

German International Abitur^{*}

Chemistry Curriculum

^{*}Diploma from German secondary school qualifying for university admission

Students at the AvH fulfill the following basic qualifications at beginning of grade 11

General Chemistry

- Modern atomic theories (quantum-mechanical model of the atom)
- Electron configuration and chemical periodicity
- Thermodynamic concepts of enthalpy, entropy and free energy changes
- States of matter
- Basic lab techniques

General organic chemistry

- Alkanes, alkenes, alkynes
- Nomenclature and stoichiometry
- Isomerism and stereochemistry
- Substitution, elimination and addition reaction
- Alcohols, aldehydes, ketones, carboxylic acids and their derivatives
- Esters

Curriculum

Semester	Content
11 1 st semester	Biochemistry <ul style="list-style-type: none">• Sugars and polysaccharides (stereoisomerism, optical rotation)• Oils and fats• Amino acids and proteins (groups of amino acids, electrophoresis, chromatography, primary, secondary, tertiary and quaternary structure of proteins, functions of proteins, enzymes)• Detection reactions• Healthy eating• Nucleotides and nucleic acids (DNA structure, replication, protein biosynthesis)• Polymerisation reactions in nature• Surface active and emulsifying agents (saponification, micelles, phospholipids)

	<p>Structure and properties</p> <ul style="list-style-type: none">• Molecules and networks• Bond energy and chemical change• Bonds between molecules (ions, dipoles and Van der Waals forces)• Hydrogen bonding• The structure and properties of synthetic polymers• Plastics: Polymer properties by design (thermoplasts, thermosets and elastomers)• Radical Polymerisation, polycondensation and polyaddition of monomers
<p>11 2nd semester</p>	<p>Chemical equilibrium</p> <ul style="list-style-type: none">• Chemical kinetics• Factors affecting reaction rates (concentration, reaction, pressure, volume)• Le Chatelier principle• Dynamic chemical equilibria• Homogeneous and heterogeneous equilibria• Law of mass action• Enzymes and rates• Catalysts• Ammonia synthesis <p>Acids and bases</p> <ul style="list-style-type: none">• Broenstedt acids and bases• Strong and weak acids• Equilibria and concentrations• Acid dissociation constant• Titration and Stoichiometry• Autoionization of water and the pH scale• Buffer Solutions

Semester	Content
12 1st semester	Electrochemistry <ul style="list-style-type: none">• Oxidation and reduction• Redox reactions between nonmetals• Balancing redox reactions by the half-reaction method (oxidation numbers)• Redox reactions and electrode potentials• Predicting the direction of redox reactions• Electrolysis and galvanic cells• Nernst equation and the effect of concentration• Primary and secondary batteries• Fuel cells• Corrosion
12 2nd semester	Dyes <ul style="list-style-type: none">• Natural and synthetic dyes (trichromatic colour vision, chromophores and auxochromes, bathochromic shift)• Dying of materials Distillation