

# Sample Paper 9

Class XII 2023-24

## Chemistry

Time: 3 Hours

Max. Marks: 70

### General Instructions:

1. There are 33 questions in this question paper with internal choice.
  2. SECTION A consists of 16 multiple-choice questions carrying 1 mark each.
  3. SECTION B consists of 5 very short answer questions carrying 2 marks each.
  4. SECTION C consists of 7 short answer questions carrying 3 marks each.
  5. SECTION D consists of 2 case-based questions carrying 4 marks each.
  6. SECTION E consists of 3 long answer questions carrying 5 marks each.
  7. All questions are compulsory.
  8. Use of log tables and calculators is not allowed.
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## SECTION-A

**Directions (Q. Nos. 1-16) :** 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. Which of the following reactions is an example of nucleophilic substitution reaction ?  
(a)  $2RX + 2NA \rightarrow R - R + 2NaX$  (b)  $RX + H_2 \rightarrow RH + HX$   
(c)  $RX + Mg \rightarrow RH + HX$  (d)  $RX + KOH \rightarrow ROH + KX$
2. Which enzyme converts glucose and fructose both into ethanol ?  
(a) Diastase (b) Invertase  
(c) Zymase (d) Maltase
3. Faraday's law of electrolysis is related to :  
(a) Atomic number of cation (b) Speed of cation  
(c) Speed of anion (d) Equivalent weight of element
4. The green residue (B) has the formula :  
(a)  $CrO_2$  (b)  $Cr_2O_2$   
(c)  $Cr_2O_3$  (d)  $CrO_5$
5. The compound having tetrahedral geometry is –  
(a)  $[NiCl_4]^{2-}$  (b)  $[Ni(CN)_4]^{2-}$   
(c)  $[PdCl_4]^{2-}$  (d)  $[NiCl_4]^{2-}$  and  $[PdCl_4]^{2-}$  both

6. In test for primary amines, the amine is treated with  $\text{CHCl}_3$  and  $\text{KOH}$  and a bad smelling compound is formed. If the primary amine used is ethylamine, identify the bad smelling compound formed?
- (a)  $\text{CH}_3\text{CN}$  (b)  $\text{CH}_3\text{CN O}$   
(c)  $\text{CH}_3\text{CH}_2\text{NC}$  (d)  $\text{CH}_3\text{NCO}$
7. During osmosis, flow of water through a semi-permeable membrane is:
- (a) from both sides of semi-permeable with equal flow rates  
(b) from both sides of semi-permeable membrane with unequal flow rates  
(c) from solution having lower concentration only  
(d) from solution having higher concentration only
8. In a first-order reaction  $A \longrightarrow B$ , if  $k$  is the rate constant and initial concentration of the reactant  $A$  is 0.5 M, then the half-life is
- (a)  $\frac{\log 2}{k}$  (b)  $\frac{\log 2}{k\sqrt{0.5}}$   
(c)  $\frac{\ln 2}{k}$  (d)  $\frac{0.693}{0.5k}$
9. The number of chiral carbon in glucose is
- (a) 4 (b) 5  
(c) 3 (d) 1
10. In the Haber process for the manufacture of ammonia the following catalyst is used
- (a) platinized asbestos  
(b) iron with molybdenum as promoter  
(c) copper oxide  
(d) alumina

**Directions (Q. No. 13-16) :** Each of the following questions consists of two statements, one is Assertion and the other is Reason. Give answer :

11. **Assertion :** Cyanide ( $\text{CN}^-$ ) is a strong nucleophile.  
**Reason :** Benzotriline is prepared by the reaction of chlorobenzene with potassium cyanide.
- (a) Both Assertion and Reason are correct and Reason is a correct explanation of the Assertion.  
(b) Both Assertion and Reason are correct but Reason is not the a correct explanation of the Assertion.  
(c) Assertion is correct but Reason is incorrect.  
(d) Both the Assertion and Reason are incorrect.

- 12. Assertion :** Haemoglobin is an oxygen carrier.  
**Reason :** Oxygen binds as  $O_2^-$  to Fe of haemoglobin.
- (a) Both Assertion and Reason are correct and Reason is a correct explanation of the Assertion.  
(b) Both Assertion and Reason are correct but Reason is not the a correct explanation of the Assertion.  
(c) Assertion is correct but Reason is incorrect.  
(d) Both the Assertion and Reason are incorrect.
- 13. Assertion :** If the activation energy of a reaction is zero, temperature will have no effect on the rate constant.  
**Reason :** Lower the activation energy, faster is the reaction.
- (a) Both Assertion and Reason are correct and Reason is a correct explanation of the Assertion.  
(b) Both Assertion and Reason are correct but Reason is not the a correct explanation of the Assertion.  
(c) Assertion is correct but Reason is incorrect.  
(d) Both the Assertion and Reason are incorrect.
- 14. Assertion :** Proteins are made up of  $\alpha$ -amino acids.  
**Reason :** During denaturation, secondary and tertiary structures of proteins are destroyed.
- (a) Both Assertion and Reason are correct and Reason is a correct explanation of the Assertion.  
(b) Both Assertion and Reason are correct but Reason is not the a correct explanation of the Assertion.  
(c) Assertion is correct but Reason is incorrect.  
(d) Both the Assertion and Reason are incorrect.

## SECTION-B

**Directions (Q. Nos. 17-21) :** This section contains 5 questions with internal choice in one question. The following questions are very short answer type and carry 2 marks each.

- 15.** What is the effect of temperature on solubility of a gas in a liquid?
- 16.** In what way is the electronic configuration of transition metals different from non-transition metals?
- 17.** The decomposition of dimethyl ether leads to formation of  $CH_4$ ,  $H_2$  and  $CO$  and the reaction rate is given by  $Rate = K[P_{CH_3OCH_3}]^{3/2}$ . If the pressure is measured in bar and time in minutes then what are the units of the rate and rate constants ?

18. What are secondary alcohols ?

or

What are tertiary alcohols?

19. Write the structure of diphenyl. How is it prepared from chlorobenzene?

## SECTION-C

**Directions (Q. Nos. 22-28) :** This section contains 7 questions with internal choice in one question. The following questions are short answer type and carry 3 marks each.

20. Discuss Raoult's law of relative lowering of vapour pressure.

21. What is specific conductance and molar conductance?

22. Why is the  $E^\circ$  value for the  $Mn^{3+}/Mn^{2+}$  couple much more positive than that of  $Cr^{3+}/Cr^{2+}$  or  $Fe^{3+}/Fe^{2+}$  ? Explain.

23. Write the structural formulae of the following:

1. 4, 4 dimethyl-2-pentanol
2. 2-butanol

24. An organic compound (A) (molecular formula  $C_8H_{16}O_2$ ) was hydrolysed with dilute sulphuric acid to give a carboxylic acid (B) and an alcohol (C) Oxidation of (C) with chromic acid produced (B). (C) on dehydration gives but-2-ene as the major product. Write equation for the reaction involved.

or

Write difference between aldehyde and ketone.

25. What are aldehydes, ketones, carboxylic acid?

26. Define Collision frequency.

Continue on next page.....

## SECTION-D

**Directions (Q. Nos. 29-30) :** The following questions are case-based questions. Each question has an internal choice and carries 4 marks each. Read the passage carefully and answer the questions that follow.

- 27.** In a reaction, the rates of disappearance of different reactants or rates of formation of different products may not be equal but rate of reaction at any instant of time has the same value expressed in terms of any reactant or product. Further, the rate of reaction may not depend upon the stoichiometric coefficients of the balanced chemical equation. The exact powers of molar concentrations of reactants on which rate depends are found experimentally and expressed in terms of 'order of reaction'. Each reaction has a characteristic rate constant depends upon temperature. The units of the rate constant depend upon the order of reaction.

Answer the following questions :

- (a) The rate constant of a reaction is found to be  $3 \times 10^{-3} \text{ mol}^{-2} \text{ L}^2 \text{ sec}^{-1}$ . What is the order of the reaction?
- (b) Rate of a reaction can be expressed by following rate expression,  $\text{Rate} = k[A]^2[B]$ , if concentration of A is increased by 3 times and concentration of B is increased by 2 times, how many times rate of reaction increases?
- (c) The rate of a certain reaction is given by,  $\text{rate} = k[\text{H}^+]^n$ . The rate increases 100 times when the pH changes from 3 to 1. What is the order ( $n$ ) of the reaction ?

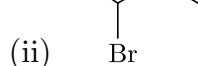
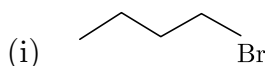
**or**

- (d) In a chemical reaction  $A + 2B \rightarrow \text{products}$ , when concentration of A is doubled, rate of the reaction increases 4 times and when concentration of B alone is doubled rate continues to be the same. What is the order of the reaction ?

- 28.** When haloalkanes with ( $\beta$ -hydrogen atom are boiled with alcoholic solution of KOH, they undergo elimination of hydrogen halide resulting in the formation of alkenes. These reactions are called ( $\beta$ -elimination reactions or dehydrohalogenation reactions. These reactions follow Saytzeff's rule. Substitution and elimination reactions often compete with each other. Mostly bases behave as nucleophiles and therefore can engage in substitution or elimination reactions depending upon the alkyl halide and the reaction conditions.

Answer the following questions :

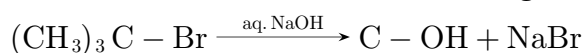
- (a) Which alkyl halide from the following pair is chiral and undergoes faster  $\text{S}_{\text{N}}2$  reaction ?



- (b) What happens when ethyl chloride is treated with aqueous KOH?
- (c) Out of 2-bromopentane, 2-bromo-2-methylbutane, and 1-bromopentane, which compound is most reactive towards elimination reaction and why?

**or**

- (d) Write the mechanism of the following  $\text{S}_{\text{N}}1$  reaction.



## SECTION-E

**Directions (Q. Nos. 31-33) :** The following questions are long answer type and carry 5 marks each. Two questions have an internal choice.

**29.** Arrange the following :

- (i) In decreasing order of  $pK_b$  values :  
 $C_2N_5NH_2, C_6H_5NHCH_3, (C_2H_5)_2NH$  and  $C_6H_5NH_2$
- (ii) In increasing order of basic strength (or basicity) :  
 $C_6H_5NH_2, C_6H_5N(CH_3)_2, (C_2H_5)_2NH$  and  $CH_3NH_2$
- (iii) increasing order of basic strength or (basicity) :
- (a) Aniline, p-nitroaniline and p-toluidine  
(b)  $C_6H_5NH_2, C_6H_5NHCH_3, C_6H_5CH_2NH_2$   
(c)  $C_6H_5NH_2, C_6H_5NHCH_3, C_6H_5N(CH_3)_2$
- (iv) Decreasing order of basic strength in the gas phase :  
 $C_2H_5NH_2, (C_2H_5)_2NH, (C_2H_5)_2N$  and  $NH_3$ .
- (v) Decreasing order of basic strength :  
 $C_2H_5NH_2, C_2H_5NH_2, (C_2H_5)_2NH, NH_3$

**30.** Give the reactions occurring at two electrodes during electrolysis of aqueous sodium chloride solution.

or

What are fuel cells? Discuss  $H_2 - O_2$  fuel cell. List some advantages of fuel cells over other cells?

**31.** Explain IUPAC system of Nomenclature of coordination compounds.

or

Explain bonding in co-ordination compounds with the help of valence bond theory.

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