SET- 2

DAV INSTITUTIONS CG ZONE

CLASS- XII   SESSION 2023-24

TIME: 3 HRS   **SUBJECT : CHEMISTRY**   **MM: 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.

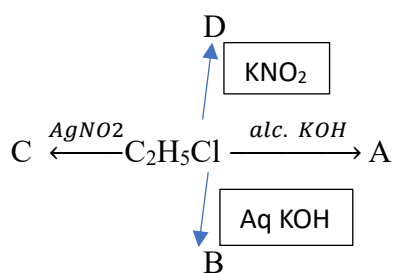**(h) Use of log tables and calculators is not allowed.**

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. The C-O-C bond angle in diethyl ether is:

    (a) 111°

    (b) 90°

    (c) 120°

    (d) 180°

2. Which of the following does not react with glucose ?

    (a) NH_2OH

    (b) HCN

    (c) 2,4 -DNP

    (d) Br_2 (aq)

3. Li is best reducing agent because:

    (a) It has lowest reduction potential

    (b) It has highest reduction potential

    (c) It has lowest oxidation potential

    (d) It has lowest ionisation enthalpy

4. Which of the following conditions is correct for an ideal solution ?

(a) $\Delta H_{mix} = 0$ and $\Delta V_{mix} = 0$

(b) $\Delta H_{mix} > 0$ and $\Delta V_{mix} > 0$

(c) $\Delta H_{mix} < 0$ and $\Delta V_{mix} < 0$

(d) $\Delta H_{mix} > 0$ and $\Delta V_{mix} < 0$

5. Increasing the temperature of an aqueous solution of CO_2 will cause:

(a) Increase in K_H (b) increase in solubility   (c) decrease in K_H (d) No change in K_H

6. Which of the following metals of 3d series have lowest melting point ?

(a) Fe   (b) Mn   (c) Zn   (d) Cu

7. $[Co(NH_3)_6]Cl_3$, on reaction with $AgNO_3$ (aq) gives :

(a) No ppt   (b) 1 mole of AgCl   (c) 2 mole of AgCl   (d) 3 mole of AgCl

8. Which of the following is not correct about amines ?

(a) Aniline is less basic than NH_3

(b) K_b of ethyl amine is more in benzyl amine

(c) CH_3NH_2 reacts with HNO_2 to give N_2

(d) Hinsberg reagent reacts with $(CH_3)_2NH$ to form salt soluble in water

9. The order of reaction

$2\ HI\ (g) \xrightarrow{\ Sunlight\ } H_2 + I_2\ (g)$

(a) Zero   (b) 1   (c) 2   (d) 3

10. $[NiCl_4]^{2-}$ has CFSE 8000 cm^{-1}, what is the CFSE for $[NiCl_6]^{4-}$

(a) 18000 cm^{-1} (b) 8000 cm^{-1} (c) 9000 cm^{-1} (d) 27000 cm^{-1}

11. Identify A,B, C and D :

$$\text{C} \xleftarrow{AgNO2} \text{C}_2\text{H}_5\text{Cl} \xrightarrow{alc.\ KOH} \text{A}$$

with D above (via KNO_2) and B below (via Aq KOH)

(a) $A = C_2H_4$, $B= C_2H_5OH$, $C = C_2H_5NO_2$, $D= C_2H_5\ ONO$

(b) $A = C_2H_5OH$, $B= C_2H_4$, $C = C_2H_5CN$, $D= C_2H_5\ NC$

(c) $A = C_2H_4$, $B= C_2H_5OH$, $C = C_2H_5CN$, $D= C_2H_5\ NC$

(d) $A = C_2H_5OH$, $B= C_2H_4$, $C = C_2H_5NC$, $D= C_2H_5\ CN$

12. The heating phenyl methyl ether with HI produces

(a) Iodobenzene   (b) phenol   (c) benzene   (d) ethyl chloride

In the following questions (Q.No. 13-16), a statement of assertion followed by statement of a reason is given. Choose the correct answer out of the following choices.

(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

13. **Assertion (A)**: Alcohols and phenols are soluble in water.

   Reason (R) : They form H-Bonds with water.

14. **Assertion (A)**: Tertiary structures ruptured on denaturation of proteins.

   Reason (R) : Primary structure of proteins remains intact during denaturation.

15. **Assertion (A):** Zinc has lowest enthalpy of atomization in 3d – series.

   Reason (R) : Zinc is not regarded as transition metal.

16. **Assertion (A):** Aniline reacts with $NaNO_2$, and HCI at 0-5°C to give benzene diazonium salt.

   Reason (R) : Benzene diazonium salt is stable at room temperature.

SECTION- B

17. (a)Can we separate an azeotropic mixture by distillation ? Why do we call it a mixture ?

   (b) What happens when we place blood cell in water (hypotonic solution) ? Give reason.

18. (a) What is the difference between acidic amino acids and basic amino acids?

   (b) Which one of the following is a monosaccharide:

   Starch, maltose, fructose, cellulose

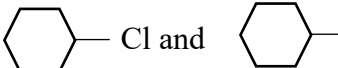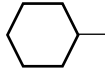19. The following compounds are given to you:

   2- Bromopentane, 2- Bromo-2-methylbutane, 1- Bromopentane

   (a) Write the compound which is most reactive towards S_N2 reaction.
   (b) Write the compound which is optically active.

   <div align="center">Or</div>

   (a) Why *dextro* and *laevo* -rotatory isomers of butan-2-ol are difficult to separate by fractional distillation ?

   (b) ⬡— Cl and ⬡—CH₂Cl , which one is most reactive towards S_N2 reaction ?

20. (a) When one mole of $CoCl_3.5NH_3$ was treated with excess of silver nitrate solution, 2 mol of AgCl was precipitated. Write the formula of the compound.

   (b) Draw one of the geometrical isomers of the complex $[Co (en)_2Cl_2]^+$ which is optically active.

21. The following data were obtained during the first order thermal decomposition of SO_2Cl_2, at a constant volume:

   $SO_2Cl_2(g) \rightarrow SO_2 (g)+ Cl_2 (g)$

Experiments	Time (s)	Total pressure (atm)
1	0	0.4
2	100	0.7

Calculate the rate constant (k).

[Given: log 2 = 0.3010; log 4 = 0.6021]

SECTION- C

22. Define the following terms with a suitable example of each:

    (a) Tertiary structure of proteins

    (b) Essential amino acid

    (c) Oligosaccharides

23. Suggest a possible reason for the following observations:

    (a) The order of boiling points of haloalkanes is RI> RBr > RCl

    (b) $CHCI_3$ is stored in dark-coloured bottles

    (c) State one use each of DDT and iodoform.

24. (a) 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 x 10^3 ohm. Calculate its resistivity and conductivity.

    (b) $2Fe^{2+}$ (aq) +2 I^- (aq) $\rightarrow$ 2Fe $^{2+}$(aq) + I_2(s) has E° = 0.236 V at 298 K. Calculate ΔG°.

    (1F= 96500C)

25. Write the reactions involved in the following:

    (a) Hell-Volhard Zelinsky reaction

    (b) Decarboxylation reaction

    (c) Why does benzaldehyde give Cannizzaro's reaction but acetaldehyde does not?

26. How do you convert the following:

    (a) Phenol to 2-hydroxyacetophenone

    (b) Ethyl chloride to methoxy ethane

    (c) Acetone to 2-methylpropan-2-ol

27. Give the formula of each of the following coordination entities:

    (a) Co^{2+} ion is bound to one CI^-, one NH_3 molecule and two bidentate ethylene diamine (en) molecules.

    (b) (b) Ni^{2+} ion is bound to two water molecules and two Oxalate ions.

    (c) Write the name and magnetic behaviour of each of the above coordination entities.

    (At. nos. Co = 27, Ni = 28)

28. A solution is prepared by dissolving 10 g of non-volatile solute in 200 g of water. It has a vapour pressure of 31.84 mm Hg at 308 K. Calculate the molar mass of the solute. (Vapour pressure of pure water at 308 K= 32 mm Hg)

Or

18 g of glucose, $C_6H_{12}O_6$, is dissolved in 1 kg of water in a saucepan. At what temperature will water boil at 1.103 bar ?   (K_b for H_2O is 0.52 K kg mol^{-1})

SECTION- D

The following questions are case-based questions. 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. Read the passage given below and answer the following questions:

Amines can be considered as derivatives of ammonia and are usually formed from nitriles, nitro, halides, amides, etc. They show hydrogen bonding which influences their physical properties. In aromatic amines, electron releasing and withdrawing groups respectively increase and decrease their basic character. Hinsberg test is used for the identification and distinction between primary, secondary and tertiary amines.

(a) What happens when methyl cyanide is reduced with $LiAlH_4$?

Or

Why do tertiary amines do not react with Hinsberg's reagent?

(b) Give one chemical test to distinguish between Aniline and N-methylaniline.

(c) Convert: Methanamine to Ethanamine.

30. Observe the table given showing volume of CO_2 obtained by reaction of $CaCO_3$ and dilute HCl after every minute. Answer the questions that follow:

Table showing volume of CO_2 at one minute interval by reaction of $CaCO_3$ with dilute HCl.

Time in minutes	Volume of CO_2 / cm^3
0	0
1	24 cm^3
2	34 cm^3
3	38 cm^3
4	40 cm^3
5	40 cm^3
6	40 cm^3

(a) What happens to rate of reaction with time?

(b) Why does $CaCO_3$ powder react faster than marble chips?

(c) What happens to rate of reaction if concentrated HCI is used? Give reason.

Or

(c) A(g)+2B(g)→2C(g). Concentration of 'A' or 'B' were changed keeping the concentration of one of reactants constant and rates were measured as a function of initial concentration and following results were obtained: S

Experiment	[A]	[B]	Initial rate [mol $L^{-1} s^{-1}$]
1	0.01	0.01	0.005
2	0.02	0.01	0.020
3	0.02	0.03	0.060

Write rate law or rate equation.
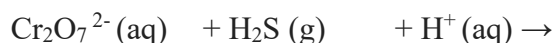
SECTION- E

31. Attempt any five out of the following :

(a) Mn^{3+} is strong oxidising agent, why?

(b) The third ionisation enthalpy of Zn(30) is exceptionally high. Why?

(c) Eu is strong reducing agent. Give reason.

(d) Why does Cr have higher melting point and Mn has lower melting point?

(e) $KMnO_4 \xrightarrow{Heat}$
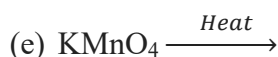
(f) Write the product and balance the ionic equation:

$Cr_2O_7^{2-}$ (aq) $+ H_2S$ (g) $+ H^+$ (aq) →

(g) Actinoid contraction is greater than lanthanoid contraction. Give reason.

32. a) The conductivity of 0.20 mol L^{-1} solution of KCl is 2.48 x 10 S cm^{-1}. Calculate its molar conductivity and degree of dissociation (α).

[Given: $\Lambda°(K^+) = 73.5$ S cm^2 mol^{-1} and $\Lambda°(Cl^+) = 76.5$ S cm^2 mol^{-1}]

 (b) What type of battery is mercury cell? Why is it more advantageous than dry cell?

Or

(a) Calculate emf of the following cell at 298 K :

Al (s) / Al^{3+} (0.1 M) // Cu^{2+} (0.01 M) / Cu (s)

(Given : $E°_{cell} = 2.00$ V)

(b) Define molar conductivity. On dilution, why does molar conductivity of HCOOH increase drastically, while that of HCOONa increases gradually ?

33. (a) How will you carry out following conversions:

(i) Acetone to Propane

(ii) Toluene to Benzamide

(iii) Acetone to 2-methyl propene

(b) Give chemical test to distinguish between following compounds:

(i) Ethanoic acid and Methanoic acid

(ii) Benzoic acid and Methyl benzoate

or

(a) Give reasons:

(i) HCHO is more reactive than CH_3CHO towards addition of HCN.

(ii) pKa of 0_2N-CH_2-COOH is lower than that of CH_3-COOH.

(iii) Alpha hydrogen of aldehydes and ketones is acidic in nature.

(b) Give simple chemical tests to distinguish between the following pairs of compounds:

(i) Ethanal and Propanone

(ii) Pentan-2-one and Pentan-3-one