INDIAN SCHOOL SOHAR
PRE-BOARD I EXAMINATION (2023-2024)
CHEMISTRY (043)
SET 2

CLASS: XII   MAX.MARKS: 70
DATE: 05/12/23   TIME   : 3 HOURS

General Instructions:
(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.   What will be the molar conductivity of Al^{3+} ions at infinite dilution if the molar conductivity of $Al_2(SO_4)_3$ is 858 S cm^2 mol^{-1} and the ionic conductance of SO_4^{2-} is 160 S cm^2 mol^{-1} at infinite dilution?
(a) 698 S cm^2 mol^{-1} (b) 189 S cm^2 mol^{-1}
(c) 1018 S cm^2 mol^{-1} (d) 429 S cm^2 mol^{-1}

2.   How many g of dibasic acid (mol. weight 200) should be present in 100 mL of the aqueous solution to give a strength of 0.1 N?
(a) 10 g   (b) 2 g
(c) 1 g   (d) 20 g

3.   On the basis of crystal field theory, the electronic configuration of d^4 in an octahedral field when $\Delta_0 < P$
(a) $t^3_{2g} e^1_g$ (b) $t^2_{2g} e^2_g$
(c) $t^1_{2g} e^3_g$ (d) $t^4_{2g} e^0_g$

4.   Which transition metal can show the highest oxidation state?
(a) Sc   (b) Os
(c) Ti   (d) Zn

5.   The product Y in the following reaction sequence is:

(a)

(b)

(c)

(d)
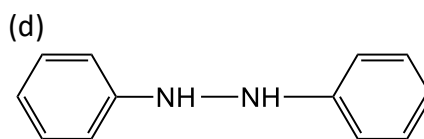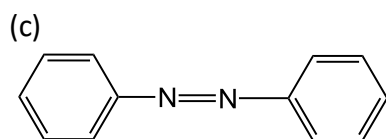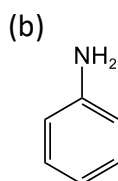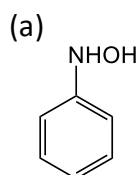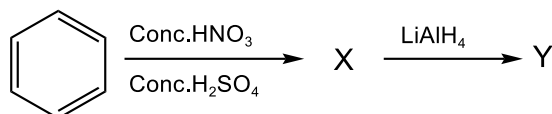
6. For the reaction A + 2B $\longrightarrow$ C + D, the rate law is given by $r = k[A][B]^2$, the concentration of A is kept constant while that of B is doubled. The rate of the reaction will:
(a) doubled
(b) become half
(c) not change
(d) quadruple

7. Which of the following is known as the Sandmeyer reaction?

(a) $C_6H_6 + CH_3Cl \xrightarrow{AlCl_3} C_6H_5CH_3$

(b) $C_6H_5OH \xrightarrow[NaOH]{CO_2} C_6H_5(OH)COOH$

(c) $C_6H_5N_2^+Cl^- \xrightarrow{Cu_2Cl_2} C_6H_5Cl + N_2 \uparrow$

(d) $2HCHO \longrightarrow CH_3OH + HCOONa$

8. The disease caused due to a deficiency of vitamin B_{12} is:
(a) Beri-Beri
(b) Scurvy
(c) Rickets
(d) Pernicious anemia

9. The correct IUPAC name of the following compound is:

$$CH_3 - \underset{\underset{OH}{|}}{\overset{\overset{CH_3}{|}}{C}} - CH_2CH_3$$

(a) tert-butyl alcohol
(b) 2,2-Dimethylpropanol
(c) 2- Methylbutan-2-ol
(d) 3- Methylbutan-3-ol

10. Which of the following does not react with the Heinsberg reagent?
(a) $C_2H_5NH_2$
(b) $(C_2H_5)_2NH$
(c) $(C_2H_5)_3N$
(d) CH_3NH_2

11. A 5% solution of cane sugar (mol. wt. = 342) is isotonic with a 1% solution of a substance X. The molecular weight of X is:
(a) 68.4
(b) 171.2
(c) 34.2
(d) 136.8

12. Which of these when passed over heated copper at 573 K forms an alkene?
(a) An alkane
(b) An alkyne
(c) Secondary alcohol
(d) Tertiary alcohol

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

(a) Assertion and reason both are correct statements and reason is the correct explanation for assertion.

(b) Assertion and reason both are correct statements but the reason is not the correct explanation for assertion.

(c) Assertion is a correct statement but the reason is wrong.

(d) Assertion is a wrong statement but the reason is correct.

13. **Assertion:** P-nitrophenol is more acidic than phenol.
    Reason: Nitro group helps in the stabilization of the phenoxide ion by dispersal of negative charge due to resonance.

14. **Assertion:** La(OH)$_3$ is more basic than Lu(OH)$_3$.
    Reason: The basic character of hydroxides of lanthanoids decreases on moving from La^{3+} to Lu^{3+}.

15. **Assertion:** Sucrose is a reducing sugar.
    Reason: Reducing groups of glucose and fructose are involved in glycosidic bond formation.

16. **Assertion:** The rate of the reaction is the rate of change of concentration of a reaction or product.
    Reason: The rate of reaction remains constant during the course of the reaction.

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. (a) Cutting onions taken from the refrigerator is more comfortable than cutting onions at room temperature. Why?   2x1

(b) What type of azeotrope is formed by the negative deviation from Raoult's law? Give an example.

18. (a) p-dichlorobenzene has a higher melting point than those of o- and m-isomers. Give reason.   2x1

(b) Write the equation for the oxidation of chloroform by air and light.

19. Observe the graph and answer the following questions.   2x1
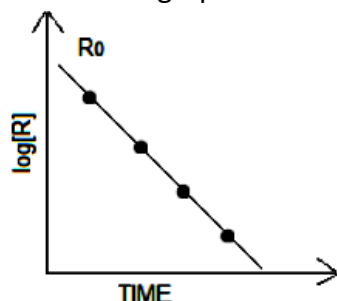
(a) If slope is equal to -2.0×10^{-6} sec^{-1}, what will be the value of rate constant?

(b) How does the half-life of zero order reaction related to its rate constant?

20. Explain what is meant by the following: 2x1

(i) peptide linkage

(ii) pyranose structure of glucose

OR

(a) Amino acids show amphoteric behavior. Why?

(b) What are biocatalysts? Give an example.

21. (a) Draw one of the geometrical isomers of the complex $[Pt(en)_2Cl_2]^{2+}$ that is optically inactive.   2x1

(b) Why a solution of $[Ni(H_2O)_6]^{2+}$ is green while a solution of $[Ni(CN)_4]^{2-}$ is colourless?
(Atomic no: of Ni = 28)

**SECTION-C**

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

22. The freezing point of a solution containing 5 g of benzoic acid (M= 122 g mol^{-1}) in 35 g of benzene is depressed by 2.94 K. What is the percentage association of benzoic acid if it forms a dimer in the solution? (K_f for benzene = 4.9 K kg mol^{-1})   1x3

23. A first-order reaction is 50 % complete in 30 minutes at 27 ^{0}C and in 10 minutes at 47 ^{0}C. Calculate the activation energy (E_a) for the reaction. [Given R = 8.314 J K^{-1} mol^{-1}, log 2= 0.3010, log 3= 0.4771, log 4= 0.6021, log 5 = 0.6991]   1x3

24. (a) Arrange the following in the decreasing order of their acidic strengths: 3x1
Benzoic acid, 4- Nitrobenzoic acid, 3,4- Dinitrobezoic acid, 4- Methoxybenzoic acid.

(b) Oxidation of toluene with CrO_3 to benzaldehyde is carried out in the presence of acetic anhydride. Give reason.

(c) Give the mechanism of cyanohydrin formation when carbonyl compounds react with HCN in the presence of alkali.

25. Write the equations involved in the

(i) acetylation of salicylic acid.

(ii) reaction of phenol with bromine water.   3x1

(iii) conversion of formaldehyde to ethanol.

OR

(a) Write the mechanism of the following reaction:

$$2\ CH_3CH_2OH \xrightarrow[413\ K]{Conc.H_2SO_4} CH_3CH_2\text{-}O\text{-}CH_2CH_3$$

2+1
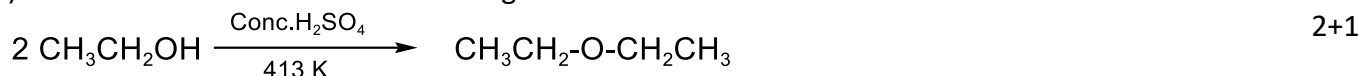
(b) How will you distinguish between Propanol and tert- butyl alcohol?

26. (a) Calculate the emf and ΔG of the following cell at 298 K: $Cr_{(s)}|\ Cr^{3+}(0.1\ M)\ ||\ Fe^{2+}(0.01\ M)\ |\ Fe_{(s)}$ 2+1

[Given: $E^0_{Cr^{3+}/Cr} = -0.74$ V and $E^0_{Fe^{3+}/Fe} = -0.44$ V, F=96500C, log 2= 0.3010, log 3 = 0.4471]

(b) Why conductivity of an electrolyte solution decrease with a decrease in concentration?

27. How would you convert the following?   3x1
   (a) Prop-1-ene to 1-flouropropane
   (b) Ethanol to Propane nitrile
   (c) Benzene to diphenyl

28. (a) What is the basic structural difference between starch and cellulose?   3x1
   (b) Write the reaction involved when D-glucose is treated with Br_2 water.
   (c) If one strand of DNA has the sequence ---A T G C T T C A---, what is the sequence of the bases in the complementary strand?

SECTION-D

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

29. **Read the passage given below and answer the questions which follow:**

In coordination compounds, metals show two types of linkages primary and secondary. Primary valencies are ionisable and are satisfied by negatively charged ions. Secondary valances 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. Valance bond theory based on hybridization helps in determining the shape of complexes, magnetic properties, and outer or inner orbital complexes.

Answer the following questions:

(a) One mole of the coordination compound $CrCl_3.6\ H_2O$ reacts with an excess of $AgNO_3$ solution to yield two moles of $AgCl_{(s)}$. Write the formula of the compound.

(b) Write the IUPAC name of $[PtCl(NO_2)(NH_3)_4]SO_4$

(c) Write the hybridization, shape and magnetic behavior of $[CoF_4]^{2-}$.

OR

(i) Write the formula of Potassium tetracyanidonickelate (II)

(ii) What are the primary and secondary valencies of cobalt in $[\ CoBr_2(en)_2]Cl$?

30. **Read the passage given below and answer the questions which follow:**

Amines are usually formed from nitro compounds, halides, amides, imides, etc. They exhibit hydrogen bonding which influences their physical properties. In alkyl amines, a combination of electron-releasing, steric, and hydrogen bonding factors influence the stability of the substituted ammonium cations in protic polar solvents and thus affect the basic nature of amines. In aromatic amines electron releasing and withdrawing groups respectively increase and decrease the basic character. The influence of the number of hydrogen atoms in nitrogen atom on the type of reactions and nature of products is responsible for the identification and distinction between primary, secondary and tertiary amines. The presence of the amino group in the aromatic ring enhances the reactivity of the aromatic amines. Aryl diazonium salts provide advantageous methods of producing aryl halides, cyanides, phenols and arenes by reductive removal of the diazo group.
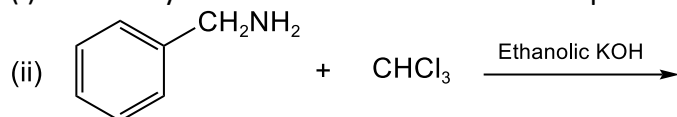
Answer the following questions:

(a)
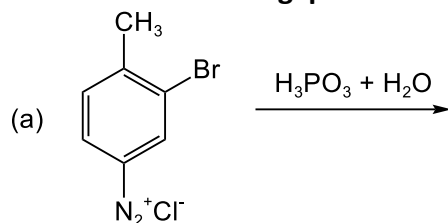
(b) Arrange the following in the increasing order of their pK_b values in aqueous solution:
$C_2H_5NH_2$, $(C_2H_5)_2NH$, $(C_2H_5)_3N$
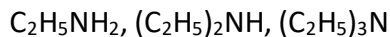
(c) An aromatic compound **'A'** of molecular formula $C_7H_6O_2$ on treatment with aqueous ammonia and heating forms compound **'B'**. Compound **'B'** on heating with Br_2 and aqueous KOH gives a compound **'C'** of molecular formula C_6H_7N. Write the reactions involved and the structures of **A, B** and **C**.

OR

(i) How will you convert Bromoethane to Propanamine?

(ii)

SECTION-E

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

31. Attempt any five of the following

    (a) Write one similarity and one difference between the chemistry of lanthanoid and actinoid elements.

    (b) The enthalpies of atomization of the transition metals are high. Give reason.   5x1

    (c) Write the reactions involved in the preparation of $Na_2Cr_2O_7$ from Na_2CrO_4.

    (d) Which of the following ions will have a magnetic moment value of 1.73 BM?
        Sc^{3+}, Ti^{3+}, Ti^{2+}, Cu^{2+}, Zn^{2+}
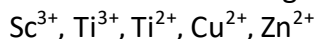
    (e) Complete and balance the following equation: $MnO_4^- + I^- + H^+ \longrightarrow$

    (f) Copper has an exceptionally positive $E^0_{M^{2+}/M}$ value. Why?

    (g) Write the formula of an oxo-anion of chromium and manganese in which it shows the oxidation state equal to its group number.

32. (a) A ketone **A**(C_4H_8O), which undergoes a haloform reaction gives compound **B** on reduction. **B** on heating with sulphuric acid gives a compound **C** which forms monozonide **D**. **D** on hydrolysis in the presence of zinc dust gives only **E**. Identify **A, B, C, D** and **E**. Write the reactions involved. Give the iodoform reaction of compound **A**.   3+1+1
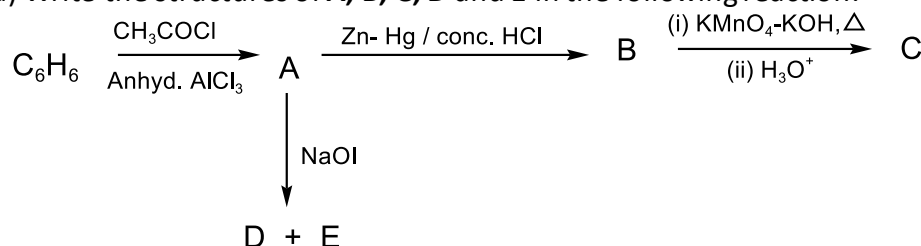
    (b) Give a simple test to distinguish between acetophenone and benzophenone.

    (c) How will you convert Ethanol to 3-Hydroxybutanal?

OR

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

                    3+1+1

    (b) What is Formalin? What is its use?

    (c) Write the chemical reaction to illustrate the Rosenmund reduction reaction.

33. (a) The electrical resistance of a column of 0.05 M KOH solution of 50 cm and area cross-section $\qquad$ 3+2
0.625 cm^2 is 5 x 10^3 ohm. Calculate its resistivity, conductivity and molar conductivity.

(b) Write the name of the cell, which is generally used in hearing aids. Write the reactions taking place at the anode and the cathode of the cell.

OR

(a) (i) Predict the products of electrolysis of an aqueous solution of copper sulphate with platinum electrodes. Write the electrode reactions involved.

(ii) Calculate the time to deposit 1.27 g of copper at the cathode when a current of 2 A was passed through the solution of copper sulphate. $\qquad$ 3+2

(b) Solutions of two electrolytes **A** and **B** are diluted. The Λ_m of B increases 1.5 times while that of **A** increases 25 times.

(i) Which of the two is a strong electrolyte? Justify your answer.

(ii) Graphically show the behaviour of **A** and **B.**

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