metals

**S32. Ans. (b)**

**Sol.** [A] The defects introduced in the crystal lattice due to the presence of a certain impurity are called impurity defects. This type of defect arises in the crystal due to the presence of impurity or a foreign particle in a lattice. When $Sr^{2+}$ replaces $2Na^+$ ions, it occupies only one site and leaves the other site vacant. Thus, this causes a vacancy.

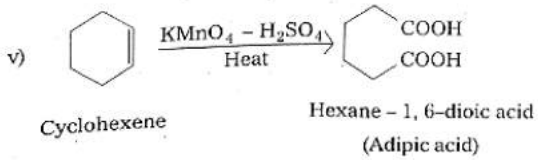
[B] Metal excess defects can occur due to a missing anion from an ideal ionic solid, which leads to the creation of an F-centre, which is generally occupied by an unpaired electron. e.g., NaCl with the anionic site.

[C] FeO shows metal deficiency defect. In crystal of FeO some $Fe^{2+}$ cations are missing and the loss of positive charge is made up by the presence of required number of $Fe^{3+}$ ions.

[D] When an atom is not present at their lattice sites, then that lattice site is vacant and it creates a vacancy defect. Due to this, the density of a substance decreases.

**S33. Ans. (a)**

**Sol.**

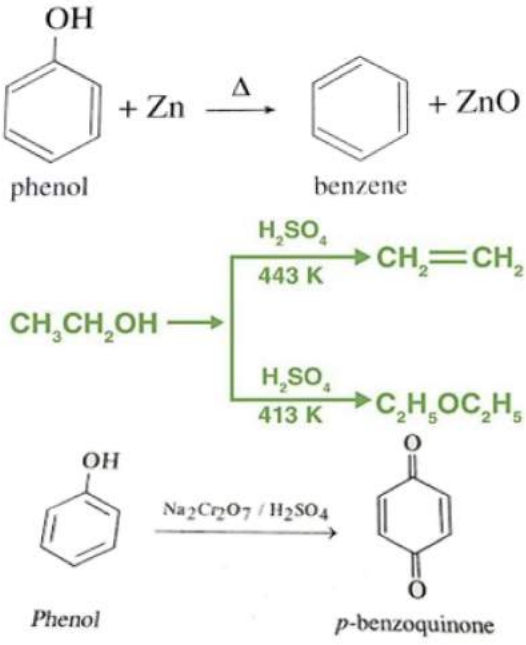



**S34. Ans. (b)**

**Sol.** [B] The principle emulsifying agents for O/W emulsion (i.e. oil dispersed in water) are proteins, gums, agar, natural and synthetic soaps while the principle emulsifying agents for W/O emulsions (i.e. water dispersed in oil) are heavy metal salts of fatty acids, long chain alcohols, lampblack etc.
Remaining are correct.

**S35. Ans. (a)**

**Sol.**




**S36. Ans. (b)**

**Sol.** The IUPAC name of the compound $C_6H_5O(CH_2)_6CH_3$ is 1-phenoxy heptane.

**S37. Ans. (c)**

**Sol.** Benadryl, a well-known antihistaminic drug also contains tertiary amino group.

**S38. Ans. (c)**

**Sol.** AgBr has both schottky and frenkel defects. In general, silver haldies show both schottky and frenkel defects. In schottky defect, equal number of cations and anions are missing from crystal lattice.
-In AgCl, as the anion is much larger than the cation, it shows Frenkel defect

**S39. Ans. (c)**

**Sol.** The role of a catalyst is to change the activation energy of the reaction. However, catalyst does not changes Gibbs energy of reaction, enthalpy of reaction and equilibrium constant.

**S40. Ans. (b)**

**Sol.** $Pb \rightarrow Pb^{2+} + 2e^-$

$Pb^{2+} + SO_4^{2-} \rightarrow PbSO_4$

Overall reaction at anode during discharge:

$Pb + SO_4^{2-} \rightarrow PbSO_4 + 2e^-$

**S41. Ans. (d)**

**Sol.** The 9 essential amino acids are: histidine, isoleucine, leucine, lysine, methionine, phenylalanine, threonine, tryptophan, and valine.

**S42. Ans. (a)**

**Sol.** $H_3\overset{\oplus}{N} - CH_2 - COOH \rightleftharpoons H_3\overset{\oplus}{N} - CH_2 - COO^-$ (Zwitterion form)

$pK_a = 9.60$ $pK_a = 2.34$

**S43. Ans. (d)**

**Sol.** Glycine is an amino acid, it contains both $NH_2$ as well as –COOH groups and therefore, its aqueous solution form Zwitterion which is amphoteric in nature.

**S44. Ans. (b)**

**Sol.** Glycine has no chiral center. So, it is optically inactive.

**S45. Ans. (d)**

**Sol.** The structure of Ribose and Deoxyribose is almost identical, with just one difference. Ribose sugar has a hydroxyl (OH) group at position 2, whereas deoxyribose sugar has a hydrogen (H) atom at position 2.

**S46. Ans. (c)**

**Sol.** Electronic configuration of sulphur is $1s^2 2s^2 2p^6 3s^2 3p^4$

So, electronic configuration is $[Ne]3s^2 3p^4$

**S47. Ans. (d)**

**Sol.** Magnesium Sulphate is also known as Epsom salt. It is an inorganic salt and its formula is $MgSO_4(H_2O)x$.

**S48. Ans. (a)**

**Sol.** The Oxidation Number of P in $H_3PO_2$ is + 1

Thus oxidation states of P in $H_4P_2O_5$, $H_4P_2O_6$, $H_4P_2O_7$, are +3, +4 and +5.

The oxidation number of P in $H_3PO_3$ is + 3

The oxidation number of Phosphorus (P) in Phosphoric acid ($H_3PO_4$) is equal to +5.

**S49. Ans. (c)**

**Sol.** $U(s) + 3ClF_3(l) \rightarrow UF_4(l) + 3ClF(s)$

**S50. Ans. (a)**

**Sol.** As we move down the group the size of the central atom increases thereby their orbital become more diffused, hence the nucleophilicity of the lone pair is less dense over the bigger atoms thereby decreasing the basicity. So, the increasing order of their basic character is, $BiH_3 < SbH_3 < AsH_3 < PH_3 < NH_3$.