



COMMON PRE-BOARD EXAMINATION 2022-23

Subject: CHEMISTRY (043)



Class: XII

Max. Marks: 70

Date:

Time: 3Hrs.

General Instructions:

Read the following instructions carefully.

- i. There are 35 questions in this question paper with internal choice.
- ii. SECTION A consists of 18 multiple choice questions carrying 1 mark each.
- iii. SECTION B consists of 7 very short answer questions carrying 2 marks each.
- iv. SECTION C consists of 5 short answer questions carrying 3 marks each.
- v. SECTION D consists of 2 case-based questions carrying 4 marks each.
- vi. SECTION E consists of 3 long answer questions carrying 5 marks each.
- vii. All questions are compulsory.
- viii. Use of log tables and calculators is not allowed.

SECTION A

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

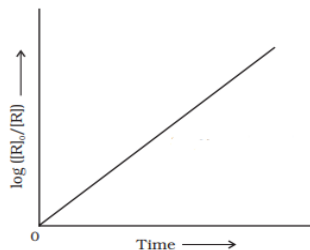
1. Benzene diazonium chloride when treated with hypophosphorous acid produces 1
 - (a) Phenylphosphate
 - (b) Phenol
 - (c) Benzene
 - (d) Chlorobenzene
2. When a coordination compound $\text{CrCl}_3 \cdot 6\text{H}_2\text{O}$ is mixed with excess of AgNO_3 , 2 moles of AgCl are precipitated. The structural formula of the compound is 1
 - (a) $[\text{Cr}(\text{H}_2\text{O})_3 \text{Cl}_3] \cdot 3\text{H}_2\text{O}$
 - (b) $[\text{Cr}(\text{H}_2\text{O})_5 \text{Cl}] \text{Cl}_2 \cdot \text{H}_2\text{O}$
 - (c) $[\text{Cr}(\text{H}_2\text{O})_4 \text{Cl}_2] \text{Cl} \cdot 2\text{H}_2\text{O}$
 - (d) $[\text{Cr}(\text{H}_2\text{O})_6 \text{Cl}] \text{Cl}_2$
3. The mass of Zinc deposited when a current of 2A is passed through a ZnSO_4 solution (atomic mass of $\text{Zn} = 65$) for 10 minutes is 1
 - (a) 0.404g
 - (b) 0.067g
 - (c) 0.808g
 - (d) 0.352g

4. In the following reaction sequence Z is $\text{CH}_3 - \underset{\substack{| \\ \text{OH} \\ \text{(X)}}}{\text{CH}} - \text{CH}_3 \xrightarrow{[\text{O}]} \text{Y} \xrightarrow[\text{H}^+/\text{H}_2\text{O}]{\text{CH}_3\text{MgBr}} \text{Z}$ 1
- (a) butan-1-ol
(b) butan-2-ol
(c) 2-methylpropan-1-ol
(d) 2-Methylpropan-2-ol
5. The rate constant of a reaction is $k = 3.15 \times 10^{-2} \text{ mol}^{-1} \text{ L sec}^{-1}$. The order of the reaction is 1
- (a) Zero order
(b) First order
(c) Second order
(d) Third order
6. KMnO_4 on heating to 513K gives 1
- (a) K_2MnO_4 , Mn_2O_3
(b) K_2MnO_4 , MnO_2 , O_2
(c) K_2MnO_4 , MnO , O_2
(d) K_2MnO_4 , MnO_2
7. Which of the following compounds can yield only one monochlorinated product upon free radical chlorination? 1
- (a) 2, 2-Dimethylpropane
(b) 2-Methylpropane
(c) 2-Methylbutane
(d) n-Butane
8. Arrange the following in increasing order of their basic strength in aqueous medium 1
- CH_3NH_2 , $(\text{CH}_3)_2\text{NH}$, $(\text{CH}_3)_3\text{N}$, $\text{C}_6\text{H}_5\text{NH}_2$, $\text{C}_6\text{H}_5\text{CH}_2\text{NH}_2$.
- (a) $\text{C}_6\text{H}_5\text{CH}_2\text{NH}_2 < \text{C}_6\text{H}_5\text{NH}_2 < (\text{CH}_3)_3\text{N} < \text{CH}_3\text{NH}_2 < (\text{CH}_3)_2\text{NH}$
(b) $\text{C}_6\text{H}_5\text{NH}_2 < \text{C}_6\text{H}_5\text{CH}_2\text{NH}_2 < (\text{CH}_3)_3\text{N} < \text{CH}_3\text{NH}_2 < (\text{CH}_3)_2\text{NH}$
(c) $\text{C}_6\text{H}_5\text{NH}_2 < \text{C}_6\text{H}_5\text{CH}_2\text{NH}_2 < \text{CH}_3\text{NH}_2 < (\text{CH}_3)_2\text{NH} < (\text{CH}_3)_3\text{N}$
(d) $\text{C}_6\text{H}_5\text{NH}_2 > \text{C}_6\text{H}_5\text{CH}_2\text{NH}_2 > \text{CH}_3\text{NH}_2 > (\text{CH}_3)_2\text{NH} > (\text{CH}_3)_3\text{N}$
9. IUPAC name of the compound $\text{CH}_3\text{O} - \underset{\substack{| \\ \text{CH}_3}}{\text{CH}} - \text{CH}_3$ is 1
- (a) 1-Methoxy-1-methyl ethane
(b) 2-Methoxy-2-methylethane
(c) 2-Methoxypropane
(d) Isopropylmethylether

10. Which of the following is the most stable complex species? 1

- (a) $[\text{Fe}(\text{CO})_5]$
- (b) $[\text{Fe}(\text{CN})_6]^{3-}$
- (c) $[\text{Fe}(\text{C}_2\text{O}_4)_3]^{3-}$
- (d) $[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$

11. The slope in the plot of $\log[R]_0/[R]$ Vs time is 1



- (a) $2.303/k$
- (b) $k/2.303$
- (c) $-K$
- (d) $-E_a/R$

12. Which of the following compounds is most reactive towards nucleophilic addition reaction? 1

- (a) CH_3CHO
- (b) CH_3COCH_3
- (c) $\text{C}_6\text{H}_5\text{COCH}_3$
- (d) $\text{CH}_3\text{CH}_2\text{CHO}$

13. The decomposition of ammonia on a platinum surface is a zero order reaction. The rates of production of H_2 if $k = 1.5 \times 10^{-2} \text{ mol}^{-1} \text{ L s}^{-1}$ 1

- (a) $1.5 \times 10^{-2} \text{ mol L}^{-1} \text{ s}^{-1}$
- (b) $0.5 \times 10^{-2} \text{ mol L}^{-1} \text{ s}^{-1}$
- (c) $4.5 \times 10^{-2} \text{ mol L}^{-1} \text{ s}^{-1}$
- (d) $3.0 \times 10^{-2} \text{ mol L}^{-1} \text{ s}^{-1}$

14. Benzaldehyde on nitration gives 1

- (a) o-Nitrobenzaldehyde
- (b) p-Nitrobenzaldehyde
- (c) m-Nitrobenzaldehyde
- (d) o and p -Nitrobenzaldehyde

15. Given below are two statements labelled as Assertion (A) and Reason (R) 1
Assertion: Aromatic Carboxylic acids do not undergo Friedel - Crafts reaction.
Reason: -COOH group is a meta directing group.
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, and R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.
16. Given below are two statements labelled as Assertion (A) and Reason (R) 1
Assertion: Manganese has an exceptionally low melting point in 3d series.
Reason: Manganese has weak metallic bonds due to electronic repulsion.
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, and R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.
17. Given below are two statements labelled as Assertion (A) and Reason (R) 1
Assertion: Gabriel phthalimide synthesis cannot be used to prepare aromatic primary amines
Reason: Aryl halides do not undergo nucleophilic substitution reaction.
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, and R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.
18. Given below are two statements labelled as Assertion (A) and Reason (R) 1
Assertion: Purine bases present in DNA are adenine and guanine.
Reason: The base uracil is present in DNA whereas the base thymine is present in RNA.
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, and R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.

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. (a) The following haloalkanes are hydrolysed in presence of aq.KOH 2
- i. Chlorobutane
 - ii. 2-Chloro-2-methylpropane
- Which of the above is most likely to give a racemic mixture? Justify your answer.
- (b) Predict all the alkenes that would be formed by dehydrohalogenation of 1-Bromo-1-methylcyclohexane with sodium ethoxide in ethanol and identify the major alkene.
20. What is meant by crystal field splitting energy? On the basis of crystal field theory, write the electronic configuration for d^4 ion when $\Delta_0 > P$. 2

OR

What type of isomerism is exhibited by the complex $[\text{Co}(\text{NH}_3)_5\text{SO}_4]\text{Br}$? Give the isomer and a chemical test to distinguish between the two isomers.

21. Name the product formed when ethanol undergoes acid catalyzed dehydration at 413 K? Write the mechanism involved in the following reaction. 2
22. Explain the following: 2
- i. Pseudo first order reaction
 - ii. Elementary reaction
23. (a) Write the product formed when D-glucose is treated with Bromine water. What do you infer about the structure of Glucose by this reaction? 2
- (b) What are the components of starch?
24. What happens when? (Give equations for the following reactions) 2
- i. 2-Methylpropan-2-ol is treated with Cu at 573K
 - ii. Phenol is treated with chloroform in the presence of Sodium hydroxide.
25. The half- life for a first order reaction is 37.9 minutes. Calculate the time taken for 75% completion. 2
- ($\log 2 = 0.3010$, $\log 3 = 0.4771$, $\log 4 = 0.6021$, $\log 5 = 0.6990$)

OR

The rate of a particular reaction triples when temperature changes from 20°C to 50°C . Calculate the activation energy for the reaction.

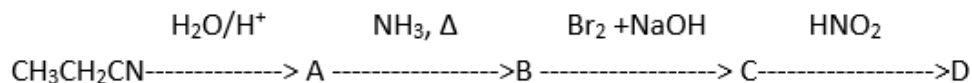
($\log 3 = 0.4771$, $R = 8.314\text{JK}^{-1}\text{mol}^{-1}$)

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. Explain giving suitable reasons: 3
- Alkaline medium inhibits the rusting of iron.
 - On the basis of E^0 value, O_2 gas should be liberated at anode but it is Chlorine gas which is liberated in the electrolysis of aqueous NaCl.
 - The cell potential of a mercury cell remains constant throughout its life time.

27. (a) Give the structures of A, B, C and D in the following reactions: 3



- (b) Give a chemical test to distinguish between Methylamine and Dimethyl amine.
28. (a) Why is an increase in temperature observed on mixing chloroform and acetone? 3
- (b) What type of azeotropes are formed by solutions that exhibit large positive deviation from Raoult's law? Give an example.
- (c) When mercuric iodide is added to an aqueous solution of KI, the freezing point is raised. Why?

OR

- (a) Give any two characteristics of ideal solutions.
- (b) What is the effect of temperature on the solubility of a gas in a liquid? Explain
- (c) Scuba divers carry oxygen cylinders diluted with helium. Give reason.
29. (a) What are enantiomers? 3
- (b) How are the following conversions carried out?
- Ethanol to propanenitrile
 - Chlorobenzene to p-nitrophenol
30. (a) Write the formula of: Potassium tetracyanonickelate(II) 3
- (b) Using valence bond theory explain the type of hybridization, shape and magnetic behaviour of the complex $[\text{Co}(\text{en})_3]^{3+}$ (Atomic number of Co = 27)

OR

- (a) Give the IUPAC name of the following coordination compound: $[\text{Co}(\text{NH}_3)_4\text{Cl}(\text{NO}_2)]\text{Cl}$
- (b) Explain $[\text{Co}(\text{NH}_3)_6]^{3+}$ is an inner orbital complex whereas $[\text{Ni}(\text{NH}_3)_6]^{2+}$ is an outer orbital complex.

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.

31. The phenomenon of the flow of solvent through a semipermeable membrane from the solution of low solute concentration to that of higher solute concentration is called osmosis. 4

The excess pressure which must be applied to a solution to stop osmosis is osmotic pressure. Van't Hoff made a thorough study of the osmotic pressure of the dilute or ideal solutions. He concluded that a dilute or ideal solution behave like an ideal gas and the different gas laws are applicable to the dilute solutions as well.

Answer the following questions:

- (a) Measurement of osmotic pressure method is preferred for the determination of molar masses of macromolecules such as proteins and polymers. Give reason.
- (b) What will happen when a pressure greater than osmotic pressure is applied on the solution separated by a semipermeable membrane from the solvent? Explain.
- (c) The osmotic pressure of blood is 8.21 atm at 37°C. How much glucose should be added used per litre for an intravenous injection that is isotonic with blood?
($R = 0.082 \text{ L atm mol}^{-1}\text{K}^{-1}$, Molar mass of Glucose = 180gmol^{-1})

OR

- (c) 0.85% aqueous solution of NaNO_3 is apparently 90% dissociated at 27°C.
Calculate its osmotic pressure.
($R = 0.0821 \text{ L atm mol}^{-1}\text{K}^{-1}$, Molar mass of $\text{NaNO}_3 = 85 \text{ gmol}^{-1}$)

32. Proteins are the most abundant biomolecules of the living system. The chief sources of proteins are milk, cheese, pulses, fish, meat, peanuts, etc. They are found in every part of the body and form a fundamental basis of the structure and functions of life. These are also required for the growth and maintenance of the body. The word protein is derived from the Greek word, 'proteios' meaning 'primary' or of 'prime importance'. 4

Answer the following questions:

- (a) Name the amino acid which is optically inactive.
- (b) What type of bonding stabilizes the α -helix structure of protein?
- (c) What do you understand by the primary and secondary structure of protein?

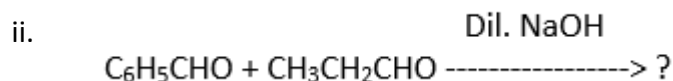
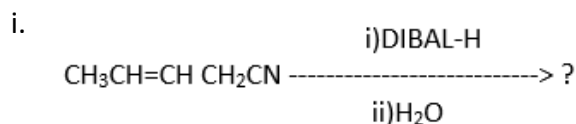
OR

- (c) What are essential and non-essential amino acids? Give examples.

SECTION E

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

33. (a) An organic compound 'A' which has characteristic odour, on treatment with NaOH forms two compounds 'B' and 'C'. Compound 'B' has the molecular formula C_7H_8O which on oxidation gives back compound 'A'. Compound 'C' is the sodium salt of the acid. 'C' when heated with soda lime yields an aromatic hydrocarbon 'D'. Deduce the structures of A to D and give the reactions involved. 5
- (b) Write the major product in the following reactions:



OR

- (a) A compound A with molecular formula $C_5H_{12}O$ on oxidation forms compound B with the molecular formula $C_5H_{10}O$. The compound B gives iodoform test but does not reduce Tollen's reagent. The compound B on reduction with Zn-Hg and HCl gives compound C with molecular formula C_5H_{12} . Identify A, B and C and give the chemical reactions involved.
- (b) Account for the following:
- Carboxylic acids do not give characteristic reactions of carbonyl group.
 - Oxidation of toluene to benzaldehyde is carried out in the presence of acetic anhydride.

34. (a) What happens when an external potential greater than 1.1 V is applied to the Daniel cell? 5
- (b) Two metals A and B have reduction potential values -0.76V and 0.34V respectively. Which of these will liberate hydrogen gas from dilute sulphuric acid?
- (c) Calculate the emf and standard Gibbs free energy of the cell at $25^\circ C$



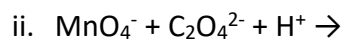
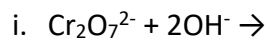
$$\text{Given } E^0 Cr^{3+}/Cr = -0.75V, E^0 Fe^{2+}/Fe = -0.45V$$

OR

- (a) Define molar conductivity. Explain with a graph the variation of molar conductivity for a weak electrolyte with decrease in concentration.
- (b) At 291K, the molar conductivities at infinite dilution of NH_4Cl , NaOH and NaCl are 129.8, 217.4 and $108.9 \text{ Scm}^2\text{mol}^{-1}$ respectively. If the conductivity of 0.01M solution of NH_4OH is $9.33 \times 10^{-5} \text{ Scm}^{-1}$, what is the percentage dissociation of NH_4OH at this dilution?

35. (a) Complete the following equations:

5



(b) Assign reasons for the following:

i. With the same d^4 configuration Cr^{2+} is reducing while Mn^{3+} is oxidizing.

ii. Cu^+ is unstable in aqueous solution.

(c) Write a balanced chemical equation for the preparation of K_2MnO_4 from pyrolusite ore.