IB CHEMISTRY YEAR 1 - Unit 3

IB Chemistry PLC		**Subject Group and Course**	Group 4 - Chemistry		
Course Part and Topic	6.1 - Collision Theory and Rates of Reaction 7.1 - Equilibrium	**SL or HL / Year 1 or 2**	SL Year 1	**Dates**	January to March 2023
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.		• Unit 03 Summative Assessment - *featuring Paper 1, Paper 2, and Paper 3 questions from Topics 6 and 7*			

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: If photosynthesis stopped, the balance of carbon dioxide exchange would be disturbed.

Statement of Inquiry: Many chemical reactions are reversible in nature.

1. **Students can** analyze graphs of concentration, volume, or mass versus time to determine relative rates of reaction.
2. **Students can** apply collision theory to discuss the rate of a chemical reaction and how the rate is affected by external or internal factors such as a catalyst.
3. **Students can** discuss the characteristics of chemical and physical systems in equilibrium.
4. **Students can** use the equilibrium constant (K_c) or reaction quotient (Q) as well as Le Chatelier's Principle to analyze systems at equilibrium, systems not at equilibrium, or systems that are modified and return to equilibrium.

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: • **Rate of reaction is expressed as change in concentration of a particular reactant/product per unit time** • **Concentration changes in a reaction can be followed indirectly by monitoring changes in mass, volume and colour** • **Species react as a result of collisions of sufficient energy and proper orientation** • **Activation energy (Ea) is the minimum energy that colliding molecules need in order to have successful collisions leading to a reaction** • **By decreasing Ea, a catalyst increases the rate of a chemical reaction, without itself being permanently chemically changed** • **A state of equilibrium is reached in a closed system when the rates of the forward and reverse reactions are equal** • **The equilibrium law describes how the equilibrium constant (Kc) can be determined for a particular chemical reaction** • **The magnitude of the equilibrium constant indicates the extent of a reaction at equilibrium and is temperature dependent** • **The reaction quotient (Q) measures the relative amount of products and reactants present during a reaction at a particular point in time. Q is the equilibrium expression with non-equilibrium concentrations. The position of the equilibrium changes with changes in concentration, pressure, and temperature.** • **A catalyst has no effect on the position of equilibrium or the equilibrium constant** Students will DEVELOP the following SKILLS: • **Analyze graphical and numerical data from rate experiments** • **Calculate reaction rate from tangents of graphs of concentration, volume or mass vs. time** • **Interpret the above types of graphs** • **Lab: Determine the rate of a chemical reaction using experimental data collected using one of the methods discussed** • **Describe the kinetic theory in terms of the movement of particles whose average kinetic energy is proportional to temperature in Kelvin** • **Explain the effects of temperature, pressure/concentration and particle size on rate of reaction** • **Sketch and explain energy profiles with and without catalysts** • **Sketch Maxwell-Boltzmann energy distribution curves to account for the probability of successful collisions and factors affecting them, including the effect of a catalyst** • **Discuss the characteristics of chemical and physical systems in equilibrium** • **Understand the concepts of forward and reverse reactions and equilibrium position**	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, practice problems, and lab work.* ☒ Other(s): *practice problems, lab work* **Formative assessment(s):** *Short closer quizzes for each lesson* *Daily formative checks*

• **Deduce the Kc expression for a given chemical reaction** • **Determine the relationship between different Kc for the same reaction at the same temperature (multiple or inverse)** • **Apply Le Châtelier's principle to predict the qualitative effects of changes of temperature, pressure and concentration on the position of equilibrium and on the value of the equilibrium constant**	**Summative assessments:** *Topic test consisting of Paper 1, Paper 2, and Paper 3 questions* *Lab Report: Measuring Rates of Reaction*
	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 be continuously challenged to develop higher-order thinking skills as they take prior knowledge, combine it with new content, and synthesize a lab report.

Students will build social groups through group work and intentional reflection activities.

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

Students will continue to work on self-management and organization skills.

Students will complete background research for their lab report.

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.*	□ 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: *Students may apply creativity in their lab work.*

Students will acquire new vocabulary. *Students will continually demonstrate proficiency with chemistry vocabulary in class discussions and group work.*		

Resources *List and attach (if applicable) any resources used in this unit*
• Textbooks (Oxford and Pearson - see page 1) • Laboratory resources • 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*