Lesson 5-1: Electrochemistry	
Curriculum Expectations	• F2.1 • F2.2 • F3.1
Learning Goals	**Learning Goals:** • Explore the characteristics of oxidation-reduction (redox) reactions. • Write half-reactions. • Learn terms related to redox reactions including oxidation, reduction, reducing agent, oxidizing agent. • Investigate oxidation numbers and understand how they relate to the elements of the periodic table.
Success Criteria	I know I have achieved the learning goals for this lesson when I can: • Classify a reaction as an oxidation-reduction reaction • Identify which species are oxidized and which are reduced in a redox reaction • Determine the oxidation numbers of reactants and products in an electrochemical reaction
Teacher Prep	• Printout sheets for Gridlock Activitiy • Make sure videos in learning activities load up.

Minds On

Goal: To introduce concepts related to Electrochemistry

1. **Electrochemistry Think-Pair-Share**

   Instructions:

   - For this activity you can put students into groups of 2.
   - Have them respond to the following prompt:

   "What does electrochemistry mean? Can you think of any examples of electrochemistry that are common in our everyday lives?"

   - Have each student carefully think about the prompt for 2 minutes. How would they answer it? What connections can they make to what they know?
   - Have each pair discuss the prompt together for 4-5 minutes, sharing ideas and discussing the prompt.
   - Students should ask each other questions to clarify thinking.
   - One member of the group will share the ideas with the class.

Action

****Refer to the Differentiation Resources link for additional practice worksheets, and to enrich your classroom teaching using different tools throughout the lesson. ****

1. **5-1A: Electrochemistry Introduction**

   - For each section of this activity have students read through the section and take notes on their own.
   - When all students have read through a section, use the text and images within to present the material to the class as a whole.
   - Take your time as you navigate through this activity to focus on the terminology as it is crucial going forward. Makre sure students have detailed, accurate notes that describe the following terms:
     - Oxidation
     - Reduction
     - Oxidizing Agent
     - Reducing Agent

    - Spectator Ion
    - Half-reaction
- Allow time for questions and encourage students to speak up if they don't understand.
- For the sample problem have the students attempt to answer the question on their own, then take up the solution as a class.
- View the embedded video at the bottom together, as a class. Pause as the video progresses to make sure students are following and understand.
- Encourage questions throughout.

2. 5-1B: Oxidation Numbers

- For each section of this activity have students read through the section and take notes on their own.
- When all students have read through a section, use the text and images within to present the material to the class as a whole.
- Students must have written notes that describe the rules for assigning oxidation numbers.
- Allow time for questions and encourage students to speak up if they don't understand.
- For the sample problems have the students attempt to answer the question on their own, then take up the solutions as a class.
- View the embedded video at the bottom together, as a class. Pause as the video progresses to make sure students are following and understand.
- For the practice questions video, pause before the solutions are presented and have individual students present their solution to the class. Follow this up by viewing the solutions together.
- Encourage questions throughout.

3. Oxidation Numbers Gridlock Activity – pH, pOH & Kw

- In this activity students will work in pairs to complete the grids on the gridlocks worksheet or you can put the gridlock up on a screen and work through the grids as a class. Read the instructions for each grid and use these to explain to students how each grid needs to be completed.

Teacher Information:

Gridlock Puzzles are designed to do 3 major things:

1. They give the students a problem solving context for the activity – students like solving problems and there is a sense of satisfaction in completing the gridlock. There can be an aspect of competition as well: who solved the most, who was quickest or

who made the least mistakes. In the online versions the students are trying to beat the clock.

2. The students need to engage with the factual information the gridlock is based on. In order to solve the puzzle they need to recall the relationships between the data established in the first part of the activity. For example they need to recall that 3 electron pairs gives trigonal planar geometry or that sulfuric acid forms sulfate salts. Whilst they are solving the gridlocks they should find themselves referring to the initial data repeatedly so much so that they recall a fair bit of it by the end.

3. It develops some important thinking skills. The students have to survey the data given in the gridlock to find which squares can initially be filled in. They cannot simply choose a square at random and fill it in because there may not be enough information yet in the grid to narrow down the options to one possible answer. This thinking skill is sadly missing in the students who, given a titration calculation want to straight multiply a concentration by a volume to give the moles of the reactant asks for despite not having all the relevant information yet. Gridlocks also encourage logical reasoning e.g. 'it has to be x because it can't be w, y or z'.

How they might be used:

Gridlocks are suitable for an episode in a lesson or homework. They are designed to be follow up activities rather than an introduction to a topic. The students should have met at least some of the data the gridlocks are based on. The online gridlocks could be tackled by students working individually or a class using a projector. The paper based gridlocks are easy to set and readily peer or self assessed. Some gridlocks go beyond specifications and could be used as extension activities.

The first time you use a gridlock:

It is best to put up the gridlock on a screen and show the class how they work by talking through how to fill in the first few boxes on the first gridlock. Otherwise too many will say 'I don't get it'. Weaker groups may need this careful introduction several times.

Consolidation

1. **5-1D: Electrochemistry Quiz**
    - To be completed individually either at home or in class.

- Answers should be taken up together as a class, identify any issues or areas of weakness and review this material.
- Call on individual students to share their answers and explanations to each question.
- Address any misconceptions or questions by reviewing material from the lesson

2. Redox Reactions Review & Practice I, II & III

- To be completed individually, in small groups in class or at home.
- You may wish to print out the worksheets and have students complete them as a group.
- Take up the answers together the following day.
- Address any misconceptions or questions by reviewing material from the lesson.

****Refer to Differentiation Resources for additional practice worksheets, and to enrich your classroom teaching using different tools. ****