



विद्या सर्वार्थ साधिका

ANANDALAYA  
PREBOARD EXAMINATION  
Class: XII

Subject: Chemistry  
Date : 04-01-2023

MM : 70  
Time: 3 hours

**General Instructions:**

Read the following instructions carefully.

- There are 35 questions in this question paper with internal choice.
- SECTION A consists of 18 multiple-choice questions carrying 1 mark each.
- SECTION B consists of 7 very short answer questions carrying 2 marks each.
- SECTION C consists of 5 short answer questions carrying 3 marks each.
- SECTION D consists of 2 case- based questions carrying 4 marks each.
- SECTION E consists of 3 long answer questions carrying 5 marks each.
- All questions are compulsory.
- Use of log tables and calculators 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.

- Conductivity  $k$ , is equal to \_\_\_\_\_. (1)  
(A)  $\frac{1}{R}$       (B)  $\frac{G^*}{R}$       (C)  $\lambda_m$       (D)  $\frac{1}{A}$
- For the reaction  $n_1A + n_2B \rightarrow \text{Products}$  (1)  
$$\text{rate} = K[A]^3[B]^0$$

If concentration of A is double and concentration of B halved, then reaction rate \_\_\_\_\_.

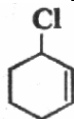
(A) increases by four times      (B) increases by eight times  
(C) is doubled      (D) Becomes ten times
- Consider the following chemical reaction. (1)  
$$N_{2(g)} + 3H_{2(g)} \rightleftharpoons 2NH_{3(g)}$$

The rate of reactant  $H_2$  is  $2.4 \times 10^{-2}$ . The rate of production of  $NH_3$  will be \_\_\_\_\_.

(A)  $1.6 \times 10^{-2}$       (B)  $3.6 \times 10^{-2}$       (C)  $9.0 \times 10^{-3}$       (D)  $4.8 \times 10^{-2}$
- What is value of slope of first order reaction graph of  $\log[R]_t \rightarrow t$  ? (1)  
(A)  $-\frac{K}{2.303}$       (B)  $-\frac{K}{2.303R}$       (C)  $-\frac{K}{2.303RT}$       (D)  $+\frac{K}{2.303R}$
- What is the general electronic configuration of Lanthanoids? (1)  
(A)  $(n-2)f^{0-14}(n-1)d^{0-1}ns^2$   
(B)  $[Xe]4f^{0-14}5d^{0-1}6s^2$   
(C)  $[Rn]5f^{0-14}6d^{0-1}7s^2$   
(D)  $[Xe]4f^{14}5d^{10}6s^2$

6. When 0.1 mol  $\text{CoCl}_3(\text{NH}_3)_5$  is treated with excess of  $\text{AgNO}_3$ , 0.2 mol of  $\text{AgCl}$  are obtained. (1)  
The conductivity of solution will correspond to \_\_\_\_\_.  
(A) 1: 3 electrolyte (B) 1: 2 electrolyte  
(C) 1: 1 electrolyte (D) 3: 1 electrolyte

7. The IUPAC name of the following compound is \_\_\_\_\_. (1)



- (A) 1-Chloro cyclohex-1-ene (B) 2-Chloro cyclohex-2-ene  
(C) 3-Chloro cyclohex-1-ene (D) 4-Chloro cyclohex-3-ene

8. The followings are some reagents for organic chemical change. (1)  
(i)  $\text{Br}_2/\text{water}$  (ii)  $\text{Na}$  (iii) neutral  $\text{FeCl}_3$  (iv)  $\text{NaOH}$

Select the reagent/s from the followings that can be used to distinguished Phenol from ethanol.

- (A) Only (i) (B) (i) and (iii) (C) (i), (iii) and (iv) (D) (ii)

9. 
$$\begin{array}{c} \text{CH}_3 - \text{CH} - \text{OCH}_3 \\ | \\ \text{CH}_3 \end{array}$$
 (1)

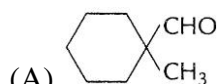
IUPAC name of the compound is \_\_\_\_\_.

- (A) 1-methoxy-1-methylethane (B) 2-methoxy-2-methylethane  
(C) 2-methoxypropane (D) isopropylmethyl ether

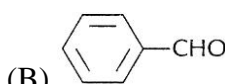
10. The correct order of increasing acidic strength is \_\_\_\_\_. (1)

- (A) phenol < ethanol < chloroacetic acid < acetic acid  
(B) ethanol < phenol < chloroacetic acid < acetic acid  
(C) ethanol < phenol < acetic acid < chloroacetic acid  
(D) chloroacetic acid < acetic acid < phenol < ethanol

11. Cannizzaro's reaction is given by \_\_\_\_\_. (1)

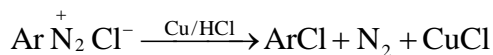


- (C)  $\text{HCHO}$



- (D)  $\text{CH}_3\text{CHO}$

12. The following reaction is known as \_\_\_\_\_. (1)



- (A) Sandmeyer reaction (B) Gattermann reaction  
(C) Claisen reaction (D) Carbylamine reaction

13. Amongst the following, the strongest base in aqueous medium is ..... (1)

- (A)  $\text{CH}_3\text{NH}_2$  (B)  $\text{NCCH}_2\text{NH}_2$  (C)  $(\text{CH}_3)_2\text{NH}$  (D)  $\text{C}_6\text{H}_5\text{NHCH}_3$

14. Which of the following statements is not true about glucose? (1)

- (A) It is an aldohexose  
(B) On heating with  $\text{HI}$ , it forms n-hexane  
(C) It is present in furanose form  
(D) It does not give 2,4-DNP test

Q. 15 to 18 are assertion and reasoning type questions. Given below 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. A and R both are wrong statement.

15. **Assertion (A):** Separation of Zr and Hf is difficult. (1)  
**Reason (R):** Because Zr and Hf lie in the same group of the periodic table.
16. **Assertion (A):** Phenol forms 2, 4, 6-tribromophenol on treatment with Br<sub>2</sub> in carbon di-sulphide at 273 K. (1)  
**Reason (R):** Bromide ion polarizes in carbon disulphide.
17. **Assertion (A):** N, N – di-ethylbenzene sulphonamide is insoluble in alkali. (1)  
**Reason (R):** Sulphonyl group attached to nitrogen atom is strong electron withdrawing group.
18. **Assertion (A):** Vitamin D can be stored in our body (1)  
**Reason (R):** Vitamin D is fat soluble vitamin

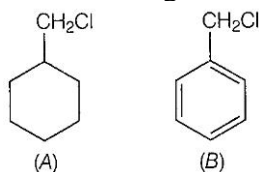
### SECTION B

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. Which will have greater molar conductivity and why? (2)  
(i) 1 mole acetic acid dissolved in 200 cc of the solution and (ii) 1 mole acetic acid dissolved in 500 cc of the solution.
20. For a first order reaction, show that time required for 99% completion is twice the time required for the completion of 90% of reaction. (2)
- OR**
- (a) Give an example of zero ordered reaction.  
(b) H<sub>2</sub>O<sub>2</sub> gets decomposed in the presence of catalyst I<sup>-</sup> to give water and oxygen. Express the rate law for this reaction considering the concept of complex reactions.
21. (a) Why are the complexes of Cu<sup>+</sup>, Zn<sup>2+</sup>, Ag<sup>+</sup> and Ti<sup>4+</sup> colourless? (2)  
(b) Arrange the following complexes in the increasing order of conductivity of their solution:  
[Co (NH<sub>3</sub>)<sub>3</sub> Cl<sub>3</sub>], [Co (NH<sub>3</sub>)<sub>4</sub> Cl<sub>2</sub>] Cl, [Co (NH<sub>3</sub>)<sub>6</sub>] Cl<sub>3</sub>, [Co (NH<sub>3</sub>)<sub>5</sub>Cl] Cl<sub>2</sub>

**OR**

- (a) Draw a figure to show synergic bond formation in metal carbonyls.  
(b) [Fe (CN)<sub>6</sub>]<sup>4-</sup> and [Fe (H<sub>2</sub>O)<sub>6</sub>]<sup>2+</sup> are of different colours in dilute solutions. Why?
22. Which of the following compounds would undergo S<sub>N</sub>1 reaction faster and why? (2)



23. What is meant by Oxime? Give an example also. (2)
24. (a) What do you mean by Peptide linkage? (2)  
(b) Explain the term: Invert Sugar

25. (a) Give the electronic configuration of  $[\text{Fe}(\text{CN})_6]^{4-}$  complex on the basis of Crystal Field Splitting theory. (2)  
 (b) Using IUPAC norms write the name of the following:  $[\text{Co}(\text{NH}_3)_4\text{Cl}(\text{NO}_2)]\text{Cl}$

### SECTION C

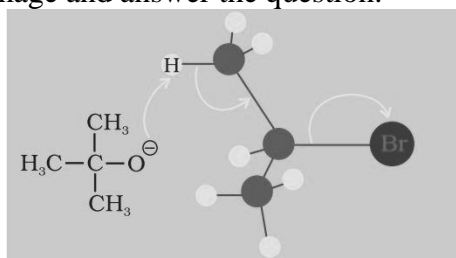
The following 5 questions are short answer type and carry 3 marks each.

26. (a) Predict the product of electrolysis at cathode for each of the following cases. (3)  
 i. An aq. Solution of  $\text{AgNO}_3$  with silver electrodes  
 ii. An aq. Solution of  $\text{AgNO}_3$  with Platinum electrode  
 (b) How much charge in Faraday is required to produce 2.5 moles of  $\text{MnO}_4^-$  from  $\text{Mn}^{+2}$ ?
27. In a reaction between A and B, the initial rate of reaction ( $r_0$ ) was measured for different initial concentrations of A and B as given below: (3)

<b>A/mol L<sup>-1</sup></b>	0.20	0.20	0.40
<b>B/mol L<sup>-1</sup></b>	0.30	0.10	0.05
<b><math>r_0/\text{mol L}^{-1}\text{s}^{-1}</math></b>	$5.07 \times 10^{-5}$	$5.07 \times 10^{-5}$	$1.43 \times 10^{-4}$

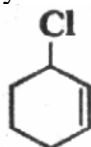
What is the order of the reaction with respect to A and B?

28. Write down the three-step mechanism for the acidic dehydration of ethanol to give ethene. (3)
29. Give the answers of any **three out of four** questions. (3)  
 (a) Why are aryl halides less reactive towards nucleophilic substitution reactions than alkyl halides? (Give any two reasons)  
 (b) Among the isomeric alkanes of molecular formula  $\text{C}_5\text{H}_{12}$ , identify the one that on photochemical chlorination yields a single monochloride.  
 (c) Observe the following image and answer the question.



If the compound in ball and stick structure is 2 – bromopropane, what will be the product of the above chemical reaction?

- (d) Classify the following compound as Aryl or alky or vinyl or allyl or Benzyl?



30. (a) Give a chemical reaction when Glucose is heated with conc. HI. Also give the conclusion which can be drawn from this. (3)  
 (b) What type of bonding helps in stabilising the  $\alpha$ -helix structure of proteins?  
 (c) What is the base which is present in RNA but not in DNA?

## SECTION D

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

31. Observe the table in which azeotropic mixtures are given along with their boiling points of pure components and azeotropes and answer the questions that follow. (4)

Some Azeotropic Mixtures					
A	B	Minimum Boiling Azeotropes	Boiling Points		
			A	B	Mixture Azeotropes
H <sub>2</sub> O	C <sub>2</sub> H <sub>5</sub> OH	95.37%	373K	351.3K	351.15
H <sub>2</sub> O	C <sub>3</sub> H <sub>7</sub> OH	71.69%	373K	370.19K	350.72
CH <sub>3</sub> COCH <sub>3</sub>	CS <sub>2</sub>	67%	329.25K	319.25K	312.30
A	B	Maximum Boiling Azeotropes	A	B	Mixture Azeotropes
H <sub>2</sub> O	HCl	20.3%	373K	188K	383K
H <sub>2</sub> O	HNO <sub>3</sub>	68.0%	373K	359K	393.5K
H <sub>2</sub> O	HClO <sub>4</sub>	71.6%	373K	383K	476K

- (a) At what mole fraction of 'A', vapour pressure of A ( $P^\circ A = 450 \text{ mm}$ ) and vapour pressure of B ( $P^\circ B = 200 \text{ mm}$ ) in solution will be equal if both A and B form ideal solution.
- (b) What will be the value of  $\Delta V$  for Minimum boiling azeotropes?
- (c) Give one example of ideal solution. What type of liquids form ideal solutions?
32. The diazonium salts (*di* refers to 'two', *azo* is indicative of 'nitrogen' and *ium* implies that it is cationic in nature), or diazonium compounds, are the class of organic compounds with the general formula  $R-N_2^+X^-$  where X is an organic or inorganic anion (for example,  $Cl^-$ ,  $Br^-$ ,  $BF_4^-$ , etc.) and R is an alkyl or aryl group. (4)

Hence, they have two nitrogen atoms with one being charged. Benzene diazonium chloride ( $C_6H_5N_2^+Cl^-$ ), benzene diazonium hydrogen sulphate ( $C_6H_5N_2^+HSO_4^-$ ), etc. are some examples of the diazonium salt.

Diazonium salts are one of the most versatile combinations of organic and inorganic components. Its general way of representation is  $R-N_2^+X^-$ . The R is an organic group, generally an aryl group while X represents an ion. Generally, diazonium salts have  $Cl^-$ ,  $Br^-$ ,  $BF_4^-$ , as X. The name of these salts is based on the presence of the  $N_2^+$  group or the diazonium group.

The naming of these salts is done by adding the suffix diazonium to the parent hydrocarbon from which they are derived and then it is followed by the anion X such as bromide.

Aromatic salts and stable but aliphatic salts are not stable and hence aromatic diazonium salts are also used for the preparations of great variety of other compounds

- (a) What is the product when  $C_6H_5CH_2NH_2$  reacts with  $HNO_2$ ? Draw the structure of the product.
- (b) Account for: "Aromatic diazonium salts are stable but not aliphatic."
- (c) Convert: Aniline to fluorobenzene

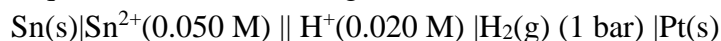
## SECTION E

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

33. a) Write the cell reaction of a lead storage battery when it is discharged. (5)
- b) Limiting molar conductivities of  $NH_4Cl$ ,  $NaOH$  and  $NaCl$  are respectively 129.8, 217.4 and  $108.9 \text{ S cm}^2$  and the molar conductivity of  $10^{-2} \text{ M}$  solution of  $NH_4OH$  is  $9.33 \text{ cm}^2 \text{ mol}^{-1}$ . Calculate the degree of dissociation of  $NH_4OH$ .
- c) State: Second law of Faraday of electrolysis

OR

- a) How many hours does it take to reduce 3 moles of  $\text{Fe}^{+3}$  to  $\text{Fe}^{+2}$  with 2.0 A current?  
b) What is the sign of  $\Delta G$  in electrolytic cell?  
c) Write the Nernst equation for the following cell at 298 K



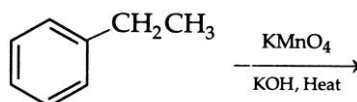
- (d) If  $E^\circ$  for the reaction  $\text{Fe}^{3+}(\text{aq.}) + e^- \rightarrow \text{Fe}^{2+}(\text{aq.})$  is + 0.77 V, what will be  $E^\circ$  value for the reaction  $2\text{Fe}^{3+}(\text{aq.}) + 2e^- \rightarrow 2\text{Fe}^{2+}(\text{aq.})$ ?

34. (a) How will you convert ethanol into But-2-enal? Give a chemical reaction to show this change. (5)

- (b) Arrange the following compounds in increasing order of their  $K_a$  values.  
 $\text{CH}_3\text{CH}_2\text{CH}(\text{Br})\text{COOH}$ ,  $\text{CH}_3\text{CH}(\text{Br})\text{CH}_2\text{COOH}$ ,  
 $(\text{CH}_3)_2\text{CHCOOH}$ ,  $\text{CH}_3\text{CH}_2\text{CH}_2\text{COOH}$

- (c) Give simple chemical tests to distinguish between the following pair of compounds:  
Phenol and Benzoic acid

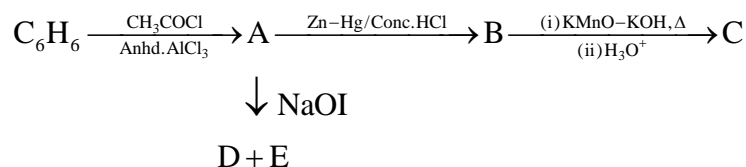
- (d) Complete the reaction:



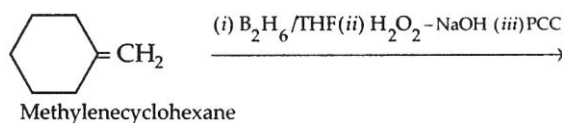
- (e) Carboxylic acids contain carbonyl group but do not show the nucleophilic addition reaction like aldehydes or ketones. Why?

OR

- (a) Write the structures of A, B, C, D and E in the following reactions:



- (b) Complete the reaction



- (c) Arrange the following carboxylic acids in the increasing  $K_a$  value.  
Benzoic acid, 4-Nitrobenzoic acid, 3, 4-Dinitrobenzoic acid, 4-Methoxybenzoic acid

35. (a) Explain why  $\text{Cu}^+$  ion is not stable in aqueous solutions? (5)

- (b) Write the balanced chemical equation for the following reaction.

The acidified potassium permanganate solution oxidises oxalate anion.

- (c) How would you account for the following?

Of the  $d^4$  species,  $\text{Cr}^{2+}$  is strongly reducing while manganese (III) is strongly oxidising.

- (d) Give a chemical reaction to explain the catalytic behaviour of transition metals

- (e) Define: Lanthanoid contraction