In-House Chemistry Curriculum

The following form the **basis** for the in-house school curriculum: the Chemistry Curriculum for the *Gymnasium* and regular schools (*Regelschule*) in Thuringia, 1999, as well as the regional curriculum set forth at the conference of curriculum coordinators from education region 1, held at the German School in Washington DC on March 27-31, 2011. The educational content for Grade 10 reflects the content set forth at this conference for all schools in North America.

Chemistry is to be taught **bilingually**. The distribution of the language percentages is 70% German and 30% English in the introductory class which is taught in Grade 7. The English percentage for Grades 9-12 is 50%.

Recommended **textbooks:**

Section 1

- Elemente Chemie, Klett Verlag
- Chemistry, Prentice Hall (paper version and online book)

Section 2

- Chemie heute Sek. 2, Schroedel Verlag
- Chemistry: The Central Science, Tenth Edition, Pearson Education

Evaluation of student performance:

The student's performance in chemistry is assessed based on 2 complex assignments per semester and other achievements. The 2 complex assignments comprise 50% of the final grade and the other achievements comprise 50% of the final grade.

Examples of complex assignments include:

- Class assignments and tests
- Complex projects
- Complex student presentations

Examples of other achievements include:

- Oral or written tests (maximum 15 minutes)
- Student presentations
- Experiments and keeping records
- Homework
- Quality and quantity of student participation

The complex assignments must include coursework taken in the following 3 **requirements areas**:

Requirements Area I (Reproduction) includes:

- reproducing known sets of facts from a defined area in unaltered form

- using work techniques in a defined area and being able to repeat them

Requirements Area II (Reconstruction/Reorganization) includes:

- reproducing known sets of facts in a changed situation
- independently explaining, processing and classifying known sets of facts

Requirements Area III (Construction) includes:

- independently applying what has been learned to comparable sets of facts or situations
- recognizing, processing and solving problems

The following must be taken into account when evaluating student performance:

- objectivity (the results of the evaluation must be verifiable)
- validity (the performance evaluation must reflect the learning goals and the educational content)
- reliability (the same evaluation criteria apply to all students)
- practicability (assignments must be appropriate and doable)
- transparency (the evaluation standards and assessment criteria must be published)

Grading is done in accordance with the percentage points in effect at GISSV – Grading Guidelines for Calculating Grades.

Klasse 5 - 9	
Punkte	Note
100 - 95	1
94,5 - 90	1-
89,5 - 85	2+
84,5 - 80	2
79,5 - 75	2-
74,5 - 70	3+
69,5 - 65	3
64,5 - 60	3-
59,5 – 53,5	4+
53 – 46,5	4
46 - 40	4-
39,5 - 35	5+
34,5 - 30	5
29,5 - 25	5-
24,5 - 0	6

Klasse 10	
Punkte	Note
100 - 95	1
94,5 - 90	1-
89,5 – 84,5	2+
84 - 78	2
77,5 - 72,5	2-
72 – 67	3+
66,5 – 60,5	3
60 - 55	3-
54,5 – 49,5	4+
49 - 43	4
42,5 - 37,5	4-
37 - 32	5+
31,5 – 25,5	5
25- 20	5-
19,5 - 0	6

Klasse 11 + 12		
Punkte	Note	Punkte
100 – 95	(1+)	15
94 – 90	1	14
89 – 85	1-	13
84 – 80	2+	12
79 – 75	2	11
74 – 70	2-	10
69 – 65	3+	9
64 – 60	3	8
59 – 55	3-	7
54 – 50	4+	6
49 – 45	4	5
44 – 40	4-	4
39 – 34	5+	3
33 – 27	5	2
26 – 20	5-	1
19 – 0	6	0

Internal differentiation between a Gymnasium and a Realschule course of study

- Unless otherwise noted, both courses of study offer the same subjects and competence areas.
- Unlike a Realschule course of study, a Gymnasium course of study is essentially characterized by deeper and more complex modes of observation, in order to fulfill the basic preconditions for the study of chemistry in the school's Gymnasium-level high school program.
- Moreover, the Gymnasium course of study offers a greater variety of teaching materials and more intensive quantitative observations.

- The Realschule course of study is designed to give students basic chemistry knowledge/skills based on examples, in order to lay the necessary foundation for vocational training.

The following criteria are used to characterize the student's current stage of development and to assess the extent to which the student has **developed competencies**.

Theoretical-technical qualifications:

- Certainty of knowledge of chemical materials and their reactions
- Classification of chemical facts in everyday life, nature and technology, according to valid chemical principles
- Use of chemistry language, mastery of the symbolic language in chemistry and of chemical calculations
- Thinking in models

Methodological-strategic qualifications:

- Mastery of culturing techniques
- Experimental work (constructive skills, keeping records)
- Preparation of models, collages, display boards, and videos

Qualifications related to various aspects:

- Readiness and ability to ask relevant questions (e.g., when participating in classroom discussions and classroom conversations)
- Readiness and ability to take on responsibilities (e.g., acquire specific information)
- Readiness and ability to communicate and cooperate (e.g., when conducting experiments and solving problems in groups)
- Ethical interpretations using chemical knowledge

Grade 7 (one hour per week or 2 hours per week during the second semester)

Chemistry

Content / Learning Goals	Suggestions for Experiments / Skills (recommended as a TE-demo or SE student experiment)	Cross-Disciplinary Possibilities	School Program
Safety training	Flinn Scientific Chemical Safety Demo Kit Flinn Scientific's Student Safety Contract		
1. Materials and their properties • Introduction to chemistry and the laboratory • Introduction to the concept of particles, the spherical particle formula (Dalton) • Properties of some solid, liquid and gaseous materials • Material mixtures and pure materials • Separating material mixes	Experiments: • Safety when conducting experiments (TE) • Sucking up liquids (SE) • Mixing ethanol and water (TE) • Determining the boiling and melting temperature of substances (SE) • Solubility (SE) • Crystallization (SE) • Density (SE) • Recognizing materials based on their properties (SE) • Distillation (TE) • Filtration (SE)	Chocolate project (Chemistry, Geography, Biology, Ethics)	Culturally aware

	• Chromatography (SE) • Separating a complex mixture (SE) Skills: • Safe experimentation • Recordkeeping in the natural sciences • Flow diagram • Mind maps	Keeping records in the natural sciences (Physics, Biology)	Together
2. Chemical reaction • Significance of chemical reactions • Characteristics of chemical reactions • Elements and binding • Symbols as chemical signs • Empirical formula • Molecules, introduction of moles • Chemical reaction and energy • Law of the conservation of mass • Setting up and balancing reaction equations	Experiments: • Burning metals (TE) • Dismantling AgO (SE) • Comparing metal oxides (SE) • Visualizing the mole • Chemical reactions (FeS) • Thermodynamics in a bag (SE) • Law of the conservation of mass (SE) • Model boxes (chips) Skills: • Teamwork		Differentiated Together

Grade 8 (2 hours per week)

Chemistry

Content / Learning Goals	Suggestions for Experiments / Skills (recommended as a TE-demo or SE student experiment)	Cross-Disciplinary Possibilities	School Program
Safety training	Flinn Scientific Chemical Safety Demo Kit Flinn Scientific's Student Safety Contract		
1. Structure of the atom • Rutherford's diffraction experiment • Nucleus-shell atomic model • Isotope • C-14 method • Ionizing energies • Shell model of the atom • Formation of ions	Skills • Models in chemistry		
2. Periodic Table of the Elements • Development of the periodic table • Atomic structure and position in the Periodic Table of the Elements • Metal, nonmetal, metalloid	Experiments: • Elements of the Periodic Table (Showcase) • Metal, nonmetal, metalloid (SE) • Properties of alkali metals (TE)		Global

• Alkaline metals • Alkaline earth metals • Noble gases • Halogens • Salts	• Properties of alkaline earth metals (SE) • Flame colors (SE) • Properties of halogens (SE) Skills: • Presentation (noble gases) • Scientific lab write-up • Reading comprehension of scientific texts in English • Highlighting scientific texts	English	Differentiated
3. Chemical bonding • Lewis dot diagrams • Electronegativity • Ionic bonds and ionic compounds • Names of common anions and cations • Bonding of metals • Covalent bonding (single, double, triple bonds) • Polar and nonpolar covalent bonds • Polar and nonpolar covalent molecules • Naming of anorganic molecules • Properties of salts and molecules, connection between bonding type and properties	Experiments: • Lewis dot structures (SE) • Properties of ionic compounds (SE) • Intermolecular attractions (SE) • H_2O – a polar molecule (SE) Skills: • Use of book of tables		

4. Oxidation, reduction, oxidation-reduction reaction • Burning materials • Starting and combating fires • Effect of concentration, level of division, intermixing and ignition temperature • Oxidation-reduction reaction: partial reactions, oxygen transfer, oxidation and reduction materials, reversibility • Technically important oxidation-reduction reactions: thermal procedure, converter process • Oxidation numbers • Oxidation-reduction reaction as electron transfer reaction	Experiments: • Burning metals with various levels of division (SE) • Determining the flame temperature (SE) • Oil fire (TE) • Thermal trial (TE) Skills: • Describing the course of chemical reactions based on experimental studies and observations • Interpreting reaction equations • The significance of chemical-technical procedures		Culturally aware
5. Solutions • Creating solutions • Factors affecting solubility • Relationship between structure and solubility • Unsaturated, saturated, and over-saturated aqueous solutions • Concentration of aqueous solutions and thinning them • Colligative properties of aqueous solutions (reduction of steam pressure, increase in the	Experiments: • Solubility experiments (SE) • Thinning solutions (SE) • Sodium acetate over-saturated solution (TE) • Increasing the boiling point or reducing the melting point, e.g., $NaCl/H_2O$ or antifreeze/H_2O (SE)		

boiling point, reduction of the melting point)	Skills: • Experimental skills • Investigating properties • Keeping records		Differentiated, Together