SET NO- 2

DAV PUBLIC SCHOOLS, ODISHA
PRE-BOARD EXAMINATION
(2023-24)

- Please check that this question paper contains **7** printed pages.
- 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 this period.

CLASS – XII
SUBJECT:CHEMISTRY

Time:3 hours **Maximum Marks: 70**

General Instructions:

Read the following instructions carefully.
(a) There are 33 questions in this question paper with internal choice.
(b) SECTION A consists of 16 multiple-choice questions carrying 1 mark each.
(c) SECTION B consists of 5 short answer questions carrying 2 marks each.
(d) SECTION C consists of 7 short answer questions carrying 3 marks each.
(e) SECTION D consists of 2 case-based questions carrying 4 marks each.
(f) SECTION E consists of 3 long answer questions carrying 5 marks each.
(g) All questions are compulsory.
(h) 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.

1. Following limiting molar conductivities are given as
$\Lambda^0_m H_2SO_4$= x Scm^2mol^{-1}, $\Lambda^0_m K_2SO_4$= y Scm^2mol^{-1}, $\Lambda^0_m CH_3COOK$= z Scm^2mol^{-1},
Λ^0_m (Scm^2mol^{-1}) for CH_3COOH is

(a) $\frac{(x-y)}{2}+z$ (b) x−y+2z (c) x+y-z (d) x−y+z

2. Which of the following does not reduce Fehling's solution?

(a) CH_3CHO (b) HCHO (c) CH_3COOH (d) HCOOH

3. The vitamins which can be stored in our body are:

(a) Vitamin A, B, D and E (b) Vitamin A, C, D and K
(c) Vitamin A, B, C and D (d) Vitamin A, D, E and K

4. Which of the following reactions can be used to obtain benzaldehyde from benzene?

(a) Rosenmund's Reduction (b) Stephen's Reaction
(c) Etard's Reaction (d) Gatterman-Koch Reaction

5. C_3H_7Cl(A) undergoes Wurtz reaction to give C_6H_{14} (B) having 1^0,3^0 carbon. Identify name of A and B.

(a) n-propyl chloride and hexane (b) Isopropyl chloride and 2,3-dimethyl butane
(c) n-propyl chloride and 2,3-dimethyl butane (d) isopropyl chloride and hexane

6. Because of the lanthanoid contraction, which of the following pairs of elements have nearly same atomic radii?

(a)Zr (40) & Hf (72) (b)Zr (40) & Ta (73) (c)Ti (22) & Zr (40) (d)Zr (40) & Nb (41)

7. Predict the order and molecularity of hydrolysis of sucrose if the rate law is

Rate = k $[C_{12}H_{22}O_{11}]$

(a) Order is zero, molecularity is one (b) Order is two, molecularity is two
(c) Order is two, molecularity is one (d) Order is one, molecularity is two

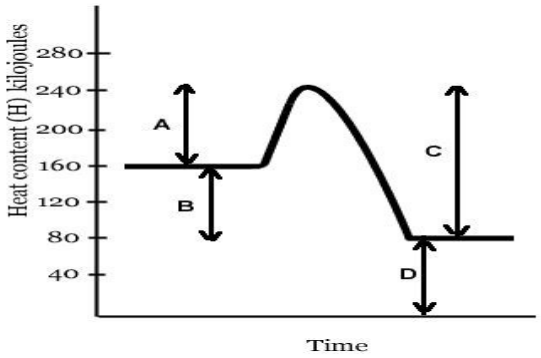
8. Which one of the following can be prepared by Gabriel phthalimide synthesis ?

(a) Aniline (b) o- Toluidine (c) Benzylamine (d) N- Methyl ethanamine

9. Which of the following observation is shown by 2 -phenylethanol with Lucas Reagent?

(a) Turbidity will be observed within five minutes.
(b) No turbidity will be observed at room temperature.
(c) Turbidity will be observed immediately.
(d) Turbidity will be observed at room temperature but will disappear after five minutes.

10.



The enthalpy of reaction (ΔrH) in kJ/mol for the above case is

(a)80 (b)-80 (c) 240 (d) -240

11. Cumenehydroperoxide on hydrolysis with dilute H_2SO_4 gives

(a) alcohol and phenol (b) only phenol (c) phenol and acetone (d) ethanol and acetone

12. The colour of $K_2Cr_2O_7$ changes from red orange to lemon yellow on treatment withaqueous KOH because of
(a) The reduction of Cr (VI)to Cr(III).
(b) The formation of chromium hydroxide.
(c) The conversion of dichromate to chromate.
(d) The oxidation of potassium hydroxide to potassium peroxide.

13.Given below are two statements labelled as **Assertion (A)** and **Reason (R)**
Assertion(A): Addition reaction of water to but-1-ene in acidic medium yields butan-2-ol**.**
Reason(R): Addition of water in acidic medium proceeds through the formation of primary carbocation.
(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 labelled as **Assertion (A)** and **Reason (R)**
Assertion(A): Oxidation of ketones is easier than aldehydes.
Reason(R): C–C bond of ketones is stronger than C–H bond of aldehydes.
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 labelled as **Assertion (A)** and **Reason (R)**
Assertion(A): Alpha(α) amino acids exist as internal salt in solution as they have amino group and carboxylic acid groups in near vicinity.
Reason(R): H^+ ion given by carboxyl group(-COOH) is captured by amino group($-NH_2$) having lone pair of electrons.
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 labelled as **Assertion (A)** and **Reason (R)**.
Assertion: : Mercury cell does not give steady potential.
Reason: In the net cell reaction, ions are not involved.
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. Rate constant k for a first order reaction is found to be 2.54×10^{-3} sec^{-1}. Calculate its 3/4th life.
(log 4 = 0.6020).

18. Henry's law constant for CO_2 in water is $1.67x10^8$ Pa at 298 K. Calculate the quantity of CO_2 in 500 mL of soda water when packed under 2.5 atm CO_2 pressure at 298 K.

19. Write the structure of an isomer of compound C_4H_9Br which is most reactive towards S_N1 Reaction and why ?

OR

Although chlorine is an electron withdrawing group, yet it is ortho-, para- directing in electrophilic aromatic substitution reactions. Explain why it is so?

20. Name the four bases present in DNA. Which one of these is not present in RNA?

21. Give a chemical test to distinguish between the following pair of compounds.
(a) Benzaldehyde and Acetophenone.
(b) Benzoic acid and Ethyl benzoate.

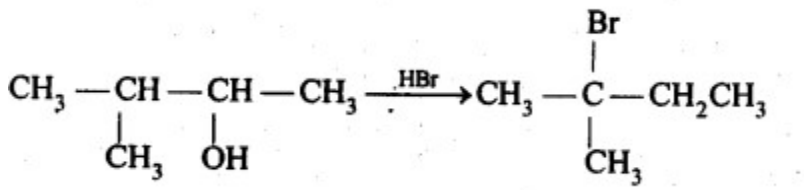
SECTION-C

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

22. Answer any three out of the following.
(a) Write the configuration for d^4 ion if $\Delta_0 > P$.
(b) Indicate the types of isomerism exhibited by the complex
$[Co(NH_3)_5 (NO_2)](NO_3)_2$
(c) When a coordination compound $CoCl_3.6NH_3$ is mixed with $AgNO_3$, 3 moles of AgCl are precipitated per mole of the compound. Write Structural formula of the complex.
(d) Write the IUPAC name of $[Pt(NH_3)_4][Pt(Cl)_4]$

23. (a) Predict the products of electrolysis of an aqueous solution of $AgNO_3$ with silver electrodes.
(b) A zinc rod is dipped in 0.1 M solution of $ZnSO_4$. The salt is 95% dissociated at this dilution at 298 K. Calculate the electrode potential.
[$E°_{Zn^{2+}}/Zn = -0.76$ V]

24. When 3-methylbutant 2-ol is treated with HBr, the following reaction takes place:



Give a mechanism for this reaction.

25. (a)For a decomposition reaction, the values of **k** at two different temperatures are given below:

$k_1 = 2.15 \times 10^{-8}$ L mol^{-1} s^{-1} at 650 K

$k_2 = 2.39 \times 10^{-7}$ L mol^{-1} s^{-1} at 700 K

Calculate the value of activation energy for this reaction. (log 11.11 = 1.046) ($R = 8.314$ J K^{-1} mol^{-1})

(b)In some cases it is found that a large number of colliding molecules have energy more than threshold energy but yet the reaction is slow. Why?

26. (a) Differentiate between amylose and amylopectin on the basis of their structure.

(b) Write the reactions when D- glucose reacts with:

(i) Hydroxylamine. (ii) Acetic anhydride.

27. Predict the major product for each of the following compounds when they are heated with alcoholic KOH.

(a) 1-Bromo-l-methylcyclohexane.

(b) 2-Chloro-2-methylbutane.

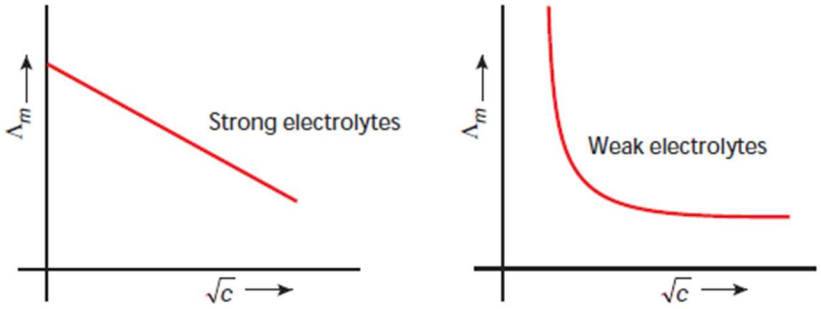
(c) 2,2,3-Trimethyl-3-bromopentane.

28. You are given four organic compounds "A", "B", "C" and "D". The compounds "A", "B" and "C" form an orange- red precipitate with 2,4 DNP reagent. Compounds "A" and "B" reduce Tollen's reagent while compounds "C" and "D" do not. Both "B" and "C" give a yellow precipitate when heated with iodine in the presence of NaOH. Compound "D" gives brisk effervescence with sodium bicarbonate solution. Identify "A", "B", "C" and "D" given the number of carbon atoms in three of these carbon compounds is three while one has two carbon atoms. Give an explanation for your answer.

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.

29.The 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 a 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 equivalent conductance of a solution does not vary linearly with concentration and it is related to specific conductance. The effect of equivalent conductance can be studied by plotting values against the square root of the concentration. The following two figures show the behaviour of strong and weak electrolytes with the change in concentration.



Answer the following questions:

(a) What is meant by 'limiting molar conductivity'?

(b) The molar conductivity of a 1.5 M solution of an electrolyte is found to be 138.9 S cm^2 mol^{-1}. Calculate the conductivity of this solution.

OR

(b) It is not possible to determine the molar conductivity of weak electrolytes at infinite dilution graphically. Do you agree with this? Justify your answer.

(c) Solutions of two electrolytes '**A**' and '**B**' are diluted. 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.

30. According to Valence bond theory the metal atom or ion under the influence of ligands can use its (n-1)d, ns, np or ns, np, nd orbitals for hybridisation to yield a set of equivalent orbitals of definite geometry such as octahedral, tetrahedral, square planar and so on.These hybridised orbitals are allowed to overlap with ligand orbitals that can donate electron pairs for bonding.Strong ligands have a tendency to pair up the d-electrons of a metal cation or atom to provide the necessary orbitals for hybridization. On the other hand, weak ligands do not have a tendency to pair up the d-electrons.The d orbital used in hybridization may be either **inner (n-1) d-orbitals** or **outer n d-orbitals**. The complex formed by inner (n-1) d-orbitals, is called **the inner orbital complex** whereas the complex formed by outer d-orbital is called the **outer orbital complex**.If unpaired electrons are present within the complex, then the complex is paramagnetic in nature while if all the electrons are paired then the complex is diamagnetic in nature.

Coordination number	Type of hybridisation	Distribution of hybrid orbitals in space
4	sp^3	Tetrahedral
4	dsp^2	Square planar
5	sp^3d	Trigonal bipyramidal
6	sp^3d^2	Octahedral
6	d^2sp^3	Octahedral

The following table shows the hybridization and geometry possible for coordination compounds based on their coordination Number.

Answer the following questions:

(a) Explain why $[Fe(H_2O)_6]^{3+}$ has magnetic moment value of 5.92 BM whereas $[Fe(CN)_6]^{3-}$ has a value of only 1.74 BM.

(b) Draw the shape of $[Fe(CO)_5]$.

(c) Explain based on valence bond theory that $[Ni(CN)_4]^{2-}$ ion with square planar structure is diamagnetic and the $[NiCl_4]^{2-}$ ion with tetrahedral geometry is paramagnetic.

OR

(c) $[Co(NH_3)_6]^{3+}$ is an inner orbital complex whereas $[Ni(NH_3)_6]^{2+}$ is an outer orbital complex.Explain.

SECTION-E

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

31. Answer **any five** of the following:

(a) The second ionization enthalpies of chromium and manganese are 1592 and 1509 kJ/mol respectively. Explain the lower value of Mn.

(b) Write the ionic equation for the reaction of KI with acidified $KMnO_4$.

(c) How would you account for the increasing oxidising power of oxoanions in the series $VO_2^+ < Cr_2O_7^{2-} < MnO_4^-$?

(d)Copper (I) ion is not known in aqueous solution. Give reason.

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

(f) The transition metals are well known for the formation of interstitial compounds.

32. (a) What is the effect of temperature on the solubility of glucose in water?

(b) Rahul collected a 10mL each of fresh water and ocean water. He observed that one sample labeled "P" froze at 0°C while the other "Q" at -1.3°C. Rahul forgot which of the two, "P" or "Q" was ocean water. Help him identify which container contains ocean water, giving rationalization for your answer.

(c) Calculate Van't Hoff factor for an aqueous solution of $K_3[Fe(CN)_6]$ if the degree of dissociation (α) is 0.852. What will be boiling point of this solution if its concentration is 1 molal? (K_b=0.52 K kg/mol)

OR

(a)Two elements **A** and **B** form compounds having the formula $\mathbf{AB_2}$ and $\mathbf{AB_4}$. When dissolved in 20g of benzene (C_6H_6), 1 g of $\mathbf{AB_2}$ lowers the freezing point by 2.3 K whereas 1.0 g of $\mathbf{AB_4}$ lowers it by 1.3 K. The molar depression constant for benzene is 5.1 K kg mol^{-1}. Calculate the atomic masses of **A** and **B**.

(b) What type of deviation from Roult's Law is expected when phenol and aniline are mixed with each other? What change in the net volume of the mixture is expected? Graphically represent the deviation.

33. A hydrocarbon 'A', (C_4H_8) on reaction with HCl gives compound'B', (C_4H_9Cl),which on reaction with 1 mol of NH_3 gives compound 'C', ($C_4H_{11}N$). On reacting with $NaNO_2$ and HCl followed by treatment with water, compound 'C' yields an optically active alcohol, 'D'. Ozonolysis of 'A' gives 2 moles of acetaldehyde.Identify compounds 'A' to 'D'. Explain the reactions involved.

OR

(a) Account for the following :

(i) Although $-NH_2$ group is o- and p-directing in aromatic electrophilic substitution reactions, aniline on nitration gives a substantial amount of m-nitroaniline .

(ii) Primary amines have higher boiling point than tertiary amines.

(iii) Aniline is acetylated before nitration reaction.

(b) Arrange the following compounds as directed :

(i) In increasing order of solubility in water : $(C_2H_5)_2NH$, $C_2H_5NH_2$, $C_6H_5NH_2$

(ii) In decreasing order of their pK_b values : $C_6H_5NH_2$, NH_3, $C_2H_5NH_2$, $(C_2H_5)_2NH$