IB CHEMISTRY YEAR 2 - Unit 5

Teacher(s)	IB Chemistry PLC	**Subject Group and Course**	Group 4 - Chemistry		
Course Part and Topic	10.2 - Functional Group Chemistry 11.3 - Spectroscopic Identification of Organic Cmpds	**SL or HL / Year 1 or 2**	SL Year 2	**Dates**	4 weeks (Feb-Mar)
Unit Description and Texts		**DP Assessment(s) for Unit**			
● Murphy et al. *Oxford IB Diploma Programme: Chemistry Course Companion*, 2014 edition. ● Brown and Ford. *Pearson Baccalaureate Standard Level Chemistry*, 2nd edition.		● Practice Papers 1 and 2 (Unit Exam)			

INQUIRY: establishing the purpose of the unit

Transfer Goals

List here one to three big, overarching, long-term goals for this unit. Transfer goals are the major goals that ask students to "transfer" or apply their knowledge, skills, and concepts at the end of the unit under new/different circumstances, and on their own without scaffolding from the teacher.

Phenomenon: An ester is formed from the reaction of a carboxylic acid and an alcohol in the presence of an acidic catalyst.

Statement of Inquiry: Organic functional groups can be transformed into others with the right chemical reaction, allowing us to create numerous different organic compounds for many useful purposes including medicine, polymers, and fuels.

1. **Students can** discuss the reactions that alkanes and alkenes undergo, including combustion, substitution, addition, and polymerization.
2. **Students can** discuss the oxidation of alcohols to form various products depending on whether the alcohol is primary, secondary, or tertiary, as well as the esterification process and simple nucleophilic and electrophilic substitution reactions.
3. **Students can** interpret spectroscopic data for simple organic molecules, including IR and proton NMR spectroscopy and mass spectrometry.

ACTION: teaching and learning through inquiry

Content / Skills / Concepts - Essential Understandings	**Learning Process** *Check the boxes for any pedagogical approaches used during the unit. Aim for a variety of approaches to help facilitate learning.*
Students will UNDERSTAND the following CONTENT: • **Alkanes have low reactivity and undergo free-radical substitution reactions** • **Alkenes are more reactive than alkanes and undergo addition reactions** • **Bromine water can be used to distinguish between alkenes and alkanes** • **Addition polymers consist of a wide range of monomers and form the basis of the plastics industry** • **Alcohols undergo nucleophilic substitution reactions with acids (also called esterification or condensation) and some undergo oxidation reactions** • **A nucleophile is an electron-rich species containing a lone pair that it donates to an electron-deficient carbon** • **Halogenoalkanes are more reactive than alkanes and can undergo (nucleophilic) substitution reactions** • **Benzene does not readily undergo addition reactions but does undergo electrophilic substitution reactions** • **The index of hydrogen deficiency (IHD) can be used to determine from a molecular formula the number of rings or multiple bonds in a molecule** • **Mass spectrometry (MS), proton nuclear magnetic resonance spectroscopy (1H NMR) and infrared spectroscopy (IR) are techniques that can be used to help identify compounds and to determine their structure** Students will DEVELOP the following SKILLS: • **Write equations for the complete and incomplete combustion of hydrocarbons** • **Write equations for the reactions of alkenes with hydrogen and halogens and of symmetrical alkenes with hydrogen halides and water** • **Outline the addition polymerization of alkenes** • **Describe the relationship between the structure of the monomer to the polymer and repeating unit** • **Explain the reaction of methane and ethane with halogens in terms of a free-radical substitution mechanism involving photochemical homolytic fission (including initiation, propagation and termination steps)** • **Write equations for the complete combustion of alcohols** • **Write equations for the oxidation reactions of primary and secondary alcohols (using acidified potassium dichromate(VI) or potassium manganate(VII) as oxidizing agents)** • **Explain distillation and reflux in the isolation of the aldehyde and carboxylic acid products** • **Explain the equation for the condensation reaction of an alcohol with a carboxylic acid, in the presence of a catalyst (e.g., concentrated sulfuric acid) to form an ester** • **Write the equation for the substitution reactions of halogenoalkanes with aqueous sodium hydroxide** • **Determine the IHD from a molecular formula**	Learning experiences and strategies/planning for self-supporting learning: ☒ Lecture □ Socratic seminar ☒ Small group/pair work ☒ PowerPoint lecture/notes ☒ Individual presentations ☒ Group presentations ☒ Student lecture/leading □ Interdisciplinary learning Details: *Students will learn through a combination of presentations, small group work, and practice problems.* ☒ Other(s): *practice problems* **Formative assessment(s):** *Short closer quizzes for each lesson*

• **Deduce information about the structural features of a compound from percentage composition data, MS, 1H NMR, or IR** • **Deduce the number of different hydrogen (proton) environments using an 1H NMR spectrum and the relative numbers of hydrogen atoms in each environment** • **Understand the regions of the electromagnetic spectrum used for each of the above techniques**	*Daily formative checks* **Summative assessments:** *Exam consisting of Paper 1 and Paper 2 questions* **Differentiation:** ☒ Affirm identity - build self-esteem ☒ Value prior knowledge ☒ Scaffold learning ☒ Extend learning Details: • *SWD/504 – Accommodations Provided* • *ELL – Reading & Vocabulary Support* • *Intervention Support* • *Extensions – Enrichment Tasks and Project*

Approaches to Learning (ATL)

Check the boxes for any explicit approaches to learning connections made during the unit. For more information on ATL, please see the guide.

□ Thinking

□ Social

☒ Communication

☒ Self-management

□ Research

Details:

Students will communicate their findings to their peers in the form of small-group presentations.

Students must use self-management skills to complete work in a timely and accurate manner.

Language and Learning *Check the boxes for any explicit language and learning connections made during the unit. For more information on the IB's approach to language and learning, please see the guide.*	**TOK Connections** *Check the boxes for any explicit TOK connections made during the unit*	**CAS Connections** *Check the boxes for any explicit CAS connections. If you check any of the boxes, provide a brief note in the "details" section explaining how students engaged in CAS for this unit.*
☒ Activating background knowledge ☒ Scaffolding for new learning ☒ Acquisition of new learning through practice ☒ Demonstrating proficiency Details: *Content and vocabulary introduced in previous science courses will be used in this unit.* *Students will acquire new vocabulary.* *Students will continually demonstrate proficiency with chemistry vocabulary in class discussions and group work.*	□ Personal and shared knowledge ☒ Ways of knowing □ Areas of knowledge □ The knowledge framework Details: *TOK knowledge questions will be included as discussion options for each lesson.*	□ Creativity □ Activity □ Service Details: N/A

Resources *List and attach (if applicable) any resources used in this unit*
● Textbooks (Oxford and Pearson - see page 1) ● Online notes and videos (Schoology)

REFLECTION: considering the planning, process, and impact of the inquiry

What worked well *List the portions of the unit (content, assessment, planning) that were successful*	**What didn't work well** *List the portions of the unit (content, assessment, planning) that were not as successful as hoped*	**Notes / Changes / Suggestions** *List any notes, suggestions, or considerations for the future teaching of this unit*
●	●	●