ARISE Curriculum Guide

Chemistry: Topic 19—Equilibirum

ChemMatters

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Articles for Student Use

Aquarium Chemistry: Feb. 2002, pp. 6-7.
Automatic Sunglasses: Dec. 1989, pp. 4-6.
Fossil Molecules: April 1988, pp. 4-7.
Caves: Chemistry Goes Underground: April 2002, pp. 7-9.
Mt. Everest: Climbing in Thin Air: Feb. 2000, pp. 4-6.
Treasure: April 1987, pp. 4-9.

Articles for Teacher Use

Number and Topic:	8. Chemical Reactions 17. Water, Aqueous Solutions 19. Equilibrium 20. Acid/ Bases/pH
Source:	*ChemMatters*, April 2002, pp. 7-9, "Caves: Chemistry Goes Underground"
Type of Material:	Student Journal Article
Building on:	Chemical Reactions, Water, Aqueous solutions
Leading to:	Equilibrium, acids, bases, pH
Links to Physics:	Thermodynamics, entropy
Links to Biology:	Ecosystems, energy flow
Good Stories:	Good stories and photographs about sinkholes swallowing up entire homes
Activity Description:	Article deals with how caves are formed. It contains some good examples of the kinds of equilibrium reactions involved and the extent to which these reactions are related to pH.

Number and Topic:	**8. Chemical Reactions** **19. Equilibrium**
Source:	*ChemMatters*, Dec. 1992, pp. 14-15, "When Good Ideas Gel"
Type of Material:	Student Journal Article
Building on:	Density, states of matter
Leading to:	Equilibrium
Links to Physics:	Density
Links to Biology:	
Good Stories:	
Activity Description:	Article describes and discusses "aerogels," materials that looks like sponges but have a density that is so low that they will float on soap bubbles of carbon dioxide.

Number and Topic:	**8. Chemical Reactions** **13. Electrons in Atoms** **19. Equilibrium** **22. Redox/Electrochemistry**
Source:	*ChemMatters*, Dec. 1989, pp. 4-6, "Automatic Sunglasses"
Type of Material:	Student Journal Article
Building on:	Chemical reactions, electrons in atoms
Leading to:	Equilibrium, redox
Links to Physics:	Light, electromagnetic spectrum
Links to Biology:	
Good Stories:	
Activity Description:	Article describes the reactions and mechanisms involved in photochromic sunglasses that darken when exposed to sunlight but turn clear when you come back indoors.

Number and Topic:	**8. Chemical Reactions** **19. Equilibrium** **20. Acid/Bases/pH** **22. Redox/Electrochemistry**
Source:	*ChemMatters*, April 1987, pp. 4-9, "Treasure"
Type of Material:	Student Journal Article
Building on:	Basic chemical knowledge
Leading to:	Discussion of acid-base and redox reactions, including equilibrium considerations and then continuing to a discussion of electrolysis, and how all of these chemical concepts can be applied to restoring articles that are recovered from a sunken ship.
Links to Physics:	Electricity
Links to Biology:	
Good Stories:	Stories of the sinking of the ship Atocha and its recovery
Activity Description:	Article deals with all the chemistry involved in restoring objects lifted from sunken ships that have been lying at the bottom of the sea for hundreds of years.

Number and Topic:	**12. Gases/Gas Laws/Kinetic Theory** **19. Equilibrium**
Source:	*ChemMatters*, Feb. 2000, pp. 4-6, "Mt. Everest: Climbing in Thin Air"
Type of Material:	Student Journal Article
Building on:	Gases
Leading to:	Dalton's Laws of Partial Pressure, Le Chatelier's Principle
Links to Physics:	Electromagnetic spectrum
Links to Biology:	Cells, respiration, hemoglobin
Good Stories:	Relates challenges involved in trying to scale Mt. Everest
Activity Description:	Discusses how atmospheric pressure changes with altitude and how this leads to a shortage of oxygen at high altitudes. This is then related to the great challenges that face any person attempting to climb Mt. Everest.

Number and Topic:	**17. Water, Aqueous Solutions** **19. Equilibrium**
Source:	*ChemMatters*, Feb. 2002, pp. 6-7, "Aquarium Chemistry"
Type of Material:	Student Journal Article
Building on:	Water, aqueous solutions, gas solubility
Leading to:	Equilibrium, pH, buffer solutions
Links to Physics:	Refractive index
Links to Biology:	Ecosystems, respiration, bacteria
Good Stories:	Features some real professional aquarists along with students
Activity Description:	Compares problems that professional keepers of large public aquariums must contend with to similar problems involved in maintaining a home aquarium.

Number and Topic:	**19. Equilibrium** **21. Organic Chemistry**
Source:	*ChemMatters*, April 1988, pp.4-7. "Fossil Molecules"
Type of Material:	Student Journal Article
Building on:	Basic chemical knowledge
Leading to:	Hydrogen bonds, organic chemistry, use of radioactive tracers
Links to Physics:	
Links to Biology:	Evolution, collagen, antibodies, amino acids, proteins
Good Stories:	The Piltdown Man hoax
Activity Description:	Article discusses how antibody binding to proteins can be used to identify and characterize different kinds of fossils.

Flinn ChemTopic Labs

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Demo: Acid in the Eye – Safety
Demo: A Burning Candle - Observations
Demo: Classifying Matter
Demo: Flaming Vapor Ramp—Safety Demo
Lab: Observation and Experiment - Introduction to the Scientific Method
Lab: Separation of a Mixture - Percent Composition
Lab: What is a Chemical Reaction - Evidence of Change
Lab: Common Gases—Physical and Chemical Properties
Lab: Preparing and Testing Hydrogen Gas—A Microscale Approach
Lab: Carbon Dioxide - What a Gas—Microscale Gas Chemistry

ICE LABS

Online Descriptions and Experiments

Number and Topic:	**19. Equilibrium**
Source:	ICE Laboratory Leadership
Type of Material:	Lab 14. Disturbing an Equilibrium System
Building on:	18. Reaction rates and kinetics
Leading to:	20. Acids/Bases/pH
Links to Physics:	Energy
Links to Biology:	Enzyme systems, ecosystems
Good Stories:	
Activity Description:	To study factors which can disturb an equilibrium system. Many chemical reactions reach a state of equilibrium if conditions are right. In an equilibrium system, forward and reverse reactions occur at equal rates so that no net change is produced. When equilibrium is reached by a reaction in a test tube, it appears that changes have stopped in the tube. Once equilibrium has been reached, is it possible to produce further observable changes in the tube? If so, can you control the kinds of changes? If not, why are further observable changes impossible? You will observe several chemical systems in this laboratory activity. A careful study of your observations will enable you to answer these questions.

Technology-Adapted Labs

No activities for this topic.