**XV. GIMNAZIJA**
**International Baccalaureate Department**
**Diploma Programme**

**Chemistry**
**Year 1 and 2**

**Course description 2019/2020**

## WHAT IS THE COURSE ABOUT?

Chemistry is an experimental science that combines academic study with the acquisition of practical and investigational skills. Chemical principles combine both the physical environment in which we live and all biological systems. Also, knowledge taught in this course is needed in higher education, such as medicine, biological science and environmental science, and serves as useful preparation for employment. The Diploma Programme chemistry course includes the essential principles of the subject but also, through selection of an option, allows teachers some flexibility to tailor the course to meet the needs of their students. The course is available at both standard level (SL) and higher level (HL), and therefore accommodates students who wish to study chemistry as their major subject in higher education and those who do not. At the school level both theory and experiments should be undertaken by all students. They should complement one another naturally, as they do in the wider scientific community. The Diploma Programme chemistry course allows students to develop traditional practical skills and techniques and to increase facility in the use of mathematics, which is the language of science. It also allows students to develop interpersonal skills, and digital technology skills, which are essential in 21st century scientific endeavour and are important life-enhancing, transferable skills in their own right.

## AIMS:

### The aims of teaching and studying Chemistry

- appreciate scientific study and creativity within a global context through stimulating and challenging opportunities
- acquire a body of knowledge, methods and techniques that characterize science and technology
- apply and use a body of knowledge, methods and techniques that characterize science and technology
- develop an ability to analyse, evaluate and synthesize scientific information
- develop a critical awareness of the need for, and the value of, effective collaboration and communication during scientific activities
- develop experimental and investigative scientific skills including the use of current technologies
- develop and apply 21st century communication skills in the study of science
- become critically aware, as global citizens, of the ethical implications of using science and technology
- develop an appreciation of the possibilities and limitations of science and technology
- develop an understanding of the relationships between scientific disciplines and their influence on other areas of knowledge.

**OBJECTIVES:**

**The objectives of teaching and studying Chemistry are to achieve at our students the following:**

1. Demonstrate knowledge and understanding of:
    a. facts, concepts, and terminology
    b. methodologies and techniques
    c. communicating scientific information.
2. Apply:
    a. facts, concepts, and terminology
    b. methodologies and techniques
    c. methods of communicating scientific information.
3. Formulate, analyse and evaluate:
    a. hypotheses, research questions and predictions
    b. methodologies and techniques
    c. primary and secondary data
    d. scientific explanations.
4. Demonstrate the appropriate research, experimental, and personal skills necessary to carry out insightful and ethical investigations.

**ASSESSMENT**

- **Unit test:**
  After the completion of each unit. Duration of a test is 1 school hours. This test will consist of two parts; the first part being multiple choice questions and the second part consisting of data analysis and/or short answer questions.
- **Progress test:**
  When big units are taught (like Organic chemistry) for monitoring the Student's progress during the unit, duration of progress test is 1 school hour, frequency of progress tests is one per big
- **Lab reports:**
  Lab reports are assessed against DIP Internal assessment criteria, frequency is after each performed experiment
- **Semester/Year Exam:**
  Two (all exams in DIP 1 and semester exam in DIP 2) or three Papers (Year exam in DIP 2). One of the Exams (Paper 1) is non-calculator and other two exams are calculator exams. Two or three grades (depending on DIP1 or DIP 2) are provided (P1, P2 (and) P3) for each part of the exam.

During the course teacher use **formative assessments.** This assessment aims to the continuous supervision of a student's progress by a wide range of assessment tools. While preparing students for the summative assessments, teachers use a variety of formative assessments to scaffold student development of content knowledge and skills.

All pieces of work will be marked on the 1 to 7 grading scale.

All tests and exams will be graded according to the grade boundaries provided.

| Grade boundaries | | | | |
|---|---|---|---|---|
| **Grade** | Tests | Exam | Lab reports | |
| | | | 1 criterion/6 | 2 criteria/12 |
| **7** | 91-100% | 86-100% | 6 | 11-12 |
| **6** | 81-90% | 71-86% | 5 | 9-10 |
| **5** | 71-80% | 55-70% | 4 | 7-8 |
| **4** | 61-70% | 45-54% | 3 | 5-6 |
| **3** | 51-60% | 31-44% | 2 | 3-4 |
| **2** | 31-50% | 15-30% | 1 | 1-2 |
| **1** | 0-30% | 0-14% | 0 | 0 |

Term Grades and Final grade will be determined according to the table below.

| **Semester** | **Component** | | | | |
|---|---|---|---|---|---|
| **1st , 2nd and 3rd Semester** | Paper 1 | Paper 2 | Paper 3 | Tests | Internal assessment (lab reports) |
| | 10% | 20% | / | 45% | 25% |
| **4th Semester** | 5% | 30% | 10% | 30% | 25% |

**IMPLEMENTATION:**

DP Year 1 and 2

The school offers 3/4 lessons per week (SL) and 5/6 lessons per week (HL), depending on the year. During DIP 1 course in taught in combined group (joined SL and HL), and in DIP 2, regarding the number of students choosing SL or HL, the group can be divided into two separated groups; one being SL and second being HL. At the beginning of DIP 2 (First semester) all students will work on their chosen Individual investigations.

**TOPICS:**

The syllabus for the Diploma Programme Chemistry course is divided into 3 parts; Core material (11 topics), additional HL material (10 topics) and Options (1 out of 4). The Core material is compulsory and is divided into 11 topics. The Optional Material consists of one of the following topics: “Materials”, “Biochemistry”, “Energy” and “Medicinal Chemistry”.

| No of unit | Name of unit | Nature of Science |
|---|---|---|
| **UNIT 1** | Stoichiometric relationships | • Making quantitative measurements with replicates<br>• Making careful observations and obtaining evidence for scientific theories |
| **UNIT 2** | Atomic structure | • Evidence and improvements in instrumentation<br>• Developments in scientific research follow improvements in apparatus<br>• Use theories to explain natural phenomena<br>• Experimental evidence to support theories |

| | | |
|---|---|---|
| **UNIT 3** | Periodicity | • Obtain evidence for scientific theories by making and testing predictions based on them<br>• Looking for patterns<br>• Looking for trends and discrepancies<br>• Models and theories |
| **UNIT 4** | Chemical bonding and structure | • Use theories to explain natural phenomena observations.<br>• Looking for trends and discrepancies<br>• Scientists use models as representations of the real world<br>• Obtain evidence for scientific theories by making and testing predictions based on them<br>• Use theories to explain natural phenomena<br>• Principle of Occam's razor<br>• The need to regard theories as uncertain |
| **UNIT 5** | Energetics/thermochemistry | • Fundamental principle<br>• Making careful observations<br>• Hypotheses<br>• Models and theories<br>• Making quantitative measurements with replicates to ensure reliability<br>• Theories can be superseded |
| **UNIT 6** | Chemical kinetics | • The principle of Occam's razor<br>• Theories can be supported or falsified and replaced by new theories |
| **UNIT 7** | Equilibrium | • Obtaining evidence for scientific theories<br>• Common language across different disciplines<br>• Employing quantitative reasoning— |
| **UNIT 8** | Acids and bases | • Falsification of theories<br>• Theories being superseded<br>• Public understanding of science<br>• Obtaining evidence for theories<br>• Occam's razor<br>• Improved instrumentation<br>• Looking for trends and<br>• The outcomes of experiments or models may be used as further evidence for a claim<br>• Risks and problems<br>• Theories can be supported, falsified or replaced by new theories |
| **UNIT 9** | Redox processes | • How evidence is used<br>• Ethical implications of research |
| **UNIT 10** | Organic chemistry | • Serendipity and scientific discoveries<br>• Ethical implications<br>• Use of data |

| | | |
|---|---|---|
| **UNIT 11** | Measurement and data processing | • Making quantitative measurements with replicates to ensure reliability<br>• The idea of correlation<br>• Improvements in instrumentation<br>• Models are developed to explain certain phenomena that may not be observable |

**Textbooks:**

- Sergey Bylikin, Gary Horner, Brian Murphy, David Tarcy; *Oxford IB Diploma Programme IB Chemistry Course companion,* Oxford 2014
- Geoffrey Neuss; *Oxford IB Diploma Programme IB Chemistry Study Guide, Oxford 2014*

[1] Document adapted from:

https://resources.ibo.org/data/d_4_chemi_gui_1402_7_e.pdf

https://resources.ibo.org/dp/subject-group/Chemistry/resource/11162-occ-file-d_4_chemi_tsm_1411_1j_e/?