# Chemistry 12
# Unit V: Electrochemistry Learning Log

The following table contains all the prescribed learning outcomes for the Dynamic Equilibrium unit of Chemistry 12. Use this table to help you stay organized and on track throughout the unit. Use it along with the Equilibrium Study Guide to determine your level of competence and understanding of each learning outcome. Once you are confident that you completely understand each learning outcome, place a check mark in the square provided.

| Essential Learning Goals | Achievement Indicators | Practice | Evidence | Study Guide Equivalent | Status |
|---|---|---|---|---|---|
| **G1:** describe oxidation and reduction processes | Define and identify<br>- Oxidation<br>- Reduction<br>- Oxidizing agent<br>- Reducing agent<br>- Half-reaction<br>- Redox reaction | | | S1 | ☐ |
| | Determine the following:<br>- The oxidation number of an atom in a chemical species<br>- The change in oxidation number an atom undergoes when it is oxidized or reduced<br>- Whether an atom has been oxidized or reduced by its change in oxidation number | | | S2 | ☐ |
| | Relate the change in oxidation number to gain or loss of electrons | | | S3 | ☐ |
| **G2:** analyse the relative strengths of reducing and oxidizing agents | From data for a series of simple redox reactions, create a simple table of reduction half reactions | | | S4 | ☐ |
| | Identify the relative strengths of oxidizing and reducing agents from their position on a half-reaction table | | | S5 | ☐ |
| | Use the "Standard Reduction Potential of Half-Cells" table to predict whether a spontaneous redox reaction will occur between any two species | | | S6 | ☐ |
| **G3:** balance equations for redox reactions | Balance the equation for<br>- A half-reaction in solutions that are acidic, basic or neutral<br>- A net ionic redox reaction in acidic or basic solution | | | T1, T2 | ☐ |
| | Write the equations for reduction and oxidation half reactions, given a redox reaction | | | T3 | ☐ |
| | Identify reactants and products for various redox reactions performed in a laboratory, and write balanced equations | | | T4 | ☐ |

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| **G4:** determine the concentration of a species by performing a redox titration | Demonstrate familiarity with at least two common reagents used in redox titrations (e.g., permanganate, dichromate, hydrogen peroxide) | | | N/A | ☐ |
| | Select a suitable reagent to be used in a redox titration, in order to determine the concentration of a species | | | T5 | ☐ |
| | Calculate the concentration of a species in a redox titration from data (e.g., grams, moles, molarity) | | | T6 | ☐ |
| **H1:** analyse an electrochemical cell in terms of its components and their functions | Construct an electrochemical cell | | | U1 | ☐ |
| | Define and label the parts of an electrochemical cell | | | U1 | ☐ |
| | Determine the half-reactions that take place at each electrode of an electrochemical cell, and use these to make predictions about the overall reaction and about<br>- The direction of movement of each type of ion in the cell<br>- The direction of flow of electrons in an external circuit<br>- What will happen to the mass of each electrode as the cell operates | | | U2, U3, U4, U5 | ☐ |
| | Predict the cell potential when equilibrium is reached | | | U6 | ☐ |
| | Determine voltages of half-reactions by analyzing the voltages of several cells, with reference to the standard hydrogen half-cell | | | U7 | ☐ |
| | Identify the standard conditions for Eo values | | | U8 | ☐ |
| | Predict the voltage (Eo) of an electrochemical cell using the "Standard Reduction Potential of Half Cells" table | | | U9 | ☐ |
| | Predict the spontaneity of the forward or reverse reaction from the Eo of a redox reaction | | | U10 | ☐ |
| **H2:** describe how electrochemical concepts can be used in various practical applications | Give examples of applications of electrochemical cells, including lead-acid storage batteries, alkali cells, and hydrogen-oxygen fuel cells, and explain how each functions | | | U11 | ☐ |
| **H3**: analyse the process of metal corrosion in electrochemical terms | Describe the conditions necessary for corrosion of metals to occur | | | V1 | ☐ |
| | Suggest several methods of preventing or inhibiting corrosion of a metal, including cathodic protection, and account for the efficiency of each | | | V2, V3, V4 | ☐ |
| **H4:** analyse an electrolytic cell in terms of its components and their functions | Define electrolysis and electrolytic cell | | | W1 | ☐ |

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| | Design and label parts of an electrolytic cell used for the electrolysis of a molten binary salt such as NaCl liquid | | | W8 | ☐ |
| | Design and label the parts of an electrolytic capable of electrolyzing an aqueous salt such as KI aqueous (use of overpotential effect not required) | | | W2 | ☐ |
| | Predict the direction of flow of all ions in the cell and electrons in the external circuit | | | W3 | ☐ |
| | Write the half-reaction occurring at each electrode and predict observations based on this information | | | W4 | ☐ |
| | Write the overall cell reaction and predict the minimum voltage required for it to operate under standard conditions | | | N/A | ☐ |
| **H5:** describe how electrolytic concepts can be used in various practical applications | Explain the principles involved in simple electroplating | | | W5 | ☐ |
| | Design and label an electrolytic cell capable of electroplating an object | | | W6 | ☐ |
| | Demonstrate familiarity with electrolytic cells in metal refining processes, including refining of zinc and aluminum | | | W7 | ☐ |
| **End of Unit Test (includes ALL Essential Learning Goals)** | | | | | |

**Note: The Chemistry 12 Study Guides are based on OLD PLO's. Use the "Study Guide Equivalent" column to match up old PLO's to the new ones.**

For example, essential learning goal B1: "Explain the concept of chemical equilibrium with reference to reacting systems" matches up to D1-D6 on study cards and review questions.