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Candidates must write the Set No on the title page of the answer book.

**SAHODAYA PRE BOARD EXAMINATION – 2023-24**

- ◆ Please check that this question paper contains 9 printed pages.
- ◆ Set number given on the right-hand side of the question paper should be written on the title page of the answer book by the candidate.
- ◆ Check that this question paper contains 33 questions.
- ◆ Write down the Serial Number of the question in the left side of the margin before attempting it.
- ◆ 15 minutes time has been allotted to read this question paper. The question paper will be distributed 15 minutes prior to the commencement of the examination. The students will read the question paper only and will not write any answer on the answer script during the period. Students should not write anything in the question paper.

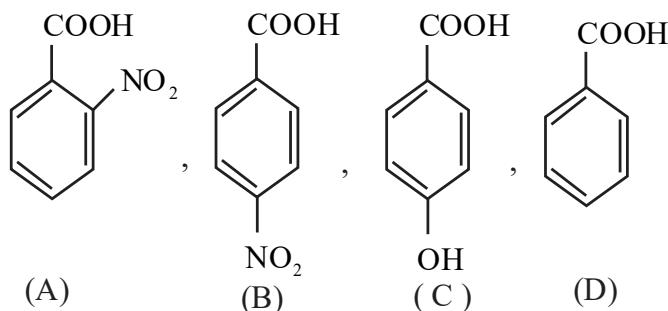
**CLASS – XII****Sub.: Chemistry(043)****Time Allowed: 3 Hours****Maximum Marks: 70****General Instructions:****Read the following instructions very carefully and follow them.**

- I. This question paper contains **33** questions. All questions are compulsory.
- II. The question paper is divided into five sections. Sections A, B, C, D, and E.
- III. **In Section-A:** Question numbers from 1 to 16 are Multiple Choice (MCQ) type questions carrying 1 mark each.
- IV. **In Section-B:** Question numbers from 17 to 21 are very short answer (VSA) type questions carrying 2 marks each.
- V. **In Section-C:** Question numbers from 22 to 28 are short answer (SA) type questions carrying 3 marks each.
- VI. **In Section-D:** Question numbers 29 and 30 are case-based questions carrying 4 marks each.
- VII. **In Section-E:** Question numbers from 31 to 33 are Long answer (LA) type questions carrying 5 marks each.
- VIII. Use of a calculator is not allowed.

## 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.

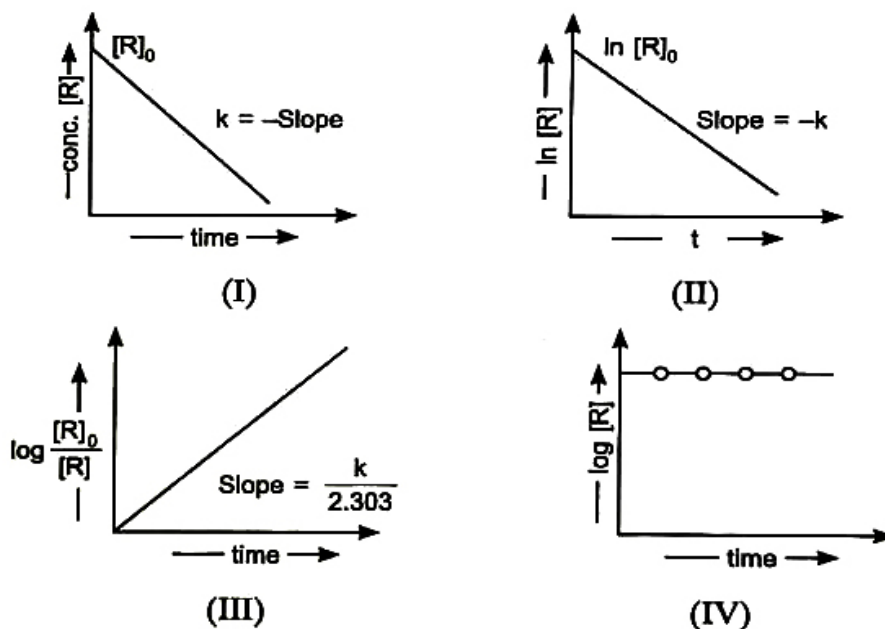
- Zinc is coated over iron to prevent rusting of iron because: [1]
  - $E_{Zn^{2+}/Zn}^0 = E_{Fe^{2+}/Fe}^0$
  - $E_{Zn^{2+}/Zn}^0 < E_{Fe^{2+}/Fe}^0$
  - $E_{Zn^{2+}/Zn}^0 > E_{Fe^{2+}/Fe}^0$
  - $E_{Zn^{2+}/Zn}^0 - E_{Fe^{2+}/Fe}^0 = 0$
- On heating of benzyl-ethyl ether with HI produces: [1]
  - Phenol and ethyl iodide
  - Benzyl iodide and ethyl alcohol
  - Benzyl alcohol and ethyl iodide
  - Iodobenzene and ethyl alcohol
- E1, E2, and E3 are the emf values of the following three galvanic cells respectively: [1]
  - $Zn(s) | Zn^{2+}(1M) || Cu^{2+}(0.1M) | Cu(s)$
  - $Zn(s) | Zn^{2+}(1M) || Cu^{2+}(1M) | Cu(s)$
  - $Zn(s) | Zn^{2+}(0.1M) || Cu^{2+}(1M) | Cu(s)$
 Which of the following is true?
  - $E2 > E3 > E1$
  - $E3 > E2 > E1$
  - $E1 > E2 > E3$
  - $E1 > E3 > E2$
- In which of the following compounds, the central atom/ion does not exhibit an oxidation state +4. [1]
  - $[PtCl_2(en)_2](NO_3)_2$
  - $[PtCl_2(en)_2]SO_4$
  - $K_2[Pt(NH_3)_2(CN)_4]$
  - $[Pt(en)_2(NO_3)_2]Cl_2$
- Which parts of amino acids molecules are linked through hydrogen bonds in the secondary structure of proteins? [1]
  - NH<sub>2</sub> group
  - COOH group
  - CO- and -NH- groups
  - None of the above
- A solution containing 50g of ethylene glycol in 200g of water is cooled to -9.3°C. The amount of ice that will separate out will be ( $K_f = 1.86 \text{ Kg.mol}^{-1}$ ) [1]
  - 18.71g
  - 28.71g
  - 38.71g
  - 48.71g
- 49% H<sub>2</sub>SO<sub>4</sub> by mass has density 1.8 g cm<sup>-3</sup>. The molarity of the solution will be: [1]
  - 4.9 M
  - 9.0 M
  - 9.8 M
  - 0.9 M
- Arrange the following acids in order of increasing acidity. [1]



- $B < C < A < D$
- $A < B < C < D$
- $C < B < D < A$
- $C < D < B < A$

9. Which of the following statements is not correct for amines? [1]
- (a) Most alkyl amines are more basic than ammonia solutions.  
 (b)  $pK_b$  value of ethylamine is lower than benzyl amine.  
 (c)  $C_2H_5NH_2$  in reaction with nitrous acid releases  $NO_2$  gas.  
 (d) Hinsberg's reagent reacts with secondary amines to form N, N-Dialkyl benzene sulphonamides.

10. Which of the following graphs are correct for 1st order reaction? [1]



- (a) I and II                      (b) II and III                      (c) III and IV                      (d) I and IV
11. What is the IUPAC name of the ketone A, which undergoes iodoform reaction to give  $CH_3CH=C(CH_3)COONa$  and yellow precipitate of  $CHI_3$ ? [1]
- (a) 3-Methylpent-3-en-2-one                      (b) 3-Methylpent-2-en-4-one  
 (c) 3, 4-Dimethylpentan-2-one                      (d) 3- Methylpentanone
12. Which of the following is most reactive towards nucleophilic substitution? [1]
- (a)  $CH_3=CH-Cl$                       (b)  $C_6H_5Cl$   
 (c)  $CH_3-CH=CH-Cl$                       (d)  $CH_2=CH-CH_2Cl$
13. Given below are two statements labeled Assertion (A) and Reason (R). [1]
- Assertion (A):** For the reaction  $2N_2O_5 \rightarrow 4NO_2 + O_2$ ,  $\text{Rate} = k[N_2O_5]$   
**Reason (R):** Rate of decomposition of  $N_2O_5$  is determined by slow step.  
 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.

14. Given below are two statements labeled Assertion (A) and Reason (R). [1]  
**Assertion (A):** Benzoic acid does not undergo Friedel-Crafts reaction.  
**Reason (R):** The carboxyl group is activating and undergoes electrophilic 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 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.
15. Given below are two statements labeled Assertion (A) and Reason (R). [1]  
**Assertion (A):** Tetrahedral complexes do not show geometrical isomerism.  
**Reason (R):** Ligands occupy identical positions in tetrahedral complexes.  
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.
16. Given below are two statements labeled Assertion (A) and Reason (R). [1]  
**Assertion (A):** Sucrose is dextrorotatory but on hydrolysis in the presence of little hydrochloric acid, it becomes laevorotatory.  
**Reason (R):** Sucrose on hydrolysis gives unequal amounts of glucose and fructose as a result of which a change in sign of rotation is observed.  
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.

### SECTION - B

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

17. (a) The two strands in DNA are not identical but are complementary. Explain. [2]  
(b) Name the products of hydrolysis of Maltose.
18. (a) What is Fehling's solution? Write one of its uses in chemical analysis. [2]  
(b) Write a chemical test to distinguish between propanal and ethanal.

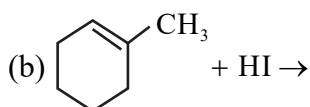
**Or**

Write the following reaction with chemical equation:

(a) Etard reaction

(b) Hell-Volhard-Zelinsky reaction.

19. Define osmotic pressure. How is the measurement of osmotic pressure more widely used for determining molar masses of macromolecules than the rise in boiling point or fall in freezing point of their solutions? [2]
20. Accounts for the following: [2]
- (a) Tertiary amine does not undergo acylation reaction.
- (b) Diazonium salts of aromatic amines are more stable than those of aliphatic amines.
21. (a) Identify the compounds A and B in the following chemical equation. Compound 'A' is having molecular formula  $C_5H_{12}O$ . [2]



### SECTION – C

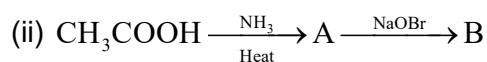
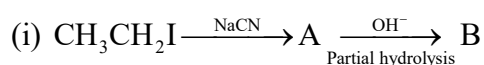
**This section contains 7 questions with internal choice in one question. The following questions are short answer type and carry 3 marks each.**

22. (a) Arrange the compounds in order of reactivity towards  $SN_2$  reaction: [3]  
2-Bromo-2-methylbutane, 1-Bromopentane, 2-Bromopentane.
- (b) Primary alkyl halide  $C_4H_9Br$  (A) reacted with alcoholic KOH to give compound (B). Compound (B) is reacted with HBr to give (C) which is an isomer of (A). When (A) is reacted with sodium metal it gives compound (D),  $C_8H_{18}$  which is different from the compound formed when n-butyl bromide is reacted with sodium. Give the structural formula of A, B, C and D.
23. (a) Write the reaction occurring at anode and cathode and the products of electrolysis of aq. NaCl. [3]
- (b) How many moles of mercury will be produced electrolyzing 1.0 M  $Hg(NO_3)_2$  solution with a current of 2A for three hours? (At wt of Hg =  $200.6 \text{ g mol}^{-1}$ )
24. (a) Complete the following reactions: [3]
- (i)  $MnO_4^- + C_2O_4^{2-} + H^+ \rightarrow ?$
- (ii)  $Cr_2O_7^{2-} + H_2S + H^+ \rightarrow ?$
- (b) Draw the structure of dichromate ion.
25. Calculate the amount of  $CaCl_2$  which must be added to 500 g of water its freezing point becomes 271.15K. Assuming that  $CaCl_2$  is completely dissociated. ( $K_f$  of water =  $1.86 \text{ K kg mol}^{-1}$ , Freezing point of pure water is 273.15K). [3]

**Or**

Calculate the mass of a non-volatile solute (molar mass  $40 \text{ g mol}^{-1}$ ) which should be dissolved in 114 g octane to reduce its vapour pressure to 80%.

26. (a) Convert the following: [3]  
 (i) Acetaldehyde to acetone.  
 (ii) Benzene to m-Nitroacetophenone.  
 (b) Draw the structure of 2,4-Dinitro phenyl hydrazone of benzaldehyde.
27. (a) What happens when D-glucose is treated with the following reagents? [3]  
 (i) Bromine water (ii)  $\text{HNO}_3$   
 (b) What is the difference between a nucleoside and a nucleotide?
28. (a) Arrange the the following in decreasing order of the  $\text{pK}_b$  values: [3]  
 $\text{C}_2\text{H}_5\text{NH}_2$ ,  $\text{C}_6\text{H}_5\text{NHCH}_3$ ,  $(\text{C}_2\text{H}_5)_2\text{NH}$  and  $\text{C}_6\text{H}_5\text{NH}_2$   
 (b) Give the structures of 'A' and 'B' in the following reactions:

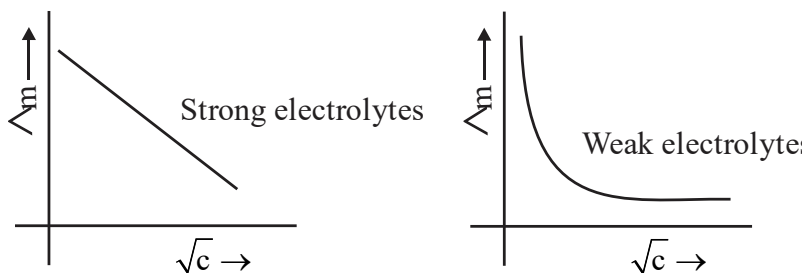


### SECTION – D

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

Answer the following questions:

29. The conductivity or specific conductivity of an electrolytic solution varies with the concentration of the solutions of different electrolytes. For comparing the conductances of the solutions of different electrolytes, it is essential that the solutions should have equal volumes and they must contain definite amount of the electrolytes which give ions carrying the same total charge. The conducting power of an electrolytic solution can be expressed in terms of equivalent conductance and molar conductance. The effect of molar conductance can be studied by plotting values against the square root of the concentration. Following two figures show the behaviour of strong and weak electrolytes with change of concentration.



- (a) What is meant by 'limiting molar conductivity'?
- (b) How specific conductance varies with concentration?

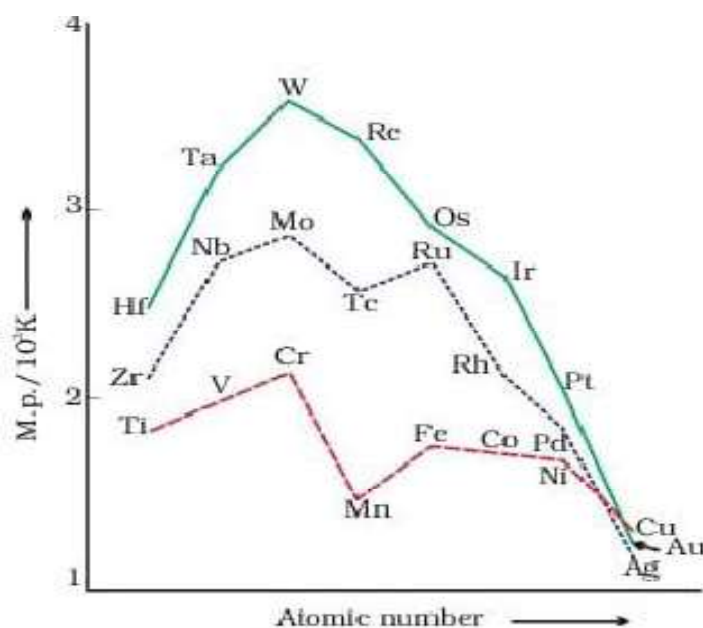
- (c) Equimolar solutions of two electrolytes 'A' and 'B' are diluted to same extent. It has been observed that, the conductivity of 'B' increases 1.5 times while that of 'A' increases 25 times. Which of the two is a strong electrolyte? Justify your answer.

Or

- (c) State Kohlraush's law of independent migration of ions? Suggest a method to calculate the limiting molar conductivity of  $\text{H}_2\text{O}$ .

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

30. The transition metals are normally hard and have low volatility. Their melting and boiling points are high. The high melting points of these metals are attributed to the involvement of greater number of electrons from  $(n-1)d$  in addition to the  $ns$  electrons in the interatomic metallic bonding. In any row the melting points of these metals rise to a maximum at  $d^5$  except for anomalous values of Mn and Tc and fall regularly as the atomic number increases. They have high enthalpies of atomisation which are shown in Figure given below.



**Answer the following questions:**

[1+1+2]

- (a) The element Tungsten (W) has highest melting point, why?  
 (b) Which element in 3d series has the lowest enthalpy of atomization and why?  
 (c) (i) Why is mercury liquid?  
 (ii) Why the melting point of Mn is abnormally low in first row transition elements?

Or

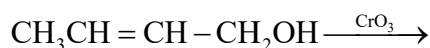
- (c) How does the density vary from left to right in 3d series and why?

## SECTION - E

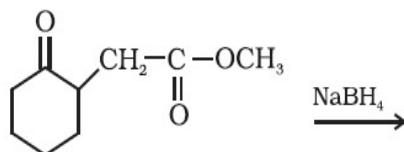
The following questions are long answer type and carry 5 marks each.

31. Attempt any **five** of the followings.

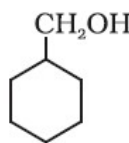
- (a) Write the mechanism of the formation of carbocation in the dehydration of ethanol.
- (b) Give chemical test to distinguish between phenol and methanol.
- (c) How do you convert Phenol to Benzoquinone.
- (d) Why o-Nitrophenol is more acidic than o-Cresol.
- (e) Complete the reaction:



- (f) Write structure of the product of the following reaction:



- (g) Show how is the following alcohol prepared by the reaction of a suitable Grignard reagent on methanal?



32. (a) Red Blood Cells (RBC) shrink when placed in saline water but swell in distilled water. Why?
- (b) On mixing liquid A and B, the volume of the resulting solution decreases. What type of deviation from Raoult's law is shown by the resulting solution? What change in temperature would you observe after mixing liquids A and B?
- (c) The vapour pressure of pure liquids A and B are 450 and 700 mm of Hg respectively, at 350 K. Find out the composition of the liquid mixture if total vapour pressure is 600 mm Hg. Also find the composition of the vapour phase.

**Or**

- (a) Write the intermolecular force acting in between
  - (i) methanol and acetone,
  - (ii) n-hexane and n-heptane.
- (b) Why the boiling point of a solution containing non-volatile solute is more than that of its pure solvent? Draw its labeled diagram.
- (c) Boiling point of water at 750 mm of Hg is 99.63°C. How much sucrose is to be added to 500 g of water such that it boils at 100°C at same pressure?  
( $K_b$  value for water = 0.52K kg mol<sup>-1</sup>)



33. (a) Write the IUPAC names of the complex:  $[\text{Co}(\text{NH}_3)_6]\text{Cl}_3$   
(b) What is meant by denticity of a ligand?  
(c) Using crystal field theory, draw energy level diagram, write electronic configuration of central metal atom/ion and determine the magnetic moment value in the complex  $[\text{Fe}(\text{H}_2\text{O})_6]^{2+}$ .

**Or**

- (a) What is ambidentate ligand? Give an example.  
(b) Which of the following ions is more stable?  
 $[\text{Cu}(\text{en})_2]^{2+}$ ,  $[\text{Cu}(\text{NH}_3)_4]^{2+}$   
(c) For the complexes,  $[\text{Co}(\text{NH}_3)_6]^{3+}$  and  $[\text{MnF}_6]^{4-}$  explain the following using valence bond theory.  
(i) Type of hybridisation  
(ii) Inner/outer orbital complex  
(iii) Magnetic behaviour

