# CBSE EXAMINATION PAPER-2023

## CHEMISTRY

### (Solved)

Time allowed : 3 hours | Maximum Marks : 77

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**General Instructions :**

Read the following instructions carefully and follow them :

i. This question paper contains **41 questions.** All questions are **compulsory.**

ii. This question paper is divided into **5 sections.**

iii. **Section A** – questions number **1 to 4** are case based questions

iv. **Section B** – questions number **5 to 22** are multiple choice questions

v. **Section C** – questions number **23 to 30** are very short answer

vi. **Section D** – questions number **31 to 36** are short answer

vii. **Section E** – questions number **37 to 41** are long answer

viii. There is no overall choice given in the question paper. However, an internal choice has been provided in few questions.

ix. Use of calculator is NOT allowed.

## Section A

**Question 1.** The rate of reaction is concerned with decrease in concentration of reactants or increase in the concentration of products per unit time. It can be expressed as instantaneous rate at a particular instant of time and average rate over a large interval of time. Mathematical representation of rate of reaction is given by rate law. Rate constant and order of a reaction can be determined from rate law or its integrated rate equation.

**Question 2.**

The rate of reaction is concerned with decrease in concentration of reactants or increase in the concentration of products per unit time. It can be expressed as instantaneous rate at a particular instant of time and average rate over a large interval of time. Mathematical representation of rate of reaction is given by rate law. Rate constant and order of a reaction can be determined from rate law or its integrated rate equation.

**Question 3.**

The following questions are case-based questions. Read the case carefully and answer the questions that follow.

The rate of reaction is concerned with decrease in concentration of reactants or increase in the concentration of products per unit time. It can be expressed as instantaneous rate at a particular instant of time and average rate over a large interval of time. Mathematical representation of rate of reaction is given by rate law. Rate constant and order of a reaction can be determined from rate law or its integrated rate equation.

**(1)**

**What is average rate of reaction ?**

[1 Marks]

**(2)**

**Write two factors that affect the rate of reaction.**

[1 Marks]

**(3)**

**(1) What happens to rate of reaction for zero order reaction ?**

**(2) What is the unit of k for zero order reaction ?**

[2 Marks]

**(4)**

**(1) For a reaction P + 2Q → Products Rate = $k[P]^{1/2}$ $[Q]^1$. What is the order of the reaction ?**

**(2) Define pseudo first order reaction with an example.**

[2 Marks]

**Question 4.**

In coordination compounds, metals show two types of linkages, primary and secondary. Primary valencies are ionisable and are satisfied by negatively charged ions. Secondary valencies are non-ionisable and are satisfied by neutral or negative ions having lone pair of electrons. Primary valencies are non-directional while secondary valencies decide the shape of the complexes.

**(1)**

**If $PtCl_2 . 2NH_3$ does not react with $AgNO_3$, what will be its formula ?**

[1 Marks]

**(2)**

**What is the secondary valency of $[Co(en)_3]^{3+}$ ?**

[1 Marks]

**(3)**

**(1) Write the formula of Iron(III)hexacyanidoferrate(II).**

**(2) Write the IUPAC name of $[Co(NH_3)_5Cl]$ $Cl_2$.**

[1 Marks]

**(4)**

**Write the hybridization and magnetic behaviour of $[Ni(CN)_4]^{2-}$ .[Atomic number : Ni = 28]**

[2 Marks]

# Section B

**Question 5.**

The colligative property used for the determination of molar mass of polymers and proteins is :

[1 Marks]

(A) Elevation is boiling point

(B) Depression in freezing point

(C) Relative lowering in vapour pressure

(D) Osmotic pressure

**Question 6.**

Low concentration of oxygen in the blood and tissues of people living at high altitude is due to :

[1 Marks]

(A) low atmospheric pressure

(B) both low temperature and high atmospheric pressure

(C) low temperature

(D) high atmospheric pressure

**Question 7.**

The correct cell to represent the following reaction is : $Zn + 2Ag^{+} \rightarrow Zn^{2+} + 2Ag$

[1 Marks]

(A) $Ag^{+} \mid Ag \parallel Zn^{2+} \mid Zn$

(B) $Ag \mid Ag^{+} \parallel Zn \mid Zn^{2+}$

(C) $2Ag \mid Ag^{+} \parallel Zn \mid Zn^{2+}$

(D) $Zn \mid Zn^{2+} \parallel Ag^{+} \mid Ag$

**Question 8.**

$\Delta G$ and $E^{\circ}_{cell}$ for a spontaneous reaction will be :

[1 Marks]

(A) positive, positive

(B) negative, positive

(C) negative, negative

(D) positive, negative

**Question 9.**

Which of the following is affected by catalyst?

[1 Marks]

(A) $\Delta G$

(B) $\Delta H$

(C) $\Delta S$

(D) $E_a$

**Question 10.**

The order of the reaction $H_2(g) + Cl_2(g) \xrightarrow{(hv)} 2HCl(g)$ is :

[1 Marks]

(A) 0

(B) 3

(C) 1

(D) 2

**Question 11.**

The most common and stable oxidation state of a Lanthanoid is :

[1 Marks]

(A) + 4

(B) + 6

(C) + 3

(D) + 2

**Question 12.**

The compounds $[Co(SO_4)(NH_3)_5]Br$ and $[Co(Br)(NH_3)_5]SO_4$ represent :

[1 Marks]

(A) ionisation isomerism

(B) linkage isomerism

(C) coordination isomerism

(D) optical isomerism

**Question 13.**

The synthesis of alkyl fluoride is best obtained from :

[1 Marks]

(A) Sandmeyer reaction

(B) Finkelstein reaction

(C) Free radicals

(D) Swartz reaction

**Question 14.**

In a reaction what is the correct order of reactivity of alcohal ?

[1 Marks]

$$R - OH + HCl \xrightarrow{ZnCl_2} RCl + H_2O,$$

(A) 3° > 2° > `1°

(B) 1° < 2° < 3°

(C) 1° > 3° > 2°

(D) 1° > 2° > 3°

**Question 15.**

$CH_3CONH_2$ on reaction with NaOH and $Br_2$ in alcoholic medium gives :

[1 Marks]

(A) $CH_3COONa$

(B) $CH_3NH_2$

(C) $CH_3CH_2Br$

(D) $CH_3CH_2NH_2$

**Question 16.**

Which of the following is least basic?

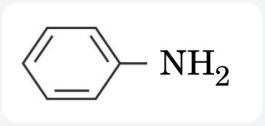
[1 Marks]

(A) $NH_3$

(B) $(CH_3)_3N$

(C) $(CH_3)_2NH$

(D) NH2




**Question 17.**

The glycosidic linkage involved in linking the glucose units in amylase part of starch is :

[1 Marks]

(A) $C_1$- $C_4$ β linkage

(B) $C_1$ -$C_6$ α linkage

(C) $C_1$- $C_6$ βlinkage

(D) $C_1$ -$C_4$ α linkage

**Question 18.**

An α- helix is a structural feature of :

[1 Marks]

(A) Starch

(B) Sucrose

(C) Polypeptides

(D) Nucleotides

**Question 19.**

Assertion (A) -$NH_2$ group is o- and p-directing in electrophilic substitution reactions.

Reason (R) : Aniline cannot undergo Friedel-Crafts reaction.

[1 Marks]

(A) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of the Assertion (A).

(B) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).

(C) Assertion (A) is false, but Reason (R) is true.

(D) Assertion (A) is true, but Reason (R) is false.

**Question 20.**

Assertion (A) : Acetylation of aniline gives a monosubstituted product.

Reason (R) : Activating effect of -$NHCOCH_3$ group is more than that of amino group.

[1 Marks]

(A) Assertion (A) is true, but Reason (R) is false.

(B) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).

(C) Assertion (A) is false, but Reason (R) is true.

(D) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of the Assertion (A).

**Question 21.**

Assertion (A) : The molecularity of the reaction $H_2 + Br_2 \rightarrow 2HBr$ appears to be 2.

Reason (R) : Two molecules of the reactants are involved in the given elementary reaction.

[1 Marks]

(A) Assertion (A) is false, but Reason (R) is true.

(B) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).

(C) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of the Assertion (A).

(D) Assertion (A) is true, but Reason (R) is false.

**Question 22.**

Assertion (A) : Low spin tetrahedral complexes are rarely observed.

Reason (R) : Crystal field splitting energy is less than pairing energy for tetrahedral complexes.

[1 Marks]

(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).

(B) Assertion (A) is true, but Reason (R) is false.

(C) Assertion (A) is false, but Reason (R) is true.

(D) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of the Assertion (A).

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## Section C

**Question 23.**

(a) On diluting two electrolytes 'A' and 'B', the $\lambda_m$ of 'A' increases 25 times while that of 'B' increases by 1.5 times. Which of the two electrolytes is strong? Justify your answer graphically.

(b) The electrical resistance of a column of 0.05 mol $L^{-1}$ NaOH solution of diameter 1 cm and length 50 cm is $5.55 \times 10^3$ ohm. Calculate the conductivity.

[2 Marks]

**Question 24.**

Complete the following equation:

(a) $2MnO_4^- + 5NO_2^- + 6H^+ \rightarrow$

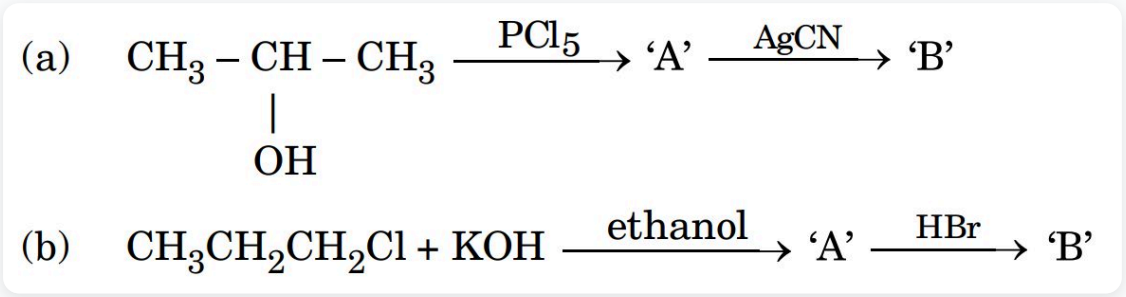
(b) $Cr_2O_7^{2-} + 14H^+ + 6e^- \rightarrow$ ?

[2 Marks]

**Question 25.**

Identify 'A' , and 'B' in the above reactions.

[2 Marks]




**Question 26.**

Account for the following:

(i) Phenol is a stronger acid than an alcohol.

(ii) The boiling point of alcohols decreases with increase in branching of alkyl chain.

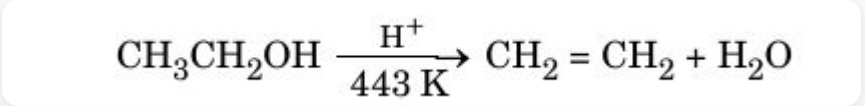
[2 Marks]

**Question 27.**

(i) Write the mechanism of the following reaction :

(ii) Write the equation involved in Reimer-Tiemann reaction.

[2 Marks]




**Question 28.**

Explain briefly :

(a) Carbylamine reaction

(b) Gabriel phthalimide synthesis

[2 Marks]

**Question 29.**

(a) Write chemical reaction to show that open structure of D-glucose contains the straight chain.

(b) What type of linkage is responsible for the formation of protein ?

[2 Marks]

**Question 30.**

What is Henry's law? Give one application of it.

[2 Marks]

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## Section D

**Question 31.**

(a) Differentiate between Ideal solution and Non-ideal solution.

(b) 30 g of urea is dissolved in 846 g of water. Calculate the vapour pressure of water for this solution if vapour pressure of pure water at 298 K is 23.8 mm Hg.

[3 Marks]

**Question 32.**

Write main product formed when :

(a) Methyl chloride is treated with NaI/Acetone.

(b) 2,4,6-trinitrochlorobenzene is subjected to hydrolysis.

(c) 2,4,6-trinitrochlorobenzene is subjected to hydrolysis.

[3 Marks]

**Question 33.**

How do you convert the following : (Any three)

(a) Phenol to picric acid

(b) Propanone to 2-Methylpropan-2-ol

(c) Phenol to anisole

(d) Phenol to anisole

[3 Marks]

**Question 34.**

Explain why:

(i) Carboxyl group in benzoic acid is meta directing.

(ii) Sodium bisulphite is used for the purification of aldehydes and ketones.

(iii) Carboxylic acids do not give characteristic reactions of carbonyl group.

[3 Marks]

**Question 35.**

An organic compound 'A', having the molecular formula $C_3H_8O$ on treatment with Cu at 573 K, gives 'B'. 'B' does not reduce Fehling's solution but gives a yellow precipitate of the compound 'C' with $I_1$/NaOH. Deduce the structures of A, B and C.

[3 Marks]

**Question 36.**

(a) What are the hydrolysis products of (i) Lactose, (ii) Maltose ?

(b) Give the basic structural difference between starch and cellulose.

[3 Marks]

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## Section E

**Question 37.**

(i) State Kohlrausch's law of independent migration of ions. Write an expression for the limiting molar conductivity of acetic acid according to Kohlrausch's law.

(ii) Calculate the maximum work and log Kc for the given reaction at 298 K:

$Ni\ (s) + 2Ag^{+}\ (aq) \rightleftharpoons Ni^{2+}\ (aq) + 2Ag\ (s)$

Given: $E°Ni^{2+}/Ni = -0.25\ V$, $E°Ag^{+}/Ag = +0.80\ V$,

$1\ F = 96500\ C\ mol^{-1}$.

[5 Marks]

**Question 38.**

(i) State Faraday's first law of electrolysis. How much charge, in terms of Faraday, is required for the reduction of 1 mol $Cu^{2+}$ to Cu?

(ii) Calculate emf of the following cell at 298 K for

$Mg\ (s) | Mg^{2+}\ (0.01\ M) || Cu^{2+}\ (0\ .01\ M) | Cu\ (s)$

[$E°cell = +\ 2.71\ V$, $1\ F = 96500\ C\ mol^{-1}$, log 10 = 1]

[5 Marks]

**Question 39.**

Assign reason for each of the following :

(i) Manganese exhibits the highest oxidation state of +7 among the 3d series of transition elements.

(ii) Transition metals and their compounds are generally found to be good catalysts in chemical reactions.

(iii) $Cr^{2+}$ is reducing in nature while with the same d-orbital configuration ($d^4$) $Mn^{3+}$ is an oxidising agent.

(iv) Zn has lowest enthalpy of atomization.

(v) $Cu^{+}$ is unstable in an aqueous solution.

[5 Marks]

**Question 40.**

(i) Carry out the following conversions :

(1) Ethanal to But-2-en-1-al

(2) Propanoic acid to 2-chloropropanoic acid

(ii) An alkene with molecular formula $C_5H_{10}$ on ozonolysis gives a mixture of two compounds 'B' and 'C'. Compound 'B' gives positive Fehling test and also reacts with iodine and NaOH solution. Compound 'C' does not give Fehling solution test but forms iodoform. Identify the compounds 'A', 'B' and 'C'.

[5 Marks]

**Question 41.**

(i) Distinguish with a suitable chemical test:

(1) $CH_3COCH_2CH_3$ and $CH_3CH_2CH_2CHO$

(2) Ethanal and Ethanoic acid

(ii) Write the structure of oxime of acetone.

(iii) Identify A to D.

[5 Marks]

