IB CHEMISTRY YEAR 2 - Unit 4

Teacher(s)	IB Chemistry PLC	**Subject Group and Course**	Group 4 - Chemistry		
Course Part and Topic	4.3 - Covalent Structure 4.4 - Intermolecular Forces 10.1 - Fundamentals of Organic Chemistry	**SL or HL / Year 1 or 2**	SL Year 2	**Dates**	6 weeks (Jan-Feb)
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: Millions of organic compounds have been discovered, and each one has a unique and systematic name and predictable structure.

Statement of Inquiry: The physical properties of molecular (including organic) substances result from different types of forces between their molecules.

1. **Students can** apply concepts of bonding to discuss different types of covalent structures, including giant covalent networks, molecules, and resonance structures.
2. **Students can** identify and name common organic functional groups as well as simple organic molecules.
3. **Students can** describe the structure of benzene using the idea of delocalized electrons.

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: • **Lewis (electron dot) structures show all the valence electrons in a covalently bonded species** • **The "octet rule" refers to the tendency of atoms to gain a valence shell with a total of 8 electrons** • **Some atoms, like Be and B, might form stable compounds with incomplete octets of electrons** • **Shapes of species are determined by the repulsion of electron pairs according to VSEPR theory** • **Resonance structures occur when there is more than 1 possible position for a double bond in a molecule** • **Carbon and silicon form giant covalent/network covalent structures** • **Intermolecular forces include London (dispersion) forces, dipole-dipole forces and hydrogen bonding** • **The relative strengths of these interactions are London (dispersion) forces < dipole-dipole forces < hydrogen bonds** • **A homologous series is a series of compounds of the same family, with the same general formula, which differ from each other by a common structural unit** • **Structural formulas can be represented in full and condensed format** • **Functional groups are the reactive parts of molecules** • **Structural isomers are compounds with the same molecular formula but different arrangements of atoms** • **Saturated compounds contain single bonds only and unsaturated compounds contain double or triple bonds** • **Benzene is an aromatic, unsaturated hydrocarbon** Students will DEVELOP the following SKILLS: • **Deduce the Lewis (electron dot) structure of molecules or ions showing all valence electrons for up to four electron pairs per atom** • **Understand and give examples of coordinate covalent bonds** • **Predict electron domain and molecular geometry for species with 2, 3, or 4 electron domains (linear, trigonal planar, tetrahedral)** • **Predict bond angles from molecular geometry and presence of lone pairs** • **Predict molecular polarity from bond polarity and molecular geometry** • **Deduce resonance structures (especially for C6H6, CO32-, and O3)** • **Explain the properties of giant covalent compounds in terms of their structures** • **Discuss the allotropes of carbon (diamond, graphite, graphene, C60 buckminsterfullerene) and SiO2** • **Deduce the types of intermolecular forces given a structure or chemical formula** • **Explain volatility, electrical conductivity, and solubility of covalent compounds in terms of structure and intermolecular forces** • **Explain the trends in boiling points of members of a homologous series**	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*

• **Distinguish between empirical, molecular and structural formulas**
• **Identify the following classes of compounds: alkanes, alkenes, alkynes, halogenoalkanes, alcohols, ethers, aldehydes, ketones, esters, carboxylic acids, amines, amides, nitriles and arenes**
• **State the general formulas of the following classes: alkanes, alkenes, alkynes, ketones, alcohols, aldehydes, and carboxylic acids**
• **Identify the following functional groups: phenyl, hydroxyl, carbonyl, carboxyl, carboxamide, aldehyde, ester, ether, amine, nitrile, alkyl, alkenyl, and alkynyl**
• **Determine the full name of the following:**
  ○ **non-cyclic alkanes and halogenoalkanes up to halohexanes**
  ○ **alkenes up to hexene and alkynes up to hexyne**
  ○ **compounds up to six carbon atoms (in the basic chain for nomenclature purposes) containing only one of the classes of functional groups: alcohols, ethers, aldehydes, halogenoalkanes, ketones, esters, and carboxylic acids**
• **Identify primary, secondary, and tertiary carbon atoms in halogenoalkanes and alcohols and primary, secondary, and tertiary nitrogen atoms in amines**
• **Apply IUPAC rules in the nomenclature of straight-chain and branched-chain isomers**
• **Construct 3-D models of organic molecules**
• **Discuss the structure of benzene using physical and chemical evidence**
	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*
●	●	●