

# A2 LEVEL CHEMISTRY (9701)

## 16 WEEK COMPREHENSIVE TEACHING PLAN

**Target:** Papers 4, 5 (Full A2 Level) | **Duration:** 16 weeks

**Weekly Structure:** 5 theory lessons + 1 planning/analysis session

## TOPIC WEIGHTINGS & TIME ALLOCATION

Topic Area	Approx. Weighting	Weeks Allocated	Key Focus
Physical Chemistry	35-40%	6 weeks	Thermodynamics, electrochemistry, kinetics, equilibria
Inorganic Chemistry	20-25%	4 weeks	Transition metals, period 3, nitrogen, sulfur
Organic Chemistry	35-40%	5 weeks	Aromatic, carbonyls, nitrogen compounds, synthesis
Synoptic Revision	-	2 weeks	AS content integration, connections
Paper 5 Skills	Integrated	Weekly	Planning, analysis, evaluation
Final Preparation	-	1 week	Exam technique, timed practice

# DETAILED 16-WEEK BREAKDOWN

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## WEEK 1-2: THERMODYNAMICS - BORN-HABER CYCLES

### Week 1: Lattice Energy & Born-Haber Cycles

- Day 1: Lattice energy definition, factors affecting magnitude
- Day 2: Born-Haber cycles for group 1 & 2 compounds
- Day 3: Enthalpy of solution, hydration enthalpy
- Day 4: Experimental determination issues, comparison with theoretical
- Day 5: **Past Paper Practice:** Born-Haber cycle calculations

**Paper 5 Skills Day 6:** Planning lattice energy experiments

### Week 2: Entropy & Free Energy

- Day 1: Entropy concept, predicting entropy changes
- Day 2: Calculating entropy changes from data
- Day 3: Gibbs free energy equation, spontaneity predictions
- Day 4: Temperature dependence of feasibility
- Day 5: **Past Paper Practice:** Thermodynamics calculations

**Practical Day 6:** Entropy changes in dissolution

## WEEK 3-4: ELECTROCHEMISTRY

### Week 3: Electrode Potentials & Cells

- Day 1: Standard electrode potentials, measuring  $E^\circ$  values
- Day 2: Calculating cell EMF, predicting feasibility
- Day 3: Electrochemical series applications
- Day 4: Commercial cells - dry cells, alkaline batteries
- Day 5: **Past Paper Practice:** Electrode potential calculations

**Practical Day 6:** Measuring EMF of simple cells

### Week 4: Fuel Cells & Redox Titrations

- Day 1: Hydrogen-oxygen fuel cells, advantages
- Day 2: Redox titrations - principles, calculations
- Day 3: Manganate(VII) titrations, iodine-thiosulfate titrations
- Day 4: Applications in analysis, percentage purity
- Day 5: **Past Paper Practice:** Redox titration calculations

**Practical Day 6:** Redox titration experiment

## WEEK 5: KINETICS - RATE EQUATIONS

### Week 5: Advanced Kinetics

- Day 1: Rate equations, order of reaction
- Day 2: Determining order - initial rates method
- Day 3: Integrated rate equations, half-life
- Day 4: Arrhenius equation, determining activation energy
- Day 5: **Past Paper Practice:** Rate equation questions

**Practical Day 6:** Determining rate constant & order

## WEEK 6: EQUILIBRIUM - $K_p$ & ACID-BASE

### Week 6: Gaseous Equilibria & Acid-Base

- Day 1:  $K_p$  expressions, calculations, units
- Day 2: Effect of conditions on  $K_p$ , mole fractions
- Day 3: Strong & weak acids, pH calculations
- Day 4:  $K_a$ ,  $pK_a$ , calculations for weak acids
- Day 5: **Past Paper Practice:**  $K_p$  & pH calculations

**Practical Day 6:** Determining  $K_a$  for weak acid

## WEEK 7: BUFFER SOLUTIONS

### Week 7: Buffers & Acid-Base Titrations

- Day 1: Buffer action, calculating buffer pH
- Day 2: Buffer preparation methods
- Day 3: pH curves, indicators, choosing suitable indicators
- Day 4: Acid-base titrations of weak/strong combinations
- Day 5: **Past Paper Practice:** Buffer & titration questions

**Practical Day 6:** Preparing & testing buffer solutions

## WEEK 8-9: TRANSITION METALS

### Week 8: Introduction to Transition Metals

- Day 1: Definition, electronic configuration
- Day 2: Characteristic properties - variable oxidation states, colour
- Day 3: Complex formation, ligands, coordination number
- Day 4: Shapes of complexes - octahedral, tetrahedral, square planar
- Day 5: **Past Paper Practice:** Transition metal basics

**Practical Day 6:** Preparing transition metal complexes

### Week 9: Transition Metal Chemistry

- Day 1: Isomerism in complexes - geometrical, optical
- Day 2: Ligand substitution reactions
- Day 3: Stability constants, chelate effect
- Day 4: Catalysis by transition metals
- Day 5: **Past Paper Practice:** Transition metal reactions

**Paper 5 Skills Day 6:** Planning transition metal experiments

## WEEK 10: PERIOD 3, NITROGEN & SULFUR

### Week 10: Inorganic Chemistry Applications

- Day 1: Period 3 elements & compounds review
- Day 2: Nitrogen chemistry - ammonia, nitrates, environmental
- Day 3: Sulfur chemistry - sulfuric acid, acid rain
- Day 4: Environmental chemistry - pollution, greenhouse effect
- Day 5: **Past Paper Practice:** Inorganic applications

**Practical Day 6:** Tests for anions, pollution analysis

## WEEK 11-12: AROMATIC CHEMISTRY

### Week 11: Benzene Structure & Reactions

- Day 1: Structure of benzene, evidence for delocalization
- Day 2: Electrophilic substitution - nitration mechanism
- Day 3: Halogenation, Friedel-Crafts reactions
- Day 4: Activating & deactivating groups, directing effects
- Day 5: **Past Paper Practice:** Aromatic mechanisms

**Practical Day 6:** Nitration of aromatic compounds

### Week 12: Phenol & Aromatic Amines

- Day 1: Phenol - acidity, reactions with bases
- Day 2: Electrophilic substitution in phenol
- Day 3: Aromatic amines - preparation, properties
- Day 4: Diazonium compounds, azo dyes
- Day 5: **Past Paper Practice:** Aromatic compounds questions

**Practical Day 6:** Preparation of azo dyes

## WEEK 13: CARBONYL COMPOUNDS & DERIVATIVES

### Week 13: Carbonyl Chemistry

- Day 1: Aldehydes & ketones - nucleophilic addition mechanisms
- Day 2: Carboxylic acids & derivatives - relative reactivity
- Day 3: Acyl chlorides, acid anhydrides - reactions
- Day 4: Esters - formation, hydrolysis, polyesters
- Day 5: **Past Paper Practice:** Carbonyl mechanisms

**Practical Day 6:** Multi-step synthesis

## WEEK 14: ORGANIC NITROGEN COMPOUNDS & POLYMERS

### Week 14: Nitrogen Compounds & Polymers

- Day 1: Amines - preparation, basicity, reactions
- Day 2: Amino acids, peptides, proteins
- Day 3: Amides, polyamides, condensation polymerization
- Day 4: Addition vs condensation polymers
- Day 5: **Past Paper Practice:** Nitrogen compounds & polymers

**Practical Day 6:** Polymer preparation experiments

## WEEK 15: ORGANIC SYNTHESIS & SPECTROSCOPY

### Week 15: Synthesis & Analysis

- Day 1: Synthetic routes, retrosynthetic analysis
- Day 2:  $^1\text{H}$  NMR spectroscopy - chemical shift, splitting
- Day 3:  $^{13}\text{C}$  NMR, combined spectral analysis
- Day 4: **Past Paper Practice:** Synthesis & spectroscopy
- Day 5: **Mock Paper 4** (2 hours) + review

Day 6: **Mock Paper 5** (1h 15min) + review

## WEEK 16: SYNOPTIC REVISION & FINAL PREP

### Week 16: Final A-Level Preparation

- Day 1: AS Physical Chemistry integration with A2
- Day 2: AS Inorganic & Organic integration with A2
- Day 3: Cross-topic connections workshop
- Day 4: **Full A-Level Mock** (Papers 4 & 5)
- Day 5: Error analysis, weak areas revision

Day 6: Exam strategy, time management, confidence

## A2 LEVEL ASSESSMENT SCHEDULE

Week	Assessment Type	Focus Area	Duration
2	Thermodynamics Test	Born-Haber, entropy	1.5 hours
4	Electrochemistry Test	EMF, redox titrations	1.5 hours
6	Equilibrium Test	K <sub>p</sub> , acid-base equilibria	1.5 hours
9	Transition Metals Test	Complexes, reactions	1 hour
12	Organic Test	Aromatic, carbonyls	1.5 hours
14	Polymers & Synthesis Test	Nitrogen compounds, synthesis	1 hour
15	Full A2 Mock	Papers 4 & 5	3h 15min
16	Final A-Level Mock	Full A-Level	5 hours

### PAPER 5 SKILLS DEVELOPMENT

#### Planning Investigation Skills (Weekly Focus):

- Weeks 1-4: Experimental design, variables, controls
- Weeks 5-8: Data collection methods, measurements
- Weeks 9-12: Risk assessment, safety considerations
- Weeks 13-16: Evaluation, suggesting improvements

#### Analysis & Evaluation Skills:

1. Data Processing: Graphs, calculations, statistical analysis
2. Conclusion Drawing: Linking results to theory
3. Error Analysis: Identifying sources of error, suggesting improvements
4. Method Evaluation: Assessing validity, reliability, accuracy

### SYNOPTIC LINKS DEVELOPMENT

#### AS-A2 Connections to Emphasize:

1. Energetics (AS) → Thermodynamics (A2): Hess's Law to Born-Haber cycles
2. Equilibrium (AS) → K<sub>p</sub> & Acid-Base (A2): K<sub>c</sub> to K<sub>p</sub>, equilibrium principles
3. Redox (AS) → Electrochemistry (A2): Simple redox to electrode potentials
4. Organic Basics (AS) → Organic Synthesis (A2): Simple reactions to multi-step synthesis

#### Cross-Topic Themes:

1. Energy Changes: Throughout physical chemistry
2. Structure-Property Relationships: Inorganic & organic