SYLLABUS CHECKLIST

JEE Main Chemistry

JEE Main 2026 syllabus (20 units) · 116 items

Source: JEE Main syllabus published by the National Testing Agency (jeemain.nta.nic.in), following NCERT Chemistry for Classes 11 and 12

Tick each box when you can explain the point without notes. Item wording is shortened from the official document; check the original for exact wording. Not affiliated with or endorsed by the exam board.

Section A: physical chemistry

Unit 1 Some basic concepts in chemistry

- ☐ 1.1 Matter and its nature; Dalton's atomic theory; atoms, molecules, elements and compounds
- ☐ 1.2 Laws of chemical combination
- ☐ 1.3 Atomic and molecular masses; mole concept; molar mass
- ☐ 1.4 Percentage composition; empirical and molecular formulas
- ☐ 1.5 Chemical equations and stoichiometry

Unit 2 Atomic structure

- ☐ 2.1 Electromagnetic radiation; photoelectric effect
- ☐ 2.2 Spectrum of the hydrogen atom; Bohr model: radii, energies, limitations
- ☐ 2.3 Dual nature of matter: de Broglie relationship
- ☐ 2.4 Heisenberg uncertainty principle
- ☐ 2.5 Quantum mechanical model: orbitals, ψ and ψ^2; quantum numbers
- ☐ 2.6 Shapes of s, p and d orbitals; nodes; electron spin
- ☐ 2.7 Aufbau principle, Pauli exclusion principle, Hund's rule
- ☐ 2.8 Electronic configurations; stability of half-filled and completely filled orbitals

Unit 3 Chemical bonding and molecular structure

- ☐ 3.1 Kossel–Lewis approach; ionic bond formation and factors; lattice enthalpy
- ☐ 3.2 Covalent bond: electronegativity, Fajans' rules, dipole moment
- ☐ 3.3 VSEPR theory and shapes of simple molecules
- ☐ 3.4 Valence bond theory: hybridisation with s, p and d orbitals; resonance
- ☐ 3.5 Molecular orbital theory: LCAO, bonding and antibonding MOs, σ and π MOs
- ☐ 3.6 MO configurations of homonuclear diatomics; bond order, bond length, bond energy
- ☐ 3.7 Metallic bonding (elementary)
- ☐ 3.8 Hydrogen bonding and its applications

Unit 4 Chemical thermodynamics

- ☐ 4.1 System and surroundings; extensive and intensive properties; state functions
- ☐ 4.2 First law: work, heat, internal energy, enthalpy, heat capacity, molar heat capacity
- ☐ 4.3 Hess's law; enthalpies of bond dissociation, combustion, formation, atomisation, sublimation, phase transition, hydration, ionisation and solution
- ☐ 4.4 Second law: spontaneity, ΔS of the universe, ΔG of the system
- ☐ 4.5 ΔG° and the equilibrium constant

Unit 5 Solutions

- [ ] 5.1 Concentration: molarity, molality, mole fraction, percentage
- [ ] 5.2 Vapour pressure of solutions; Raoult's law
- [ ] 5.3 Ideal and non-ideal solutions; vapour pressure–composition plots
- [ ] 5.4 Colligative properties: relative lowering of vapour pressure, depression of freezing point, elevation of boiling point, osmotic pressure
- [ ] 5.5 Molecular mass from colligative properties
- [ ] 5.6 Abnormal molar mass; van't Hoff factor

Unit 6 Equilibrium

- [ ] 6.1 Equilibria in physical processes: solid–liquid, liquid–gas, solid–gas; Henry's law
- [ ] 6.2 Chemical equilibrium: law of mass action, Kp and Kc and their relation
- [ ] 6.3 ΔG and equilibrium; Le Chatelier's principle
- [ ] 6.4 Ionic equilibrium: weak and strong electrolytes; ionisation of electrolytes
- [ ] 6.5 Acid–base concepts (Arrhenius, Brønsted–Lowry, Lewis); ionisation of acids and bases
- [ ] 6.6 Ionic product of water; pH scale; common ion effect
- [ ] 6.7 Hydrolysis of salts and pH of their solutions; solubility product
- [ ] 6.8 Buffer solutions

Unit 7 Redox reactions and electrochemistry

- [ ] 7.1 Oxidation and reduction; oxidation number; balancing redox reactions
- [ ] 7.2 Electrolytic and metallic conduction; conductance; specific and molar conductivity and their variation with concentration
- [ ] 7.3 Kohlrausch's law and its applications
- [ ] 7.4 Electrochemical cells: electrolytic and galvanic; electrode potentials; half-cell and cell reactions
- [ ] 7.5 EMF of a galvanic cell and its measurement; Nernst equation
- [ ] 7.6 Relation between ΔG and EMF; dry cell and lead accumulator; fuel cells

Unit 8 Chemical kinetics

- [ ] 8.1 Rate of reaction (average and instantaneous); factors affecting rate
- [ ] 8.2 Elementary and complex reactions; order and molecularity
- [ ] 8.3 Rate law, rate constant and its units
- [ ] 8.4 Differential and integral forms of zero- and first-order reactions; half-lives
- [ ] 8.5 Effect of temperature: Arrhenius theory; activation energy and its calculation
- [ ] 8.6 Collision theory of bimolecular gaseous reactions (no derivation)

Section B: inorganic chemistry

Unit 9 Classification of elements and periodicity in properties

- [ ] 9.1 Modern periodic law and the present form of the periodic table
- [ ] 9.2 s, p, d and f block elements
- [ ] 9.3 Periodic trends: atomic and ionic radii, ionisation enthalpy, electron gain enthalpy, valence, oxidation states
- [ ] 9.4 Chemical reactivity across periods and down groups

Unit 10 p-Block elements

- [ ] **10.1** Group 13 to group 18: general introduction, electronic configuration
- [ ] **10.2** General trends in physical and chemical properties
- [ ] **10.3** Unique behaviour of the first element in each group

Unit 11 d- and f-block elements

- [ ] **11.1** Transition elements: general introduction, electronic configuration, occurrence and characteristics
- [ ] **11.2** General trends: metallic character, ionisation enthalpy, oxidation states, ionic radii, colour, catalytic behaviour, magnetic properties, complex formation, interstitial compounds, alloys
- [ ] **11.3** Preparation, properties and uses of $K_2Cr_2O_7$ and $KMnO_4$
- [ ] **11.4** Inner transition elements: lanthanoids (configuration, oxidation states, lanthanoid contraction)
- [ ] **11.5** Actinoids: configuration and oxidation states

Unit 12 Coordination compounds

- [ ] **12.1** Introduction; ligands, coordination number, denticity, chelation
- [ ] **12.2** IUPAC nomenclature of mononuclear coordination compounds
- [ ] **12.3** Isomerism
- [ ] **12.4** Bonding: valence bond approach and basic ideas of crystal field theory
- [ ] **12.5** Colour and magnetic properties
- [ ] **12.6** Importance in qualitative analysis, metal extraction and biological systems

Section C: organic chemistry

Unit 13 Purification and characterisation of organic compounds

- [ ] **13.1** Purification: crystallisation, sublimation, distillation, differential extraction, chromatography (principles and applications)
- [ ] **13.2** Qualitative analysis: detection of nitrogen, sulfur, phosphorus and halogens
- [ ] **13.3** Quantitative analysis (basic principles): estimation of C, H, N, halogens, S, P
- [ ] **13.4** Empirical and molecular formulas; numerical problems

Unit 14 Some basic principles of organic chemistry

- [ ] **14.1** Tetravalency of carbon; shapes of simple molecules; hybridisation (s and p)
- [ ] **14.2** Classification by functional group: C=C, C≡C and groups containing halogen, O, N and S; homologous series
- [ ] **14.3** Isomerism: structural and stereoisomerism
- [ ] **14.4** Nomenclature (trivial and IUPAC)
- [ ] **14.5** Covalent bond fission: homolytic and heterolytic; free radicals, carbocations and carbanions; their stability
- [ ] **14.6** Electrophiles and nucleophiles
- [ ] **14.7** Electronic displacement: inductive effect, electromeric effect, resonance, hyperconjugation
- [ ] **14.8** Common types of reaction: substitution, addition, elimination, rearrangement

Unit 15 Hydrocarbons

- [ ] **15.1** Classification; isomerism; IUPAC nomenclature; general preparation, properties and reactions
- [ ] **15.2** Alkanes: conformations (Sawhorse and Newman projections of ethane); mechanism of halogenation
- [ ] **15.3** Alkenes: geometrical isomerism; mechanism of electrophilic addition (H_2, X_2, H_2O, HX); Markovnikov and peroxide effect; ozonolysis and polymerisation
- [ ] **15.4** Alkynes: acidic character; addition of H_2, X_2, HX and H_2O; polymerisation
- [ ] **15.5** Aromatic hydrocarbons: nomenclature, benzene structure and aromaticity
- [ ] **15.6** Electrophilic substitution: halogenation, nitration, Friedel–Crafts alkylation and acylation; directive influence of substituents

Unit 16 Organic compounds containing halogens

- [ ] **16.1** General methods of preparation, properties and reactions
- [ ] **16.2** Nature of the C–X bond; mechanisms of substitution reactions
- [ ] **16.3** Uses; environmental effects of chloroform, iodoform, freons and DDT

Unit 17 Organic compounds containing oxygen

- [ ] **17.1** Alcohols: identification of primary, secondary and tertiary alcohols; mechanism of dehydration
- [ ] **17.2** Phenols: acidic nature, electrophilic substitution (halogenation, nitration, sulfonation); Reimer–Tiemann reaction
- [ ] **17.3** Ethers: structure
- [ ] **17.4** Aldehydes and ketones: nature of the carbonyl group; nucleophilic addition to >C=O
- [ ] **17.5** Important reactions: nucleophilic addition, reactions with NH_3 and its derivatives, Grignard reagent
- [ ] **17.6** Oxidation, reduction (Wolff–Kishner and Clemmensen), acidity of α-hydrogen, aldol condensation, Cannizzaro reaction, haloform reaction
- [ ] **17.7** Chemical tests to distinguish aldehydes and ketones
- [ ] **17.8** Carboxylic acids: acidic strength and factors affecting it

Unit 18 Organic compounds containing nitrogen

- [ ] **18.1** Amines: nomenclature, classification, structure, basic character and identification of 1°, 2° and 3° amines
- [ ] **18.2** Diazonium salts: importance in synthetic organic chemistry

Unit 19 Biomolecules

- [ ] **19.1** Carbohydrates: classification (aldoses and ketoses); monosaccharides (glucose and fructose)
- [ ] **19.2** Constituent monosaccharides of oligosaccharides (sucrose, lactose and maltose)
- [ ] **19.3** Proteins: α-amino acids, peptide bond, polypeptides; primary, secondary, tertiary and quaternary structure; denaturation; enzymes
- [ ] **19.4** Vitamins: classification and functions
- [ ] **19.5** Nucleic acids: chemical constitution of DNA and RNA; biological functions
- [ ] **19.6** Hormones: general introduction

Unit 20 Principles related to practical chemistry

- [ ] **20.1** Detection of extra elements (N, S, halogens) in organic compounds
- [ ] **20.2** Detection of functional groups: hydroxyl (alcoholic and phenolic), carbonyl (aldehyde and ketone), carboxyl and amino groups

- [ ] **20.3** Preparation of inorganic compounds: Mohr's salt, potash alum
- [ ] **20.4** Preparation of organic compounds: acetanilide, p-nitroacetanilide, aniline yellow, iodoform
- [ ] **20.5** Titrimetric exercises: acids, bases and indicators; oxalic acid vs $KMnO_4$; Mohr's salt vs $KMnO_4$
- [ ] **20.6** Enthalpy of solution of $CuSO_4$; enthalpy of neutralisation of a strong acid and a strong base
- [ ] **20.7** Preparation of lyophilic and lyophobic sols
- [ ] **20.8** Kinetic study of the reaction of iodide with hydrogen peroxide at room temperature
- [ ] **20.9** Qualitative salt analysis: cations Pb^{2+}, Cu^{2+}, Al^{3+}, Fe^{3+}, Zn^{2+}, Ni^{2+}, Ca^{2+}, Ba^{2+}, Mg^{2+}, NH_4^+; anions CO_3^{2-}, S^{2-}, SO_4^{2-}, NO_3^-, Cl^-, Br^-, I^- (insoluble salts excluded)