SAMPLE PAPER 1 2024-25

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 IUPAC name of the compound shown below is: **[1]**
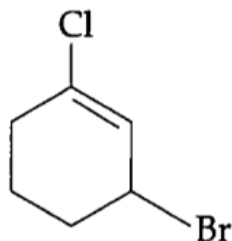
    a) 6-bromo-2-chlorocyclohexene   b) 3-bromo-1-chlorocyclohexene

    c) 2-bromo-6-chlorocyclohex-1-ene   d) 1-bromo-3-chlorocyclohexene

2. Which one is the complementary base of cytosine in one strand to that in other strand of DNA?   **[1]**

    a) Uracil   b) Thymine

    c) Guanine   d) Adenine

3. $(CH_3)_3C\text{-}O\text{-}CH_3$ reacts with HI to give: **[1]**

    a) $(CH_3)_3C\text{-}OH + CH_3\text{-}I$ b) $(CH_3)_3C\text{-}I + CH_3\text{-}I$

    c) $(CH_3)_3C\text{-}OH + CH_3OH$ d) $(CH_3)_3C\text{-}I + CH_3OH$

4. The following reaction is: **[1]**

    a) catalytic hydrogenation   b) Clemens reduction

c) catalytic ionisation   d) Wolff – Kishner reduction

5. For the reaction $3A \rightarrow 2B$, rate of reaction $-\frac{d[A]}{dt}$ is equal to **[1]**

    a) $\frac{+1}{3}\frac{d[B]}{dt}$ b) $\frac{+2}{3}\frac{d[B]}{dt}$

    c) $\frac{+1}{2}\frac{d[B]}{dt}$ d) $\frac{+3}{2}\frac{d[B]}{dt}$

6. Match the items of column I with appropriate entries of column II. **[1]**

Column I	Column II
(a) $\frac{\triangle P}{P^o_A}$	(i) $\frac{\triangle T_b}{m}$
(b) K_b	(ii) mol fraction of solute
(c) i	(iii) $\frac{\triangle T_f}{m}$
(d) K_f	(iv) Ratio of observed molar mass to actual molar mass

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

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

7. Isomers of the compound C_4H_9Br are: **[1]**

    a) 1-Bromo-2-methylbutane and 2-Bromo-2-methylbutane   b) 1 – Bromobutane and 2 – Bromobutane

    c) 1 – Bromobutane, 2 – Bromobutane, 1 – bromo- 2 – methylpropane, and 2 – bromo-2 – methylpropane   d) 1 – Bromo - 2 – methylpropane and 2 – Bromo - 2 – methylpropane

8. $KMnO_4$ acts as an oxidising agent in alkaline medium. When alkaline $KMnO_4$ is treated with KI, iodide ion is oxidised to: **[1]**

    a) IO_3^- b) IO^-

    c) I_2 d) IO_4^-

9. A reaction is first order in A and second order in B. How is rate affected when concentration of both A and B are doubled? Choose the correct option: **[1]**

    a) two times   b) eight times

    c) four times   d) three times

10. For making a distinction between 2 – pentanone and 3 – pentanone the reagent to be employed is: **[1]**

    a) $K_2Cr_2O_7 / H_2SO_4$ b) SeO_2

    c) Zn – Hg/HCl   d) Iodine/NaOH

11. 3-Pentanol is an example of: **[1]**

    a) Primary alcohol   b) Secondary alcohol

    c) Tertiary alcohol   d) Aromatic alcohol

12. Which of the following reagents would not be a good choice for reducing an aryl nitro compound to an amine? **[1]**

    a) Fe and HCl   b) $LiAlH_4$ in ether

c) Sn and HCl   d) H_2 (excess)/Pt

13. **Assertion (A):** Sucrose is a non-reducing sugar.   **[1]**

     Reason (R): Reducing groups of glucose and fructose are involved in glycosidic bond formation.

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

     c) Assertion (A) is correct, but Reason (R) is   d) Assertion (A) is incorrect, but Reason (R) is
        incorrect statement.   correct statement.

14. **Assertion (A):** The α-hydrogen atom in carbonyl compounds is less acidic.   **[1]**

     Reason (R): The anion formed after the loss of α-hydrogen atom is resonance stabilised.

     a) Both A and R are true and R is the correct   b) Both A and R are true but R is not the
        explanation of A.   correct explanation of A.

     c) A is true but R is false.   d) A is false but R is true.

15. **Assertion (A):** Benzyl bromide when kept in acetone-water, it produces benzyl alcohol.   **[1]**

     Reason (R): The reaction follows S_N2 mechanism.

     a) Both A and R are true and R is the correct   b) Both A and R are true but R is not the
        explanation of A.   correct explanation of A.

     c) A is true but R is false.   d) A is false but R is true.

16. **Assertion (A):** Phenol undergoes Kolbe's reaction but ethanol does not.   **[1]**

     Reason (R): Phenol is more acidic than ethanol.

     a) Both A and R are true and R is the correct   b) Both A and R are true but R is not the
        explanation of A.   correct explanation of A.

     c) A is true but R is false.   d) A is false but R is true.

<div align="center">Section B</div>

17. Write the formula of the following complexes: **[2]**

     i. Hexaammine platinum (IV) chloride.

     ii. Dichloro tetrammine cobalt (III) ion.

18. The outer electronic configuration of atoms of two members of lanthanoid series are given below: **[2]**

     i. $4f^1 5d^1 6s^2$

     ii. $4f^7 5d^0 6s^2$

     Find their atomic number. What oxidation states will possibly be exhibited by these elements?

19. **Answer the following:**   **[2]**

     (a)   Write the slope value obtained in the plot of log $\frac{[R_o]}{[R]}$ Vs. time for a first-order reaction.   **[1]**

     (b)   Write the slope value obtained in the plot of ln[R] vs. time for a first order reaction.   **[1]**

20. Give an example of solid solution in which the solute is a gas.   **[2]**

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

     a. Differentiate between Ideal solution and Non-ideal solution.

b. 30 g of urea is dissolved in 846 g of water. Calculate the vapour pressure of water for this solution if vapour pressure of pure water at 298 K is 23.8 mm Hg.

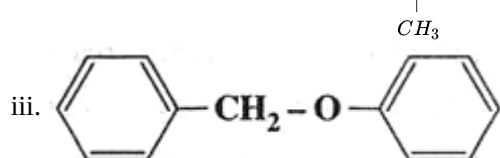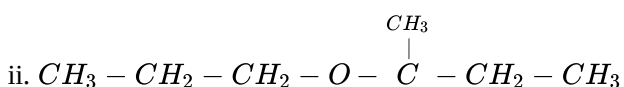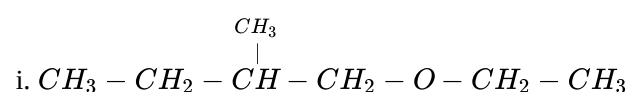21. How is aminomethane obtained from ethanal (acetaldehyde)? **[2]**

<div align="center">

Section C

</div>

22. i. The conductivity of 0.001 mol L^{-1} solution of CH$_3$COOH is 3.905 $\times$ 10^{-5} S cm^{-1}. Calculate its molar **[3]** conductivity and degree of dissociation (α). Given, $\lambda^\circ \left(\mathrm{H^+} \right) = 349.6 \mathrm{Scm^2 mol^{-1}}$ and $\lambda^\circ \left(\mathrm{CH_3COO^-} \right) = 40.9 \mathrm{Scm^2 mol^{-1}}$

    ii. Define electrochemical cell. What happens if external potential applied becomes greater than E°_{cell} of electrochemical cell?

23. In general, it is observed that the rate of a chemical reaction doubles with every 10^0 rise in temperature. If this **[3]** generalization holds for a reaction in the temperature range 295 K to 305 K, what would be the activation energy for this reaction? $\left(R = 8.314 Jk^{-1} mol^{-1} \right)$

24. Give the major products that are formed by heating each of the following ethers with HI. **[3]**

$$\text{i. } CH_3 - CH_2 - \overset{\overset{\displaystyle CH_3}{|}}{CH} - CH_2 - O - CH_2 - CH_3$$

$$\text{ii. } CH_3 - CH_2 - CH_2 - O - \overset{\overset{\displaystyle CH_3}{|}}{\underset{\underset{\displaystyle CH_3}{|}}{C}} - CH_2 - CH_3$$

iii.

<div align="center">

OR

</div>

What is fermentation? How is ethanol obtained by fermentation of molecules giving chemical equations?

25. When liquid A is treated with a freshly prepared ammoniacal silver nitrate solution, it gives bright silver mirror. **[3]** The liquid forms a white crystalline solid on treatment with sodium hydrogensulphite. Liquid B also forms a white crystalline solid with sodium hydrogensulphite but it does not give test with ammoniacal silver nitrate. Which of the two liquids is aldehyde? Write the chemical equations of these reactions also.

26. Calculate the emf of the following cell: **[3]**

Mg(s)|Mg^{2+}(0.2M) || Ag$^+$(1 $\times$ 10^{-3}M) | Ag(s)

E^0(Ag$^+$/Ag) = 0.80V

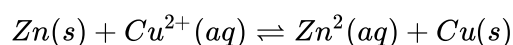E^0(Mg^{2+}/Mg) = - 2.37V

27. How the following conversions can be carried out? **[3]**

    i. 2-Methyl-1-propene to 2-chloro-2-methylpropane

    ii. Ethyl chloride to propanoic acid

    iii. But-1-ene to n-butyliodide

28. Calculate the equilibrium constant for the reaction. **[3]**

$Zn(s) + Cu^{2+}(aq) \rightleftharpoons Zn^2(aq) + Cu(s)$

Given: $E^0_{Zn^{2+}/Zn} = -0.763V$

and $E^0_{cu^{2+}/cu} = +0.34V$

<div align="center">

Section D

</div>

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

The f-block consists of the two series, lanthanoids (the fourteen elements following lanthanum) and actinoids (the fourteen elements following actinium). Because lanthanum closely resembles the lanthanoids. The chemistry of the actinoids is much more complicated. The complication arises partly owing to the occurrence of a wide range of oxidation states in these elements and partly because their radioactivity creates special problems in their study. The overall decrease in atomic and ionic radii from lanthanum to lutetium (the lanthanoid contraction) is a unique feature in the chemistry of the lanthanoids. In the lanthanoids, La(II) and Ln(III) compounds are predominant species.
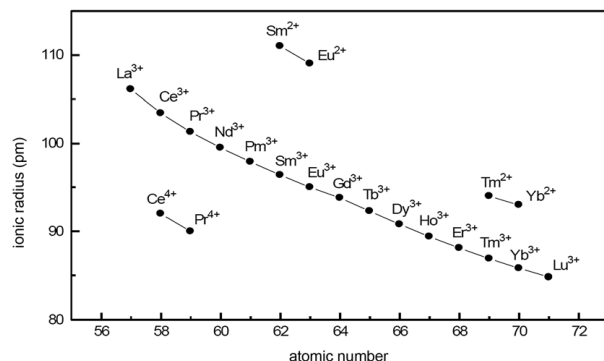
i. Which metal in the first transition series (3d series) exhibits +1 oxidation state most frequently and why? (1)

ii. The transition metals (with the exception of Zn, Cd and Hg) are hard and have high melting and boiling points. Give reason. (1)

iii. Both O_2 and F_2 stabilize high oxidation states of transition metals but the ability of oxygen to do so exceeds that of fluorine. Give reason. (2)

OR

The atomic radii of the metals of the third (5d) series of transition elements are virtually the same as those of the corresponding members of the second (4d) series. Give reason. (2)

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

Aariv Sharma is very fond of a special drink made by his grandmother using different fruits available in their hometown. It has an outstanding taste and also provide great health benefits of natural fruits. He thought of utilizing his grandmother recipe to create a new product in the beverage market that provide health benefits and also contain fizziness of various soft drinks available in the market.

i. How he can add fizz to the special drink made by his grandmother? (1)

ii. What is the law stated in the chapter that can help Aariv to make his drink fizzy? (1)

iii. What precautions he should take while bottling so that his product does not lose fizz during storage and handling across long distances? (2)

OR

The mole fraction of helium in a saturated solution at 20°C is 1.2×10-6. Find the pressure of helium above the solution. Given Henry's constant at 20°C is 144.97 kbar. (2)

Section E

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

(a) Differentiate between: **[1]**

i. Peptide linkage and Glycosidic linkage

ii. Nucleoside and Nucleotide

(b) What products would be formed when a nucleotide from DNA containing thymine is hydrolysed? **[1]**

(c) Which monosaccharide units are present in starch, cellulose and glycogen and which linkages link **[1]**

these units?

    (d)   Write the full forms of DNA and RNA. **[1]**

    (e)   Write two differences between DNA and RNA. **[1]**

    (f)   a. Write chemical reaction to show that open structure of D-glucose contains the straight chain. **[1]**

            b. What type of linkage is responsible for the formation of protein?

    (g)   What are biocatalysts? Give an example. **[1]**

32.   Discuss the nature of bonding in the following coordination entities on the basis of valence bond theory. **[5]**

    a. $[Fe(CN)_6]^{4-}$

    b. $[FeF_6]^{3-}$

    c. $[Co(C_2O_4)_3]^{3-}$

    d. $[CoF_6]^{3-}$

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

    a. A metal ion M^{n+} having d^4 valence electronic configuration combines with three bidentate ligands to form a complex compound. Assuming $\Delta_o > P$.

        i. Write the electronic configuration of d^4 ion.

        ii. What type of hybridization will M^{n+} ion has?

        iii. Name the type of isomerism exhibited by this complex.

    b. Using IUPAC norms, write the formula for the following complexes:

        i. Tetraaminediaquacobalt(III) chloride

        ii. Dibromidobis(ethane-1, 2-diamine)platinum(IV) nitrate

33.   Describe a method for the identification of primary, secondary and tertiary amines. Also write chemical **[5]** equations of the reactions involved.

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

Give one chemical test to distinguish between the following pairs of compounds:

    i. Methylamine and dimethylamine

    ii. Secondary and tertiary amines

    iii. Ethylamine and aniline

    iv. Aniline and benzylamine

    v. Aniline and N-methyl aniline