

SAMPLE QUESTION PAPER - 1
Subject – Chemistry (043)
Class XII

Time Allowed: 3 hours
Maximum Marks: 70
General Instructions:

Read the following instructions carefully.

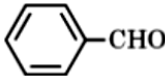
- There are **33** questions in this question paper with internal choice.
- SECTION A** consists of 16 multiple-choice questions carrying **1 mark** each.
- SECTION B** consists of 5 very short answer questions carrying **2 marks** each.
- SECTION C** consists of 7 short answer questions carrying **3 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

- Which one of the following compounds is more reactive towards S_N1 reaction? [1]
 (a) $C_6H_5CH(C_6H_5)Br$ (b) $CH_2 = CHCH_2Br$
 (c) $C_6H_5CH(CH_3)Br$ (d) $C_6H_5CH_2Br$
- β -pleated sheet structure in proteins refers to [1]
 (a) tertiary structure (b) primary structure
 (c) quaternary structure (d) secondary structure
- Anisole can be prepared by the action of methyl iodide on sodium phenate. The reaction is called [1]
 (a) Fittigs reaction (b) Wurtzs reaction
 (c) Williamsons reaction (d) Etards reaction
- A compound (A) with molecular formula $C_5H_{10}O$, forms a phenyl hydrazone and gives negative Tollens' and iodoform tests. The compound on reduction gives n-pentane. The compound (A) is: [1]
 (a) Pentan-3-one (b) Pentan-2-one
 (c) Pentanal (d) Pentanol
- The ionic reactions are generally very fast because [1]
 (a) It does not involve bond breaking
 (b) The number of collisions between ions are very large
 (c) Reactions are highly exothermic
 (d) The energy of interaction between charged
- Match the items given in column I with that in column II. [1]

	Column I		Column II
(a)	Molarity	(i)	$\frac{\text{Mass of solute}}{\text{Mass of solution}} \times 10^6$
(b)	Molality	(ii)	Number of gram moles of a solute per litre of solution
(c)	Normality	(iii)	Number of gram moles of a solute per kg of solvent
(d)	ppm	(iv)	Number of gram equivalent of a solute per litre of solution

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

7. Chlorine reacts with cold and dilute NaOH to give [1]
 (a) NaClO and NaClO₃ (b) NaCl and NaClO₃
 (c) NaCl and NaClO (d) NaCl and NaClO₄
8. The incorrect statement about interstitial compounds is: [1]
 (a) They retain metallic conductivity. (b) They are very hard.
 (c) They are chemically reactive. (d) They have high melting point.
9. The half life of a substance in a first order reaction is 15 min. The rate constant is [1]
 (a) $4.62 \times 10^{-2} \text{ min}^{-1}$ (b) $6.74 \times 10^{-2} \text{ min}^{-1}$
 (c) $2.46 \times 10^2 \text{ min}^{-1}$ (d) $7.18 \times 10^2 \text{ min}^{-1}$
10. Which of the following does not give Cannizzaro reaction? [1]
 (a) (CH₃)₃C-CHO (b) (CH₃)₂CH-CHO (c) HCHO (d) 
11. The conversion of an alkyl halide into alcohol by aqueous NaOH is classified as [1]
 (a) a dehydrohalogenation reaction (b) a substitution reaction
 (c) an addition reaction (d) a dehydration reaction
12. Which of the following methods of preparation of amines will give same number of carbon atoms in the chain of amines as in the reactant? [1]
 (a) Treatment of amide with bromine in an aqueous solution of sodium hydroxide
 (b) Heating alkylhalide with potassium salt of phthalimide followed by hydrolysis
 (c) Reaction of nitrite with LiAlH₄
 (d) Reaction of amide with LiAlH₄ followed by treatment with water
13. **Assertion (A):** Primary structure of proteins gives an idea about the conformation of the molecule. [1]
Reason (R): The differences in chemical and biological properties of various proteins arise due to the difference in primary structure.
 (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):** RCHO, RCOCH₃ and cyclic ketones react with sodium bisulphite. [1]
Reason (R): Crystalline solid derivatives are formed when aldehydes or ketones are shaken with saturated aqueous solution of sodium bisulphite.
 (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):** Aryl halide gives a mixture of o- and p-products. [1]
Reason (R): Aryl halides undergo electrophilic substitutions more readily than benzene.
 (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.

16. **Assertion (A):** Last traces of moisture in ethanol can be removed by keeping it over sodium wire [1]

Reason (R): Sodium reacts with water but not with ethanol to produce H₂ gas.

- (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) Both A and R are false.

Section B

17. i. What type of isomerism is shown by the complex $[\text{Cr}(\text{H}_2\text{O})_6]\text{Cl}_3$? [2]
 ii. On the basis of crystal field theory, write the electronic configuration for d^4 ion if $\Delta_o > P$.
 iii. Write the hybridization and shape of $[\text{CoF}_6]^{3-}$. (Atomic number of Co = 27)

18. What is lanthanoid contraction? What is its effect on the chemistry of elements which follow lanthanoids [2]

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

- (a) For a certain reaction large fraction of molecules has energy more than the threshold energy, yet the rate of reaction is very slow. Why? [1]
 (b) State a condition under which a bimolecular reaction is kinetically first-order reaction. [1]

20. The vapour pressure of pure benzene at a certain temperature is 0.850 bar. A non-volatile, non-electrolyte solid weighing 0.5 g when added to 39.0 g of benzene (molar mass 78 g mol⁻¹). Vapour pressure of the solution, then, is 0.845 bar. What is the molar mass of the solid substance? [2]

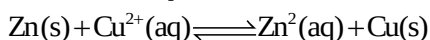
OR

Calculate the osmotic pressure in pascals exerted by a solution prepared by dissolving 1.0 g of polymer of molar mass 185,000 in 450 mL of water at 37°C.

21. Describe how the following conversions can be brought about (any two)? [2]
 i. Cyclohexanol to cyclohexan-1-one.
 ii. Ethyl benzene to benzoic acid.
 iii. Bromobenzene to benzoic acid.

Section C

22. Calculate the equilibrium constant for the reaction. [3]

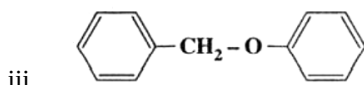
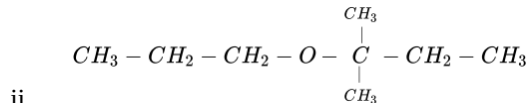
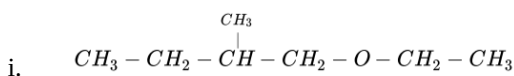


Given : $E^\circ_{\text{Zn}^{2+}/\text{Zn}} = -0.763\text{V}$

and $E^\circ_{\text{Cu}^{2+}/\text{Cu}} = +0.34\text{V}$

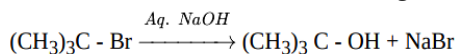
23. Consider a certain reaction $\text{A} \rightarrow \text{Products}$ with $k = 2.0 \times 10^{-2} \text{ s}^{-1}$. Calculate the concentration of A remaining after 100 s if the initial concentration of A is 1.0 mol L⁻¹. [3]

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



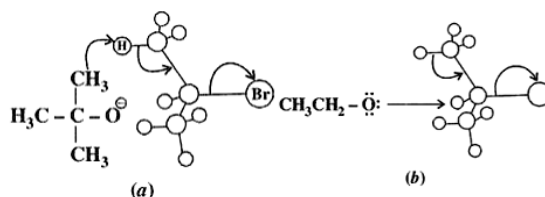
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- i. Write the mechanism of the following S_N1 reaction:



- ii. Write the equation for the preparation of 2-methyl-2-methoxypropane by Williamson synthesis.

25. Arrange the following compounds in the increasing order of their property indicated: [3]
 i. Acetaldehyde, Benzaldehyde, Acetophenone, Acetone (Reactivity towards HCN)
 ii. $(\text{CH}_3)_2\text{CHCOOH}$, $\text{CH}_3\text{CH}_2\text{CH}(\text{Br})\text{COOH}$, $\text{CH}_3\text{CH}(\text{Br})\text{CH}_2\text{COOH}$ (Acidic strength)
 iii. $\text{CH}_3\text{CH}_2\text{OH}$, CH_3CHO , CH_3COOH (Boiling point)
26. One half-cell in a voltaic cell is constructed from a silver wire dipped in silver nitrate solution of unknown concentration. The other half-cell consists of a zinc electrode in 1.0 M solution of $\text{Zn}(\text{NO}_3)_2$. A voltage of 1.48 V is measured for this cell. Use this information to calculate the concentration of silver nitrate solution. [Given, $E^\circ_{\text{Zn}^{2+}/\text{Zn}} = -0.763\text{V}$ and $E^\circ_{\text{Ag}^+/\text{Ag}} = +0.80\text{V}$]. [3]
27. One of the two figures given below represents substitution and the other represents elimination. Indicate which is substitution and which is elimination. [3]



28. What is an electrochemical series? How does it help in calculating the e.m.f of a standard cell? [3]

Section D

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

The transition metals when exposed to oxygen at low and intermediate temperatures form thin, protective oxide films of up to some thousands of Angstroms in thickness. Transition metal oxides lie between the extremes of ionic and covalent binary compounds formed by elements from the left or right side of the periodic table. They range from metallic to semiconducting and deviate by both large and small degrees from stoichiometry. Since d-electron bonding levels are involved, the cations-exist in various valence states and hence give rise to a large number of oxides. The crystal structures are often classified by considering a cubic or hexagonal close-packed lattice of one set of ions with the other set of ions filling the octahedral or tetrahedral interstices. The actual oxide structures, however, generally show departures from such regular arrays due in part to distortions caused by packing of ions of different size and to ligand field effects. These distortions depend not only on the number of d-electrons but also on the valence and the position of the transition metal in a period or group.

- Why does copper, which is in first series of transition metal exhibits +1 oxidation state most frequently? (1)
- The lowest oxide of transition metal is basic. Why? (1)
- The variability in oxidation states of d-block different from that of the p-block elements. Explain. (2)

OR

Crystal structure of oxides of transition metals often show defects. Given 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.

- How he can add fizz to the special drink made by his grandmother? (1)
- What is the law stated in the chapter that can help Aariv to make his drink fizzy? (1)
- 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]
- What is the structural feature characterising reducing sugars? [1]
 - What type of linkage is present in polysaccharides? [1]
 - Give examples of fat soluble vitamins. [1]
 - The two strands in DNA are not identical but are complementary. Explain. [1]
 - Write uses of B-Complex. [1]
 - Name the disaccharide which on hydrolysis gives two molecules of glucose. [1]
 - Name purines present in DNA? [1]
32. Write the IUPAC names of the following coordination compounds: [5]
- $[\text{Pt}(\text{NH}_3)_2\text{Cl}(\text{NO}_2)]$
 - $\text{K}_3[\text{Cr}(\text{C}_2\text{O}_4)_3]$
 - $[\text{CoCl}_2(\text{en})_2]\text{Cl}$
 - $[\text{Co}(\text{NH}_3)_5(\text{CO}_3)]\text{Cl}$
 - $\text{Hg}[\text{Co}(\text{SCN})_4]$

OR

Using Valence bond theory, explain the following in relation to the paramagnetic complex $[\text{Mn}(\text{CN})_6]^{3-}$

- type of hybridisation
 - magnetic moment value
 - type of complex - inner, outer orbital complex
33. i. Write the structures of main products when benzene diazonium chloride ($\text{C}_6\text{H}_5\text{N}_2^+\text{Cl}^-$) reacts with the following reagents : [5]
- HBF_4 / Δ
 - Cu / HBr
- ii. Write the structures of A, B and C in the following reactions :
- $\text{C}_6\text{H}_5\text{NO}_2 \xrightarrow{\text{Sn/HCl}} \text{A} \xrightarrow[273\text{ K}]{\text{NaNO}_2 + \text{HCl}} \text{B} \xrightarrow[\Delta]{\text{H}_2\text{O}} \text{C}$
 - $\text{CH}_3\text{Cl} \xrightarrow{\text{KCN}} \text{A} \xrightarrow{\text{LiAlH}_4} \text{B} \xrightarrow[273]{\text{HNO}_2} \text{C}$

OR

- Illustrate the following reactions giving suitable example in each case:
 - Ammonolysis
 - Coupling reaction
 - Acetylation of amines
- Describe Hinsberg method for the identification of primary, secondary and tertiary amines. Also, write the chemical equations of the reactions involved.

*** End ***

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