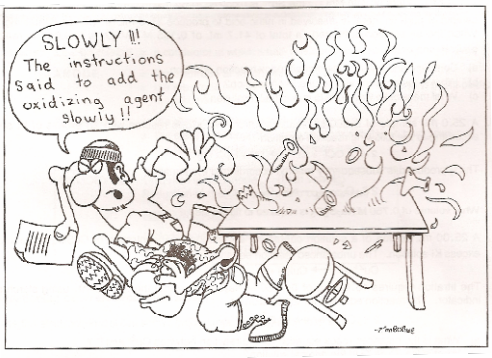
Chemistry 12

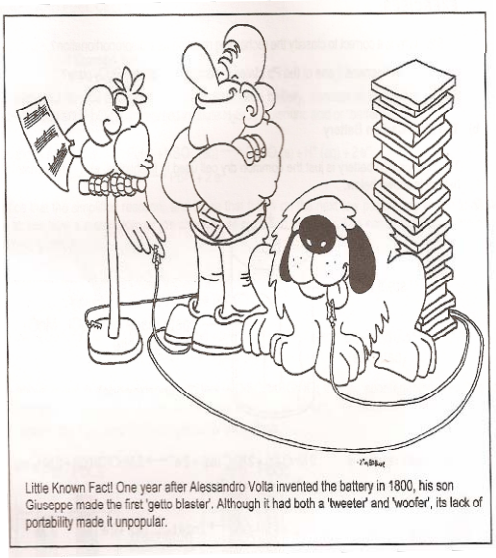
Unit V Electrochemistry

Prescribed Learning Outcomes

The following grid contains all the prescribed learning outcomes (2007 / 2008) for the Electrochemistry unit of Chemistry 12. Use this in conjunction with the Electrochemistry 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.

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

Prescribed Learning Outcomes	Achievement Indicators	Study Guide Equivalent	Status
G1 describe oxidation and reduction processes 	Define and identify - Oxidation - Reduction - Oxidizing agent - Reducing agent - Half-reaction - Redox reaction	S1	❑
	Determine the following: - The oxidation number of an atom in a chemical species - The change in oxidation number an atom undergoes when it is oxidized or reduced - 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 - A half-reaction in solutions that are acidic, basic or neutral - 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	❑
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	❑

Prescribed Learning Outcomes	Achievement Indicators	Study Guide Equivalent	Status
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 - The direction of movement of each type of ion in the cell - The direction of flow of electrons in an external circuit - 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 E^o values	U8	❑
	Predict the voltage (E^o) 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 E^o 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 electrochemical cell in terms of its components and their functions  	Define electrolysis and electrolytic cell	W1	❑
	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	❑