Explore Experiment Excel...

$CH_3COOH$ $C_2H_5OH$

$H_2SO_4$ $NaCl \rightarrow Na^+ + Cl^-$

Chemistry Builds a Better Tomorrow

HIGHER SECONDARY SECOND YEAR

# CHEMISTRY

## LESSON-WISE PYQ AND IMPORTANT QUESTIONS

1 ★ Important Two-Mark Questions

2 ★ Three-Mark Questions

3 ★ Five-Mark Questions

Small Molecules Big Changes

Organic Chemistry

Inorganic Chemistry

Physical Chemistry

Analytical Chemistry


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CHEMISTRY GURU

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Academic Year

**2026 – 2027**

Good Chemistry Brighter Futures

# CHEMISTRY GURU


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# 1. METALLURGY

| No. | Questions | Exam Year(s) |
|---|---|---|
| 1 | What are the differences between a mineral and an ore? | 2020, 2022 |
| 2 | What are the various steps involved in the extraction of pure metals from their ores? | |
| 3 | Match the given ores with their respective metals. | |
| 4 | Explain the following with suitable examples:<br>(a) Gangue (b) Slag (c) Mineral waste. | 2020 |
| 5 | For which type of ores is the froth flotation method suitable? Give two examples of such ores. | 2020, 23, 25 |
| 6 | Describe the froth flotation method. | 2021 |
| 7 | Write a note on the gravity separation method. | 2022, 2026 |
| 8 | Explain acid leaching with an example. | 2022 |
| 9 | Write about magnetic separation. | |
| 10 | What is roasting in a limited/controlled air atmosphere? Give an example. | 2024, 2026 |
| 11 | What is the use of limestone in the extraction of iron from its ore $Fe_2O_3$? | 2020, 2025 |
| 12 | Explain the role of the following in the processes given:<br>(i) Silica in copper extraction<br>(ii) Sodium cyanide in the froth flotation process. | 2024 |
| 13 | Write about blister copper. | |
| 14 | What is self-reduction? | |
| 15 | What are the limitations of the Ellingham diagram? | 2023, 2025 |
| 16 | Explain the electrolytic metallurgical method for aluminium. | |
| 17 | Explain the role of the following:<br>(i) Cryolite in the extraction of aluminium<br>(ii) Iodine in the purification of zirconium. | 2025 |
| 18 | Explain the principle of electrolytic refining with silver as an example. | 2022 |
| 19 | Write about the liquation method. | 2023 |
| 20 | Describe zone refining with an example. | 2020, 2023 |
| 21 | State the basic requirements for purification by the vapour-phase method. | 2026 |
| 22 | Describe the Mond process used for the purification of nickel. | 2022, 23, 25 |
| 23 | Write about the Van Arkel method for the purification of zirconium and titanium. | 2025 |
| 24 | Write any two uses of each of the following metals:<br>(I) Aluminium (II) Zinc (III) Gold. | |

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## 2. p-BLOCK ELEMENTS – I

| No. | Questions | Exam Year(s) |
|---|---|---|
| 1 | Give one example each for:<br>(a) Chalcogen (b) Tetragens (c) Pnictogen (d) Halogen. | 2023 |
| 2 | Write a short note on the anomalous behaviour of the first element of the p-block groups. | 2020, 2021 |
| 3 | What is back bonding? | 2022 |
| 4 | Give the uses of borax. | 2021, 2025 |
| 5 | Write about the borax bead test. | |
| 6 | Write the uses of boron. | |
| 7 | Write about the ethyl borate test. (Or)<br>How will you identify borate salt? | 2023, 2025 |
| 8 | How will you convert boric acid into boron nitride? | 2024 |
| 9 | Write the uses of boric acid. | 2022, 2024 |
| 10 | Write a note on the hydroboration reaction. | 2023 |
| 11 | How is the prepared mineral benzene? | |
| 12 | Describe the structure of diborane. | 2023, 2025 |
| 13 | Write a short note on the MacArthur process. | |
| 14 | How is potash alum prepared? | 2020 |
| 15 | What is burnt alum? | |
| 16 | Write the uses of alum. | |
| 17 | What is catenation? | 2020 |
| 18 | Write the conditions required for catenation. | 2020, 2022 |
| 19 | Differentiate between graphite and diamond. | |
| 20 | Write a short note on the Fischer–Tropsch process. | 2023, 2026 |
| 21 | Write about the water-gas shift reaction. | |
| 22 | What are silicates? What are the types of silicates? | 2024 |
| 23 | Give the uses of silicones. | 2023, 2026 |
| 24 | Write a note on zeolites. | |

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## 3. p-BLOCK ELEMENTS – II

| No. | Questions | Exam Year(s) |
|---|---|---|
| 1 | Write the valence-shell electronic configuration of the Group 15 elements. | |
| 2 | Give the reason for the anomalous behaviour of nitrogen. | |
| 3 | Differentiate between white phosphorus and red phosphorus. | |
| 4 | Write a note on the Holmes Signals | 2020 |
| 5 | What happens when $PCl_5$ is heated? | 2025 |
| 6 | Write the uses of oxygen. | 2022 |
| 7 | Explain the bleaching property of sulphur dioxide ($SO_2$). | 2021, 23, 25 |
| 8 | Prove that sulphuric acid is a dibasic acid. | 2020 |
| 9 | Explain with an example that sulphuric acid is a dehydrating agent. | 2023, 24, 26 |
| 10 | Write the uses of sulphuric acid. | 2025 |
| 11 | Write the molecular formulae and structures of sulphurous acid and Marshall's acid. | 2020 |
| 12 | Describe the large-scale manufacture of chlorine by the Deacon process. | 2020 |
| 13 | How is bleaching powder prepared? | 2020, 22, 25 |
| 14 | Write about the bleaching property of chlorine. | |
| 15 | Write balanced equations for the reactions of chlorine with cold NaOH and hot NaOH. | 2020 |
| 16 | Write the uses of chlorine. | |
| 17 | Why cannot HF be stored in glass bottles? | 2020 |
| 18 | What are interhalogen compounds? Give an example. | 2021, 2022 |
| 19 | What are the properties of interhalogen compounds? | 2022, 2025 |
| 20 | What is the hybridisation of iodine in $IF_7$? Give its structure. | |
| 21 | Identify the hybridisation in: (1) $BrF_5$ (2) $BrF_3$ (3) $IF_7$. | 2020, 2026 |
| 22 | State the oxidation state of the halogen in:<br>(a) $OF_2$ (b) $O_2F_2$ (c) $Cl_2O_6$ (d) $I_2O_4$. | 2023, 2025 |
| 23 | Write the uses of helium. | 2020, 2023 |
| 24 | Write the uses of argon. | 2022 |
| 25 | Complete the following reactions:<br>$P_4 + 3NaOH + 3H_2O \rightarrow 3NaH_2PO_2 + PH_3$;<br>$XeF_6 + 3H_2O \rightarrow XeO_3 + 6HF$;<br>$Cu + 2H_2SO_4 \rightarrow CuSO_4 + 2H_2O + 2SO_2$. | 2023 |

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## 4. TRANSITION AND INNER-TRANSITION ELEMENTS

| No. | Questions | Exam Year(s) |
|---|---|---|
| 1 | Classify the following elements as d-block and f-block:<br>(i) Tungsten (ii) Promethium (iii) Einsteinium<br>(iv) Ruthenium (v) Uranium. | 2020 |
| 2 | What are transition elements? Give an example. | |
| 3 | Why do transition elements have high melting points? | |
| 4 | Explain the variable oxidation states of transition (d-block) elements. | 2021 |
| 5 | Which is more stable, $Fe^{3+}$ or $Fe^{2+}$? Why? | 2022, 2024 |
| 6 | Which element in the 3d series shows the +1oxidation state? Why? | 2020 |
| 7 | Differentiate between paramagnetism and diamagnetism. | |
| 8 | Calculate the number of unpaired electrons and magnetic moment for $Ti^{3+}$ and $Mn^{2+}$. | 2021 |
| 9 | State the Hume–Rothery rules for alloy formation. | |
| 10 | Write a note on the Ziegler–Natta catalyst. What is its use? | 2022 |
| 11 | What are interstitial compounds? | 2020, 21, 23 |
| 12 | What are the properties of interstitial compounds? | 2022 |
| 13 | Why do transition elements form coordination compounds? | |
| 14 | Explain the preparation of potassium dichromate. | 2025 |
| 15 | Write the chromyl chloride test. | 2020 |
| 16 | Explain the oxidising property of $KMnO_4$. | |
| 17 | Complete the following $KMnO_4 \xrightarrow[\text{Red hot}]{\Delta} ?$ | 2025 |
| 18 | Establish the position of lanthanoids and actinoids in the periodic table. | |
| 19 | Give the electronic configurations of $Ce^{4+}$ and $Co^{2+}$. | 2026 |
| 20 | What is lanthanoid contraction? What are its consequences? | 2020, 2023, 2024, 2026 |
| 21 | The $Gd^{3+}$ ion is colourless. Why? | |
| 22 | Zirconium and hafnium have similar properties. Why? | 2025 |
| 23 | Which is more basic, $Lu(OH)_3$ or $La(OH)_3$? Why? | |
| 24 | Compare lanthanoids and actinoids. | 2022, 23, 25 |

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## 5. COORDINATION CHEMISTRY

| No. | Questions | Exam Year(s) |
|---|---|---|
| 1 | What are the differences between double salts and coordination compounds? | 2020, 2021, 2024, 2026 |
| 2 | State the postulates of Werner's theory. | 2020, 22, 25 |
| 3 | Define the central metal atom in a coordination compound. | 2023 |
| 4 | For $[Pt(NO_2)(H_2O)(NH_3)_2]Br$, identify:<br>(i) central metal atom (ii) ligands (iii) coordination number<br>(iv) oxidation number of the central metal ion. | 2023 |
| 5 | Write the names of the following ligands:<br>(i) $H_2O$ (ii) $Cl^-$ (iii) $C_2O_4^{2-}$ (iv) $NH_3$. | 2022 |
| 6 | Give the IUPAC names of: (i) $[Ag(NH_3)_2]^+$ (ii) $[Co(NH_3)_5Cl]^{2+}$. | 2020 |
| 7 | Write the ligand, central metal ion and name of $[Ag(NH_3)_2]^+$. | 2022 |
| 8 | What are hydrate isomers? Explain with an example. | 2025 |
| 9 | Identify the type of isomerism shown by:<br>(a) $[Co(NH_3)_4Br_2]Cl$ and $[Co(NH_3)_4ClBr]Br$<br>(b) $[Co(NH_3)_5NO_2]^{2+}$ and $[Co(NH_3)_5ONO]^{2+}$<br>(c) $[Pt(NH_3)_4][PdCl_4]$ and $[Pd(NH_3)_4][PtCl_4]$. | 2026 |
| 10 | Write any two hydrate isomers of the coordination compound $CrCl_3 \cdot 6H_2O$. | 2020 |
| 11 | Identify the isomerism present in:<br>(i) $[Co(en)_3]^{3+}$ (ii) $[Pt(NH_3)_2Cl_2]^{2+}$. | 2020 |
| 12 | Draw all possible geometrical isomers of $[Co(en)_2Cl_2]^+$ and identify the optically active isomers. | 2023, 2025 |
| 13 | Explain why $[Ni(CN)_4]^{2-}$ is diamagnetic using Valence Bond theory. | 2021 |
| 14 | Explain, using Valence Bond theory, why $[Ni(CO)_4]$ is tetrahedral while $[Ni(CN)_4]^{2-}$ is square planar. | 2026 |
| 15 | What are the limitations of Valence Bond theory? | 2021, 2022 |
| 16 | Draw the crystal-field splitting diagram of d-orbitals in an octahedral crystal field. | 2020 |
| 17 | For $K_4[Mn(CN)_6]$, give the oxidation state of the central metal ion, coordination number, nature of the ligand, magnetic property and electronic configuration in an octahedral crystal field. | 2023 |
| 18 | Explain why $[Ti(H_2O)_6]^{3+}$ is coloured whereas $[Sc(H_2O)_6]^{3+}$ is colourless. | 2020, 2025 |
| 19 | Explain the nature of bonding in metal carbonyls. | 2023 |
| 20 | Give one example of a coordination compound used in medicine and two examples of biologically important coordination compounds. | 2020, 2024 |

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## 6. SOLID STATE

| No. | Questions | Exam Year(s) |
|---|---|---|
| 1 | Differentiate crystalline solids from amorphous solids. | 2020, 2022, 2023, 2026 |
| 2 | Classify the following solids:<br>(a) $P_4$ (b) Brass (c) Diamond (d) NaCl (e) Iodine. | 2021 |
| 3 | Differentiate isotropic and anisotropic properties of solids. | 2020 |
| 4 | State any three properties of ionic crystals. | |
| 5 | Define covalent crystals. | 2022 |
| 6 | Define unit cell. | 2021, 2022 |
| 7 | Briefly explain the seven types of unit cells. | |
| 8 | Calculate the number of atoms present in SC, BCC and FCC unit cells. | 2023 |
| 9 | What is coordination number? What is the coordination number of an atom in BCC? | 2021, 2025 |
| 10 | Using Bragg's equation, how can the edge length of a unit cell be calculated? | |
| 11 | Define packing efficiency or packing fraction. | 2022 |
| 12 | Calculate the percentage packing efficiency in a body-centred cubic structure. | 2024, 2026 |
| 13 | Differentiate tetrahedral and octahedral voids. | 2020, 2025 |
| 14 | What are point defects? | |
| 15 | Explain Schottky defect. | 2020, 2023 |
| 16 | Explain Frenkel defect. | 2022, 23, 25 |
| 17 | Explain metal excess defect with an example. | 2025 |
| 18 | Explain metal deficiency defect with an example. | |
| 19 | Explain impurity defect. | |
| 20 | Aluminium crystallises in a cubic close-packed structure. If its metallic radius is 125 pm, calculate the edge length of the unit cell. | 2024 |

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## 7. CHEMICAL KINETICS

| No. | Questions | Exam Year(s) |
|---|---|---|
| 1 | Define rate law and rate constant. | |
| 2 | Differentiate rate of reaction and rate constant. | 2021, 2023 |
| 3 | Define order of reaction and molecularity. | 2022 |
| 4 | What is order of reaction? | 2024 |
| 5 | Explain the step that determines the rate of a reaction with an example. | 2026 |
| 6 | Derive the integrated rate law for a first-order reaction A → product. | 2020, 2024 |
| 7 | Write three examples of first-order reactions. | 2022, 2025 |
| 8 | Explain a pseudo-first-order reaction with an example. | 2025 |
| 9 | Give two examples of zero-order reactions. | 2023 |
| 10 | A zero-order reaction is 20% complete in 20 minutes. Calculate the rate constant. How much time is required for 80% completion? | |
| 11 | Define half-life of a reaction. | 2023 |
| 12 | Show that the half-life of a first-order reaction is independent of initial concentration. | |
| 13 | Show that the time required for 99.9% completion of a first-order reaction is approximately ten times the time required for 90% completion. | 2023 |
| 14 | Briefly explain collision theory for bimolecular reactions. | |
| 15 | Why does powdered $CaCO_3$ react faster with dilute HCl than the same amount of $CaCO_3$ marble? | 2020 |
| 16 | Explain with an example how a catalyst affects the rate of a chemical reaction. | 2020 |
| 17 | The rate constant of a first-order reaction is $1.54 \times 10^{-3}$ $s^{-1}$. Calculate its half-life. | 2020, 2025 |
| 18 | Derive the integrated rate law for a zero-order reaction A → product. | 2021, 2022, 2023 |
| 19 | Prove that, for a first-order reaction, $t_{99.9}\% = 10t_{1/2}$. | 2026 |
| 20 | Write the Arrhenius equation and explain the terms involved. | 2022, 2024 |
| 21 | If the orders with respect to reactants X, Y and Z are 1/2, 3/2 and zero respectively, write the rate law. | 2026 |

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## 8. IONIC EQUILIBRIUM

| No. | Questions | Exam Year(s) |
|---|---|---|
| 1 | Explain Arrhenius theory of acids and bases. | |
| 2 | What are the limitations of Arrhenius theory? | 2022 |
| 3 | Explain the Lowry–Brønsted theory of acids and bases. | |
| 4 | What are conjugate acid–base pairs? | 2023 |
| 5 | What are Lewis acids and Lewis bases? Give two examples of each. | 2020, 2022 |
| 6 | Differentiate Lewis acids and Lewis bases. | |
| 7 | Classify the following as Lewis acids or Lewis bases: (i) $BF_3$ (ii) $CO_2$ (iii) MgO (iv) $NH_3$ (v) $CH_3^-$ (vi) $Cu^{2+}$. | 2020 |
| 8 | Define ionic product of water and give its value at room temperature. | 2020 |
| 9 | Define pH. | 2022, 2025 |
| 10 | A fruit juice has $[H_3O^+] = 2 \times 10^{-3}$ M. Calculate $[OH^-]$ and determine whether the solution is acidic/basic. | 2023 |
| 11 | Write the approximate pH values of: (i) vinegar (ii) strong coffee (iii) baking soda solution (iv) soap water. | 2020 |
| 12 | Derive the relationship between pH and pOH. | |
| 13 | Derive Ostwald's dilution law. | 2020, 2021, 2023, 2026 |
| 14 | Explain the common-ion effect with an example. | 2020, 22, 24 |
| 15 | Calculate the pH of 0.1 M $CH_3COOH$. Ka = $1.8 \times 10^{-5}$. | 2025 |
| 16 | What is a buffer solution? Explain with an example. | 2022 |
| 17 | Define buffer action. | 2020 |
| 18 | What are the types of buffer solutions? | |
| 19 | What are buffer capacity and buffer number (β)? | 2024 |
| 20 | Derive the Henderson–Hasselbalch equation. | 2020, 2025 |
| 21 | Calculate the pH of a buffer containing 0.20 mol $L^{-1}$ sodium acetate and 0.18 mol $L^{-1}$ acetic acid. Ka = $1.8 \times 10^{-5}$. | 2021 |
| 22 | Define solubility product. | 2025 |
| 23 | For 0.1 M $CH_3COONa$, calculate (i) hydrolysis percentage (ii) hydrolysis constant (iii) pH. pKa of $CH_3COOH$ = 4.74. | 2020 |
| 24 | Establish the relation between solubility product and molar solubility for: (a) $BaSO_4$ (b) $Ag_2CrO_4$. | |
| 25 | Calculate the pH of $1.50 \times 10^{-3}$ M $Ba(OH)_2$ solution. | 2026 |

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## 9. ELECTROCHEMISTRY

| No. | Questions | Exam Year(s) |
|---|---|---|
| 1 | Define molar conductivity ($\Lambda_m$). | |
| 2 | In a conductivity cell, the distance between two platinum electrodes is 1.5 cm and the area of each electrode is 4.5 $cm^2$. The resistance measured for a 0.5 N electrolyte solution is 15 Ω. Calculate the specific conductivity. | 2020 |
| 3 | Define equivalent conductivity (Λ). | 2021, 2025 |
| 4 | State the factors affecting electrolytic conductivity. | 2021, 2022 |
| 5 | Why is AC current used instead of DC current when measuring electrolytic conductivity? | |
| 6 | Derive the Debye–Hückel and Onsager equation. | |
| 7 | State Kohlrausch's law. How is it used to determine the molar conductivity of a weak electrolyte at infinite dilution? | 2020, 2025 |
| 8 | Why does the conductivity of a solution decrease on dilution? | |
| 9 | Explain the construction of a Daniell cell and write the cell reaction. | |
| 10 | Explain the cell notation of a galvanic cell. | 2024 |
| 11 | Why is a salt bridge used in galvanic cells? | 2026 |
| 12 | Write a note on the Standard Hydrogen Electrode (SHE). | |
| 13 | Explain the thermodynamics of cell reactions. | 2026 |
| 14 | Derive the Nernst equation. | 2020, 2022, 2025 |
| 15 | State Faraday's laws of electrolysis. | 2021, 2023, 2025 |
| 16 | A silver nitrate solution is electrolysed for 20 minutes using a current of 2 A. Calculate the mass of silver deposited at the cathode. | 2020, 2022 |
| 17 | Write a note on lithium-ion batteries. | |
| 18 | Explain the working of the $H_2$–$O_2$ fuel cell. | |
| 19 | How are metals protected from corrosion by cathodic protection? | 2020 |
| 20 | Can $Fe^{3+}$ ions oxidise fluoride to fluorine under standard conditions? | 2024 |

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## 10. SURFACE CHEMISTRY

| No. | Questions | Exam Year(s) |
|---|---|---|
| 1 | Give two characteristic properties of physisorption. | 2023 |
| 2 | Differentiate physisorption and chemisorption. | 2020 |
| 3 | Explain the effect of temperature and pressure on physisorption and chemisorption. | 2024 |
| 4 | In chemisorption, why does adsorption first increase and then decrease with increase in temperature? | |
| 5 | What are the factors affecting adsorption? | 2020 |
| 6 | Define Freundlich adsorption isotherm. What are its limitations? | 2025 |
| 7 | What is a unimolecular reaction? | 2022 |
| 8 | What is a multimolecular reaction? | 2022 |
| 9 | What are the characteristics of a catalyst? | 2020, 22, 26 |
| 10 | Write notes on: (i) promoters (ii) catalyst poisons (iii) autocatalysis (iv) negative catalysis. | 2020, 2023, 2025 |
| 11 | Explain the intermediate compound formation theory of catalysis. | 2023 |
| 12 | Explain the adsorption theory of catalysis. | 2021, 2022 |
| 13 | What are active centres? | |
| 14 | Lyophilic sols are more stable than lyophobic sols. Why? | 2023 |
| 15 | What are the differences between a sol and a gel? | |
| 16 | State the dispersion medium and dispersed phase in butter. | 2020 |
| 17 | Explain the preparation of gold and graphite sols. | 2026 |
| 18 | A peptising agent is added to convert a precipitate into a colloidal solution. Explain with an example. | 2025 |
| 19 | Describe the preparation of colloids by the condensation (chemical) method. | |
| 20 | Write the forms/structures of the following colloidal particles: (i) $As_2S_3$ (ii) $Fe(OH)_3$ sol (iii) $W_3O_5$ sol. | 2020 |
| 21 | Define: (i) Tyndall effect / optical property (ii) Brownian movement / kinetic property (iii) Helmholtz electrical double layer (iv) electrophoresis (v) electro-osmosis. | 2020, 2021, 2022, 2023 |
| 22 | Give two examples of positively charged sols. | 2025 |
| 23 | What is gold number? | 2024 |
| 24 | How are colloids used in tanning and the rubber industry? | 2023 |

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# 11. HYDROXY COMPOUNDS AND ETHERS

| No. | Questions | Exam Year(s) |
|---|---|---|
| 1 | How will you prepare the following from a Grignard reagent: (i) propan-1-ol (ii) propan-2-ol? | 2020 |
| 2 | What is Lucas reagent? How is it used to distinguish ethanol/ethanol derivatives of primary, secondary and tertiary alcohols? | 2020 |
| 3 | Write the Lucas test used to distinguish 1°, 2° and 3° alcohols. | 2021, 2023, 2024 |
| 4 | Write Victor Meyer's test for distinguishing 1°, 2° and 3° alcohols. | 2020, 2025 |
| 5 | How will you carry out the following conversions?<br>(i) Ethyl alcohol → ethene (ii) Ethylene glycol → 1,4-dioxane (iii) Glycerol → acrolein. | 2025 |
| 6 | State Saytzeff's rule. | |
| 7 | How can the following conversions be carried out?<br>I. Ethylene glycol ——> Acetaldehyde<br>II. Glycerol ——> Acrolein | 2021 |
| 8 | Ethylene glycol + conc. $H_2SO_4$ ----------> X, Identify X. | 2023 |
| 9 | How will you convert glycerol into acrolein? | 2020 |
| 10 | Write the uses of glycerol. | 2022 |
| 11 | How is phenol prepared from chlorobenzene (Dow process)? | 2025 |
| 12 | How is phenol prepared from cumene? | |
| 13 | Write the Schotten–Baumann reaction. | |
| 14 | $Phenol + Zn \xrightarrow{\Delta} X$<br>$Phenol + NH_3 \xrightarrow[Anhydrous\ ZnCl_2]{\Delta} Y$ | 2025 |
| 15 | $Phenol + 3H_2 \xrightarrow[160^\circ C]{Ni}$ | |
| 16 | How is prepared picric acid? | |
| 17 | Write the Kolbe/ Kolbe–Schmitt reaction. | 2024 |
| 18 | Write the Reimer–Tiemann reaction. | |
| 19 | How will you convert phenol to phenyl ethanoate/phenyl acetate? | 2026 |
| 20 | Write the coupling reaction of phenol. | 2020 |
| 21 | What tests are used to distinguish alcohols and phenols? | |
| 22 | Write the uses of phenol. | |
| 23 | Why is the C–O–C bond angle in ethers slightly greater than the tetrahedral bond angle? | 2020 |
| 24 | Write any one method of preparing diethyl ether. | 2022 |
| 25 | Write Williamson ether synthesis. | |
| 26 | i. Ether + HI --------->x ii. Ether + excess HI ---------> | 2020 |
| 27 | Write the bromination reaction of anisole. | 2022 |
| 28 | Write about auto-oxidation of ethers. | 2020 |
| 29 | How does diethyl ether react with: (i) $Cl_2$/light<br>(ii) aqueous $H_2SO_4/H_2O$ (iii) $CH_3COCl$/anhydrous $ZnCl_2$? | 2026 |
| 30 | Write the Friedel–Crafts reaction. | |
| 31 | What are the uses of diethyl ether? | 2021 |
| 32 | Give the IUPAC name. I. $(CH_3)_3C\text{-}OH$ II. $C_6H_5—CH_2—OH$ | 2022 |

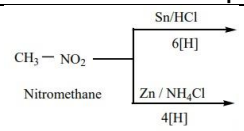
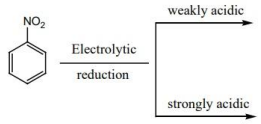
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## 12. CARBONYL COMPOUNDS AND CARBOXYLIC ACIDS

| No. | Questions | Exam Year(s) |
|---|---|---|
| 1 | How will you prepare acetaldehyde from ethane? | 2025 |
| 2 | Write Rosenmund reduction. | 2020, 2022 |
| 3 | Write Stephen's reaction. | |
| 4 | Write about the Etard reaction. | |
| 5 | Write the Gattermann–Koch reaction. | 2025 |
| 6 | Write about Friedel–Crafts acylation. | |
| 7 | What is urotropine? How is it prepared and what are its uses? | 2020 |
| 8 | How will you convert acetone into propan-2-ol by<br>(i) Clemmensen reduction (ii) Wolff–Kishner reduction? | 2023 |
| 9 | Write about the haloform reaction. | 2022 |
| 10 | Write about the aldol condensation reaction. | 2021 |
| 11 | Write about crossed aldol condensation. | |
| 12 | Write the Claisen–Schmidt condensation reaction. | |
| 13 | Write the Cannizzaro reaction and its mechanism. | 2025, 2026 |
| 14 | Write crossed Cannizzaro reaction. | |
| 15 | Write notes on: (i) Benzoin condensation (ii) Perkin reaction (iii) Knoevenagel reaction. | 2021, 2022, 2023, 2024 |
| 16 | Write notes on: (i) Schiff's reagent (ii) Malachite green. | 2021, 2023 |
| 17 | Write tests for aldehydes. | 2020 |
| 18 | An organic compound A has molecular formula $C_7H_6O$ and undergoes the Cannizzaro reaction. A reacts with chlorine in the presence of concentrated $FeCl_3$ to give B, and with chlorine in the absence of a catalyst to give C. Identify A, B and C and give suitable reactions. | 2025 |
| 19 | What is formalin? What is its use? | 2020, 2023 |
| 20 | What are the uses of aldehydes and ketones? | |
| 21 | Write about hydrolysis of esters. | |
| 22 | How is acetic acid prepared from a Grignard reagent? | 2024 |
| 23 | Write about decarboxylation. | |
| 24 | Write about Kolbe electrolysis. | |
| 25 | Write a note on the HVZ reaction. | |
| 26 | Formic acid reduces Tollens' reagent, whereas acetic acid does not. Why? | 2020 |
| 27 | Explain the reducing property of formic acid with an example. | 2022 |
| 28 | Write tests for the carboxyl group. | 2020, 2021, 2022, 2026 |
| 29 | How will you convert ethyl acetate into ethyl acetoacetate? | 2023 |
| 30 | Write the uses of carboxylic acids and their derivatives. | |

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# 13. ORGANIC NITROGEN COMPOUNDS

| No. | Questions | Exam Year(s) |
|---|---|---|
| 1 | How will you distinguish the nitro and aci forms of $CH_3NO_2$? | 2025 |
| 2 | What is chloropicrin? Give its preparation and uses. | 2020 |
| 3 |  | 2021 |
| 4 | Identify compounds A and B in the following reaction sequence. $CH_3CH_2NO_2 \xrightarrow{Sn\ /\ HCl} A \xrightarrow{CH_3COCl} B$ | 2023 |
| 5 |  | |
| 6 | Write the reduction reactions of nitrobenzene in different media. | 2020, 2022 |
| 7 | Write a note on Hofmann degradation reaction. | |
| 8 | Give a short note on Gabriel phthalimide synthesis. | 2020, 22, 25 |
| 9 | Identify compounds A and B in the following reaction sequence. $CH_3—Br \xrightarrow{NaN_3} \mathbf{A} \xrightarrow{LiAlH_4} \mathbf{B} + N_2$ | 2022 |
| 10 | Write the Schotten–Baumann reaction. | 2023 |
| 11 | How will you distinguish primary, secondary and tertiary amines? | |
| 12 | An organic compound A with molecular formula $C_2H_7N$ reacts with nitrous acid to give an unstable compound B. B is converted into compound C, which is used as a petroleum substitute. Identify A, B and C. | 2026 |
| 13 | Write the carbylamine test. | 2022 |
| 14 | Write the mustard oil test. | 2020, 2022, 2023 |
| 15 | Write the reaction of primary amines with carbon disulphide ($CS_2$). | 2024 |
| 16 | Aniline + $Br_2/H_2O \rightarrow$ X. Identify X. | 2022 |
| 17 | Give the reason why aniline does not undergo Friedel–Crafts reaction. | 2020, 2023 |
| 18 | Write the Sandmeyer reaction. | 2020 |
| 19 | Write the Gattermann reaction. | |
| 20 | Write the Balz–Schiemann reaction. | |
| 21 | Write the diazonium salt replacement (Gomberg) reaction. | 2020 |
| 22 | How will you convert benzenediazonium chloride into:<br>(i) phenol (ii) biphenyl? | 2025, 2026 |
| 23 | Write Thorpe nitrile condensation reactions. | 2023 |
| 24 | Identify compounds A, B and C in the following reaction sequence. $C_6H_5NO_2 \xrightarrow{Sn\ /\ HCl} \mathbf{A} \xrightarrow{NaNO_2+HCl} \mathbf{B} \xrightarrow{C_6H_5OH} \mathbf{C}$ | 2023 |
| 25 | Identify compounds A, B and C in the following reaction sequence. $C_6H_5NO_2 \xrightarrow{Sn\ /\ HCl} \mathbf{A} \xrightarrow{NaNO_2+HCl} \mathbf{B} \xrightarrow{CuCN} \mathbf{C}$ | 2025 |

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## 14. BIOMOLECULES

| No. | Questions | Exam Year(s) |
|---|---|---|
| 1 | How are carbohydrates classified? | |
| 2 | Classify the following as monosaccharides, oligosaccharides or polysaccharides: (i) glucose (ii) fructose (iii) sucrose (iv) maltose (v) lactose (vi) cellulose. | |
| 3 | Write about the structural formula of glucose. | |
| 4 | Write the cyclic structures of α-D-glucose and β-D-glucose. | 2024 |
| 5 | What are epimers and epimerisation? | 2022 |
| 6 | Write about the structural formula of fructose. | 2022 |
| 7 | How will you establish that the C-2 carbonyl group is present in a fructose molecule? | 2026 |
| 8 | Write the cyclic structures of α-D-fructose and β-D-fructose. | |
| 9 | Why is sucrose a non-reducing sugar? | 2025 |
| 10 | Explain the structure of sucrose. | |
| 11 | What is a glycosidic linkage? | 2020 |
| 12 | Differentiate amylose and amylopectin. Or write the structure of starch. | |
| 13 | Write the structure of cellulose. | |
| 14 | What is the importance of carbohydrates? | |
| 15 | Give examples of essential and non-essential amino acids. | |
| 16 | What are zwitterions or isoelectric point? | 2022, 2023 |
| 17 | Write a short note on peptide linkage. | 2021, 2024 |
| 18 | Draw all possible dipeptide structures formed from glycine and alanine. | |
| 19 | State the classification of proteins with examples. | 2020 |
| 20 | Write a note on denaturation of proteins. | 2020 |
| 21 | What is the importance of proteins? | 2023 |
| 22 | Define enzymes. | |
| 23 | What is the biological importance of lipids? | 2020, 2025 |
| 24 | How are vitamins classified? | |
| 25 | Name the vitamins whose deficiency causes: (i) rickets (ii) scurvy (iii) beriberi (iv) pellagra. | 2020, 2025 |
| 26 | What are the types of nucleic acids? | |
| 27 | Differentiate nucleoside and nucleotide. | |
| 28 | What are the types of RNA found in cells? | 2020, 2025 |
| 29 | Write the differences between DNA and RNA. | 2021 |
| 30 | Write a short note on DNA replication. | |
| 31 | What are hormones? Give examples. | 2023, 2026 |
| 32 | Give two differences between hormones and vitamins. | |

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## 15. CHEMISTRY IN EVERYDAY LIFE

| No. | Questions | Exam Year(s) |
|---|---|---|
| 1 | Define chemotherapy/medicinal chemistry. | |
| 2 | Define tranquillisers. | |
| 3 | How are drugs classified? | 2025 |
| 4 | What are analgesics? | |
| 5 | Classify the following drugs: (i) magnesium sulphate (ii) aspirin (iii) penicillin (iv) pyridine. | 2020 |
| 6 | What are antacids? Give an example. | |
| 7 | What are antibiotics? | 2024 |
| 8 | Differentiate antiseptics and disinfectants. | 2020, 2026 |
| 9 | What are the benefits of food additives? | 2020 |
| 10 | What are antioxidants? Give an example. | 2020 |
| 11 | What are food preservatives? Give two examples. | 2023 |
| 12 | Explain the cleansing action of soap. | |
| 13 | What is Total Fatty Matter (TFM)? | |
| 14 | How is Teflon prepared? | |
| 15 | What is a copolymer? Give two examples. | 2025 |
| 16 | How is Orlon (PAN) prepared? | |
| 17 | How are Nylon-6,6 and Nylon-6 prepared? | |
| 18 | How is Terylene prepared? (Or) Write the preparation of Dacron. | 2026 |
| 19 | Write the preparation of Bakelite. | |
| 20 | What is vulcanisation of rubber? | 2020, 23, 25 |
| 21 | Write the preparation of neoprene. | 2020 |
| 22 | Write the preparation of Buna-N and Buna-S. | |
| 23 | What is a biodegradable polymer? Give an example. | 2023, 2024 |
| 24 | Write the preparation and uses of PHBV. | |
| 25 | How is Nylon-2–Nylon-6 prepared? | 2023 |

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