ÉCOLE Jeannine Manuel
International understanding through a bilingual education

CHEMISTRY SL

	Topic/unit (as identified in the IB subject guide)	Contents	Allocated time One class is 95 mins. Each week there are 2 classes.	Assessment instruments to be used	Resources
Year 1	Topic 2 Stoichiometric relationships	Stoichiometry. Moles. Avogadro's constant. % yields. Molar volume of a gas.	5 weeks	<u>Summative</u>: Short 10 minute tests every 2 weeks to test knowledge and recall. Major test at end of each Topic. End of term test will cover all work done that term. Kahoot Quiz <u>Formative</u>: Questioning Analysing student work in class or homework Summaries (in pairs) Think-pair-share Round robin charts Classroom polls (using Poll Everywhere app) Presentations Lab reports	Textbook: Chemistry Course Companion (Oxford) Pupils will have access to science department laptops. One laptop per pupil Calculations in A Level Chemistry by Jim Clarke Moles: A survival guide for science by Keith Brown Calculations for A Level Chemistry by EN Ramsden Library: Chemistry Review, Physics Review and Biological Science Review (publisher: Philip Allan). Hardcopies from September 2018. Back catalogues online.
	Topic 1 Atomic srtucture	Atomic structure. Mass spectroscopy. Electron configuration and orbitals.	2 weeks		
	Topis 4 Chemical bonding and structure	Ionic bonding and structures, Covalent bonding and structures, Intermolecular forces, metallic bonding.	6 weeks		
	Topic 5 Energetics/ thermochemistry	Measuring energy changes, enthalpy, specific heat capacity, Hess's Law, bond enthalpies.	3 weeks		
	Topic 6 Chemical kinetics	Collision theory and rates of reaction.	2 weeks		

	Topic 7 Equilibrium	Equilibrium law, reaction quotient, catalysts, Le Chatelier's principle	2 weeks		Diverse general science reading books. New Scientist Also one copy of alternative text books for the course; eg Cambridge, Pearson.
	Topic 3 Periodicity	Trends within the Periodic Table.	Pupils will peer teach this topic at the end of Term 1 (after Topic 1). Presentation time: 1 week		
	Topic 11 Measurement and data processing	Uncertainties and errors, graphical techniques, spectroscopic identification of organic compounds	This topic will be taught throughout the 2 year course, particularly during practical work. Spectroscopy taught with Topic 10 (Organic Chemistry). Allow for additional 2 weeks teaching in Year 1.		
	Prescribed practicals and IA		10 weeks		
Year 2	Topic 8 Acids and bases	Theories of acids and bases, properties of acids and bases, te pH scale, acid deposition.	5 weeks	<u>Summative</u>: Short 10 minute tests every 2 weeks to test knowledge and recall. Major test at end of each Topic. End of term test will cover all work done that term. Kahoot Quiz <u>Formative</u>: Questioning Analysing student work in class or homework Summaries (in pairs) Think-pair-share	Library Online Resources: JSTOR Bibliotheque Ecole Jeannine Manuel (has links to online libraries such as PLOS (Public Library of Science) and Science 360 video collection. New Scientist
	Topic 9 Redox processes	Oxidation and reduction, Electrochemical cells.	4 weeks		

	Topic 10 Organic chemistry	Structural formulae and 3-D models, functional group chemistry.	5 weeks	Round robin charts Classroom polls (using Poll Everywhere app) Presentations Lab reports	
	Topic 11 Measurement and data processing	Uncertainties and errors, graphical techniques, spectroscopic identification of organic compounds	This topic will be taught throughout the 2 year course, particularly during practical work. Spectroscopy taught with Topic 10 (Organic Chemistry). Allow for additional 2 weeks teaching in Year 2.		
	Prescribed Practicals		5 weeks		

Revision : 1 week of exam revision in Year 1 (total 34 weeks instruction) and 3 weeks exam revision in Year 2 (total 24 weeks instruction

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1. 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.

Aim to do the Group 4 Project at the end of Term 1 and look at feasibility of doing it with Year 1 and Year 2 students together. Emphasise cross-curricular links such as with history, geography, economics, bio/chjem/phys.
Several weeks before the start of the Group 4 Project introduce pupils to the Group 4 Project. This will give them time to research the Project to be more informed on the visit.
Assign all pupils of Group 4 subjects (Years 1 and 2) into groups of 3 or 4 pupils (currently we envisage a cohort of around 40 pupils in Years 1 and 2). Ensure that at least three subjects are represented in each group.
Allocate 2 full days for pupils to carry out the Project. The dates should be made known to pupils, parents and other teachers several weeks in advance. Pupils must be made aware of the importance of being prepared to carry out their Project on that day.
Allow 1 hour before the project day to give final instructions to pupils.
Allow pupils 5-6 hours to complete their Project on the Project Day.

Suggested topic for Group 4:
Day 1 : Pupils visit a water treatment plant and are given a guided tour. Groups choose one aspect of water treatment to do as their project.
Day 2 : Pupils are given 5-6 hours to prepare their project. International-mindedness is a very important part of the IB course of study and this project could be done with another school overseas to compare and contrast water treatments in the two different countries. On the afternoon of Day 2 groups present their findings, and evaluate their methodology to other pupils. Parents, teachers, school governors and other interested parties (press, water treatment staff) can be present. This is expected to last 1-2 hours.

That evening there should be an open presentation where other pupils and their parents, plus interested members of the public, can walk around the different presentations and disuss with the Group 4 pupils who prepared the Projects. This will link to aspects of the Learner profile : communicators, reflective, knowledgeable.

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

Name of the topic	Experiment	Any ICT used? *Remember you must use all five within your programme.*
Topic 1.2 Stoichiometric relationships	Obtain and using experimental data for deriving empirical formulas from reactions involving mass change	No
Topic 1.3 Stoichiometric relationships	Use of the experimental method of titration to calculate the concentration of a solution by reference to a standard solution.	Yes. pH data loggers.
Topic 1.3 Stoichiometric relationships	Obtaining and using experimental values to calculate the molar mass of a gas from the ideal gas equation.	No
Topic 2 Atomic Structure	Emission Spectra Activity	Yes
Topic 4: Chemical Bonding and Structure	Solubility of salts (design only)	No
Topic 5.1 Energetics/thermochemistry	A calorimetry experiment for an enthalpy of reaction.	Temperature probes. Graphing and data logging.
Topic 6.1 Chemicl kinetics	Investigation of rates of reaction experimentally and evaluation of results.	Data logging with carbon dioxide/temperature sensors. Spreadsheets for data processing. Graphing.
Topic 8.2 Acids and bases	Acid base titrations with different indicators to include universal indicator.	Compare with data logger of pH changes.
Topic 8.3 Acids and bases	Acid base titrations with pH meter.	Use of data logger with pH meter. Spreadsheets for data processing.
Topic 9.2 Redox processes	A lab experiment involving a typical voltaic cell using two metal/metal=ion half cells.	
Topic 10.1 Organic chemistry	Construction of 3D models of organic molecules.	Computer modelling and simulations.

3. Links to TOK

Topic	Link with TOK (including description of lesson plan)
To examine how hypotheses and the beliefs that underlie them are formed.	Time allowed : 1.5 hours Class is divided into groups of 3 or 4 students. Each group given copy of information below (The Three Martians). Pupils are allocated one hypothesis each (A or B or C). Pupil are to come up with all the possible reasons to defend their hypotesis. Depending on the number of pupils the debate could be a whole class debate or a debate between groups of students. Pupils should defend their hypothesis until another group gives them proof that they are wrong. This exercise can lead to furter discussion on the virtues of each hypotesis, what are the requirements of any hypothesis in science, how each hypothesis could be tested, what is the dividing line between scientific and pseudo-scientific claims ? **The Three Martians** Three Martians, A, B and C, were crossing the Great Victoria Desert when they came upon an object (a thermometer) which had possibly been lost by an explorer. Having observed it for a few days, they realize that there is something inside it (the column of mercury) which at different times can be seen to be in different positions. They discuss the possible reasons for such strange behaviour. **A** proposes the hypothesis that the behaviour is related to the time of day. This would explain why at night the column drops, and why it rises during the day. **B** suggests that the reason must be heat and cold, which also would explain why it drops at night and rises during the day. **C** says that both A and B are wrong. The real reason for the movement lies in the nature of the enclosed substance that is animated by invisible spirits who adopt a capricious behaviour when imprisoned. These spirits make the substance rise or fall whenever they feel like it. This would explain what both the other hypotheses have explained; moreover, it would explain any variation, at any time and under any circumstances.

4. Approaches to learning

Topic	Contribution to the development of students' approaches to learning skills (including one or more skill category)
Topic 3 : Periodicity	Learning Skills : Research and Communication Following Topic 2 (Atomic Structure) pupils will be given a section of Topic 3 (Periodicity) to research and then present to their classmates. Pupils will need to research and understand their section of the topic and then present it to their peers in a form that is accessible and covers the syllabus. Pupils will need to communicate the information in different ways using powerpoints, worksheets, quizzes, film, etc.

5. International mindedness

Topic	Contribution to the development of international mindedness (including resources you will use)
Topic 5 : Energetics/thermochemistry	The Montreal Protocol has been ratified by all members of the UN and it looks to limit the production and use of chemicals that damage ozone. The Montreal Protocol is seen as the most successful international agreement to date. Why is the Montreal Protocol seen as a success and other international agreements (such as the Kyoto Protocol) are viewed as less of a success ? Why were some developing countries granted exemptions or longer to implement the Protocol (eg the phasing out of methyl bromide)? Should developing countries expect exemptions to international treaties or longer timescales to implement them ? Should developed countries bear most of the cost of dealing with environmental clean-ups ? Sample of resources available online : http://theconversation.com/saving-the-ozone-layer-why-the-montreal-protocol-worked-9249 https://www.theguardian.com/environment/blog/2012/nov/26/kyoto-protocol-carbon-emissions http://conf.montreal-protocol.org/meeting/oewg/oewg-37-resumed/presession/Briefing%20Notes/Briefing_note_on_exemptions.pdf https://gpnmag.com/news/montreal-protocol-approves-methyl-bromide-exemptions-after-phase-out-deadline/

6. Development of the IB learner profile

Topic	Contribution to the development of the attribute(s) of the IB learner profile
Reflective	During every experiment encourage pupils to review the data as they collect it. Are the results as they expect? Can they see a pattern ? Do the results make sense? Is the method fit for purpose? Are the repeat results precise? If the repeat results are not precise what might be the cause of this ? Does the method need to be revised ? Is the equipment suitable to get the required degree of accuracy and precision? What are the strengths and weaknesses of their method? If pupil can be 'trained' to think in this way they will build reflection into their practical work. By building reflection into the experimental work of pupils, the Analysis and Evaluation sections of the IA will be more relevant to pupils and more achieveable.