SL/HL Course Outline

UAIS – IB Chemistry

We do not have separate classes for HL and SL students. All students are exposed to the Core & AHL material and conduct HL labs. The only difference in the courses is the 4th semester review. SL students are only expected to review Core material where HL students must review Core & AHL material.

Year 1 First Semester

Topic (s)	Prescribed Labs
Review of Chemistry 10	
1 & 11 Stoichiometric Relationships Part I Reactions, Equations, % comp, Avogadro's number, limiting reagents, formulas, etc. Solutions Lab technique/etiquette	Determining the formula of on oxide Types of Chemical Reactions Copper Cycle
1 & 11 Gas Laws - Graphical interpretation - Best Fit - Error Analysis - Quotient/gradient	PV = nRT mini experiments Data Logging Temperature Lab Data Logging Pressure Lab Determining the M_r of an unknown gas Experimentally determining the rate constant using the PV & nT
TOK/NOS/Internationalism - Learning the language of chemistry	
2 & 12 Atomic Structure - Mass Spectrometry - Atomic Spectrum - The Nuclear Atom - Electron Configuration - Electromagnetic Spectrum - Aufbau, Hund, Pauli	Beer's Law Lab Emission Spectrum of Elements
TOK/NOS/Internationalism - Flame testing – Why do we not use flame testing to test all elements? - Development of the current model of the atom.	
3 & 13 Periodicity & The Period Table & Transition Metals - Understanding of the periodic table - Trends in the periodic table - Period 3 Oxides	Halogens vs. Halides Reactivity of Group 1 & 2 Metals
TOK/NOS/Internationalism - Development of the Periodic Table	

4 & 14 Chemical Bonding & Structure — VSEPR Models & Simulation

- Ionic vs. Covalent Bonding — Predicting Bond Structures from data
- Nomenclature
- Comparison of bonds (single, double, triple)
- Polarity
- Resonance
- VSEPR & Shapes of molecules
- Giant covalent structures
- Allotropes
- Coordinative dative covalent bonding
- Intramolecular vs. Intermolecular forces
- Metallic Bonding (alloys)

TOK/NOS/Internationalism

- Evidence of ions
- Benzene, worth the risk?
- Mining of resources

Year 1 Second Semester

Topic (s)

1 Stoichiometric Relationships Part II — Percent Comp of Egg Shell

5 & 15 Energetics/Thermochemistry — Edo vs. Exo Reactions

- Energy changes — Neutralization of an acid
- Enthalpy of reactions (delta H of formation, combustion) — Food Calorimetry
- Hess's Law — Specific Heat of unknown metal
- Bond Enthalpies
- Energy Graphs

TOK/NOS/Internationalism

- Evidence of ions
- Reduction of Fossil Fuels
- Experimental vs. Theoretical differences

Group 4 Project — varies

Students work in a cross disciplinary capacity and present at a symposium for parents and peers. The topic is changed each year and the students are able to use technology to collect and present data (this could be experimental or theoretical). They must also tie in internationalism and ethics.

6 & 16 Chemical Kinetics

- Collision Theory — Rate of Reaction
- Kinetic Molecular Theory — Rate Order
- Rate of Reactions — Determination of E_a for a reaction
- Rate Order — Effect of a catalyst
- Maxwell-Boltzmann

TOK/NOS/Internationalism

- Chemistry & Industry
- Origin: Kelvin scale (gas), Celsius (water)

7 & 17 Equilibrium

- Revisit Haber/Contact Processes
- Le Chatêlier's Principle
- Equilibrium Constant

Predicting Shifts
Determining Equilibrium Constant

TOK/NOS/Internationalism

- Fritz Haber – good or bad?
- Contact Process

Year 2 First Semester

1-7, 11-17 Review of Year 1 Material

8 & 18 Acid-Base Reactions

- Definitions of Acids & Bases
- Conjugate acid-base pairs
- Revisit prediction of products
- pH scale & conversions
- Strong vs. Weak
- K_w, K_a, K_b calculations
- Acid deposition
- Indicators
- Buffers

Titration to determine concentration of an acid
-using indicators & data loggers (graphical)
Determining the Strength of an Acid
Determining the equilibrium Constant

TOK/NOS/Internationalism

- "Acid rain"
- Polluters vs. Polluted
- History of Acid- Base Theories

9 & 19 Redox Processes

- Oxidation & Reduction Reactions
- oxidizing and reducing agent
- relation of the activity series to oxidation
- Winkler Method & BOD
- Voltaic & Electrochemical Cells

Voltaic Cell
Electrolytic Cell
Halogen vs. Halide

TOK/NOS/Internationalism

- Collaboration on Energy
- Use of oxidizing agents to disinfect water
- Fuel Cells

10 & 20 & 11 Organics

- Homologous series & trends
- Naming, structures, functional groups
- Polarity of bonds vs. molecule, effect on reactivity
- Benzene
- Identification of halogenoalkanes (alcohols) & nitrogen (amines)
- stereoisomerism
- Reactions: incomplete combustion, polymerization, oxidation of alcohols, condensation, substitution, free radical mechanisms,

Molecular Models
Organic Reactions (sim)
Alkane vs. Alkene
Esterification
DUI – Alcohols & Redox

TOK/NOS/Internationalism

- octane rating
- chemistry of life – biochemistry
- Kekulé's dream
- The "Fat" debate

21 Measurement & Analysis — Spectral Analysis of an Unknown

- Spectroscopic Identification of Organic Compounds
- ^{1}H NMR, MS, IR

TOK/NOS/Internationalism
- Greenhouses Gases

Year 2 Second Semester

Internal Assessment — *varies*

The internal assessment is a student originated, developed, and executed experiment. It is presented formally and makes up 20% of the overall IB Chemistry score. Students are given 2 weeks of class time and 2 additional weeks outside of class to complete their IA.

Option B Energy

- Energy Sources
- Fossil Fuels
- Nuclear fusion and fission
- Solar energy
- Environmental Impact

Energy of Fuels
Greenhouse Effect (sim)

TOK/NOS/Internationalism
- Carbon footprint
- Cold fusion
- Climate change

IB Course Review

Please note: Uncertainties & errors are discussed with every lab. Students are expected to be able to calculate uncertainty and use error bars (when applicable). They are also expected to calculate the percentage yield and/or percentage error for all labs that apply. Each lab is followed up with a discussion on the random & systematic errors and how they affected the lab results. Some of the labs involve a full or partial formal lab write up, but this varies by year and experiments**.**