Diploma Programme subject outline—Group 4: sciences			
School name	Gymnázium, Šrobárova 1, Košice, Slovakia	**School code**	061626
Name of the DP subject *(indicate language)*	DP Chemistry		
Level *(indicate with X)*	Higher [ ] Standard completed in two years [X] Standard completed in one year * [ ]		
Name of the teacher who completed this outline	Mária Grutková	**Date of IB training**	3 February – 3 March 2021
Date when outline was completed	June 2021	**Name of workshop** *(indicate name of subject and workshop category)*	Chemistry Cat1 online workshop

* All Diploma Programme courses are designed as two-year learning experiences. However, up to two standard level subjects, excluding languages ab initio and pilot subjects, can be completed in one year, according to conditions established in the *Handbook of procedures for the Diploma Programme*.

1. Course outline

– Use the following table to organize the topics to be taught in the course. If you need to include topics that cover other requirements you have to teach (for example, national syllabus), make sure that you do so in an integrated way, but also differentiate them using italics. Add as many rows as you need.

– This document should not be a day-by-day accounting of each unit. It is an outline showing how you will distribute the topics and the time to ensure that students are prepared to comply with the requirements of the subject.

– This outline should show how you will develop the teaching of the subject. It should reflect the individual nature of the course in your classroom and should not just be a “copy and paste” from the subject guide.

– If you will teach both higher and standard level, make sure that this is clearly identified in your outline.

	Topic/unit (as identified in the IB subject guide) *State the topics/units in the order you are planning to teach them.*	Contents	Allocated time One class is 45 minutes. In one week there are 4 classes.	Assessment instruments to be used	Resources *List the main resources to be used, including information technology if applicable.*
Year 1	Intro to the course	Chemistry topics Internal formative and summative assessment Practical scheme of work Teachers expectations Assessment schedule and marking criteria	4 lessons (3 hours)/1 week	Formative -lab calculating the empirical formula of magnesium oxide -quizpaper 1 and 2 sample questions - reflection and portfolio	Textbooks: Oxford IB Prepared **CHEMISTRY** Serey Bilikin, Brian Murphy, Alexander Juniper Pearson Baccalaureate **STANDARD LEVEL CHEMISTRY** *2-nd edition* **supporting every learner across the IB continuum** Lab materials Library resources Textbook
	Topic 1: Stoichiometric Relationships	1.1 Introduction to the particulate nature of matter and chemical change 1.2 The mole concept 1.3 Reacting masses and volumes	16 lessons (12hours)/4 weeks		
	Topic 2: Atomic structure	2.1 The nuclear atom 2.2 Electron configuration	16 lessons (12 hours)/4 weeks	Formative -Paper 1 and paper 2 questions -Simulation assessment -Flame test lab -reflection and portfolio Formative	Simulation of Rutherford's gold fiold experiment Simulation of atomic structure on Lab materials Library resources Textbook

	Topic 3: Periodicity	3.1 Periodic table 3.2 Periodic trends	12lessons (9 hours)/3 weeks	-seminar discussion IUPAC and language of chemistry -Past paper questions -Periodicity presentations Formative	Databases for periodic trends http://www.periodicvideos.com/ Library resources textbook Molecular models http://phet.colorado.edu/ Library resources textbook Allotropes of carbon: https://www.youtube.com/watch?v=tGH0mXCcEFU
	Topic 4: Chemical bonding and structure	4.1 Ionic bonding and structure 4.2 Covalent bonding 4.3 Covalent structures 4.4 Intermolecular forces 4.5 Metallic bonding	16 lessons (12 hours)/4 weeks	-VSEPR – building molecular models lab and simulation -individual presentations Formative	
	Topic 5: Energetics / Thermochemistry	5.1 Measuring energy changes 5.2 Hess's Law 5.3 Bond enthalpies	16 lessons (12 hours)/4 weeks	-Lab combustion of alcohols with increasing number of carbons -Use databases to analyze energy content of foods -Lab enthalpy change copper sulphate and zinc reaction using datalogger Formative	Data logger Databases Library resources textbook

	Topic 6: Chemical kinetics	6.1 Collision theory and rates of reaction	16 lessons (12 hours)/4 weeks	-rate of reaction lab change of concentration and temperature - Debate moral ethical, social, economic and environmental consequences of ozone depletion and its causes Using topic 5 and 6 -past paper questions - reflection and portfolio Formative -discussion haber process revolutionized global food product, but also large impact on weaponry, should scientiest be held morally responsible for the appllications -past paper questions Summative test topic 6-7 Formative	Simulation molecular collision Simulation rate of reaction http://www.chemcollective.org/kinetics Lab material for rate of reaction Data logger http://ozonewatch.gsfc.nasa.gov Library resources textbook Library resources textbook
	Topic 7: Equilibrium	7.1 Equilibrium	16 lessons (12 hours)/4 weeks		

	Topic 8: Theories of acids and bases	8.1 Theories of acids and bases 8.2 Properties of acids and bases 8.3 The pH scale 8.4 Strong and weak acids and bases 8.5 Acid deposition	16 lessons (12 hours)/4 weeks	-titration simulation -acid/base dissociation simulation -lab pH indicator -lab titration $CaCO_3$ in eggshells -presentations acid deposition Summative -Topic 8 test	Lab materials Titration simulation Library resources textbook
Year 2	Topic 9: Redox processes	9.1 Oxidation and reduction 9.2 Electrochemical cells	20 lessons (15 hours)/5 weeks	Formative lab voltaic cell using two metal/metal-ion half cells - discussion using oxidizing agents such as chlorine can be used as disinfectants but also a concern due to harmful byproducts -past paper questions Summative Topic 9 test	Voltaic cell simulation Lab materials voltaic cell, redox titrations Library resources textbook

	Topic 10: Organic Chemistry	10.1 Fundamentals of organic chemistry 10.2 Functional group chemistry	24 lessons (18 hours)/6 weeks	Formative -molecular models lab and simulation -past paper questions	Molecular models Simulation organic compounds Databases organic compounds Library resources textbook
	Topic 11: Measurement and Data Processing	11.1 Uncertainties and errors in measurement and results 11.2 Graphical techniques 11.3 Spectroscopic identification of organic compounds	20 lessons (15 hours)/5 weeks	Formative -standard curve lab data analysis -Topic 1.2 Lab data analysis	Lab materials Library resources textbook

	Option B Biochemistry	B.1 Introduction to biochemistry B.2 Proteins and enzymes B.3 Lipids B.4 Carbohydrates B.5 Vitamins B.6 Biochemistry and the environment	28 lessons (21 hours)/ 7 weeks	Formative -Group presentaion -Lab chromatography Summative Paper 3	Lab materials Databases Graphing software Enzymes: https://www.youtube.com/watch?v=NdMVRL4oaUo Library resources textbook

2. The group 4 project

As the IB guides say, "The group 4 project is a collaborative activity where students from different group 4 subjects work together on a scientific or technological topic, allowing for concepts and perceptions from across the disciplines to be shared in line with aim 10—that is, to 'encourage an understanding of the relationships between scientific disciplines and the overarching nature of the scientific method.'" Describe how you will organize this activity. Indicate the timeline and subjects involved, if applicable.

The Group 4 project is performed collaboratively between IB Biology, IB Chemistry and IB Physics. Each group of learners will consist of a mixture of disciplines of Biology, Chemistry, and Physics. All of the teachers involved work together to determine with the learners an appropriate topic that can be examined within their disciplines. Teachers then determine the groups and the learners work to create and present an original research project. This project begins in the middle of the second semester during the 1st year. Learners have 10 classes to work on the project and 4 classes of presentations at the end of the semester.

3. IB practical work and the internal assessment requirement to be completed during the course

As you know, students should undergo practical work related to the syllabus.

- Physics, chemistry and biology: 40 hours (at standard level) or 60 hours (at higher level)
- Computer science: 40 hours (at standard level) or 40 hours (at higher level)
- Design technology: 60 hours (at standard level) or 96 hours (at higher level)
- Sport, exercise and health science: 40 hours (at standard level) or 60 hours (at higher level)

Use the table below to indicate the name of the experiment you would propose for the different topics in the syllabus.

An example is given. Add as many rows as necessary.

Name of the topic	Experiment	Any ICT used? *Remember you must use all five within your programme.*
Acids and bases	Titration	Yes
Topic 1 stoichiometric relationships	Mandatory Lab – Empirical formula of MgO Obtaining/use of experimental data for deriving empirical formula from reactions involving mass changes	Yes The Vernier interfaces and sensors
Topic 4 Chemical bonding and structure	Molecular models and simulation Use both simulation and molecular models to Understand shapes of covalent compounds	Yes
Topic 5 Energetics / Thermochemistry	Enthalpy of combustion of different alcohols (ethanol, propanol, butanol)	Yes
Topic 5 Energetics / Thermochemistry	Mandatory Lab – Investigating the enthalpy change of a reaction using calorimetric method (copper sulphate and zinc reaction)	Yes
Topic 6 Chemical kinetics	Mandatory Lab – Inversitgating rate by changing concentration of reactant and temperature (sodium thiosulfate and hydrochloric acid	Yes

Topic 7 Equilibrium	Examining the effect of temperature on equilibrium	No
Topic 8 Acids and bases	Recognizing Acids and Bases with Natural indicators	No
Topic 8 Acids and bases	Mandatory Lab – Titration of Calcium carbonate in eggshells Acid-base titration with different indicators. Use of pH meter and universial indicator	Yes
Topic 9 Redox processes	Invesitigating electrolysis of molten salt simulation	Yes
Topic 9 Redox processes	Mandatory Lab – Voltaic Cell Experiment involving typical voltaic cell using two metal/metal ion half cells	Yes
Topic 10 Organic Chemistry	Mandatory Lab – Molecular Models of organic compounds and virtual lab Computer generated molecular graphic programmes and use of molecular models to generate various organic compounds	Yes
Option B Biochemistry	Separation of photosynthetic pigments by Thin Layer Chromatography	No

4. Laboratory facilities

Describe the laboratory and indicate whether it is presently equipped to facilitate the practical work that you have indicated in the chart above. If it is not, indicate the timeline to achieve this objective and describe the safety measures that are applicable.

Teachers are fully qualified to follow all safety procedures when undertaking practical work and safety rules are prominently displayed on laboratory walls. Students are required to wear protective clothing which includes protective gloves, splash resistant spectacles or protective shields. Appropriate fire extinguisher is accessible in the laboratory as well as fire blankets, first aid kit and emergency shower and eyewash station too. We do not use bottled gas supply, we use main gas and an independent switch for gas that shuts off all supplies is available at the teacher´s desk and an independent switch for electricity that shuts off all supplies is available at the corridor right next to the lab in the fuse box. We have a separate room for our laboratory supplies. All chemicals and other dangerous equipment are stored in a lockable, ventilated room where students are not allowed without teacher´s presence. All chemical containers are labelled with the name of the chemical and with the hazard warning. The school (chemistry department) maintain an inventory of all the laboratory chemicals. In this extra room glass materials, devices to be used in experiments, and safety materials are available too. We have bought a fume hood in the laboratory. This massive change of equipment of the laboratory must be approved by The Monuments Board of The Slovak Republic because of the specific character of our school building. All chemicals are properly disposed of according to local legal requirements and consideration for the environment.

5. Other resources

Indicate what other resources the school has to support the implementation of the subject and what plans there are to improve them, if needed.

The library has resources and reference materials which continually get updated Hodder Education **INTERNAL ASSESSMENT FOR CHEMISTRY Skills for success** Christopher Talbot Cambridge University Press **CHEMISTRY FOR THE IB DIPLOMA Exam Preparation Guide** Steve Oven, Chris Martin Oxford IB Diploma Programme **CHEMISTRY with online resource access card** https://questionbank.ibo.org/ https://resources.ibo.org/home http://www.rsc.org/learn-chemistry http://chemcollective.org/home http://www.bozemanscience.com/ap-chemistry

6. Links to TOK

You are expected to explore links between the topics of your subject and TOK. As an example of how you would do this, choose one topic from your course outline that would allow your students to make links with TOK. Describe how you would plan the lesson.

Topic	Link with TOK (including description of lesson plan)
Topic 3	What role did inductive and deductive reasoning play in the development of the periodic table? What role does inductive and deductive reasoning have in science in general? Students will be told to find in the periodic table selected elements: Li, Na, Be, Mg, O, S, F, Cl . They will find the atomic number, atomic mass, the will write electron configurations, compare values and think about in which group and which period are these elements and why.

7. Approaches to learning

Every IB course should contribute to the development of students' approaches to learning skills. As an example of how you would do this, choose one topic from your outline that would allow your students to specifically develop one or more of these skill categories (thinking, communication, social, self-management or research).

Topic	Contribution to the development of students' approaches to learning skills (including one or more skill category)
Topic 7 Some of Topic 3 and 4	Students take ownership of their own learning. Where they collaboratively problem solve, research and discuss the question above. Students will be given a research paper about chlorine gas and resources such as the Haber process, as well as just a general statement about Haber's Nobel prize in 1918 and his contributions to weaponry during the world war. Students will prepare for their discussion by organizing their thinking and researching background information related to the topic. This type of lesson will develop many of the student's approaches to learning as they develop their communication and social skills during the discussion through talking, note taking, balancing and team working; their self-management skills during preperation as well as when they lead their own discussion and reflect/self-ass; reasearch skills as they develop their topic and build deeper; and thinking skills as they continue the process of building on their main goal and making their discussion and thinking visible.

8. International mindedness

Every IB course should contribute to the development of international-mindedness in students. As an example of how you would do this, choose one topic from your outline that would allow your students to analyse it from different cultural perspectives. Briefly explain the reason for your choice and what resources you will use to achieve this goal.

Topic	Contribution to the development of international mindedness (including resources you will use)
Topic 2	Isotope enrichment uses physical properties to separate isotopes of uranium, and is employed in many countries as part of nuclear energy and weaponry programmes.

9. Development of the IB learner profile

Through the course it is also expected that students will develop the attributes of the IB learner profile. As an example of how you would do this, choose one topic from your course outline and explain how the contents and related skills would pursue the development of any attribute(s) of the IB learner profile that you will identify.

Topic	Contribution to the development of the attribute(s) of the IB learner profile
Topic 5 and 6	Debate moral ethical, social, economic and environmental consequences of ozone depletion and its causes Using topic 5 and 6 This activity allows students to be thinkers by using a visible thinking routine to organize their thought process. The topic allows for them to be open-minded, reflective and caring about the science but also the world around us in multiple areas. It also dives into being prinicpled and balanced as we see what we have done and how can we take actions be it through education or laws for justice, respect and fairness in our environment.