ROLL NUMBER				

SET	A

INDIAN SCHOOL MUSCAT
FINAL EXAMINATION 2022
CHEMISTRY[043]

CLASS : XII
DATE: 23.11.22

TIME ALLOTED : 3 HRS.
MAXIMUM MARKS: 70

GENERAL INSTRUCTIONS:

a) There are 35 questions in this question paper with internal choice.
b) SECTION A consists of 18 multiple-choice questions carrying 1 mark each.
c) SECTION B consists of 7 very short answer questions carrying 2 marks each.
d) SECTION C consists of 5 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.
h) Use of log tables and calculators is not allowed

SECTION A

The questions from 1 to 14 are multiple-choice questions with one correct answer.
Each question carries 1 mark.
There is no internal choice in this section.

1. Which of the following is water soluble vitamin? 1
a) A b) D c) E d) B

2. The initial step during hydration of alkene to alcohol is 1
a) Elimination of water b) Protonation of alcohol c) Formation of carbocation
d) Nucleophilic attack of protonated alcohol

3. Which of the following colligative properties can provide molar mass of proteins with greater precision? 1
a) Relative lowering of vapour pressure b) elevation in boiling point
c) depression in freezing point d) Osmotic pressure

4. The correct IUPAC name of $CH_3CH(CH_3)CH_2C(CH_3)_2COCH_3$ is 1
a) 2,4,4-trimethylhexan-2-one b) 3,3,4-trimethylhexan-2-one c) 3,3,5-trimethylhexan-2-one
d) 3,3-dimethylheptan-2-one

5. Propene on hydroboration oxidation produces 1
a) Propan-1-ol b) Propanone c) Proan-2-ol d) Propanal

6. What is the concentration of an aqueous sodium chloride solution that could be used in the bloodstream, if the average osmotic pressure of human blood is 5.1 atm at 27°C? [R= 0.083 L atm $K^{-1}mol^{-1}$]. 1
a) 0.28 mol/L b) 0.1 mol/L c) 0.01 mol/L d) 0.36 mol/L

7. The common name of Benzene-1,2-dicarbaldehyde is 1
a) Acetaldehyde b) Phthaldehyde c) Valeraldehyde d) Acrolein

8. 1

$$RCN + SnCl_2 + HCl \longrightarrow RCH = NH \xrightarrow{H_3O^+} RCHO$$

The above reaction represents
a) Rosenmund reduction b) Kolbe reaction c) Stephen reaction d) Etard reaction

9. The charge required for the reduction of 1 mol of $Cr_2O_7^{2-}$ to Cr^{3+} 1
a) 3 F b) 2 F c) 5 F d) 6 F

10. Which of the following is likely to be diamagnetic? 1
a) Sc^{3+} b) Cu^{2+} c) Ti^{3+} d) Fe^{3+}

11. Complete hydrolysis of starch gives: 1
a) α-D-glucose b) α-D-fructose c) β-D-ribose d) β-D-glucose

12. Methanal reacts with Grignard reagent to form a/an 1
a) 3° alcohol b) 2° alcohol c) ether d) 1° alcohol

13. The reagent used for separation of acetaldehyde and acetophenone is 1
a) $C_6H_5NH\ NH_2$ b) $NaHSO_3$ c) NH_2OH d) $NaOH\text{-}I_2$

14. The best reagent for converting propanamide to ethanamine is 1
a) Br_2,NaOH b) NH_3 c) $LiAlH_4$ d) HONO

The questions from 15 to 18 are assertion and reason type questions.
Each question carries 1 mark.
There is no internal choice in this section.

ASSERTION REASONING
(A) Assertion and reason both are correct statements and reason is correct explanation for assertion.
(B) Assertion and reason both are correct statements but reason is not correct explanation for assertion.
(C) Assertion is correct statement but reason is wrong statement.
(D) Assertion and reason both are incorrect statements.
(E) Assertion is wrong statement but reason is correct statement.

15. Assertion: When NaCl is added to water a depression in freezing point is observed. 1
Reason: The lowering of the vapour pressure of a solution causes depression in the freezing point.

16. Assertion: Two liquids, nitric acid and water form a maximum boiling azeotrope when mixed in the ratio of 68% and 32% respectively. 1
Reason: Interaction between nitric acid and water are weaker than nitric acid – nitric acid interactions and water-water interactions

17. Assertion: Glucose is a reducing sugar. 1
Reason: Glucose has pyranose structure.

18. Assertion: Mixture of 2-nitropehenol and 4-nitrophenol cannot be separated by steam distillation. 1
Reason: 2-nitrophenol has intramolecular hydrogen bond whereas 4-nitrophenol has intermolecular hydrogen bonding.

SECTION B

This section contains 7 questions with internal choice in two questions.
The following questions are very short answer type and carry 2 marks each

19. Explain the mechanism of the following reaction: 2
$(CH_3)_3CCl + OH^- \rightarrow (CH_3)_3COH + Cl^-$

20. Give reason 2
i) Haloarenes are less reactive than haloalkanes towards nucleophiles.
ii) p-dihalobenzenes have higher melting points than their ortho isomers.

21. Name the product obtained when [write equations] 2
i) But-1-yne is hydrated in the presence of mercuric sulphate and sulphuric acid.
ii) Propanol is treated with Cu at 573 K

OR

Give chemical test to distinguish between
a) Acetophenone and benzophenone
b) Propanal and benzaldehyde

22. i) Illustrate Clemmensen reduction. 2
ii) Draw the structure of oxime of propanone.

23. The conductivity of 0.1 mol L^{-1} solution of NaCl is 1.06×10^{-2} S cm^{-1}. Calculate its molar conductivity and degree of dissociation. 2
[Given $\lambda°(Na^+) = 50.1$ S $cm^2 mol^{-1}$ and $\lambda°(Cl^-) = 76.5$ S cm^2 mol^{-1}]

OR

Calculate the mass of copper deposited when aqueous copper sulphate was electrolysed between platinum electrodes using a current of 0.128 A for 50 minutes.
[Given: Atomic mass of copper = 63.5 g/mol and F= 96500 C/mol]

24. i) Aromatic amines cannot be prepared by Gabriel phthalimide synthesis. Why? 2
ii) Convert benzenediazonium chloride to fluorobenzene.

25. Complete and balance 2
i) $MnO_4^- + S_2O_3^{2-} + H_2O \rightarrow$
ii) $Cr_2O_7^{2-} + Fe^{2+} + H^+ \rightarrow$

SECTION C

This section contains 5 questions with internal choice in two questions.
The following questions are short answer type and carry 3 marks each.

26. i) Name the reagents and write the chemical equation for the preparation of methoxy benzene by Williamson's synthesis. 3
ii) Why phenol undergoes electrophilic substitution reaction with ease when compared to benzene?

27. i) Name the type of linkage connecting nucleotides in a polynucleotide. 3
ii) Give one structural and one functional difference between DNA and RNA.

OR

a) What do you understand by the term anomers?
b) How are essential amino acids different from non-essential amino acids?
c) What is the effect of denaturation on the structure of proteins?

28. Effect the following conversions- 3
i) Propene to 1- iodopropane
ii) Chloropropane to fluoropropane
iii) Benzene to biphenyl;

29. An aqueous solution of a weak dibasic acid contains 0.1 *g* of the acid in 21.7*g* of water. It freezes at 272.715 *K*. What is the molecular mass of the acid, if it undergoes 60% dissociation in solution? [Given: Freezing point of water = 273 K, K_f for water is 1.86 *K/m*] 3

OR

Calculate the vapor pressure of a mixture containing 252 g of n-pentane (molar mass 72 g/mol) and 1400 g of n-heptane (molar mass 100g/mol) at 20°C. The vapor pressure of n-pentane and n-heptane are 420 mm Hg and 36 mm Hg respectively.

30. i) Define colligative property 3
ii) Calculate the boiling point of a solution containing 13.44g of $CuCl_2$ (molar mass 134.4 u) in 1000g of water assuming complete dissociation. (Given: Boiling point of water = 373 K, K_b = 0.52 K Kg/mol)

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 data/passage carefully and answer the questions that follow.

31. E^0 value stands for standard electrode potential of a half cell. SHE is used to measure the standard electrode potentials of half cells. To measure standard electrode potential of a half cell, the half-cell is connected to SHE to construct a galvanic cell in which SHE acts anode and the other half cell as cathode. If the concentrations of solutions are unity then the cell potential is equal to standard electrode potential of the half cell.

The table below shows E^0 for iron and four other metals A, B, C and D. The reduction potential values for each, in volts, is also given.

Reaction	E^{o}_{red} (V)
$Fe^{2+} + 2e^{-} \rightarrow Fe$	-0.44
$A^{2+} + 2e^{-} \rightarrow A$	-2.37
$B^{2+} + 2e^{-} \rightarrow B$	-0.14
$C^{2+} + 2e^{-} \rightarrow C$	+0.34
$D^{+} + e^{-} \rightarrow D$	+0.80

i) Predict which among A, B, C and D is best for coating the surface of iron to prevent corrosion and why? 1

ii) If an external potential greater than the standard cell potential is applied to a cell, what will you observe? 1

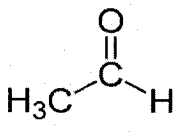
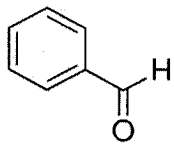
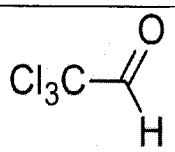
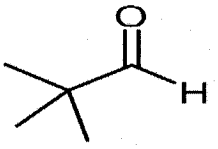
iii) Construct a cell, using a suitable anode and a cathode from the above given table, such that maximum work can be obtained by the operation of that cell. Also calculate the standard cell potential of that cell. 2

(OR)

From the above data table, a cell reaction is represented as
$A_{(s)} + C^{2+}_{(aq)} \rightarrow A^{2+}_{(aq)} + C_{(s)}$
Calculate standard Gibbs energy of this cell. [Given: F = 96500 C/mol]

32. The compounds containing a carbonyl group (the -C=O group) are called carbonyl compounds. Aldehydes and ketones are considered to be carbonyl compounds. Having similar carbonyl functional group, both aldehydes and ketones undergo nucleophilic addition but differ in their reactivity.

The following are some examples of carbonyl compounds-

 A	 B	 C	 D

i) Which of the above compounds will undergo aldol condensation to produce but-2-enal? 1

ii) What are the products obtained when B is treated with concentrated alkali? 1

iii) Write the products formed when A is reacted with B in the presence of dilute alkali. 2

OR

Reaction of compound A with D is shown below-

$A + D \xrightarrow{\text{dil NaOH}} X \xrightarrow{\Delta} Y$

Identify X and Y in the above reaction.

SECTION E

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

33. (i) Write the anode and cathode reactions in mercury cell. 5

(ii) Calculate the EMF of the following cell at 298 K.

$Al_{(s)} / Al^{3+}_{(aq)} (10^{-2} M) \parallel Sn^{4+}_{(aq)} (10^{-2} M) / Sn^{2+}_{(aq)} (10^{-4} M), Pt_{(s)}$

Given that E^0 of $Al^{3+} / Al = -1.66$ V and E^0 of $Sn^{4+} / Sn^{2+} = 0.15$ V

(OR)

(i) Write equations to explain electrochemical theory of rusting.
(ii) Calculate the potential for half-cell containing 0.1 M aqueous potassium dichromate, 0.2 M aqueous Cr^{3+} and 1×10^{-4} M aqueous H^+ ions. The half-cell reaction is

$Cr_2O_7^{2-}{}_{(aq)} + 14\,H^+{}_{(aq)} + 6\,e^- \rightarrow 2Cr^{3+}{}_{(aq)} + 7\,H_2O_{(aq)}$

The standard electrode potential is E^0 is 1.33 V

34. (i) E^0 for Ce^{4+} / Ce^{3+} is highly positive. Why? 5
(ii) Transition metals form colored salts. Why?
(iii) Why, in the 3d series, the enthalpy of atomization of Zn is the lowest?
(iv) Write equation for thermal decomposition of potassium permanganate.
(v) Define lanthanoid contraction.

OR

A blackish brown solid 'A' when fused with alkali metal hydroxide in presence of air, produces a dark green coloured compound 'B', which on electrolytic oxidation in alkaline medium gives a dark purple coloured compound 'C'. Identify A, B, C and write the reactions involved. Also give balanced equation for the Lab preparation of compound C.

35. i) How will you convert the following? 5
(a) Benzene into aniline
(b) Ethanenitrile into methanamine
(c) Aniline into N-phenylbenzamide
(Write the chemical equations involved.)

ii) State reasons for the following:
a) Kb value for aniline is less than that for methylamine.
b) Arrange the following in increasing order of their solubility in water
Methanamine, Aniline, N-Methylmethanamine.

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

ROLL NUMBER				

SET	B

INDIAN SCHOOL MUSCAT
FINAL EXAMINATION 2022
CHEMISTRY[043]

CLASS : XII
DATE: 23.11.22

TIME ALLOTED : 3 HRS.
MAXIMUM MARKS: 70

GENERAL INSTRUCTIONS:

a) There are 35 questions in this question paper with internal choice.
b) SECTION A consists of 18 multiple-choice questions carrying 1 mark each.
c) SECTION B consists of 7 very short answer questions carrying 2 marks each.
d) SECTION C consists of 5 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.
h) Use of log tables and calculators is not allowed

SECTION A

The questions from 1 to 14 are multiple-choice questions with one correct answer.
Each question carries 1 mark.
There is no internal choice in this section.

1. Which of the following is water soluble vitamin? 1
a) A b) D c) E d) B

2. The initial step during dehydration of alcohol with concentrated sulphuric acid at 443K 1
a) Elimination of water b) Protonation of alcohol c) Formation of carbocation
d) Nucleophilic attack of protonated alcohol

3. Which of the following colligative properties can provide molar mass of proteins with greater precision? 1
a) Relative lowering of vapour pressure b) elevation in boiling point
c) depression in freezing point d) Osmotic pressure

4. The correct IUPAC name of $CH_3CH(CH_3)CH_2C(CH_3)_2COCH_3$ is 1
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5. But-1-ene on hydroboration oxidation produces 1
a) Butan-1-ol b) Butanone c) Butan-2-ol d) Butanal

6. What is the concentration of an aqueous sodium chloride solution that could be used in the bloodstream, if the average osmotic pressure of human blood is 5.1 atm at 27°C? [R= 0.083 L atm $K^{-1}mol^{-1}$]. 1
a) 0.28 mol/L b) 0.1 mol/L c) 0.01 mol/L d) 0.36 mol/L

7. The common name of Benzene-1,2-dicarbaldehyde is 1
a) Acetaldehyde b) Phthaldehyde c) Valeraldehyde d) Acrolein

8. 1

$$RCN + SnCl_2 + HCl \longrightarrow RCH = NH \xrightarrow{H_3O^+} RCHO$$

The above reaction represents
a) Rosenmund reduction b) Kolbe reaction c) Stephen reaction d) Etard reaction

9. The charge required for the reduction of 1 mol of MnO_4^- to Mn^{2+} is 1
a) 1 F b) 3 F c) 5 F d) 6 F

10. Which of the following is likely to form colourless salts? 1
a) Ca^{2+} b) Cu^{2+} c) Ti^{3+} d) Fe^{3+}

11. Complete hydrolysis of cellulose gives: 1
a) α-D-glucose b) α-D-fructose c) β-D-ribose d) β-D-glucose

12. Acetone reacts with Grignard reagent to form a/an 1
a) 3° alcohol b) 2° alcohol c) ether d) 1° alcohol

13. The reagent used for separation of acetaldehyde and acetophenone is 1
a) $C_6H_5NH\ NH_2$ b) $NaHSO_3$ c) NH_2OH d) $NaOH\text{-}I_2$

14. The best reagent for converting propanamide to propanamine is 1
a) Br_2,NaOH b) NH_3 c) $LiAlH_4$ d) HONO

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17. Assertion: Glucose is a reducing sugar. 1
Reason: Glucose has pyranose structure.

18. Assertion: Mixture of 2-nitropehenol and 4-nitrophenol cannot be separated by steam distillation. 1
Reason: 2-nitrophenol has intramolecular hydrogen bond whereas 4-nitrophenol has intermolecular hydrogen bonding.

SECTION B

This section contains 7 questions with internal choice in two questions.
The following questions are very short answer type and carry 2 marks each

19. Explain the mechanism of the following reaction: 2

$CH_3Cl + OH^- \rightarrow CH_3OH + Cl^-$

20. Give reason 2
i) Haloarenes are less reactive than haloalkanes towards nucleophiles.
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21. Name the product obtained when [write equations] 2
i) Propyne is hydrated in the presence of mercuric sulphate and sulphuric acid
ii) Propanol is treated with Cu at 573K

OR

Give chemical test to distinguish between
a) Acetophenone and benzophenone
b) Propanal and benzaldehyde

22. i) Illustrate Gattermann-Koch reaction. 2
ii) Draw the structure of hydrazone of propanone.

23. The conductivity of 0.1 mol L^{-1} solution of NaCl is 1.06×10^{-2} S cm^{-1}. Calculate its molar conductivity and degree of dissociation. 2
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ii) Convert benzenediazonium chloride to benzene.

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ii) $Cr_2O_7^{2-} + H_2S + H^+ \rightarrow$

SECTION C

This section contains 5 questions with internal choice in two questions.
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26. i) Name the reagents and write the chemical equation for the preparation of methoxy benzene by Williamson's synthesis. 3

ii) Why phenol undergoes electrophilic substitution reaction with ease when compared to benzene?

27. i) Name the type of linkage connecting nucleotides in a polynucleotide 3

ii) Give one structural and one functional difference between DNA and RNA.

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a) What do you understand by the term anomers?

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SECTION D

The following questions are case-based questions.
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31. E^0 value stands for standard electrode potential of a half cell. SHE is used to measure the standard electrode potentials of half cells. To measure standard electrode potential of a half cell, the half-cell is connected to SHE to construct a galvanic cell in which SHE acts anode and the other half cell as cathode. If the concentrations of solutions are unity then the cell potential is equal to standard electrode potential of the half cell.

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$D^{+} + e^- \rightarrow D$	+0.80

i) Predict which among A, B, C and D is best for coating the surface of iron to prevent corrosion and why? 1

ii) If an external potential greater than the standard cell potential is applied to a cell, what will you observe? 1

iii) Construct a cell, using a suitable anode and a cathode from the above given table, such that maximum work can be obtained by the operation of that cell. Also calculate the standard cell potential of that cell. 2

(OR)

From the above data table, a cell reaction is represented as

$A_{(s)} + C^{2+}{}_{(aq)} \rightarrow A^{2+}{}_{(aq)} + C_{(s)}$

Calculate standard Gibbs energy of this cell. [Given: F = 96500 C/mol]

32. The compounds containing a carbonyl group (the -C=O group) are called carbonyl compounds. Aldehydes and ketones are considered to be carbonyl compounds. Having similar carbonyl functional group, both aldehydes and ketones undergo nucleophilic addition but differ in their reactivity.

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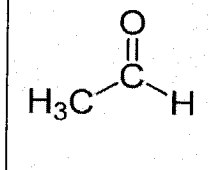	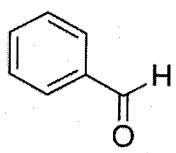	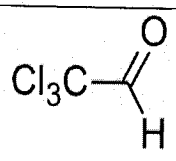	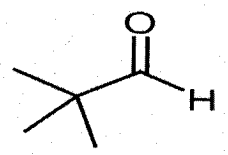
A	B	C	D

i) Which of the above compounds will undergo aldol condensation to produce but-2-enal? 1

ii) What are the products obtained when B is treated with concentrated alkali? 1

iii) Write the products formed when A is reacted with B in the presence of dilute alkali. 2

(OR)

Reaction of compound A with D is shown below-

$A + D \xrightarrow{\text{dil NaOH}} X \xrightarrow{\Delta} Y$

Identify X and Y in the above reaction.

SECTION E

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

33. (i) Write the anode and cathode reactions in mercury cell. 5

(ii) Calculate the EMF of the following cell at 298 K.

$$Al_{(s)} / Al^{3+}_{(aq)} (10^{-2}\ M) \parallel Sn^{4+}_{(aq)} (10^{-2}\ M) / Sn^{2+}_{(aq)} (10^{-4}\ M), Pt_{(s)}$$

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(ii) Transition metals form complex compounds. Why?
(iii) Why, in the 3d series, the enthalpy of atomization of Zn is the lowest?
(iv) What happens when pH of chromate solution is lowered? Write equation.
(v) Define lanthanoid contraction.

OR

A blackish brown solid 'A' when fused with alkali metal hydroxide in presence of air, produces a dark green coloured compound 'B', which on electrolytic oxidation in alkaline medium gives a dark purple coloured compound 'C'. Identify A, B, C and write the reactions involved. Also give balanced equation for the Lab preparation of compound C.

35. i) How will you convert the following? 5
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(b) Ethanenitrile into methanamine
(c) Aniline into N-phenylbenzamide
(Write the chemical equations involved.)

ii) State reasons for the following:
a) Kb value for aniline is less than that for methylamine.
b) Arrange the following in increasing order of their solubility in water.
Methanamine, Aniline, N-methylmethanamine.

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

ROLL NUMBER				

SET	C

INDIAN SCHOOL MUSCAT
FINAL EXAMINATION 2022
CHEMISTRY[043]

CLASS : XII
DATE: 23.11.22

TIME ALLOTED : 3 HRS.
MAXIMUM MARKS: 70

GENERAL INSTRUCTIONS:

a) There are 35 questions in this question paper with internal choice.
b) SECTION A consists of 18 multiple-choice questions carrying 1 mark each.
c) SECTION B consists of 7 very short answer questions carrying 2 marks each.
d) SECTION C consists of 5 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.
h) Use of log tables and calculators is not allowed

SECTION A

The questions from 1 to 14 are multiple-choice questions with one correct answer.
Each question carries 1 mark.
There is no internal choice in this section.

1. Which of the following is fat soluble vitamin? 1
a) B_{12} b) C c) E d) B_2

2. The initial step during hydration of alkene to alcohol is 1
a) Elimination of water b) Protonation of alcohol c) Formation of carbocation
d) Nucleophilic attack of protonated alcohol

3. Which of the following colligative properties can provide molar mass of proteins with greater precision? 1
a) Relative lowering of vapour pressure b) Elevation in boiling point
c) Depression in freezing point d) Osmotic pressure

4. The correct IUPAC name of $CH_3CH(CH_3)CH_2C(CH_3)_2COCH_3$ is 1
a)2,4,4-trimethylhexan-2-one b) 3,3,4-trimethylhexan-2-one c)3,3,5-trimethylhexan-2-one
d) 3,3-dimethylheptan-2-one

5. Propene on hydroboration oxidation produces 1
a) Propan-1-ol b) Propanone c) Propan-2-ol d) Propanal

6. What is the concentration of aqueous sodium chloride solution that could be used in the bloodstream, if the average osmotic pressure of human blood is 5.1 atm at 27°C? [R= 0.083 L atm $K^{-1}mol^{-1}$]. 1
a) 0.28 mol/L b) 0.1 mol/L c) 0.01 mol/L d) 0.36 mol/L

7. The common name of Benzene-1,2-dicarbaldehyde is 1
a) Acetaldehyde b) Phthaldehyde c) Valeraldehyde d) Acrolein

8. 1

$$RCN + SnCl_2 + HCl \longrightarrow RCH = NH \xrightarrow{H_2O} RCHO$$

The above reaction represents
a) Rosenmund reduction b) Kolbe reaction c) Stephen reaction d) Etard reaction

9. The charge required for the reduction of 1 mol of FeO to Fe_2O_3 1
a) 1 F b) 2 F c) 3 F d) 4 F

10. Which of the following is likely to be diamagnetic? 1
a) Sc^{3+} b) Cu^{2+} c) Ti^{3+} d) Fe^{3+}

11. Complete hydrolysis of amylopectin gives: 1
a) α-D-glucose b) α-D-fructose c) β-D-ribose d) β-D-glucose

12. Acetone reacts with Grignard reagent to form a/an 1
a) 3° alcohol b) 2° alcohol c) ether d) 1° alcohol

13. The reagent used for separation of acetaldehyde and acetophenone is 1
a) $C_6H_5NH\ NH_2$ b) $NaHSO_3$ c) NH_2OH d) $NaOH\text{-}I_2$

14. The best reagent for converting ethanamide to methanamine is 1
a) Br_2,NaOH b) NH_3 c) $LiAlH_4$ d) HONO

The questions from 15 to 18 are assertion and reason type questions.
Each question carries 1 mark.
There is no internal choice in this section.

ASSERTION REASONING
(A) Assertion and reason both are correct statements and reason is correct explanation for assertion.
(B) Assertion and reason both are correct statements but reason is not correct explanation for assertion.
(C) Assertion is correct statement but reason is wrong statement.
(D) Assertion and reason both are incorrect statements.
(E) Assertion is wrong statement but reason is correct statement.

15. Assertion : When NaCl is added to water a depression in freezing point is observed. 1
Reason : The lowering of the vapour pressure of a solution causes depression in the freezing point.

16. Assertion: Two liquids, nitric acid and water form a maximum boiling azeotrope when mixed in the ratio of 68% and 32% respectively. 1
Reason: Interaction between nitric acid and water are weaker than nitric acid – nitric acid interactions and water-water interactions

17. Assertion: Glucose is a reducing sugar. 1
Reason: Glucose has pyranose structure.

18. Assertion: Mixture of 2-nitropehenol and 4-nitrophenol cannot be separated by steam distillation. 1
Reason: 2-nitrophenol has intramolecular hydrogen bond whereas 4-nitrophenol has intermolecular hydrogen bonding.

SECTION B

This section contains 7 questions with internal choice in two questions.
The following questions are very short answer type and carry 2 marks each

19. Explain the mechanism of the following reaction: 2
$CH_3Br + OH^- \rightarrow CH_3OH + Br^-$

20. Give reason 2
i) Haloarenes are less reactive than haloalkanes towards nucleophiles.
ii) p-dihalobenzenes have higher melting points than their ortho isomers.

21. Name the product obtained when [write equations] 2
i) Ethyne is treated with mercuric sulphate in presence of sulphuric acid
ii) Ethanol is treated with Cu at 573K

OR

Give chemical test to distinguish between
a) Acetophenone and benzophenone
b) Propanal and benzaldehyde

22. i) Illustrate HVZ reaction. 2
ii) Draw the structure of semicarbazone of propanone.

23. The conductivity of 0.1 mol L^{-1} solution of NaCl is 1.06×10^{-2} S cm^{-1}. Calculate its molar conductivity and degree of dissociation. 2
[Given $\Lambda°(Na^+) = 50.1$ S $cm^2 mol^{-1}$ and $\Lambda°(Cl^-) = 76.5$ S cm^2 mol^{-1}]

OR

Calculate the mass of copper deposited when aqueous copper sulphate was electrolysed between platinum electrodes using a current of 0.128 A for 50 minutes.
[Given: Atomic mass of copper=63.5g/mol and F=96500C/mol]

24. i) Aromatic amines cannot be prepared by Gabriel phthalimide synthesis. Why? 2
ii) Convert benzenediazonium chloride to fluorobenzene.

25. Complete and balance 2
i) $MnO_4^- + S_2O_3^{2-} + H_2O \rightarrow$
ii) $Cr_2O_7^{2-} + Fe^{2+} + H^+ \rightarrow$

SECTION C

This section contains 5 questions with internal choice in two questions.
The following questions are short answer type and carry 3 marks each.

26. i) Name the reagents and write the chemical equation for the preparation of methoxy benzene by Williamson's synthesis. 3
ii) Why phenol undergoes electrophilic substitution reaction with ease when compared to benzene?

27. i) Name the type of linkage connecting nucleotides in a polynucleotide. 3
ii) Give one structural and one functional difference between DNA and RNA.

OR

a) What do you understand by the term anomers?
b) How are essential amino acids different from non-essential amino acids?
c) What is the effect of denaturation on the structure of proteins?

28. Effect the following conversions- 3
i) Propene to 1- iodopropane
ii) Chloropropane to fluoropropane
iii) Benzene to biphenyl

29. An aqueous solution of a weak dibasic acid contains 0.1 *g* of the acid in 21.7*g* of water. It freezes at 272.715 *K*. What is the molecular mass of the acid, if it undergoes 60% dissociation in solution? [Given: Freezing point of water = 273 K, K_f for water is 1.86 *K/m*] 3

OR

Calculate the vapor pressure of a mixture containing 252 g of n-pentane (molar mass 72 g/mol) and 1400 g of n-heptane (molar mass 100g/mol) at 20°C. The vapor pressure of n-pentane and n-heptane are 420 mm Hg and 36 mm Hg respectively.

30. i) Define colligative property 3
ii) Calculate the boiling point of a solution containing 13.44g of $CuCl_2$ (molar mass 134.4 u) in 1000g of water assuming complete dissociation. (Given: Boiling point of water = 373 K, K_b = 0.52 K Kg/mol)

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 data/passage carefully and answer the questions that follow.

31. E^0 value stands for standard electrode potential of a half cell. SHE is used to measure the standard electrode potentials of half cells. To measure standard electrode potential of a half cell, the half-cell is connected to SHE to construct a galvanic cell in which SHE acts anode and the other half cell as cathode. If the concentrations of solutions are unity then the cell potential is equal to standard electrode potential of the half cell.
The table below shows E^0 for iron and four other metals A, B, C and D. The reduction potential values for each, in volts, is also given.

Reaction	E^o_{red} (V)
$Fe^{2+} + 2e^- \rightarrow Fe$	-0.44
$A^{2+} + 2e^- \rightarrow A$	-2.37
$B^{2+} + 2e^- \rightarrow B$	-0.14
$C^{2+} + 2e^- \rightarrow C$	+0.34
$D^+ + e^- \rightarrow D$	+0.80

i) Predict which among A, B, C and D is best for coating the surface of iron to prevent corrosion and why? 1

ii) If an external potential greater than the standard cell potential is applied to a cell, what will you observe? 1

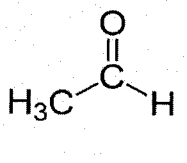
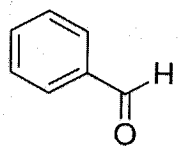
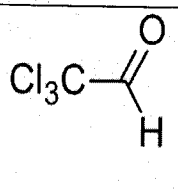
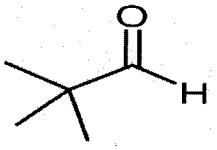
iii) Construct a cell, using a suitable anode and a cathode from the above given table, such that maximum work can be obtained by the operation of that cell. Also calculate the standard cell potential of that cell. 2

(OR)

From the above data table, a cell reaction is represented as
$A_{(s)} + C^{2+}_{(aq)} \rightarrow A^{2+}_{(aq)} + C_{(s)}$
Calculate standard Gibbs energy of this cell. [Given: F = 96500 C/mol]

32. The compounds containing a carbonyl group (the -C=O group) are called carbonyl compounds. Aldehydes and ketones are considered to be carbonyl compounds. Having similar carbonyl functional group, both aldehydes and ketones undergo nucleophilic addition but differ in their reactivity.

The following are some examples of carbonyl compounds-

			
A	B	C	D

i) Which of the above compounds will undergo aldol condensation to produce but-2-enal? 1

ii) What are the products obtained when B is treated with concentrated alkali? 1

iii) Write the products formed when A is reacted with B in the presence of dilute alkali. 2

OR

Reaction of compound A with D is shown below-

$$A + D \xrightarrow{\text{dil NaOH}} X \xrightarrow{\Delta} Y$$

Identify X and Y in the above reaction.

SECTION E

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

33. (i) Write the anode and cathode reactions in mercury cell. 5

(ii) Calculate the EMF of the following cell at 298 K.

$Al_{(s)} / Al^{3+}_{(aq)} (10^{-2} M) \parallel Sn^{4+}_{(aq)} (10^{-2} M) / Sn^{2+}_{(aq)} (10^{-4} M), Pt_{(s)}$

Given that E^0 of $Al^{3+} / Al = -1.66$ V and E^0 of $Sn^{4+} / Sn^{2+} = 0.15$ V

(OR)

(i) Write equations to explain electrochemical theory of rusting.
(ii) Calculate the potential for half-cell containing 0.1 M aqueous potassium dichromate, 0.2 M aqueous Cr^{3+} and 1×10^{-4} M aqueous H^+ ions. The half-cell reaction is

$$Cr_2O_7^{2-}{}_{(aq)} + 14\,H^+{}_{(aq)} + 6\,e^- \rightarrow 2Cr^{3+}{}_{(aq)} + 7\,H_2O_{(aq)}$$

The standard electrode potential is E^0 is 1.33 V

34. (i) E^0 for Ce^{4+} / Ce^{3+} is highly positive. Why? 5
(ii) Transition metals form colored salts. Why?
(iii) Why, in the 3d series, the enthalpy of atomization of Zn is the lowest?
(iv) Write equation for thermal decomposition of potassium permanganate.
(v) Define lanthanoid contraction.

OR

A blackish brown solid 'A' when fused with alkali metal hydroxide in presence of air, produces a dark green coloured compound 'B', which on electrolytic oxidation in alkaline medium gives a dark purple coloured compound 'C'. Identify A, B, C and write the reactions involved. Also give balanced equation for the Lab preparation of compound C.

35. i) How will you convert the following? 5
(a) Butan-1-amine into butan-1-ol
(b) Ethanoic acid into methanamine
(c) Aniline into N-phenylethanamide
(Write the chemical equations involved.)

ii) State reasons for the following:
a) Kb value for methylamine is more than that for aniline.
b) Arrange the following in increasing order of their solubility in water.
Methanamine, Aniline, N-methylmethanamine.

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