

15-chapter blueprint checklist for JEE main

Chapter 1 — Chemical Bonding & Molecular Structure IC | ~8–10 Q

- VSEPR theory & geometry prediction
- MO theory for O₂, N₂, CO, NO — bond order & magnetic character
- Hybridisation — sp, sp², sp³, sp³d, sp³d²
- Bond angle trends with lone pairs
- Resonance structures & formal charge
- Dipole moment & polarity — zero vs non-zero
- Hydrogen bonding — inter vs intramolecular
- Ionic vs covalent character — Fajans' rules
- Back bonding in BF₃ and (CH₃)₃N
- Born–Haber cycle calculations

Chapter 2 — Electrochemistry PC | ~6–8 Q

- Nernst equation — derivation & equilibrium case
- EMF calculation of galvanic cells
- ΔG , K and E° cell relationship
- Kohlrausch's law & limiting molar conductivity
- Faraday's laws — quantitative electrolysis
- Standard electrode potential table usage
- Concentration cells — EMF direction
- Corrosion — galvanic & hydrogen type
- Conductance vs concentration curves
- Battery chemistry — Pb acid, NiCd, Li-ion

Chapter 3 — Chemical Kinetics PC | ~6–8 Q

- Rate law & order determination from data tables
- Integrated rate laws — 0th, 1st, 2nd order
- Half-life formulas — all three orders
- Arrhenius equation & activation energy
- Effect of catalyst — lowers E_a, NOT ΔH
- Pseudo-first-order reactions
- Mechanism & rate-determining step
- Temperature coefficient Q₁₀
- Molecularity vs order distinction
- Collision theory & steric factor

Chapter 4 — Coordination Compounds IC | ~6–8 Q

- IUPAC nomenclature — full rules
- CFT — Δ_o and Δ_t splitting
- High spin vs low spin — spectrochemical series
- Isomerism — geometric, optical, linkage, ionisation
- EAN rule
- Magnetic moment — $\sqrt{n(n+2)}$ BM formula
- VBT — inner vs outer orbital complexes
- Trans effect in square planar
- Chelate effect & stability constants
- Organometallics — ferrocene & Wilkinson's catalyst

Chapter 5 — Thermodynamics & Thermochemistry PC | ~6–7 Q

- First law — $\Delta U = q + w$, sign conventions
- Hess's law & standard enthalpy calculations
- Bond enthalpy method for ΔH
- Kirchhoff's law — ΔH variation with T
- Second law — entropy & spontaneity
- Gibbs free energy — $\Delta G = \Delta H - T\Delta S$
- C_p vs C_v — $C_p - C_v = R$
- Reversible vs irreversible work
- Standard enthalpy of formation, combustion, atomisation
- Third law & absolute entropy

Chapter 6 — Equilibrium PC | ~5–7 Q

- K_c , K_p and $K_p = K_c(RT)^{\Delta n}$
- Le Chatelier's principle — pressure, temp, concentration
- K_{sp} and common ion effect
- Henderson–Hasselbalch buffer pH
- Degree of dissociation for weak acids
- Salt hydrolysis — acidic/basic/neutral
- Reaction quotient Q vs K
- Simultaneous equilibria
- Isohydric solutions
- Acid-base titration curves & equivalence point

Chapter 8 — p-Block Elements (Gr 15, 16, 17, 18) IC | ~7–9 Q

- Structures of oxoacids — HNO_2 , HNO_3 , H_2SO_3 , H_2SO_4 , H_3PO_3 , H_3PO_4
- Oxidising power order — $\text{F}_2 > \text{Cl}_2 > \text{Br}_2 > \text{I}_2$
- Interhalogen compounds — types & geometry
- Noble gas compounds — XeF_2 , XeF_4 , XeF_6

- Nitrogen oxides — N_2O , NO , N_2O_3 , N_2O_4 , N_2O_5
- Sulphur allotropes & reactions
- Bleaching powder — structure & test
- Ozone depletion — CFC mechanism
- Phosphorus allotropes — white, red, black
- HF anomalous properties vs other HX

Chapter 9 — d & f Block Elements IC | ~4–5 Q

- Electronic config exceptions — Cr, Cu, Mo, Ag
- Oxidation states & colours of transition ions
- Magnetic properties — unpaired electron count
- Catalytic properties — examples
- Interstitial compounds & alloy formation
- Lanthanide contraction — cause & consequences
- KMnO_4 — preparation & reactions in all 3 media
- $\text{K}_2\text{Cr}_2\text{O}_7$ — preparation & reactions
- Actinides vs lanthanides differences
- Why Zn, Cd, Hg are NOT true transition elements

Chapter 10 — Alcohols, Phenols & Ethers OC | ~4–6 Q

- Acidity order — $\text{RCOOH} > \text{PhOH} > \text{H}_2\text{O} > \text{ROH}$
- Lucas test — 1° , 2° , 3° distinction
- Reimer–Tiemann reaction mechanism
- Kolbe's reaction
- Williamson synthesis — $\text{S}_\text{N}2$, no 3° halide
- Ether cleavage with HI/HBr
- Pinacol–pinacolone rearrangement
- Dehydration — Saytzeff's rule
- Victor Meyer test
- Phenol vs alcohol reactivity comparison

Chapter 11 — Aldehydes, Ketones & Carboxylic Acids OC | ~5–7 Q

- Aldol condensation — self & crossed
- Cannizzaro reaction — which aldehydes
- Clemmensen vs Wolff–Kishner reduction
- Tollens vs Fehling test — which fail
- Perkin reaction
- Hell–Volhard–Zelinsky reaction
- Acidity order of carboxylic acid derivatives
- Reactivity order — acid chloride $>$ anhydride $>$ ester $>$ amide
- Fischer esterification mechanism
- Decarboxylation — conditions

Chapter 12 — Amines & Biomolecules OC | ~4–5 Q

- Basicity order — aliphatic > NH_3 > aromatic amines
- Diazonium salts — Sandmeyer, Balz-Schiemann, coupling
- Gabriel synthesis — primary amines only
- Carbylamine reaction — isocyanide test
- Hofmann bromamide degradation
- Amino acids — essential list & zwitterion form
- Peptide bond formation & hydrolysis
- DNA vs RNA — structural differences
- Enzymes — induced fit vs lock & key
- Vitamins — fat-soluble vs water-soluble

Chapter 13 — Atomic Structure & Periodicity PC | ~3–4 Q

- de Broglie wavelength — $\lambda = h/mv$
- Heisenberg uncertainty principle
- Quantum numbers — all 4, selection rules
- Radial and angular nodes
- Electronic configuration — Aufbau, Pauli, Hund
- Effective nuclear charge — Slater's rules
- Ionisation energy trends & anomalies
- Electron affinity trends
- Electronegativity — Pauling scale
- Atomic & ionic radii periodic trends

Chapter 14 — Solutions & Colligative Properties PC | ~3–5 Q

- Raoult's law — ideal & non-ideal solutions
- Vapour pressure lowering — mole fraction
- Boiling point elevation — $\Delta T_b = iK_b m$
- Freezing point depression — $\Delta T_f = iK_f m$
- Osmotic pressure — $\pi = iMRT$
- Van't Hoff factor i — association vs dissociation
- Abnormal molar mass calculations
- Azeotropes — maximum & minimum boiling
- Henry's law for gas solubility
- Degree of dissociation from colligative data
- Chapter 15 : qualitative and Quantitative basics**