S R Study Material

SPECIAL SAMPLE PAPER 2

Class 12 - Chemistry

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

General Instructions:

Read the following instructions carefully.

1. There are **33** questions in this question paper with internal choice.
2. SECTION A consists of 16 multiple-choice questions carrying 1 mark each.
3. SECTION B consists of 5 very short answer questions carrying 2 marks each.
4. SECTION C consists of 7 short answer questions carrying 3 marks each.
5. SECTION D consists of 2 case-based questions carrying 4 marks each.
6. SECTION E consists of 3 long answer questions carrying 5 marks each.
7. **All questions are compulsory.**
8. **Use of log tables and calculators is not allowed.**

Section A

1. The conversion of an alkyl halide into an alcohol by aqueous NaOH is classified as **[1]**

   a) a dehydrohalogenation reaction
   b) a substitution reaction
   c) an addition reaction
   d) a dehydration reaction

2. Aspirin is formed by the acetylation of: **[1]**

   a) Benzoic acid
   b) Phenol
   c) Salicylic acid
   d) Phthalic acid

3. Which of the following does not give silver mirror test? **[1]**

   a) CH_3CH_2CHO
   b) HCOOH
   c) CH_3CHO
   d) CH_3COCH_3

4. Phenol does **not** undergo nucleophilic substitution reaction easily due to: **[1]**

   a) Instability of phenoxide ion
   b) Partial double bond character of C-OH bond
   c) Acidic nature of phenol
   d) Partial double bond character of C-C bond

5. Reaction which takes place in one step is known as **[1]**

   a) Elementary reaction
   b) Unimolecular reaction
   c) Reaction rate
   d) Bimolecular reaction

6. Match the items given in column I with that in column II **[1]**

Column I	Column II

(a) $E^{\odot}$	(i) m = ZIt
(b) Nernst Equation	(ii) $\frac{\text{Molar conductivity at concentration C}}{\text{Limiting Molar conductivity}}$
(c) Degree of ionisation (α) at concentration C	(iii) $\frac{-\triangle G^{\odot}}{nF}$
(d) Faraday's First Law	(iv) Mathematical relation which relates E and $E^{\odot}$ of cell

a) (a) - (i), (b) - (iii), (c) - (iv), (d) - (ii)

b) (a) - (iv), (b) - (ii), (c) - (i), (d) - (iii)

c) (a) - (iii), (b) - (iv), (c) - (ii), (d) - (i)

d) (a) - (ii), (b) - (i), (c) - (iii), (d) - (iv)

7. The IUPAC name of $CH_3 - \overset{O}{\overset{||}{C}} - CH_2 - \overset{O}{\overset{||}{C}} - H$ is: **[1]**

a) 1-oxobutanal

b) 3-oxobutanal

c) 1-oxobutanal-3-one

d) 3-oxobutanone

8. Two nucleic acid chains are wound about each other and held together by hydrogen bonds between pairs of bases, this is called **[1]**

a) Secondary structure of DNA

b) Primary structure of DNA

c) Secondary structure of RNA

d) Primary structure of RNA

9. The half-life periods of a reaction at initial concentration of 0.1 mol/L and 0.5 mol/L are 200 s and 40 s respectively. The order of the reaction is **[1]**

a) 2

b) $\frac{1}{2}$

c) 0

d) 1

10. Benzaldehyde and acetone can be best distinguished by using: **[1]**

a) Hydrazine

b) Tollen's reagent

c) 2, 4 – DNP reagent

d) Sodium hydroxide solution

11. An organic compound X is oxidized by using acidified $K_2Cr_2O_7$. The product obtained reacts with Phenyl hydrazine but does not answer the silver mirror test. The possible structure of X is: **[1]**

a) $(CH_3)_2CHOH$

b) $(CH_4)_2CH_3OH$

c) CH_3CHO

d) CH_3CH_2OH

12. Which of the following amines can be prepared by Gabriel synthesis? **[1]**

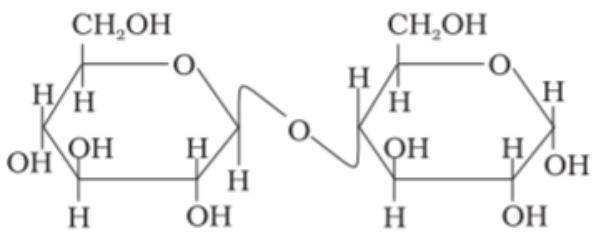
a) Isobutyl amine

b) N-methylbenzylamine

c) Toluene

d) Aniline

13. **Assertion (A):** β-glycosidic linkage is present in maltose, **[1]**



Reason (R): Maltose is composed of two glucose units in which C–1 of one glucose unit is linked to C–4 of another glucose unit.

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):** Glucose gets oxidised to six carbon carboxylic acid on reaction with bromine water. **[1]**
Reason (R): Glucose contains a ketonic group.

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. **Assertion (A):** Nucleophilic substitution of iodoethane is easier than chloroethane. **[1]**
Reason (R): Bond energy of C - Cl bond is less than C - I bond.

a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).

b) Both Assertion (A) and Reason (R) are true, but Reason (R) is **not** the correct explanation of the Assertion (A).

c) Assertion (A) is true, but Reason (R) is false.

d) Assertion (A) is false, but Reason (R) is true.

16. **Assertion (A):** Primary and secondary alcohols can be distinguished by Victor-Meyer's test. **[1]**
Reason (R): Primary alcohols form nitrolic acid which dissolves in NaOH to form blood-red colouration but secondary alcohols form pseudonitrols which give blue colouration with NaOH.

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

17. Show that when the mole fraction of the solvent in the solution is nearly unity, the molarity (C) and molality (m) of the solution are connected by the equation. **[2]**
$C = \rho \times m$, where p = density of the solution

18. Why is the third ionization energy of manganese (Atomic Number = 25) unexpected high? **[2]**

19. **Answer the following:** **[2]**
    (a) The rate of reaction $X \rightarrow Y$ becomes 8 times when the concentration of the reactant X is doubled. Write the rate law of the reaction. **[1]**
    (b) Will the rate constant of the reaction depend upon T if the E_{act} (activation energy) of the reaction is zero? **[1]**

20. The value of Λ_m^o of $Al_2(SO_4)_3$ is 858 S cm^2 mol^{-1} while "$\lambda^\circ_{m(SO_4^{2-})}$ is 160 S cm^2 mol^{-1} calculate the limiting ionic conductivity of Al^{3+}. **[2]**

OR

Suggest a way to determine the Λ_m° value of the water.

21. Name the electrophile produced in the reaction of benzene with benzoyl chloride in the presence of anhydrous $AlCl_3$. Name the reaction also. **[2]**

Section C

22. What is the cell potential for the cell at 25^0C [Cr/Cr^{3+}10.1m]//Fe^{2+}(0.01m)/Fe **[3]**

$E^0{}_{cr+/cr} = -0.74V$; E^0Fe^{2+}/Fe = -0.44V.

23. a. Using valence bond theory, predict the hybridization and magnetic character of following: **[3]**

$[CoF_6]^{3-}$ [Atomic number of Co = 27]

b. Write IUPAC name of the following complex:

$[CoBr_2(en)_2]^+$

c. How many ions are produced from the complex $[Co(NH_3)_6]Cl_2$ in solution?

24. Give equations of the following reactions: **[3]**

i. Oxidation of propan-1-ol with alkaline $KMnO_4$solution.

ii. Bromine in $CS_2$with phenol.

iii. Dilute $HNO_3$with phenol.

iv. Treating phenol with chloroform in presence of aqueous NaOH.

OR

Give the structure of the products you would except when each of the following alcohol reacts with (i) Butan-l-ol (ii) 2- Methylbutan-2-ol

a. HCl - $ZnCl_2$

b. HBr

c. $SOCl_2$

25. An organic compound A, which has a characteristic odour, on treatment with con.NaOH forms two compounds B and C. Compound B has molecular formula C_7H_8O which on oxidation gives back A. Compound C is the sodium salt of an acid. C, when heated with soda lime yields an aromatic hydrocarbon D. Deduce the structures of A, B, C and D. **[3]**

26. i. Calculate the mass of Ag deposited at cathode when a current of 2A was passed through a solution of $AgNO_3$ for 15 min. **[3]**

(Given: Molar mass of Ag = 108g mol^{-1}, 1 F = 96500 C mol^{-1}).

ii. Define fuel cell.

27. Justify and arrange the following compounds of each set in increasing order of reactivity towards the asked displacement: **[3]**

i. 1-Bromobutane, 2-Bromobutane, 2-Bromo-2-Methylpropane (S_N1 reaction)

ii. 1-Bromobutane, 2-Bromobutane, 2-Bromo-2-Methylpropane (S_N2 reaction)

28. What happens to most probable kinetic energy and the energy of activation with an increase in temperature? **[3]**

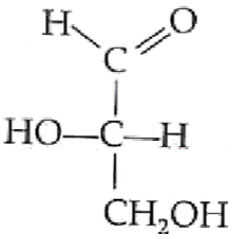
Section D

29. **Read the following text carefully and answer the questions that follow:** **[4]**

Carbohydrates can exist in either of two conformations, as determined by the orientation of the hydroxyl group about the asymmetric carbon farthest from the carbonyl group.

By convention, a monosaccharide is said to have D configuration if the hydroxyl group is attached to the asymmetric carbon atom adjacent to the CH_2OH group is on the right hand side irrespective of the position of

the other hydroxyl groups. On the other hand, the molecule is assigned L configuration if the -OH group is attached to the carbon adjacent to the CH_2OH group is on the left hand side.



i. Identify the configuration of carbohydrate in the above structure. (1)

ii. What is the relation between D-Glyceraldehyde and L-Glyceraldehyde? (1)

iii. What are the two functional group present in typical carbohydrate? (2)

OR

Which type of monosaccharide D-L or both is present in majority in human body? (2)

30. **Read the following text carefully and answer the questions that follow:** **[4]**

The existence of coordination compounds with the same formula but different arrangements of the ligands was crucial in the development of coordination chemistry. Two or more compounds with the same formula but different arrangements of the atoms are called isomers. Isomers are compounds with the same molecular formula but different structural formulas and do not necessarily share similar properties. There are many different classes of isomers, like stereoisomers, enantiomers, and geometrical isomers. There are two main forms of isomerism: structural isomerism and stereoisomerism. The different chemical formulas in structural isomers are caused either by a difference in what ligands are bonded to the central atoms or how the individual ligands are bonded to the central atoms.

i. What type of isomerism is observed in $[Cr(H_2O)_4CI_2]^+$?. (1)

ii. What kind of isomerism exists between $[Cr(H_2O)_6]CI_3$ (violet) and $[Cr(H_2O)_5CI]CI_2H_2O$ (greyish - green)? (1)

iii. Define linkage isomersm. (2)

OR

What type of isomerism is observed in palladium complexes of the type $[Pd(C_6H_5)_2(SCN)_2]$ and $[Pd(C_6H_5)_2(NCS)_2]$? (2)

Section E

31. **Attempt any five of the following:** **[5]**

(a) Why transition elements act as good catalyst? **[1]**

(b) How is $KMnO_4$ prepared from pyrolusite? Give steps involved with equations. **[1]**

(c) Explain the following observation **[1]**

i. Zn^{2+} salt are colourless.

ii. Copper has exceptionally positive $\mathbf{E^o_{M^{2+}/M}}$ value.

(d) What are interstitial compounds. Give two examples **[1]**

(e) The chemistry of the actinoids is more complex as compared to lanthanoids. Why? **[1]**

(f) Account for the following: There are irregularities in the electronic configuration of actinoids. **[1]**

(g) Identify the following: **[1]**

i. Transition metal of 3d series that exhibits the maximum number of oxidation states.

ii. An alloy consisting of approximately 95% lanthanoid metal used to produce bullet, shell and lighter flint.

32. a. Draw the graph between vapour pressure and temperature and explain the elevation in boiling point of a solvent in solution. **[5]**

b. Determine the osmotic pressure of a solution prepared by dissolving 25 mg of K_2SO_4 in 2 litres of water at 25^oC assuming it to be completely dissociated. (Atomic masses K = 39 u, S = 32 u, O = 16 u)

OR

Boiling point of water at 750 mm Hg is 99.63^oC. How much sucrose is to be added to 500 g of water such that it boils at 100^oC.

33. a. Give reasons for the following : **[5]**

i. Acetylation of aniline reduces its activation effect.

ii. CH_3NH_2 is more basic than $C_6H_5NH_2$.

iii. Although $-NH_2$ is o/p-directing group, yet aniline on nitration gives a significant amount of m-nitroaniline.

b. Explain the following reactions:

i. Coupling reaction

ii. Gabriel phthalimide reaction

OR

Write the structure of A, B, C, D and E in the following reactions: