ROLL NUMBER					

CODE NUMBER	043/1/1
SET NUMBER	1

INDIAN SCHOOL MUSCAT
PRE BOARD EXAMINATION 2023
CHEMISTRY(043)

CLASS : XII
DATE: 26-11-2023

TIME ALLOTED : 3 HRS.
MAXIMUM MARKS:70

GENERAL INSTRUCTIONS:

a) There are 33 questions in this question paper with internal choice.
b) SECTION A consists of 16 multiple -choice questions carrying 1 mark each.
c) SECTION B consists of 5 short answer questions carrying 2 marks each.
d) SECTION C consists of 7 short answer questions carrying 3 marks each.
e) SECTION D consists of 2 case - based questions carrying 4 marks each.
f) SECTION E consists of 3 long answer questions carrying 5 marks each.
g) All questions are compulsory.

SECTION A

The following questions are multiple -choice questions with one correct answer. Each question carries 1 mark. There is no internal choice in this section.

1. The quantity of charge required to obtain one mole of aluminium from Al_2O_3 is: 1

(a)1F (b)6F (c)3F (d)2F

2. Match the items of Column I and Column II 1

Column I	Column II
A. Mathematical expression for rate of reaction.	1. Rate constant
B. Rate of reaction for zero order reaction is equal to	2. Rate law
C. Units of rate constant for zero order reaction is same as that of	3. slowest step
D. Order of a complex reaction is determined by	4. Rate of reaction

(a) A→2, B→1, C→4, D→3

(b) A→2, B→1, C→3, D→4

(c) A→1, B→2, C→4, D→3

(d) A→3, B→1, C→2, D→4

3. The rate law for a particular reaction is given as rate = $k[A][B]^2$. How is the rate of reaction affected if we double the concentration of B ? 1

(a) two times (b) four times (c) three times (d) becomes half

4. The most common oxidation state for all lanthanoids is : 1

(a) + 7 (b) + 2 (c) + 3 (d) + 4

5. Which of the following ions has the maximum number of unpaired d-electrons ? [Atomic number : Fe = 26, V = 23, Ti = 22, Sc = 21] 1

(a) Fe^{3+} (b) V^{3+} (c) Ti^{3+} (d) Sc^{3+}

6. Which of the following belongs to the class of alkyl halides ? 1

(a) $CH_2 = CH\ Cl$

(b) $CH_2 = CH\ CH_2\ CH_2\ Cl$

(c) $CH_2 = C\ Cl\ CH_2\ CH_3$

(d) $CH_3\ C{\equiv}\ CCH_2\ Cl$

7. Slowest step in the dehydration of alcohols is 1

(a) protonation of alcohol

(b) formation of carbocation

(c) formation of alkene by elimination of proton

(d) Rearrangement of carbocation

8. $A \xrightarrow{Pd/BaSO_4} C_6H_5CHO \xleftarrow[ii)\ H_2O]{i)\ SnCl_2/HCl} B$ 1

A and B respectively are

(a) Benzoyl chloride, Benzonitrile

(b) Benzyl chloride, Phenyl carbonitrile

(c) Benzaldichloride, Benzonitrile

(d) Benzotrichloride, Benzonitrile .

9. Among the following which one is more reactive towards nucleophilic addition reaction 1

(a) Benzaldehyde (b) p-Tolualdehyde (c) p-nitrobenzaldehyde (d) Acetophenone

10. Among the following, the strongest base in aqueous medium is _____. 1

(a) CH_3NH_2

(b) $(CH_3)_3N$

(c) $(CH_3)_2NH$

(d) $C_6H_5NHCH_3$

11. Which is correct statement? 1

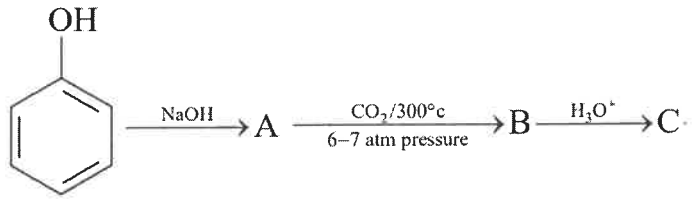
(a) Starch is a polymer of β -glucose

(b) Amylose is a component of cellulose

(c) Proteins are compounds of only one type of amino acid

(d) In cyclic structure of fructose, there are four carbons and one oxygen atom in the ring

12. 1



Identify C:

(a) Benzoquinione (b)Salicylaldehyde (c)Salicylicacid (d)Aspirin

Given below (Q: nos 13-16) are two statements labelled as Assertion (A) and Reason (R)

Select the most appropriate answer from the options given below:

(a) Both A and R are true and R is the correct explanation of A

(b) Both A and R are true but R is not the correct explanation of A.

(c) A is true but R is false.

(d) A is false but R is true.

(e) Both A and R are false

13. Assertion (A): In acetaldehyde, the carbonyl carbon acts as a Lewis acid and the carbonyl oxygen acts as a Lewis base. 1

Reason (R): Carbonyl compounds have substantial dipole moments

14. Assertion (A) : Proteins are polymers of alpha-amino acids connected by a peptide bond. 1

Reason (R) : A tetrapeptide contains 4 amino acids linked by 4 peptide bonds

15. Assertion (A): 2-Methoxy-2-methyl propane reacts with hydrogen iodide to form methyl alcohol and 2-Iodo-2-methylpropane. 1

Reason (R): The reaction given in (A) follows S_N2 mechanism.

16. Assertion(A):The electrolyte of aqueous solution NaCl gives sodium at the cathode and chlorine at the anode. 1

Reason(R): Chlorine has higher oxidation potential than water.

SECTION B

This section contains 5 questions with internal choice in one question. The following questions are very short answer type and carry 2 marks each.

17. The rate of a reaction quadruples when the temperature changes from 293 K to 313 K. Calculate the energy of activation of the reaction, assuming that it does not change with temperature. 2

[$R = 8{\cdot}314\ J\ K^{-1}\ mol^{-1}$]

(log 2 = 0·3010, log 4 = 0·6021)

18. Calculate the boiling point elevation for a solution prepared by adding 10 g of $CaCl_2$ to 200 g of water. (K_b for water = 0.512 K kg mol^{-1}, Molar mass of $CaCl_2$ = 111 g mol^{-1}) 2

19. (a) Write the IUPAC name of $CH_3CH_2COCH(C_2H_5)\ CH_2CH_2Cl$ 2

(b) Write the structure of the product when chlorobenzene is treated with chloromethane in presence of sodium metal and dry ether

20. (a) Why is sucrose not a reducing sugar? 2

(b) The two strands in DNA are not identical ,but complimentary.Explain

21. Draw the structure of the following: 2

(a) 2,4 – dinitrophenylhydrazone of benzaldehyde

(b) Acetaldehyde semicarbazone

OR

Give reasons :

(a) Carboxylic acids do not give reactions of carbonyl group

(b) Chloroacetic acid is stronger than acetic acid.

SECTION C

This section contains 7 questions with internal choice in one question. The following questions are short answer type and carry 3 marks each.

22. (a) Write Nernst equation and calculate the emf of following cell at 298 K: 3

$$Mg_{(s)}|Mg^{2+}_{(0.001\ M)}||Cu^{2+}_{(0.0001\ M)}|Cu_{(s)} \quad .Given\ E^0_{cell} = 2.71\ V$$

(b) Write any two advantages of $H_2 - O_2$ fuel cell.

23. (a) For a first order reaction, show that time required for 99% completion is twice the time required for the completion of 90% of reaction. 3

(b) For the reaction $R \rightarrow P$, a graph of [R] against time is found to be a straight line with negative slope. What is the order of reaction?

24. Using valence bond theory, predict 3

(a) Hybridisation of central metal atom of the complex $[Fe(CN)_6]^{3-}$.

(b) Its shape and magnetic behaviour.

(c) Whether it is a high spin or a low spin complex.

[Atomic number : Fe= 26]

25. Name the products of hydrolysis of 3

a) Protein b) Nucleotide c) Lactose

26. Give equations of the following reactions: 3

(a) Sodium tert-butoxide is treated with CH_3Cl.

(b) Methanal on reaction with ethylmagnesium bromide followed by acid hydrolysis.

(c) Bromine in CS_2 with phenol.

27. Among all the isomers of molecular formula C_4H_9Br, identify 3

(a) the one isomer which is optically active.

(b) the one isomer which is highly reactive towards S_N2.

(c) the two isomers which give same product on dehydrohalogenation with alcoholic KOH.

28. (a) Compound A undergoes Rosenmund reduction to give compound B with molecular formula C_7H_6O. Compound B does not give Fehling s test but reacts with conc. NaOH to give C and D. Identify A, B, C and D. 3

(b) Write one chemical test to distinguish between compound B and propanone

OR

Explain the following with equations:

(a) Hell-Volhard-Zelinsky reaction.

(b) Wolff-Kischner reduction.

(c) Aldol condensation

SECTION D

The following questions are case -based questions. Each question has an internal choice and carries 4 (1+1+2) marks each. Read the passage carefully and answer the questions that follow.

29. Metallic conductance involves the movement of electrons throughout a metal. Electrolytic conduction consists of the movement of ions throughout a pure liquid or result. The measurement of electrolytic conductivity is widely applied as a control parameter and its relevance is continuously increasing, not only in industrial applications but also in the environmental monitoring domain. Electrochemistry plays a very important part in our daily life. Primary cells like dry cell is used in torches, wall clock, mercury cell is used in hearing aids, watches. Secondary cells Ni–Cd cell is used in cordless phones, lithium battery is used in mobiles, lead storage battery is used in vehicle and inverter. Fuel cells like H_2—O_2 cell was used in Apollo space programme. A 38% solution of sulphuric and is used in lead storage battery. Its density is 1.30 g mL^{-1}. The battery holds 3.5 L of the acid. During the discharge of the battery, the density of H_2SO_4 falls to 1.14 g mL^{-1} . 4

Answer the following :

(a) Calculate the potential of hydrogen electrode in contact with a solution having pH value 10

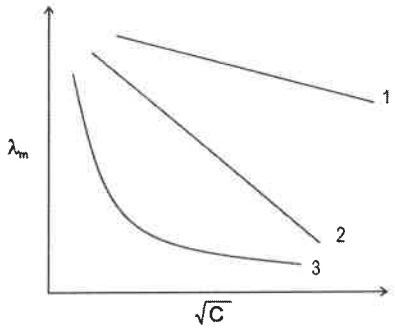
(b) Write the overall cell reaction in lead storage battery during discharging?

(c) The conductivity of 0.001M CH_3COOH is 4.95×10^{-5} S/cm. Calculate its degree of dissociation, if limiting molar conductivity of acetic acid is , 390.5 $Scm^2\ mol^{-1}$.

OR

(i) Calculate the time required to deposit 1.27g of copper at cathode when a current of 2A was passed through the solution of $CuSO_4$. (Molar mass of Cu = 63.5g mol^{-1}, 1F = 96500 C mol^{-1})

(ii) The molar conductivity vs $\sqrt{c}$ curve for NaCl, HCl, and NH_4OH are shown below in random order. Identify which graph corresponds to HCl, NaCl, and NH_4OH.



30. The color of a coordination complex can be predicted using the Crystal Field Theory (CFT). The tendency for coordination complexes to display such a wide array of colors is merely coincidental; their absorption energies happen to fall within range of the visible light spectrum. Chemists and physicists often study the color of a substance not to understand its appearance, because color is an indicator of a chemical's physical properties on the atomic level. The electromagnetic spectrum (EM) spectrum is made up of photons of different wavelengths. Photons, unique in displaying the properties of both waves and particles, create visible light and colors in a small portion of the EM spectrum. This visible light portion has wavelengths in approximately the 400-700 nanometer range . Each specific wavelength corresponds to a different color and when all the wavelengths are present, it appears as white light. 4

Answer the following:

(a) Write the IUPAC name of $[Pt(NH_3)(H_2O)Cl_2]$

(b) When 1 mol $CrCl_3 .6H_2O$ is treated with excess of $AgNO_3$, 3 mol of AgCl are obtained. Write the formula of the complex .

(c)

(i) What type of isomerism is shown by $[Co(NH_3)_5ONO]Cl_2$?

(ii) On the basis of crystal field theory, write the electronic configuration for d^4 ion if $\Delta_o < P$.

OR

(i) Write the stereochemistry of the complex $K[Cr(H_2O)_2 (C_2O_4)_2]$.

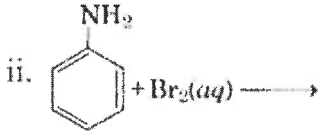
(ii) The CFSE of $[CoCl_6]^{3-}$ is 18000 cm^{-1} Calculate the CFSE for $[CoCl_4]^-$

SECTION E

The following questions are long answer type and carry 5 marks each. All questions have an internal choice.

31. (a) Complete the following ; 5

i. $C_6H_5N_2^+Cl^- \xrightarrow{H_3PO_2 + H_2O}$

ii. 

(b) An aromatic compound A on treatment with aqueous ammonia and heating forms compound B which on heating with $Br_2$and KOH forms a compound C of molecular formula C_6H_7N.Write the structures of A,B and C.

(c) Write the IUPAC name and structure of the product obtained by the reaction of ethanamine and benzoyl chloride.

OR

(a) Convert

(i) Aniline to toluene.

(ii) Nitrobenzene to Acetanilide.

(iii)Benzene diazonium chloride to nitrobenzene

(b) Give reasons for the following :

(i) Reduction with iron scrap and HCl is preferred for the preparation of amines from nitro compounds.

(ii) Although amino group is o- and p-directing in aromatic electrophilic substitution reactions, aniline on nitration gives substantial amount of m-nitroaniline.

32. (a) Write the equations involved in the preparation of $KMnO_4$ from Pyrolusite ore (MnO_2). 5

(b) Write any two consequences of lanthanoid contraction.

(c) Complete the following chemical equations:

(i) $MnO_4^-(aq) + S_2O_3^{2-}(aq) + H_2O(l) \rightarrow$

(ii) $Cr_2O_7^{2-}(aq) + Fe^{2+}(aq) + H^+(aq) \rightarrow$

OR

(a) Following ions of 3d-transition series are given: Ti^{4+}, V^{3+}, Cr^{3+}, Mn^{3+}

(Atomic number of Ti-22, V-23, Cr= 24, Mn = 25).

Identify the ion which is

(i) most stable in aqueous solution.

(ii) a strong oxidising agent.

(iii)colourless in aqueous solution. Give suitable reason in each

(b) Account for the following:

(i) Transition metals generally form coloured compounds.

(ii) The enthalpy of atomization of the transition metals is high.

33. Answer any five from the following: 5

(i) Pure ethanol cannot be prepared by fractional distillation of ethanol – water mixture. Why?

(ii) Decrease in the vapour pressure of water by adding 1.0 mol of sucrose to one kg of water is nearly similar to that produced by adding 1.0 mol of urea to the same quantity of water at the same temperature. How?

(iii)Write any two points of difference between ideal and non ideal solution..

(iv)The vapour pressure of a solution of glucose in water is 750 mm Hg at 100 ^{0}C. Calculate the mole fraction of solute. (Vapour pressure of water at 373 K = 760 mm Hg)

(v) Calculate Van't Hoff factor for an aqueous solution of Na_2SO_4 if the degree of dissociation (α) is 0.852.

(vi)Draw the graph between vapour pressure and temperature to explain the elevation in boiling point of a solvent in solution.

(vii) The mole fraction of Ethyl alcohol in its solution with Methyl alcohol is 0.80. The vapour pressure of pure Ethyl alcohol at this temperature is 40mm of Mercury. What is its vapour pressure in the solution if the solution is ideal?

******END OF THE QUESTION PAPER******

ROLL NUMBER					

CODE NUMBER	043/1/2
SET NUMBER	2

INDIAN SCHOOL MUSCAT
PRE BOARD EXAMINATION 2023
CHEMISTRY(043)

CLASS : XII
DATE: 26-11-2023

TIME ALLOTED : 3 HRS.
MAXIMUM MARKS:70

GENERAL INSTRUCTIONS:

a) There are 33 questions in this question paper with internal choice.
b) SECTION A consists of 16 multiple -choice questions carrying 1 mark each.
c) SECTION B consists of 5 short answer questions carrying 2 marks each.
d) SECTION C consists of 7 short answer questions carrying 3 marks each.
e) SECTION D consists of 2 case - based questions carrying 4 marks each.
f) SECTION E consists of 3 long answer questions carrying 5 marks each.
g) All questions are compulsory.

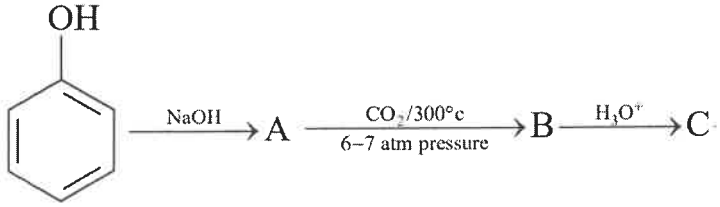
SECTION A

The following questions are multiple -choice questions with one correct answer. Each question carries 1 mark. There is no internal choice in this section.

1. How much charge is required for the reduction of 1mole of Cu^{2+} to Cu ? 1

(a) 193000 C (b) 93132 C (c) 96500 C (c) None of these

2. 1



Identify C:

(a) Benzoquinione (b)Salicylaldehyde (c)Salicylicacid (d)Aspirin

3. $A \xrightarrow{Pd/BaSO_4} C_6H_5CHO \xleftarrow[ii)\ H_2O]{i)\ SnCl_2/HCl} B$ 1

A and B respectively are :

(a) Benzoyl chloride, Benzonitrile
(b) Benzyl chloride, Phenyl carbonitrile
(c) Benzaldichloride, Benzonitrile
(d) Benzotrichloride, Benzonitrile

4. Match the items of Column I and Column II 1

Column I	Column II
A. Mathematical expression for rate of reaction.	1. Rate constant
B. Rate of reaction for zero order reaction is equal to	2. Rate law
C. Units of rate constant for zero order reaction is same as that of	3. slowest step
D. Order of a complex reaction is determined by	4. Rate of reaction

(a) A→2, B→1, C→4, D→3
(b) A→2, B→1, C→3, D→4
(c) A→1, B→2, C→4, D→3
(d) A→3, B→1, C→2, D→4

5. Which of the following ions has the maximum number of unpaired d-electrons ? 1
(a) Fe^{3+} (b) V^{3+} (c) Ti^{3+} (d) Sc^{3+}

6. Slowest step in the dehydration of alcohols is 1
(a) protonation of alcohol
(b) formation of carbocation
(c) formation of alkene by elimination of proton
(d) Rearrangement of carbocation.

7. Among the following, the strongest base in aqueous medium is _____. 1
(a) CH_3NH_2
(b) $(CH_3)_3N$
(c) $(CH_3)_2NH$
(d) $C_6H_5NHCH_3$

8. Which is correct statement? 1
(a) Starch is a polymer of β -glucose
(b) Amylose is a component of cellulose
(c) Proteins are compounds of only one type of amino acid
(d) In cyclic structure of fructose, there are four carbons and one oxygen atom in the ring

9. The reaction of CH_3MgBr on dry ice followed by hydrolysis give 1
(a) Ethanoic acid (b) Propanoic acid (c) Methanoic acid (d) Benzoic acid

10. The rate law for a particular reaction is given as rate = $k[A][B]^2$. How is the rate of reaction affected if concentration of A is tripled ? 1
(a) two times (b) four times (c) three times (d) becomes half

11. Which of the following belongs to the class of alkyl halides ? 1
(a) $CH_2 = CH\ Cl$

(b) $CH_2 = CH\ CH_2\ CH_2\ Cl$
(c) $CH_2 = CCl\ CH_2\ CH_3$
(d) $CH_3\ C \equiv CCH_2\ Cl$

12. The most common oxidation state for all lanthanoids is : 1
(a) + 7 (b) + 2 (c) + 3 (d) + 4

Given below (Q: nos 13-16) are two statements labelled as Assertion (A) and Reason (R)

Select the most appropriate answer from the options given below:
(a) Both A and R are true and R is the correct explanation of A
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.
(e) Both A and R are false

13. Assertion (A): 2-Methoxy-2-methyl propane reacts with hydrogen iodide to form methyl alcohol and 2-Iodo-2-methylpropane. 1
Reason (R): The reaction given in (A) follows S_N2 mechanism

14. Assertion(A):The electrolyte of aqueous solution NaCl gives hydrogen at the cathode and chlorine at the anode. 1
Reason(R): Chlorine has higher oxidation potential than water

15. Assertion (A) : Proteins are polymers of alpha-amino acids connected by a peptide bond. 1
Reason (R) : A tetrapeptide contains 4 amino acids linked by 4 peptide bonds

16. Assertion (A): In acetaldehyde, the carbonyl carbon acts as a Lewis acid and the carbonyl oxygen acts as a Lewis base. 1
Reason (R): Carbonyl compounds have substantial dipole moments

SECTION B

This section contains 5 questions with internal choice in one question. The following questions are very short answer type and carry 2 marks each.

17. The rate of the chemical reaction doubles for an increase of 10K in absolute temperature from 298K. Calculate the energy of activation. 2
[$R = 8{\cdot}314\ J\ K^{-1}\ mol^{-1}$]
($\log 2 = 0{\cdot}3010$, $\log 4 = 0{\cdot}6021$)

18. Calculate the boiling point elevation for a solution prepared by adding 10 g of KCl to 200 g of water. (K_b for water = 0.512 K kg mol^{-1}, Molar mass of KCl = 74.5g mol^{-1}) 2

19. (a) Arrange the given set of compounds in the increasing order of the boiling points : 2
Bromomethane, Bromoform, Chloromethane, Dibromomethane
(b) A hydrocarbon C_5H_{10} doesnot react with chlorine in dark but gives a single mono chloro compound C_5H_9Cl in bright sunlight. Identify the hydrocarbon

20. Draw the structure of the following: 2
(a) 2,4 – dinitrophenylhydrazone of benzaldehyde
(b) Acetaldehyde semicarbazone

OR

Give reasons :

(a) Carboxylic acids do not give reactions of carbonyl group

(b) Chloroacetic acid is stronger than acetic acid.

21. (a) Why is sucrose not a reducing sugar? 2

(b) The two strands in DNA are not identical ,but complimentary.Explain

SECTION C

This section contains 7 questions with internal choice in one question. The following questions are short answer type and carry 3 marks each.

22. Using valence bond theory, predict 3

(a) Hybridisation of central metal atom of the complex $[Fe(CN)_6]^{4-}$.

(b) Its shape and magnetic behaviour.

(c) Whether it is a high spin or a low spin complex.

[Atomic number : Fe= 26]

23. (a) Write Nernst equation and calculate the emf of following cell at 298 K: 3

$$\mathbf{Mg_{(s)}|Mg^{2+}_{(0.001\ M)}||Cu^{2+}_{(0.0001\ M)}|Cu_{(s)}}\quad \textbf{.Given } \mathbf{E^0_{cell}= 2.71\ V}$$

(b) Write any two advantages of $H_2 - O_2$ fuel cell.

24. Name the products of hydrolysis of 3

a) Protein b) Nucleotide c) Lactose

25. (a) Compound A undergoes Rosenmund reduction to give compound B with molecular formula C_7H_6O. Compound B does not give Fehling s test but reacts with conc. NaOH to give C and D. Identify A, B, C and D. 3

(b) Write one chemical test to distinguish between compound B and propanone.

OR

Explain the following with equations:

(a) Hell-Volhard-Zelinsky reaction.

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(c) Aldol condensation..

26. Give equations of the following reactions: 3

(a) Sodium tert-butoxide is treated with CH_3Cl.

(b) Methanal on reaction with ethylmagnesium bromide followed by acid hydrolysis.

(c) Bromine in CS_2 with phenol

27. Among all the isomers of molecular formula C_4H_9Br, identify 3

(a) the one isomer which is optically active.
(b) the one isomer which is highly reactive towards S_N2.
(c) the two isomers which give same product on dehydrohalogenation with alcoholic KOH

28. A first order reaction takes 23.1 minutes for 50% completion. Calculate the time required for 75% completion of this reaction. (Given : log 2 = 0.301, log 3 = 0.4771, log 4 =0.6021). 3

SECTION D

The following questions are case -based questions. Each question has an internal choice and carries 4 (1+1+2) marks each. Read the passage carefully and answer the questions that follow.

29. Metallic conductance involves the movement of electrons throughout a metal. Electrolytic conduction consists of the movement of ions throughout a pure liquid or result. The measurement of electrolytic conductivity is widely applied as a control parameter and its relevance is continuously increasing, not only in industrial applications but also in the environmental monitoring domain. Electrochemistry plays a very important part in our daily life. Primary cells like dry cell is used in torches, wall clock, mercury cell is used in hearing aids, watches. Secondary cells Ni–Cd cell is used in cordless phones, lithium battery is used in mobiles, lead storage battery is used in vehicle and inverter. Fuel cells like H_2—O_2 cell was used in Apollo space programme. A 38% solution of sulphuric and is used in lead storage battery. Its density is 1.30 g mL^{-1}. The battery holds 3.5 L of the acid. During the discharge of the battery, the density of H_2SO_4 falls to 1.14 g mL^{-1} 4

Answer the following :

(a) Calculate the potential of hydrogen electrode in contact with a solution having pH value 10
(b) Write the overall cell reaction in lead storage battery during discharging?
(c) The conductivity of 0.001M CH_3COOH is 4.95×10^{-5} S/cm. Calculate its degree of dissociation, if limiting molar conductivity of acetic acid is , 390.5 $Scm^2\ mol^{-1}$.

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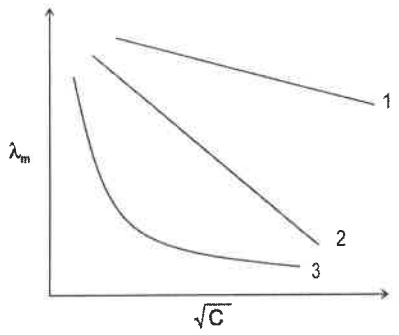
(i) Calculate the time required to deposit 1.27g of copper at cathode when a current of 2A was passed through the solution of $CuSO_4$. (Molar mass of Cu = 63.5g mol^{-1}, 1F = 96500 C mol^{-1})

(ii) The molar conductivity vs $\sqrt{c}$ curve for NaCl, HCl, and NH_4OH are shown below in random order. Identify which graph corresponds to HCl, NaCl, and NH_4OH



30. The color of a coordination complex can be predicted using the Crystal Field Theory (CFT). The tendency for coordination complexes to display such a wide array of colors is merely coincidental; their absorption energies happen to fall within range of the visible light spectrum. Chemists and physicists often study the color of a substance not to understand its appearance, because color is an indicator of a chemical's physical properties on the atomic level. The electromagnetic spectrum (EM) spectrum is made up of photons of different wavelengths. Photons, unique in displaying the properties of both waves and particles, create visible light and colors in a small portion of the EM spectrum. This visible light portion has wavelengths in approximately the 400-700 nanometer range . Each specific wavelength corresponds to a different color and when all the wavelengths are present, it appears as white light. 4

Answer the following:

(a) Write the IUPAC name of $[Pt(NH_3)(H_2O)Cl_2]$

(b) When 1 mol $CrCl_3 .6H_2O$ is treated with excess of $AgNO_3$, 3 mol of AgCl are obtained. Write the formula of the complex .

(c)

(i) What type of isomerism is shown by $[Co(NH_3)_5ONO]Cl_2$?

(ii) On the basis of crystal field theory, write the electronic configuration for d^4 ion if $\Delta_o < P$.

OR

(i) Write the stereochemistry of the complex $K[Cr(H_2O)_2 (C_2O_4)_2]$.

(ii) The CFSE of $[CoCl_6]^{3-}$ is 18000 cm^{-1} Calculate the CFSE for $[CoCl_4]^-$

SECTION E

The following questions are long answer type and carry 5 marks each. All questions have an internal choice.

31. (a) Write the equations involved in the preparation of $KMnO_4$ from Pyrolusite ore (MnO_2). 5

(b) Write any two consequences of lanthanoid contraction.

(c) Complete the following chemical equations:

(i) $MnO_4^-(aq) + S_2O_3^{2-}(aq) + H_2O(l) \rightarrow$

(ii) $Cr_2O_7^{2-}(aq) + Fe^{2+}(aq) + H^+(aq) \rightarrow$

OR

(a) Following ions of 3d-transition series are given: Ti^{4+}, V^{3+}, Cr^{3+} , Mn^{3+}

(Atomic number of Ti-22, V-23, Cr= 24, Mn = 25).

Identify the ion which is

(i) most stable in aqueous solution.

(ii) a strong oxidising agent.

(iii)colourless in aqueous solution. Give suitable reason in each

(b) Account for the following:

(i) Transition metals generally form coloured compounds.

(ii) The enthalpy of atomization of the transition metals is high.

32. Answer any five from the following: 5

(i) Pure ethanol cannot be prepared by fractional distillation of ethanol – water mixture. Why?

(ii) Decrease in the vapour pressure of water by adding 1.0 mol of sucrose to one kg of water is nearly similar to that produced by adding 1.0 mol of urea to the same quantity of water at the same temperature. How?

(iii) Write any two points of difference between ideal and non ideal solution..

(iv) The vapour pressure of a solution of glucose in water is 750 mm Hg at 100 ^{0}C. Calculate the mole fraction of solute. (Vapour pressure of water at 373 K = 760 mm Hg)

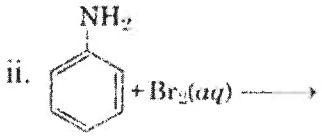
(v) Calculate Van't Hoff factor for an aqueous solution of Na_2SO_4 if the degree of dissociation (α) is 0.852.

(vi) Draw the graph between vapour pressure and temperature to explain the elevation in boiling point of a solvent in solution.

(vii) The mole fraction of Ethyl alcohol in its solution with Methyl alcohol is 0.80. The vapour pressure of pure Ethyl alcohol at this temperature is 40mm of Mercury. What is its vapour pressure in the solution if the solution is ideal

33. (a) Complete the following ; 5

i. $C_6H_5N_2Cl \xrightarrow{H_3PO_2 + H_2O}$

ii. 

(b) An aromatic compound A on treatment with aqueous ammonia and heating forms compound B which on heating with $Br_2$and KOH forms a compound C of molecular formula C_6H_7N.Write the structures of A,B and C.

(c) Write the IUPAC name and structure of the product obtained by the reaction of ethanamine and benzoyl chloride.

OR

(a) Convert

(i) Aniline to toluene.

(ii) Nitrobenzene to Acetanilide.

(iii) Benzene diazonium chloride to nitrobenzene

(b) Give reasons for the following :

(i) Reduction with iron scrap and HCl is preferred for the preparation of amines from nitro compounds.

(ii) Although amino group is o- and p-directing in aromatic electrophilic substitution reactions, aniline on nitration gives substantial amount of m-nitroaniline.

******END OF THE QUESTION PAPER******

ROLL NUMBER					

CODE NUMBER	043/1/3
SET NUMBER	3

INDIAN SCHOOL MUSCAT
PRE BOARD EXAMINATION 2023
CHEMISTRY(043)

CLASS : XII
DATE: 26-11-2023

TIME ALLOTED : 3 HRS.
MAXIMUM MARKS:70

GENERAL INSTRUCTIONS:

a) There are 33 questions in this question paper with internal choice.
b) SECTION A consists of 16 multiple -choice questions carrying 1 mark each.
c) SECTION B consists of 5 short answer questions carrying 2 marks each.
d) SECTION C consists of 7 short answer questions carrying 3 marks each.
e) SECTION D consists of 2 case - based questions carrying 4 marks each.
f) SECTION E consists of 3 long answer questions carrying 5 marks each.
g) All questions are compulsory.

SECTION A

The following questions are multiple -choice questions with one correct answer. Each question carries 1 mark. There is no internal choice in this section.

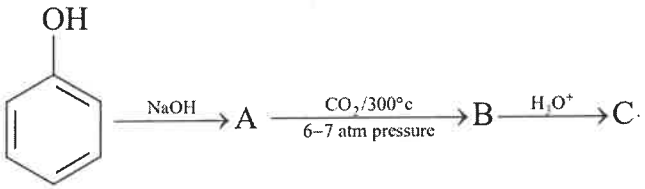
1. The quantity of charge required to obtain one mole of Fe from FeO is: 1
   (a)1F (b)6F (c)3F (d)2F
2. The most common oxidation state for all lanthanoids is : 1
   (a) + 7 (b) + 2 (c) + 3 (d) + 4
3. The rate law for a particular reaction is given as rate = $k[A][B]^2$. How is the rate of reaction affected if we double the concentration of A ? 1
   (a) two times (b) four times (c) three times (d) becomes half
4. Which of the following belongs to the class of alkyl halides ? 1
   (a) $CH_2 = CH\ Cl$ (b)$CH_2 = CH\ CH_2\ CH_2\ Cl$
   (c) $CH_2 = C\ Cl\ CH_2\ CH_3$ (d)$CH_3\ C{\equiv}\ CCH_2\ Cl$
5. Slowest step in the dehydration of alcohols is 1
   (a) protonation of alcohol
   (b) formation of carbocation
   (c) formation of alkene by elimination of proton
   (d) Rearrangement of carbocation

6. $A \xrightarrow{Pd/BaSO_4} C_6H_5CHO \xleftarrow[ii)\ H_2O]{i)\ SnCl_2/HCl} B$ A and B respectively are 1

(a) Benzoyl chloride, Benzonitrile
(b) Benzyl chloride, Phenyl carbonitrile
(c) Benzaldichloride, Benzonitrile
(d) Benzotrichloride, Benzonitrile

7. Which is correct statement? 1

(a) Starch is a polymer of β -glucose
(b) Amylose is a component of cellulose
(c) Proteins are compounds of only one type of amino acid
(d) In cyclic structure of fructose, there are four carbons and one oxygen atom in the ring

8.  1

Identify C:

(a) Benzoquinione (b)Salicylaldehyde (c)Salicylicacid (d)Aspirin

9. Arrange the following compounds in increasing order of their reactivity towards nucleophilic addition reaction 1

i) CH_3CHO
ii) CH_3CH_2CHO
iii) CH_3COCH_3
iv) $CH_3CH_2COCH_3$

(a) iii < ii < iv < i (b) ii < i < iii < iv (c) iv < iii < ii < i (d i < ii < iii < iv

10. Among the following, the strongest base in aqueous medium is _____. 1

(a) CH_3NH_2
(b) $(CH_3)_3N$
(c) $(CH_3)_2NH$
(d) $C_6H_5NHCH_3$

11. Which of the following ions has the maximum number of unpaired d-electrons ? 1

(a) Fe^{3+} (b) V^{3+} (c) Ti^{3+} (d) Sc^{3+}

12. Match the items of Column I and Column II 1

Column I	Column II
A. Mathematical expression for rate of reaction.	1. Rate constant
B. Rate of reaction for zero order reaction is equal to	2. Rate law
C. Units of rate constant for zero order reaction is same as that of	3. slowest step

D. Order of a complex reaction is determined by	4. Rate of reaction

(a) A→2, B→1, C→4, D→3
(b) A→2, B→1, C→3, D→4
(c) A→1, B→2, C→4, D→3
(d) A→3, B→1, C→4, D→4

Given below (Q: nos 13-16) are two statements labelled as Assertion (A) and Reason (R)

Select the most appropriate answer from the options given below:
(a) Both A and R are true and R is the correct explanation of A
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.
(e) Both A and R are false

13. Assertion(A):The electrolyte of aqueous solution NaCl gives hydrogen at the cathode and chlorine at the anode. 1
Reason(R): Chlorine has higher oxidation potential than water.

14. Assertion (A): 2-Methoxy-2-methyl propane reacts with hydrogen iodide to form methyl alcohol and 2-Iodo-2-methylpropane. 1
Reason (R): The reaction given in (A) follows S_N2 mechanism.

15. Assertion (A): In acetaldehyde, the carbonyl carbon acts as a Lewis acid and the carbonyl oxygen acts as a Lewis base. 1
Reason (R): Carbonyl compounds have substantial dipole moments.

16. Assertion (A) : Proteins are polymers of alpha-amino acids connected by a peptide bond. 1
Reason (R) : A tetrapeptide contains 4 amino acids linked by 4 peptide bonds.

SECTION B

This section contains 5 questions with internal choice in one question. The following questions are very short answer type and carry 2 marks each.

17. The rate of a particular reaction triples when temperature changes from 50°C to 100°C. Calculate the activation energy of the reaction. 2
[Given log 3 = 0.4771; log 4=0.6021 $R = 8.314\ K^{-1}\ mol^{-1}$]

18. Calculate the boiling point elevation for a solution prepared by adding 10 g of $AlCl_3$ to 200 g of water. (K_b for water = 0.512 K kg mol^{-1}, Molar mass of $AlCl_3$ = 133.5 g mol^{-1}) 2

19. (a) Why is sucrose not a reducing sugar? 2
(b) The two strands in DNA are not identical ,but complimentary.Explain

20. Draw the structure of the following: 2
(a) 2,4 – dinitrophenylhydrazone of benzaldehyde
(b) Acetaldehyde semicarbazone

OR

Give reasons :

(a) Carboxylic acids do not give reactions of carbonyl group

(b) Chloroacetic acid is stronger than acetic acid.

21. (a) Arrange the given set of compounds in the increasing order of the boiling points : 2
Bromomethane, Bromoform, Chloromethane, Dibromomethane

(b) A hydrocarbon C_5H_{10} doesnot react with chlorine in dark but gives a single mono chloro compound C_5H_9Cl in bright sunlight. Identify the hydrocarbon

SECTION C

This section contains 7 questions with internal choice in one question. The following questions are short answer type and carry 3 marks each.

22. A first order reaction takes 23.1 minutes for 50% completion. Calculate the time required for 75% completion of this reaction. (Given : log 2 = 0.301, log 3 = 0.4771, log 4 =0.6021). 3

23. Explain as to how the two complexes of nickel, $[Ni(CN)_4]^{2-}$ and $[Ni(CO)_4]$, have different structures but do not differ in their magnetic behavior. (At no: of Ni = 28) 3

24. (a) Compound A undergoes Rosenmund reduction to give compound B with molecular formula C_7H_6O. Compound B does not give Fehling s test but reacts with conc. NaOH to give C and D. Identify A, B, C and D. 3

(b) Write one chemical test to distinguish between compound B and propanone.

OR

Explain the following with equations:

(a) Hell-Volhard-Zelinsky reaction.

(b) Wolff-Kischner reduction.

(c) Aldol condensation.

25. Name the products of hydrolysis of 3

a) Protein b) Nucleotide c) Lactose

26. Give equations of the following reactions: 3

(a) Sodium tert-butoxide is treated with CH_3Cl.

(b) Methanal on reaction with ethylmagnesium bromide followed by acid hydrolysis.

(c) Bromine in CS_2 with phenol

27. Among all the isomers of molecular formula C_4H_9Br, identify 3

(a) the one isomer which is optically active.

(b) the one isomer which is highly reactive towards S_N2.

(c) the two isomers which give same product on dehydrohalogenation with alcoholic KOH

28. (a) Write Nernst equation and calculate the emf of following cell at 298 K: 3

$$\mathbf{Mg_{(s)}|Mg^{2+}_{(0.001\ M)}||Cu^{2+}_{(0.0001\ M)}|Cu_{(s)}\ .Given\ E^0_{cell}= 2.71\ V}$$

(b) Write any two advantages of H_2 –O_2 fuel cell.

SECTION D

The following questions are case -based questions. Each question has an internal choice and carries 4 (1+1+2) marks each. Read the passage carefully and answer the questions that follow.

29. Metallic conductance involves the movement of electrons throughout a metal. Electrolytic conduction consists of the movement of ions throughout a pure liquid or result. The measurement of electrolytic conductivity is widely applied as a control parameter and its relevance is continuously increasing, not only in industrial applications but also in the environmental monitoring domain. Electrochemistry plays a very important part in our daily life. Primary cells like dry cell is used in torches, wall clock, mercury cell is used in hearing aids, watches. Secondary cells Ni–Cd cell is used in cordless phones, lithium battery is used in mobiles, lead storage battery is used in vehicle and inverter. Fuel cells like H_2—O_2 cell was used in Apollo space programme. A 38% solution of sulphuric and is used in lead storage battery. Its density is 1.30 g mL^{-1}. The battery holds 3.5 L of the acid. During the discharge of the battery, the density of H_2SO_4 falls to 1.14 g mL^{-1} 4

Answer the following :

(a) Calculate the potential of hydrogen electrode in contact with a solution having pH value 10

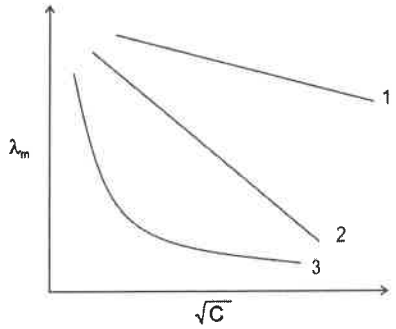
(b) Write the overall cell reaction in lead storage battery during discharging?

(c) The conductivity of 0.001M CH_3COOH is 4.95×10^{-5} S/cm. Calculate its degree of dissociation, if limiting molar conductivity of acetic acid is , 390.5 $Scm^2\ mol^{-1}$.

OR

(i) Calculate the time required to deposit 1.27g of copper at cathode when a current of 2A was passed through the solution of $CuSO_4$. (Molar mass of Cu = 63.5g mol^{-1}, 1F = 96500 C mol^{-1})

(ii) The molar conductivity vs $\sqrt{c}$ curve for NaCl, HCl, and NH_4OH are shown below in random order .Identify which graph corresponds to HCl, NaCl, and NH_4OH.



30. The color of a coordination complex can be predicted using the Crystal Field Theory (CFT). The tendency for coordination complexes to display such a wide array of colors is merely coincidental; their absorption energies happen to fall within range of the visible light spectrum. Chemists and physicists often study the color of a substance not to understand its appearance, because color is an indicator of a chemical's physical properties on the atomic level. The electromagnetic spectrum (EM) spectrum is made up of photons of different wavelengths. Photons, unique in displaying the properties 4

of both waves and particles, create visible light and colors in a small portion of the EM spectrum. This visible light portion has wavelengths in approximately the 400-700 nanometer range . Each specific wavelength corresponds to a different color and when all the wavelengths are present, it appears as white light.

Answer the following:

(a) Write the IUPAC name of $[Pt(NH_3)(H_2O)Cl_2]$

(b) When 1 mol $CrCl_3 .6H_2O$ is treated with excess of $AgNO_3$, 3 mol of AgCl are obtained. Write the formula of the complex .

(c)

(i) What type of isomerism is shown by $[Co(NH_3)_5ONO]Cl_2$?

(ii) On the basis of crystal field theory, write the electronic configuration for d^4 ion if $\Delta_o < P$.

OR

(i) Write the stereochemistry of the complex $K[Cr(H_2O)_2 (C_2O_4)_2]$.

(ii) The CFSE of $[CoCl_6]^{3-}$ is 18000 cm^{-1} Calculate the CFSE for $[CoCl_4]^-$

SECTION E

The following questions are long answer type and carry 5 marks each. All questions have an internal choice.

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(i) Pure ethanol cannot be prepared by fractional distillation of ethanol – water mixture. Why?

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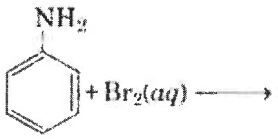
ii.  $+ Br_2(aq) \longrightarrow$

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(ii) Although amino group is o- and p-directing in aromatic electrophilic substitution reactions, aniline on nitration gives substantial amount of m-nitroaniline.

33. (a) Write the equations involved in the preparation of $KMnO_4$ from Pyrolusite ore (MnO_2). 5

(b) Write any two consequences of lanthanoid contraction.

(c) Complete the following chemical equations:

(i) $MnO_4^-(aq) + S_2O_3^{2-}(aq) + H_2O(l) \rightarrow$

(ii) $Cr_2O_7^{2-}(aq) + Fe^{2+}(aq) + H^+(aq) \rightarrow$

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