O.P.JINDAL SCHOOL,SAVITRINAGAR
HALF YEARLY EXAMINATION-(2025-26)

CLASS-XII   **MAX.MARKS-70**

SUBJECT-CHEMISTRY   **MAX.TIME-3HOURS**

General Instruction:-

(i)All questions are compulsory .There are 33 questions in all.

(ii)SECTION –A: Question numbers 1 to 16 are MCQs carrying one mark each.

(iii) SECTION –B:Question numbers 17 to 21 are short answer type-I questions and carrying 2 marks each.

(iv) SECTION –C: Question numbers 22 to 28 are short answer type-II questions and carrying 3 marks each.

(v) SECTION –D:Question numbers 29 and 30 are case-based questions carrying 4 marks each.

(v) SECTION –E:Question numbers 31 to 33 are al long answer type questions and carrying 5 marks each.

(vi)There is no overall choice. However,an internal choice has been provided in some questions.

(vii)Use of calculator is not permitted. However, you may use log tables, if necessary.

SECTION-A

1.The molar ionic conductivities of Al^{3+} and SO_4^{2-} are 189 Scm^2mol^{-1} and 160 Scm^2mol^{-1} respectively.The value of limiting molar conductivity of $Al_2(SO_4)_3$ will be :

(a)198 Scm^2mol^{-1} (b)858 Scm^2mol^{-1}

(c)588 Scm^2mol^{-1} (d)891 Scm^2mol^{-1}

2.van't Hoff factor for $Na_2SO.10H_2O$ solution, assuming the complete ionization is

(a)1   (b)2

(c)13   (d)3

3.In a given graph of zero order reaction,the slope and intercept are :
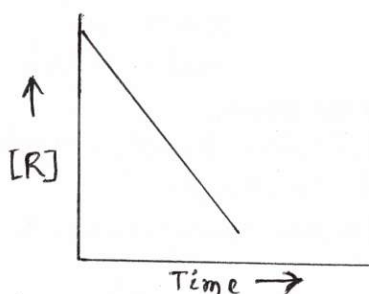
(a)Slope =k ,intercept=$[R]_0$ (b) Slope = -k ,intercept=$[R]_0$

(c) Slope =k/2.303 ,intercept=$ln[R]_0$ (d) Slope = -k /2.303,intercept=lnA

4.Which of the following ions has the electronic configuration $3d^6$?

(a) Co^{3+} (b) Ni^{3+}

(c)Mn^{2+} (d)Mn^{3+}

(XII-Chem-1)

5. The co-ordination number of Co in the complex $[Co(en)_3]^{3+}$ is :

    (a)3   (b)4

    (c)5   (d)6

6. Which alkyl haide from the given option will undergo S_N1 reaction faster ?

    (a)$(CH_3)_3C-Br$ (b)$(CH_3)_2CH-Br$

    (c)$CH_3 - CH_2 -Br$ (d)$(CH_3)_3C-CH_2 -Br$

7. Which of the following alcohols will not undergo oxidation?

    (a)Butan-1-ol   (b)Butan-2-ol

    (c)2-methylbutan-2-ol   (d) 3-methylbutan-2-ol

8. Deficiency of which of the following vitamins causes pernicious anaemia?

    (a)Vitamin B_1 (b)Vitamin-B_2

    (c)Vitamin B_6 (d)Vitamin-B_{12}

9. An azeotropic solution of two liquids has a boiling point higher than either of the two when,it

    (a)shows a negative deviation from Raoult's law   (b)is satuted

    (c) shows a positive deviation from Raoult's law   (d)Shows no deviation from Raoult's law

10. Which of the following cell was used in Apollo space programme?

    (a)Mercury cell   (b)Daniel cell

    (c)$H_2 -O_2$ fuel cell   (d)Dry cell

11. The rate of a reaction increases 16 times when the concentration of the reactant increases four times.The order of the reaction is:

    (a)2.5   (b)2.0

    (c)1.5   (d)0.5

12. Transition metals are known to make interstitial compounds.Formation of interstitial compounds makes the transition metal:

    (a)more hard   (b)more soft

    (c)more ductile   (d)more metallic

Questions 13-16 are Assertion and Reason questions:

In these questions(13-16) 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 and reason is not the correct explanation for assertion.

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

(d) Assertion is wrong statement but reason is correct statement

13 .Assertion: Methoxy ethane reacts with HI to give ethanol and iodoethane.

    Reason: Reaction of ether with HI follows $S_N 2$ mechanism.

14. **Assertion:**.Chlorobenzene is resistant to nucleophilic substitution reaction at room
    temperature.
    Reason: C—Cl bond gets weaker due to resonance.

15. **Assertion :**Low spin tetrahedral complexes are rarely observed.
    Reason: Crystal field splitting energy is less than pairing energy for tetrahedral complexes.

16. **Assertion:**.Vitamin C can not be stored in our body.
    Reason: Vitamin C is fat soluble and excreted from the body in urine.

SECTION-B

17.Give reason for the following.
   (i) Thionyl chloride method is preferred for preparing alkyl chlorides from alcohols.
   (ii) Out of 1-Bromopentane or 2-Bromopentane,which will react faster towards S_N2 reaction ?
                    OR
   (i) Name the suitable haloalkane and reagent from methyl isocyanide can be prepared.
   (ii) Out of ethyl bromide and ethyl iodide,which will react faster towards S_N2 reaction ?

18. Calculate the mass of compound (molar mass=256 g mol^{-1}) to be dissolved in 75 g of
    benzene to lower its freezing point by 0.48K.(K_f =5.12 Kkg mol^{-1})

19.Accont for the following:
   (i) All the carbon atoms in glucose are linked in a straight chain.
   (ii) Amphoteric behavior of amino acids.
                    OR
   What happens when D-glucose is treated with following reagents:
   (i)Br_2 water
   (ii) Hydroxyl amine

20.A reaction is of first order in reactant A and of second order in reactant B.How is the rate of
   reaction affected when
   (i)the concentration of B alone is increased to three times?
   (ii)the concentration of A as well as B are doubled?

21.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 the:
   (i)structural formula of the complex.
   (ii)IUPAC name of the complex.

SECTION-C

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

23. For the complex [Fe(en)$_2$Cl$_2$]Cl , explain the
    (i) type of hybridization   **(ii)**magnetic behaviour **(iii)**number of its geometrical isomers

(XII-Chem-3)

24. What are fuel cell? Explain the electrode reactions involved in the working of H_2—O_2 fuel cell.

OR

(i) The cell in which the following reaction occurs:

$$2Fe^{3+}(aq) + 2I^-(aq) \longrightarrow 2Fe^{2+}(aq) + I_2(s) \; ; \; \text{has } E^0_{cell} = 0.236V \text{ at}$$
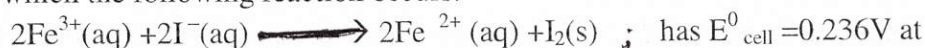
298K. Calculate the standard Gibb's energy of the cell reaction. (1F=96500C)

(ii) How many electrons flow through metallic wire if a current of 0.5A is passed for 2h.

25. State Raoult's law for a solution containing volatile components. How does Raoult's law become a special case of Henry's law ?

26. Write the reaction and IUPAC name of the product formed.

(i) When ethanal is treated with ethyl magnesium bromide followed by hydrolysis.

(ii) Phenol is treated with conc. H_2SO_4 and conc. HNO_3

(iii) Phenol is heated with zinc dust

OR

Write the mechanism of conversion of ethanol to ethoxy ethane.

27. Explain the following cases giving appropriate reasons.

(i) Nickel does not form low spin octahedral complexes.

(ii) The π- complexes are known for the transition metals only.

(iii) Co^{2+} is easily oxidized to Co^{3+} in the presence of a strong ligand.

OR

(i) On the basis of crystal Field theory, write the electronic configuration for d^5 ion with a strong field ligand for which $\Delta_0 > P$.

(ii) $[Ni(CO)_4]$ has tetrahedral geometry while $[Ni(CN)_4]^{2-}$ has square planar yet both exhibit diamagnetism. Explain.

(iii) What is chelate complex. Give one example.

28. Complete and balance the following chemical equations .

(i) $Cr_2O_7^{2-} + I^- + H^+ \longrightarrow$

(ii) $MnO_4^- + SO_3^{2-} + H^+ \longrightarrow$

(iii) $MnO_4^- + C_2O_4^{2-} + H^+ \longrightarrow$
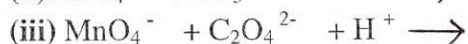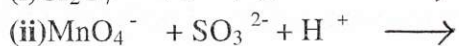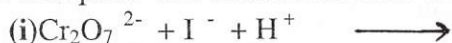
SECTION-D

29. Read the following and answer the questions given below.

Living systems are made up of various complex biomolecules like carbohydrates, proteins, nucleic acid, lipids etc. Carbohydrates are optically active polyhydroxy aldehydes or ketones. They are broadly classified into monosaccharides, oligosaccharides and polysaccharides. The

monosaccharides are held together by glycosidic linkages to form disaccharides like

(XII-Chem-4)

sucrose, maltose or polysaccharides like starch and cellulose.

Another biomolecule:proteins are polymers of α-aminoacids which are linked by peptide Bonds.Ten amino acids are called essential amino acids. Structure and shape of proteins can be studied at four different levels i.e.primary,seciondary,tertiary and quertanary,each level being more complex than previous one.

(i)What is the difference between a glycosidic linkage and peptide linkage?

(ii)Which amino acids are called essential amino acids? Give one example.

(iii)What are the common types of secondary structures of proteins ?Write any two forces which stabilize the secondary and tertiary structures of protein.

OR

(iii)Define denaturation of protein with an example. During denaturation which structures of protein lose their biological activity?

30.The rate of a reaction is concerned with decrease in concentration of reactants or increase in concentration of the 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.A number of factors such as concentration of reactants, temperature, catalyst affect the rate of reaction.

Mathematical representation of a rate of reaction is given by rate law:

$$Rate=k[A]^x[B]^y$$

X and y indicate how sensitive the rate is to the change in concentration of A and B. Sum of x+y gives the overall order of a reaction.

When a sequence of elementary reactions gives us the products, the reactions are called complex reactions. Molecularity and order of an elementary reaction are same.Zero order reactions are relatively uncommon but they occur under special conditions.All natural and artificial radio active decay of unstable nuclei takes place by first order kinetics.

(i)What is the effect of temperatureon the rate constant of a reaction?

(ii)How order and molecularityare different for complex reactions?

(iii)A first order reaction has a rate constant $2X10^{-3}$ s^{-1} .How long will 6 gram of this reactant take reduce to 2g?

OR

(iii)The half life of radioactive decay of ^{14}C is 6930 years.An archaeological artifact containing Wood had only 75% of the ^{14}C found in a living tree.Find the age of the sample.
(log4=0.6021 ,log 3=0.4771 , log 2=0.3010 ,log 10=1)

SECTION-E

31.Attempt any five of the following. Accounts for the following:

(i)The transition metals and their compounds act as good catalyst.

(ii)E^0 value for(Mn^{2+}/Mn) is negative, where as for (Cu^{2+}/Cu) is positive.

(iii)$La(OH)_3$ is more basic than $Lu(OH)_3$.

(XII-Chem-5)

(iv) The enthalpies of atomization of transition elements are quite high.

(v) With same d^4 configuration, Cr(II) is reducing where Mn(III) is oxidising.

(vi) Sc^{3+} is colourless in aqueous solution whereas Ti^{3+} is coloured

(vii) Ce^{4+} is a strong oxidising agent.

32.(i) How will you convert the following?

    (a) Phenol to anisole   (b) Phenol to benzoquinone

(ii) Write the mechanism for the following reaction.

$$C_2H_5OH \xrightarrow{\ \ H^+\ \ } H_2C = CH_2$$
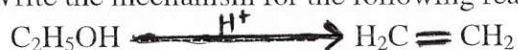
(iii) Why phenol undergoes electrophilic substitution reaction more easily than benzene?

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

(i) Account for the following.

    (a) o-nitrophenol is more steam volatile than p-nitrophenol.

    (b) tert-butyl chloride on heating with sodium methoxide gives 2- methylpropene instead of Tert-butyl methyl ether.

(ii) Write the reaction invoved for the following.

    (a) Reimer-Tiemann reaction   (b) Kolbe's reaction

(iii) Why is phenol more acidic thancyclohexanol?

33.(i) electrical resistance of a column of 0.05M KOH solution of length 50 cm area of cross section of length 50 cm and area of cross section 0.625 cm^2 is 5×10^3 ohm. Calculate its resistivity, conductivity and molar conductivity.

(ii) Explain with a graph, the variation of molar conductivity of a strong electrolyte with dilution.

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

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

    Al(s) I Al^{3+}(0.15M) ‖ Cu^{2+} (0.025M) ICu(s)
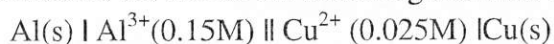
    Given: $E^0_{(Al^{3+}/Al)}$ = -1.66V ,$E^0_{(Cu^{2+}/Cu)}$= 0.34V ,log 0.15=0.8239 ,log 0.025= -1.6020)

(ii) Calculate the time to deposit 1.27g of copper at cathode when a current of 2A was passed through the solution of $CuSO_4$.

    (Molar mass of Cu=63.5 g mol^{-1} ,1F=96500C mol^{-1})