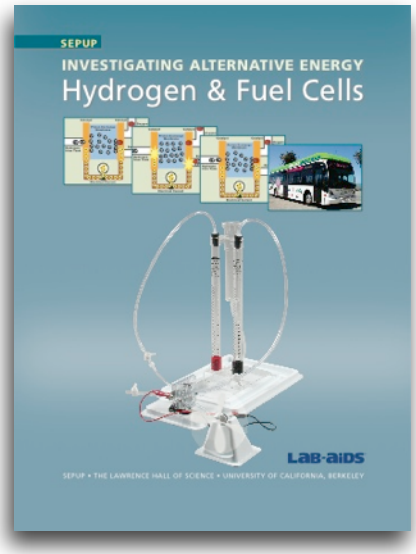
New York



Correlations to SEPUP's *Investigating Alternative Energy: Hydrogen & Fuel Cells*

Investigating Alternative Energy: Hydrogen & Fuel Cells was developed by SEPUP at The Lawrence Hall of Science, and is published by, and available exclusively from, LAB-AIDS, Inc. This document is intended to show selected locations in the *Hydrogen & Fuel Cells* module that support the New York State Education Department standards for high school science. It is not an exhaustive list; other locations may exist that are not listed here.

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Chemistry

Performance Indicator 3.1: Explain the properties of materials in terms of the arrangement and properties of the atoms that compose them.

Performance Indicator Descriptor	Location in Module	Where Assessed
3.1b: Each atom has a nucleus,with an overall positive charge, surrounded by negatively charged electrons.	Activity 4	Procedure Parts A & B
3.1e: Protons and electrons have equal but opposite charges. The number of protons equals the number of electrons in an atom.	Activity 4	Procedure Parts A & B
3.1rr: An electrolyte is a substance which, when dissolved in water, forms a solution capable of conducting an electric current. The ability of a solution to conduct an electric current depends on the concentration of ions.	Activity 2	Analysis #2

Performance Indicator 3.2: Use atomic and molecular models to explain common chemical reactions.

Performance Indicator Descriptor	Location in Module	Where Assessed
3.2d: An oxidation-reduction (redox) reaction involves the transfer of electrons (e-).	Activity 4	Activity 4, Procedure Parts A and B
3.2e: Reduction is the gain of electrons.	Activity 4	Procedure Parts A and B
3.2f: A half-reaction can be written to represent reduction.	Activity 4	Procedure Parts A and B
3.2g: Oxidation is the loss of electrons.	Activity 4	Procedure Parts A and B
3.2h: A half-reaction can be written to represent oxidation.	Activity 4	Procedure Parts A and B
3.2j: An electrochemical cell can be either voltaic or electrolytic. In an electrochemical cell, oxidation occurs at the anode and reduction at the cathode.	Activity 4	Procedure Parts A and B
3.2k: A voltaic cell spontaneously converts chemical energy to electrical energy.	Activities 3, 4, and 5	Throughout Activities 3, 4, and 5
3.2l: An electrolytic cell requires electrical energy to produce a chemical change. This process is known as electrolysis.	Activity 2	Procedure Steps and Calculations

Performance Indicator 3.3: Apply the principle of conservation of mass to chemical reactions.

Performance Indicator Descriptor	Location in Module	Where Assessed
3.3a In all chemical reactions there is a conservation of mass, energy, and charge.	Activity 4	Procedures Part A and B
3.3b In a redox reaction the number of electrons lost is equal to the number of electrons gained.	Activity 4	Procedures Part A and B

Performance Indicator 4.1: Observe and describe transmission of various forms of energy.

Performance Indicator Descriptor	Location in Module	Where Assessed
4.1a Energy can exist in different forms, such as chemical, electrical, electromagnetic, thermal, mechanical, nuclear.	Activities 3 and 5	Activity 5, Analysis #3
4.1d Energy released or absorbed during a chemical reaction (heat of reaction) is equal to the difference between the potential energy of the products and potential energy of the reactants.	Activity 5	Throughout Activity 5

Physics

Performance Indicator: Students can observe and describe transmission of various forms of energy.

Performance Indicator Descriptor	Location in Module	Where Assessed
4.1a All energy transfers are governed by the law of conservation of energy.*	Activities 3 and 5	Throughout Activity 5
4.1b Energy may be converted among mechanical, electromagnetic, nuclear, and thermal forms.	Activities 3 and 5	Throughout Activity 5
4.1i Power* is the time-rate at which work is done or energy is expended.	Activity 5	Procedure Steps, Student Sheet 5.1
4.1p Electrical power* and energy* can be determined for electric circuits.	Activity 5	Procedure Steps and Student Sheet 5.1