

Previous Years Paper

13 June 2023 (Shift - 3)

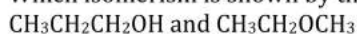
Q1. Which of the following statements is not applicable to chemisorption?

- (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?



- (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) $\text{C}_2\text{O}_4^{2-}$

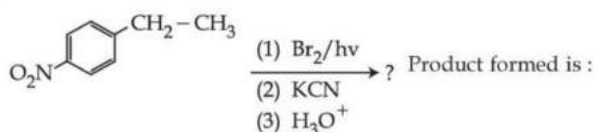
Q4. How many Cr-O bonds in dichromate ions are of the same bond length and are in resonance?

- (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:

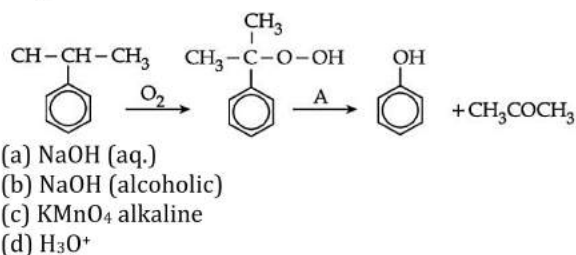
- (a) 240 min
- (b) 48 min
- (c) 120 min
- (d) 72 min

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 ores. 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**:

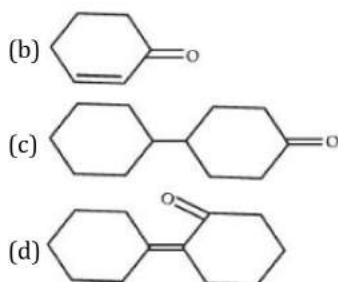
List-I		List-II	
(A)	Instantaneous Rate	(I)	rate constant
(B)	Average Rate	(II)	rate law
(C)	Mathematical expression for rate of reaction in terms of concentration of reactants	(III)	Short interval of time
(D)	Rate of reaction for zero order reaction is equal to	(IV)	long direction of time

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?





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

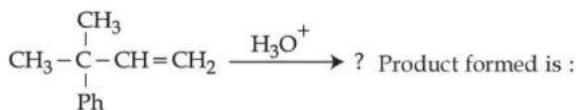
Choose the **correct** answer from the options given below:

- (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.



- (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 mmHg 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
$R_0/\text{mol L}^{-1}\text{s}^{-1}$	6.81×10^{-4}	2.27×10^{-4}	13.62×10^{-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) $56.75 \times 10^{-4} \text{ mol L}^{-1}\text{s}^{-1}$
 (b) $5.675 \times 10^{-4} \text{ mol L}^{-1}\text{s}^{-1}$
 (c) $21.67 \times 10^{-4} \text{ mol L}^{-1}\text{s}^{-1}$
 (d) $2.167 \times 10^{-4} \text{ mol L}^{-1}\text{s}^{-1}$

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) $\text{CH}_3\text{CH}_2 - \text{NH}_2$
- (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)	FeCl_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) $\text{CH}_3\text{CH}_2\text{Br} + \text{alc. KOH} \rightarrow$	(I) $\text{CH}_3\text{CH}_2\text{NO}_2$
(B) $\text{CH}_3\text{CH}_2\text{Br} + \text{aq. KOH} \rightarrow$	(II) $\text{CH}_2 = \text{CH}_2$
(C) $\text{CH}_3\text{CH}_2\text{Br} + \text{KNO}_2 \rightarrow$	(III) $\text{CH}_3\text{CH}_2\text{ONO}$
(D) $\text{CH}_3\text{CH}_2\text{Br} + \text{AgNO}_2 \rightarrow$	(IV) $\text{CH}_3\text{CH}_2\text{OH}$

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) NaCl
 (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)

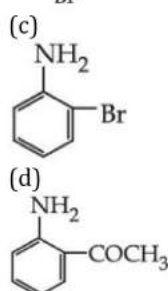
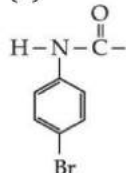
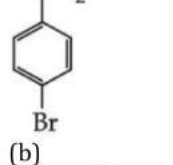
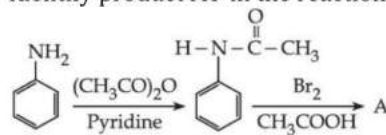
Q26. Which of the following statement is/ are correct for complex $[\text{NiCl}_4]^{2-}$

- (A) Ni has oxidation state + 2
 (B) Cl is 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:



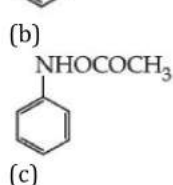
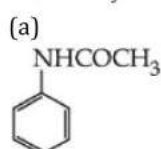
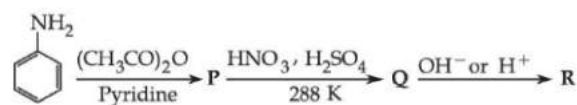
Q28. Correct order of boiling points in the following is:

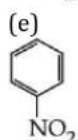
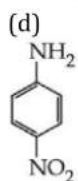
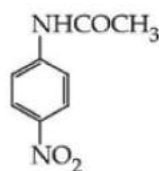
- (A) CH_3CHO
 (B) CH_3COOH
 (C) $\text{CH}_3\text{CH}_2\text{OH}$
 (D) CH_3CH_3
 (E) $\text{CH}_3\text{CH}_2\text{Cl}$

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.





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 S_N1 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) $\text{PbO}_2 + \text{SO}_4^{2-}(\text{aq}) + \text{H}^+(\text{aq}) + 2\text{e}^- \rightarrow \text{PbSO}_4(\text{s}) + 2\text{H}_2\text{O}(\text{l})$
(b) $\text{Pb}(\text{s}) + \text{SO}_4^{2-}(\text{aq}) \rightarrow \text{PbSO}_4(\text{s}) + 2\text{e}^-$
(c) $\text{PbSO}_4 + 2\text{e}^- \rightarrow \text{Pb}(\text{s}) + \text{SO}_4^{2-}(\text{aq})$
(d) $\text{PbSO}_4(\text{s}) + 2\text{H}_2\text{O}(\text{l}) \rightarrow \text{Pb}(\text{s}) + 2\text{H}_2\text{SO}_4 + \text{SO}_4^{2-}(\text{aq}) + \text{H}^+(\text{aq}) + 2\text{e}^-$

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 $-\text{NH}_2$ group on left hand side.

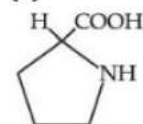
Q41. Which of the following amino acid is essential?

- (a) Glycine
(b) Glutamic acid
(c) Alanine
(d) Valine

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

- (a) $\begin{array}{c} \text{R} \\ | \\ \text{NH}_3^+ - \text{CH} - \text{COO}^- \end{array}$
(b) $\begin{array}{c} \text{R} \\ | \\ \text{NH}_4^+ - \text{CH} - \text{COO}^- \end{array}$
(c) $\begin{array}{c} \text{NH}_2 - \text{CH} - \text{COOH} \\ | \\ (\text{CH}_2)_2 - \text{COOH} \end{array}$
(d) $\begin{array}{c} \text{R} \\ | \\ \text{NH}_2 - \text{CH} - \text{COOH} \end{array}$

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

- (a) $\begin{array}{c} \text{NH}_2 \\ | \\ (\text{CH}_2)_3 - \text{NH} - \text{C} = \text{NH} \\ | \\ \text{NH}_2 - \text{CH} - \text{COOH} \end{array}$
(b) 
(c) $\begin{array}{c} \text{CH}_2 - \text{COOH} \\ | \\ \text{NH}_2 - \text{CH} - \text{COOH} \end{array}$
(d) $\text{NH}_2 - \text{C}_2\text{H}_5 - \text{COOH}$

Q44. Optically inactive amino acid from the following is:

- (a) Valine

- (b) Glycine
(c) Alanine
(d) Proline

Q45. β -D-Deoxyribose and β -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) $[\text{Ne}] 3s^2 3p^2$
(b) $[\text{He}] 2s^2 2p^4$
(c) $[\text{Ne}] 3s^2 3p^4$
(d) $[\text{Ne}] 3s^2 3p^6$

Q47. Identify the epsom salt out of the following salts:

- (a) PbS
(b) ZnS
(c) CuFeS_2
(d) $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$

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)	$\text{H}_4\text{P}_2\text{O}_6$	(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?



- (a) $\text{UF}_4(\text{g})$ and $3\text{UCl}(\text{g})$
(b) $\text{UF}_6(\text{g})$ and $3\text{ClF}(\text{g})$
(c) $\text{UF}_4(\text{g})$ and $3\text{ClF}(\text{g})$
(d) $\text{UF}_6(\text{g})$ and $3\text{UCl}(\text{g})$

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. $\text{CH}_3\text{CH}_2\text{OCH}_3$ and $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$ have different functional groups, hence, they are functional isomers.

S3. Ans. (d)

Sol. As $\text{C}_2\text{O}_4^{2-}$ is a bidentate chelating ligand, it forms rings and hence $\text{C}_2\text{O}_4^{2-}$ will form the most stable complex.

S4. Ans. (b)

Sol. In $\text{Cr}_2\text{O}_7^{2-}$ 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)

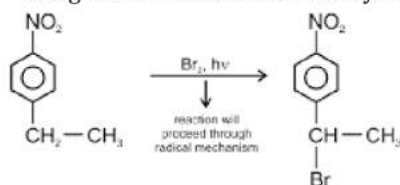
Sol. $t_{90} = 2.303/k \log(100/10)$

$$k = 0.09595$$

$$t_{99.9} = 2.303/0.09595 \log(100/0.1) = 72.00 \text{ min}$$

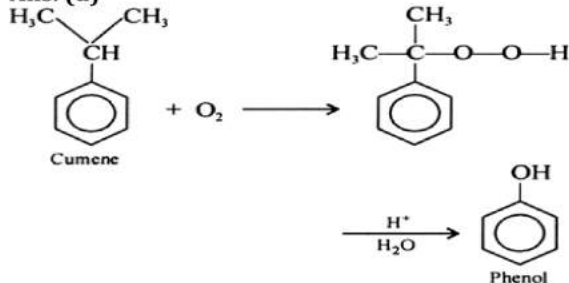
S6. Ans. (c)

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



If Br/FeBr_3 was given then 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)

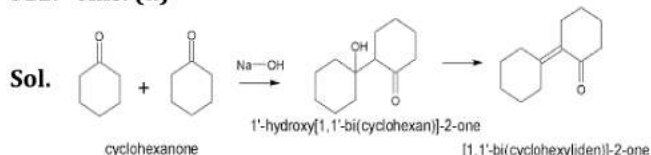
Sol. [A] The instantaneous rate is the rate of a reaction at a period of time that is so short that the concentrations of reactants and products change by a negligible amount.

[B] Average rate: the average rate of a reaction is defined as a rate of change of concentration 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 $\text{rate} = k$, where k is the rate constant.

S12. Ans. (d)



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

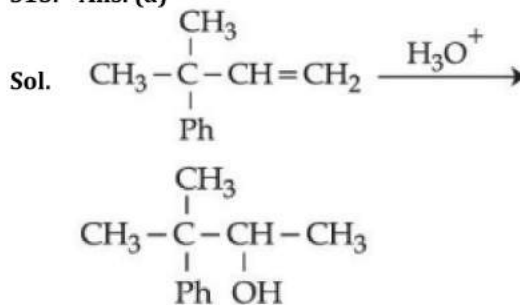
[C] Corrosion occurs at the anode

[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)



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)

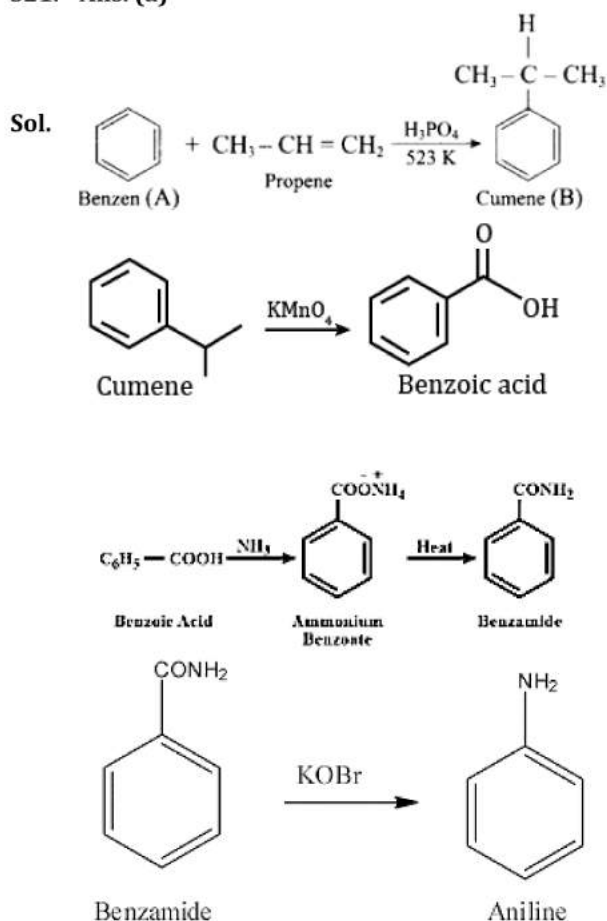
Sol. $\text{Pu}(Z - 94) = [\text{Rn}]5f^67s^2$

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 K_b .

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

S21. Ans. (a)



S22. Ans. (d)

Sol. [A] CH_3COCH_3 will have alpha-hydrogen and give iodoform test.
 [B] The above given reaction,
 $\text{CH}_3\text{COOH} (\text{aq}) + \text{NaHCO}_3 (\text{s}) \rightarrow \text{CH}_3\text{COONa} (\text{aq}) + \text{H}_2\text{O} (\text{l}) + \text{CO}_2 (\text{g}) \uparrow$
 [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.

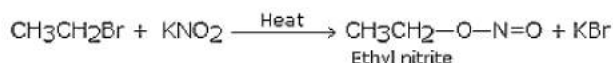
7. Some require coenzymes.

8. They are inhibited by inhibitors.

S24. Ans. (c)



Sol.



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

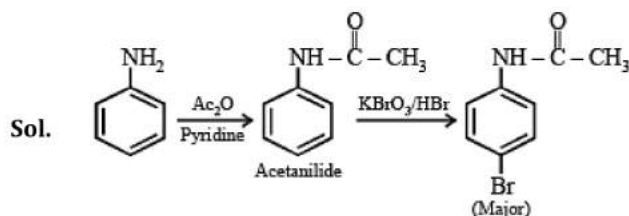
Nickel (Ni) in the complex $[\text{NiCl}_4]^{2-}$ is in a +2 oxidation state.

In $[\text{NiCl}_4]^{2-}$, 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 3d orbitals. Hence it is paramagnetic

$[\text{NiCl}_4]^{2-}$ is a tetrahedral complex with sp^3 hybridization

As there are unpaired electrons in the d-orbitals, $[\text{NiCl}_4]^{2-}$ is paramagnetic and is referred to as a high spin outer orbital complex

S27. Ans. (b)

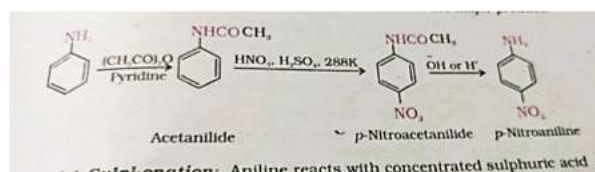


S28. Ans. (d)

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-I) bond is the weakest bond due to large difference in the size of carbon and iodine. So, $(\text{CH}_3)_3\text{C-I}$ gives $\text{S}_{\text{N}}1$ 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.

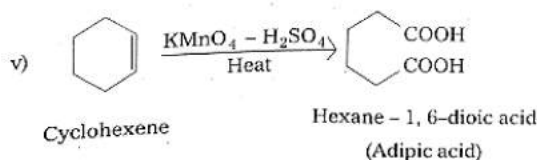
[C] FeO shows metal deficiency defect. In crystal of FeO some Fe^{2+} cations are missing and the loss of

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)

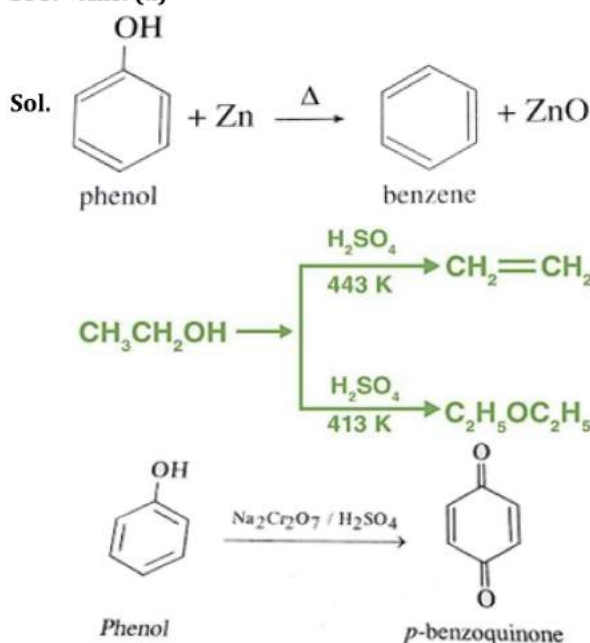
Sol.



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)



S36. Ans. (b)

Sol. The IUPAC name of the compound $\text{C}_6\text{H}_5\text{O}(\text{CH}_2)_6\text{CH}_3$ 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 change Gibbs energy of reaction, enthalpy of reaction and equilibrium constant.

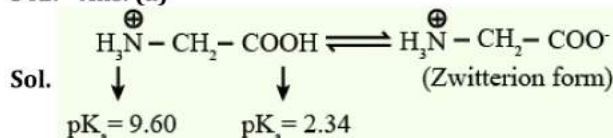
S40. Ans. (b)

Sol. $\text{Pb} \rightarrow \text{Pb}^{2+} + 2\text{e}^-$
 $\text{Pb}^{2+} + \text{SO}_4^{2-} \rightarrow \text{PbSO}_4$
 Overall reaction at anode during discharge:
 $\text{Pb} + \text{SO}_4^{2-} \rightarrow \text{PbSO}_4 + 2\text{e}^-$

S41. Ans. (d)

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

S42. Ans. (a)



S43. Ans. (d)

Sol. Glycine is an amino acid, it contains both NH_2 as well as $-\text{COOH}$ 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 $[\text{Ne}] 3s^2 3p^4$

S47. Ans. (d)

Sol. Magnesium Sulphate is also known as Epsom salt. It is an inorganic salt and its formula is $\text{MgSO}_4(\text{H}_2\text{O})_x$.

S48. Ans. (a)

Sol. The Oxidation Number of P in H_3PO_2 is +1
 Thus oxidation states of P in $\text{H}_4\text{P}_2\text{O}_5$, $\text{H}_4\text{P}_2\text{O}_6$, $\text{H}_4\text{P}_2\text{O}_7$, 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. $\text{U (s)} + 3\text{ClF}_3 (\text{l}) \rightarrow \text{UF}_4 (\text{l}) + 3\text{ClF (s)}$

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, $\text{BiH}_3 < \text{SbH}_3 < \text{AsH}_3 < \text{PH}_3 < \text{NH}_3$.