BANGALORE SAHODAYA SCHOOLS COMPLEX ASSOCIATION

PRE-BOARD EXAMINATION (2023-2024)

SET - 1

Grade XII

Date: _____ **Max. Marks: 70**

Subject: CHEMISTRY **Time: 3 Hours**

GENERAL INSTRUCTIONS

- *Read all the questions carefully.*
- *All questions are compulsory.*
- *Write in neat handwriting.*
- *There are 33 questions in this question paper with internal choice.*
- *SECTION A consists of 16 multiple -choice questions carrying 1 mark each.*
- *SECTION B consists of 5 short answer questions carrying 2 marks each.*
- *SECTION C consists of 7 short answer questions carrying 3 marks each.*
- *SECTION D consists of 2 case - based questions carrying 4 marks each.*
- *SECTION E consists of 3 long answer questions carrying 5 marks each.*
- *All questions are compulsory.*
- *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. (1x16 =16)

1. An electrochemical cell behave like an electrolytic cell when

a. $E_{cell} = E_{External}$ b. $E_{cell} = 0$

c. $E_{External} > E_{cell}$ d. $E_{External} < E_{cell}$

2. The half-life period for a zero order reaction is equal to

a. 0.693 / k b. 2k / [R] c. 2.303/ k d. [R] / 2k

3. Out of the following transition elements the maximum number of oxidation states are shown by

a. Sc b. Cr c. Mn d. Fe

4. The reason for Cu in 3d series having positive SRP value is

a. First IE is large b. Sublimation energy is very high

c. IE_1+IE_2 is not compensated by hydration enthalpy d. All of the above

5. Which of the following represents correct variation of the property indicated

a. BP of $C_2H_5Br > C_2H_5I > C_2H_5Cl$

b. MP of $p\text{-}C_6H_4Cl_2 > m-C_6H_4Cl_2 > o-C_6H_4Cl_2$

c. BP of $o-C_6H_4Cl_2 > p-C_6H_4Cl_2 > m-C_6H_4Cl_2$

d. BP of $CH_3CH_2CH_2CH_2Br > C(CH_3)_3Br > CH_3CH_2\text{-}\underset{\displaystyle Br}{\underset{|}{CH}}\text{-}CH_3$

6. Which of the following group present at p-position increases the acidic character of phenol?

a. CH_3O- b. CH_3 - c. Cl - d. All of these

7. Which of the following reacts with acetic anhydride to form aspirin?

a. Benzoic acid b. Salicylic acid c. Phthalic acid d. Acetic acid

8. During dehydration of alcohols to alkenes by heating with concentrated H_2SO_4 the initiation step is

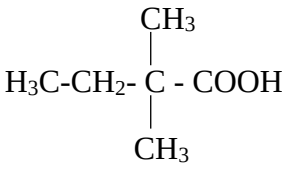
a. Protonation of alcohol molecule b. Formation of carbocation

c. Elimination of water d. Formation of an ester

9. Iodoform test is not given by

a. Ethanol b. Ethanal c. Pentan – 2- one d. Pentan – 3-one

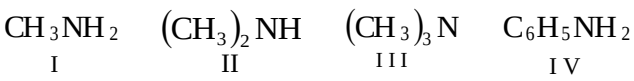
10. What is the correct IUPAC name of the given compound.



a. 2,2 –Dimethylbutanoic acid b. 2- Carboxyl – 2 – methyl butane

c. 2 – Ethyl – 2- methylpropanoic acid d. 3- Methyl butane carboxylic acid

11. The correct decreasing order of pk_b for the following compounds is



(a) II, IV, I, III (b) IV, III, I, II (c) I, II, III, IV (d) III, II, IV, I

12. Propanamide on reaction with bromine in aqueous NaOH gives

a. Propanamine b. Ethanamine

c. N – Methylethanamine d. Propanenitrile

13. Which one of the following statements is correct about sucrose?

a. It can reduce Tollen's reagent, however cannot reduce Fehling's solution.

b. It undergoes mutarotation like glucose and fructose.

c. It undergoes inversion in configuration on hydrolysis.

d. It is laevorotatory in nature.

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**.

14. Assertion (A): Conductivity of an electrolyte increases with decrease in concentration.

Reason (R) : Number of ions per unit volume decreases on dilution.

15. Assertion (A): The molecularity of the reaction appears to be 2.

$H_2 + Br_2 \longrightarrow 2\ HBr$

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

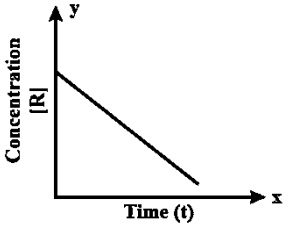
16. Assertion (A) : Reactivity of ketones is more than aldehydes.

Reason (R) : The carbonyl carbon of ketone is less electrophilic as compared to aldehydes.

SECTION –B

17. Calculate the molarity of 9.8 percent (w/W) solution for H_2SO_4 if the density of the solution is 1.02 gram/ ml. (molar mass of H_2SO_4 = 98 g/mol)

18. For a chemical reaction R $\longrightarrow$ P, the variation in the concentration [R] vs t plot is given as



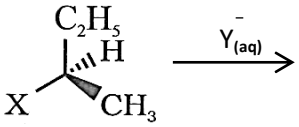
(i) Predict the order of the reaction and derive the integrated rate law expression for the same.

(ii) What is the slope of the curve?

19. (a) Arrange the following compounds in the increasing order of reactivity towards S_N2 mechanism.

$C_6H_5CH_2Br$, $(C_6H_5)_3CBr$, $(C_6H_5)_2C(CH_3)Br$ and $C_6H_5CH(CH_3)Br$

(b) Predict the stereochemistry in the following reaction (nucleophilic substitution reaction)



20. Write the chemical reaction to illustrate each of the following name reactions: -

a. Rosenmund reaction b. Cannizzaro reaction

OR

a. Wolff – Kishner reduction b. HVZ reaction

21. Give two differences for each of the following:-

a. Amylose and Amylopectin

b. Globular proteins and Fibrous proteins

SECTION –C

22. (a) Conductivity of 0.00241 M acetic acid is $8\times10^{-5}\ Scm^{-1}$. Calculate its molar conductivity. If Λ^o_m for acetic acid is 390.5 Scm^2/mol, what is its extent of dissociation?

(b) State Kohlrausch's Law.

23. The rate constant of a first order reaction increases from 2 x 10^{-2} to 4 x 10^{-2}. When the temperature changes from 300 K to 310 K. Calculate the energy of activation. Log 2 = 0.3010, Log 3 = 0.4771, Log 4 = 0.6021.

24. For the complex $[NiCl_4]^{2-}$,

(a) Explain bonding and hybridization type based on VBT.

(b) Calculate the μ of the complex.

(c) Give its IUPAC nomenclature. (Atomic number of Ni – 28).

25. Identify the product formed when propan – 1 –ol is treated with conc. H_2SO_4 at 413 K. Write the mechanism involved in the reaction.

26. How do you convert the following:-

(a) Phenol to Anisole (b) Propan – 2 –ol to 2-Methylpropan – 2- ol

(c) Nitrobenzene to Phenol

OR

(a) Chlorobenzene to Benzoquinone

(b) 2 – Bromopropane to Propan – 1- ol

(c) Benzene to 2 – Bromoacetophenone

27. (a) What happens when D – glucose is treated with the following reagents?

(i) Bromine water (ii) HCN

(b) Name the sugar present in DNA and draw its Haworth structure.

28. Account for the following:-

a. Aniline does not give Friedel crafts reaction.

b. pK_b of methyl amine is less than that of aniline.

c. It is difficult to prepare pure amines by ammonolysis of alkyl halides.

SECTION -D

29. Read the passage given below and answer the following questions: -

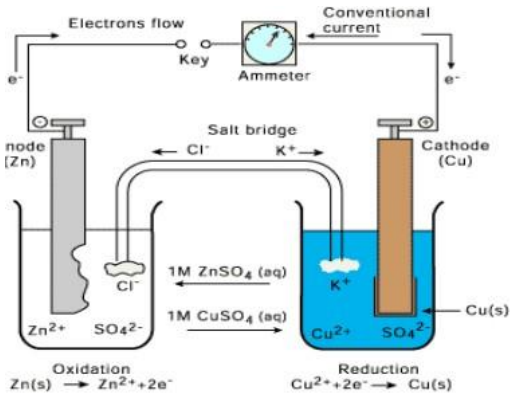
A device used to convert the energy evolved in a redox reaction into electrical energy is called an electrochemical cell. These devices are also called galvanic cells or voltaic cells, after the names of Luigi Galvani (1780) and Alessandro Volta (1800) who were the first to perform experiments on the conversion of chemical energy into electrical energy. How exactly the chemical energy of a redox reaction is converted into electrical energy can be seen from the following example: Redox reaction between Zn and CuSO4.

The reaction is represented as: Zn(s) + CuSO4(aq) → ZnSO4(aq) + Cu(s) It may also be written in ionic form as: $Zn + Cu^{2+} \rightarrow Zn^{2+} + Cu$

The reaction essentially comprises of two half reactions: one for reduction and the other for oxidation.

$Zn(s) \rightarrow Zn^{2+}(aq) + 2e^-$

$Cu^{2+}(aq) + 2e^- \rightarrow Cu(s)$ Thus, Zn is oxidized to Zn^{2+} in the oxidation half reaction and Cu^{2+} is reduced to Cu in the reduction half reaction. The overall reaction can be obtained by adding the two half reactions.



Electrochemical cell based on redox reaction

a) What will be the direction of flow of current if a cell is set up using Ag / Ag^{+} and Br_2 / Br^{-} if

$E^{o}_{Ag^{+}/Ag} = 0.8V$

$E^{o}_{Br^{+}/Br^{-}2} = 1.08V$

b) Suggest two materials other than hydrogen that can be used as fuel in fuel cell.

c) Give the construction and working of Dry cell.

OR

Calculate EMF of the following cell

$Zn(S)/Zn^{2+}(0.1M)//Ag^{+}(0.01M)/Ag_{(g)}$

Given $E^{o}_{Zn^{2+}/Zn} = -0.76V$ $E^{o}_{Ag^{+}/Ag} = -0.8V$

30. The coordination compounds are of great importance. These compounds are widely present in the mineral, plant and animal worlds are known to play many important functions in area of analytical chemistry; metallurgy, biological system, industry and medicine. Formation of coordination compound is largely used in analytical chemistry for the qualitative detection and qualitative estimation of metal ions. Coordination compounds also find poisoning caused by ingestion of poisonous metal by human beings.

a. Name the ligand used to remove lead poisoning from human body?

b. Draw the isomers of platin and name the isomer used in the treatment of cancer.

c . (i) In black and white photography, film is fixed by washing with hypo solution. Give the IUPAC nomenclature of the soluble complex formed in the process.

(ii) Identify primary valency and secondary valency of the central metal atom / ion in Wilkinson catalyst.

OR

Explain bonding in Nickel carbonyl.

SECTION –E

The following questions are long answer type and carry 5 marks each. Two questions have internal choice.

31. (a) Explain the behaviour of solution formed when ethylalcohol is added to water and give its graphical representation.

(b) 20g of fluoroacetic acid dissolved in 500g of water. The depression in the freezing point of water observed is $1.0^{o}C$. Calculate the vant Hoff factor and Ka for the acid, K_f for water is 1.86 Kkg/mol. [Atomic mass of C = 6u, O = 16u, F=19u)

32. (a) Give reasons:-

(i) Transition metals and their compounds show catalytic activity.

(ii) Separation of a mixture of lanthanoid elements is difficult.

(iii) Zn, Cd and Hg are soft and have low melting point.

(b) Write the reactions for the preparation of $Na_2Cr_2O_7$ from $FeO \cdot Cr_2O_3$

(c) Write balanced ionic equation for reaction of MnO_4^{-} with I^{-} in neutral/ faintly alkaline medium.

OR

(a) Give reasons

(i) Transition metals form coloured compounds.

(ii) Co (II) is stable in aqueous solution but in the presence of strong field ligand it is easily oxidized to Co(III).

(iii)All Cu(II) halides are known except iodide.

(b)Give the reaction for method of preparation of $KMnO_4$.

(c) Write balanced ionic equation for reaction of $Cr_2O_7^{2-}$ with I^- in acidic medium.

33. (a) Write the main product in the following reactions:-

(i) $2CH_3COCl + (CH_3)_2Cd \longrightarrow$

(ii) $CH_3CH_2CHO \xrightarrow{Zn\ (Hg)/\ conc\ HCl}$

(iii) $CH_3COOH \xrightarrow{PCl_5}$

(b) What is the product formed when aniline reacts with benzoyl chloride? Write the name of the product obtained.

(c) Out of CH_3NH_2 and CH_3OH which one has higher BP? Why?

OR

(a) An organic compound A with molecular formula C_7H_7NO reacts with Br_2/ aq. KOH to give compound B which upon reaction with $NaNO_2$ and HCl at $0^\circ C$ gives C. Compound C on heating with ethanol gives a hydrocarbon D. Compound B on further reaction with Br_2 water gives white precipitate of compound E. Identify compound A, B, C, D and E. Also justify your answer by giving relevant chemical equations.

(b) Distinguish between

(i) Acetaldehyde and Benzaldehyde

(ii) Benzylchloride and Benzylbromide.

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