Marietta City Schools

2023–2024 District Unit Planner

Teacher(s)	IB Chemistry PLC	**Subject Group and Course**	Group 4 - Chemistry		
Course Part and Topic	1.3 - Reacting Masses and Volumes 9.1 - Oxidation and Reduction 9.2 - Electrochemical Cells	**SL or HL / Year 1 or 2**	SL Year 2	**Dates**	12 weeks (Aug-Oct)
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, 2, and 3 (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: A voltaic cell produces electric current spontaneously, allowing electrons to flow from one metal electrode to another while keeping charge balance throughout.

Statements of Inquiry: Mole ratios in chemical equations can be used to calculate reacting ratios by mass and gas volume.
Chemists use half-equations to determine how electrons move in reactions.

1. **Students can** apply the concepts of limiting and excess reactants to determine theoretical yield and percentage yield for a chemical reaction.
2. **Students can** properly prepare a standard solution and apply the dilution equation to lab scenarios.

3. **Students can** perform a redox titration and solve a range of problems.
4. **Students can** construct and analyze both voltaic and electrolytic cells.

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:

- ❑ **Oxidation and reduction can be considered in terms of oxygen gain/hydrogen loss, electron transfer or change in oxidation number**
- ❑ **Variable oxidation numbers exist for transition metals and most main-group nonmetals**
- ❑ **An oxidizing agent is reduced and a reducing agent is oxidized**
- ❑ **The activity series ranks metals according to the ease with which they undergo oxidation**
- ❑ **Reactants can be either limiting or excess**
- ❑ **The experimental yield can be different from the theoretical yield**
- ❑ **Avogadro's law enables the mole ratio of reacting gases to be determined from volumes of the gases**
- ❑ **The molar volume of an ideal gas is constant at a particular temperature and pressure**
- ❑ **The molar concentration of a solution is determined by the amount of solute and the volume of solution**
- ❑ **A standard solution is one of known concentration**
- ❑ **The SI units of molar concentration are mol dm^{-3}**
- ❑ **The Winkler Method can be used to measure biochemical oxygen demand (BOD), used as a measure of the degree of pollution in a water sample**
- ❑ **Voltaic cells convert energy from spontaneous, exothermic chemical processes to electrical energy; electrolytic cells convert electrical to chemical energy by bringing about non-spontaneous processes**
- ❑ **Oxidation occurs at the anode and reduction occurs at the cathode in both voltaic and electrolytic cells**
- ❑ **The anode is the negative electrode while the cathode is positive in a voltaic cell (CPAN) - the opposite is true for an electrolytic cell (CNAP)**

Students will DEVELOP the following SKILLS:

- ❑ **Deduce the name of a transition metal compound from a given formula, applying oxidation numbers represented by Roman numerals**
- ❑ **Deduce the oxidation states of an atom in an ion or a compound**
- ❑ **Deduce redox reactions using half-equations in acidic or neutral solutions**
- ❑ **Identify the species oxidized and reduced and the oxidizing and reducing agents, in redox reactions**
- ❑ **Deduce the feasibility of a redox reaction from the activity series or reaction data**
- ❑ **Use mole ratios and molar masses to interconvert the mass of a reactant to the mass of a product**
- ❑ **Calculate theoretical yield using the concept of limiting reactants**
- ❑ **Calculate percentage yield from theoretical and experimental yields**
- ❑ **Solve problems using Avogadro's Law, the molar volume of a gas, combined gas law, and ideal gas law**
- ❑ **Analyze graphs for the relationship between temperature, pressure, and volume for a fixed mass of an ideal gas**
- ❑ **Explain the deviation of real gases from ideal behavior at low temperature and high pressure**
- ❑ **Lab: Experimentally determine the molar mass of a gas using the ideal gas law**
- ❑ **Solve problems involving molar concentration, amount of solute, and volume of solution**

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
Daily formative checks

Summative assessments:

Exam consisting of Paper 1 and Paper 2 questions

❑ **Apply the dilution equation c1V1 = c2V2 to lab scenarios** ❑ **Lab: Perform a titration using a standard alkaline solution to calculate the concentration of an acid** ❑ **Solve a range of redox titration problems** ❑ **Apply the Winkler Method to calculate BOD** ❑ **Construct and annotate both types of electrochemical cells - including cell diagram convention** ❑ **Explain how a redox reaction is used to produce electricity in a voltaic cell and how current is conducted in an electrolytic cell** ❑ **Distinguish between electron and ion flow in both electrochemical cells** ❑ **Deduce the products of the electrolysis of a molten salt** ❑ **Lab: Construct and use a voltaic cell using two metal/metal-ion half-cells**	**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*
• Laboratory resources • 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*
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