

# Part I

## INTRODUCTION

The following is meant to provide the user of *ChemSource* with examples of how the 22 “core” modules can be used as references to one another, and particularly how the “enrichment” modules can be used to augment the “core” modules. Beneath each topic heading are listed the categories (*e.g.*, *Laboratory Activity*, *Common Student Misconceptions*) and specific examples of related items that can be used to further illuminate the topics central to all introductory chemistry courses. Part I contains a list of the cross-referenced items for each of the core modules. Part II lists how each enrichment module can be used in conjunction with the core modules.

**Laboratory Activity**

- BICY 1: Carbon Dioxide, p.4  
EQIL 2: Temperature Effects, p.11  
HALO 1: Production and Chemistry of Chlorine, p.5  
INDL 1: Physical and Chemical Examination of Soil, p.5  
MEDI 1: Synthesis of Aspirin, p.4  
PERD 1: Comparing the Reactivity of Al, Cu, Mg, and S with Water and Dilute Acid, p.6  
PERD 2: Trends in Oxy-Hydrogen Compounds of Third-Period Element, p.12  
QUAL 1: Qualitative Analysis Laboratory I. Developing a Qualitative Analysis Scheme for the Cations  $Zn^{2+}$ ,  $Ca^{2+}$ ,  $Cu^{2+}$ ,  $Al^{3+}$ , and  $Co^{2+}$ , p.5  
THER 2: Heats of Reaction, p.15

**ACIDS AND  
BASES (ACID)****Demonstrations**

- ALKA 2: Reaction of Metals with Water, p.7  
BICY 2: The Solubility of Carbon Dioxide and Ammonia, p.22  
ELEC 3: Electrolysis of Water in Color, p.14  
HALO 3: The Activity of HF as an Acid, p.22  
INDL 1: Reaction of Metals with Acids and Bases, p.21  
INDL 4: Properties of Fertilizers, p.24  
INDL 5: Soil pH, p.24  
ROCK 4: Precipitation and Redissolution of Calcium Carbonate, p.17  
RXNS 8: Indicators, p.18  
STOI 3: Limiting Reactant, p.23

**Counterintuitive Examples and Discrepant Events**

- HALO 1: HF is a Weak Acid, p.25  
STOI: Acidity of Carbon Dioxide in Water, p.25

**Common Student Misconceptions**

- FOOD 1: Cereals, p.30  
FOOD 2: Orange Juice with Calcium Added, p.30  
HALO 1: "HF is a Strong Acid." p.28  
INDL 2: "The Main Use of Ammonia is in Household Cleaners." p.32  
INDL 3: "Most of the  $H_2SO_4$  Produced Industrially is Used in Chemistry Labs." p.33

**Tips for the Teacher**

- INDL: Background Notes, p.27  
MEDI 4: Antacids, p.13

## Decision Making

INST: Acid Rain, p.18

## History

INDL: Haber, Ostwald, p.36

INST: Beckman, p.19

SOLN 1: Arrhenius, p.26

## Links and Connections

### Within Chemistry

BICY, p.41; EQIL, p.25; GASS, p.26; INDL, p.40; MEDI, p.42; MOLE, p.39;  
ORGN, p.32; QUAL, p.20; RXNS, p.30; SOLN, p.30; STOI, p.33

## ALKALI METALS (ALKA)

### Laboratory Activity

FOOD 1: Analysis of Sodium Chloride in Snack Food, p.3

MATR 1: Preparation of Colored Glass, p.5

ROCK 2: Identification of Minerals by Borax Bead Tests and Flame Tests,  
p.10

### Demonstrations

ATOM 7: Flame Tests, p.13

ELEC 4: Electrolysis of Potassium Iodide, p.15

OXID 2: Sodium in Water, p.16

PERD 1: Relative Reactions of Alkali Metals with Water, p.17

PHOT (Other Demos 3): Flame Tests, p.14

QUAL 1: Flame Tests, p.15

QUAL 2: Spectrum Demonstration, p.15

RXNS 5: Sodium with Water, p.16

### Tips for the Teacher

INDL, p.27

### History

QUAL: Robert Wood Anecdote, p.17

### Links and Connections

#### Within Chemistry

PERD, p.48; RATE, p.45

#### To the Contemporary World

BICY, p.41

## Laboratory Activity

- PHOT 1: The Chemistry of Photography. A Survey, p.4  
ROCK 2: Identification of Minerals by Borax Bead Tests and Flame Tests, p.10

## ATOMIC STRUCTURE (ATOM)

## Demonstrations

- ALKA 1: Identification of Metal Ions by Flame Tests, p.6  
PHOT (Other Demos 3): Flame Tests, p.14  
QUAL 1: Flame Tests, p.15  
TRAN 2: Paramagnetism in Transition Metal Compounds, p.18

## Common Student Misconceptions

- ALKA 1: "The Alkali Metals Easily Lose One Electron Each." p.21  
BOND 3: "Mathematical or Mental Constructs such as Electron Clouds Represent Something Solid." p.35  
PERD 3: "Elements are Arranged According to Atomic Weight." p.39

## Pictures in the Mind

- PERD: Ion Sizes, p.23

## Analogies and Metaphors

- INST: Black Box Activity, p.12

## Pattern Recognition

- ALKA, p.15; PHOT, p.17

## History

- BOND: Dalton, p.37  
INST: Aston, Bunsen, Crookes, Davisson, Moseley, Thomson, p.19  
NUCL: Curie, Thomson, Soddy, Rutherford, Chadwick, Seaborg, Gell-Mann, p.10  
QUAL: Robert Wood Anecdote, p.17  
THER: Bunsen, p.43

## Links and Connections

### Within Chemistry

- PERD, p.48; MATR, p.21; NUCL, p.13

### Between Chemistry and Other Disciplines

- ALKA, p.33

### To the Contemporary World

- ALKA, p.34; PHOT, p.21

## **CHEMICAL BONDING (BOND)**

### **Laboratory Activity**

- GEOM 1: Building Molecular Models, p.5
- POLY 1: Thermoplastic and Thermoset Polymers, p.4
- POLY 2: Preparation and Properties of a Crosslinking Polymer, p.10
- SEPN 1: Separating Mixtures, p.4

### **Demonstrations**

- GEOM 1: Three-Dimensional Structures of Molecules, p.15
- GEOM 2: Polar Molecules, p.16
- GEOM 3: Demonstration Models, p.18
- GEOM 4: Two-Dimensional Analogy of Molecular Geometry, p.19
- MATR 2: Resistance through a Conductor, p.13
- MATR 3: Meissner Effect Using a Superconductor, p.13
- POLY 5: Properties of Polymers, p.18
- POLY 6: Making Polyurethane Foam, p.18
- SEPN 1: Separation of Two Immiscible Liquids, p.19
- SEPN 3: Separation of Chlorophyll Pigments by Paper Chromatography, p.21

### **Counterintuitive Examples and Discrepant Events**

- ATOM 4: Atomic Size, p.16

### **Common Student Misconceptions**

- OXID 1: "All Bonds Formed are Ionic, as Shown by the Use of Oxidation Numbers." p.27

### **Pictures in the Mind**

- INST: Infrared Spectroscopy, Nuclear Magnetic Resonance, and X-Ray Diffraction, p.14
- MATR: Charge Transfer, p.16
- OXID 6: Reducing Agent at Work, p.24
- POLY: Picturing Polymers as Paperclip Chains, Pop Beads, *etc.*, p.20
- ROCK: Models of Silicate Minerals, p.20

### **Analogies and Metaphors**

- GEOM: What's in a Name, p.22
- HALO 1, 2, 3: Halogens as Electron-Greedy, Reactive, and Striving for an Octet, p.25
- MATR: Movement of Electrons through a Superconductor, p.16

### **Tips for the Teacher**

- BICY: Carbon Cycle, p.28

### **Pattern Recognition**

- MATR: Silicate Structures, p.17

PHOT: Electromagnetic Spectrum, p.17

SEPN: Solubility, p.26

### **Problem Solving**

INST 2: Determining Crystalline and Molecular Structures, p.17

### **Language of Chemistry**

COND: Hydrogen Bonding in Water, p.31

### **History**

GEOM: G. N. Lewis, p.27

ORGN: Kekulé, p.24

### **Links and Connections**

#### **Within Chemistry**

ACID, p.31; FORS, p.27; GEOM, p.32; INST, p.24; MATR, p.21; ORGN, p.32;  
PPTN, p.19; ROCK, p.25

#### **Between Chemistry and Other Disciplines**

ROCK, p.25

### **Laboratory Activity**

BOND 1: Physical Properties and Chemical Bonding in Solids, p.6

FOOD 3: Analysis of Milk, p.15

MATR 1: Preparation of Colored Glass, p.5

SEAW 1: Analysis of Seawater, p.4

SOLN 2: The Freezing Point Depression of Lauric Acid, p.12

## **CONDENSED STATES (COND)**

### **Demonstrations**

FOOD 1: "Light" Margarine, Paying More for Less, p.22

MATR 1: Glass Bending, Blowing, and Breaking, p.12

MATR 2: Resistance through a Conductor, p.13

PPTN 1: Solubility and Immiscibility, p.8

PPTN 2: Negative Coefficient of Solubility, p.9

SEAW 2: Buoyancy and Density, p.20

SEAW 3: Osmotic Pressure, p.21

SOLN 2: Colloids, the Tyndall Effect, and More, p.17

SOLN (Other Suggested Demos): Ice Cream, p.24

THER 6: Heat, Temperature, and Heat Capacity in Balloons, p.29

### **Counterintuitive Examples and Discrepant Events**

THER 2: Household Dehumidifiers, p.34

### **Common Student Misconceptions**

MATR: "Glass is a Crystalline Solid." p.17

RXNS 3: "All Solutions are Pure Liquids." p.22

### **Pictures in the Mind**

INST: X-Ray Diffraction, p.15

MATR: Charge Transfer, p.16

RXNS: Phases, p.23

### **Problem Solving**

INST 2: Determining Crystalline and Molecular Structure, p.17

### **Links and Connections**

#### **Within Chemistry**

MATR, p.21; MOLE, p.39

## **ELECTRO- CHEMISTRY (ELEC)**

### **Laboratory Activity**

OXID 1: Oxidation States of Manganese, p.5

### **Demonstrations**

HALO 2: Chlorine Production by Electrolysis of a Chloride Solution, p.20

INDL 3: Electrolysis of Aqueous Copper(II) Chloride, p.22

SEAW 1: Comparison of the Electrical Conductivity of Distilled Water with Tap Water and Seawater, p.20

SOLN (Other Suggested Demos): Conductivity of Solutions, p.24

STOI 2: Electrolysis of Water, p.22

THER (Other Suggested Demos 2): Electrolysis of Water in Hoffman's Apparatus, p.32

### **Tips for the Teacher**

INDL, p.27

### **History**

HALO: Fluorine, Chlorine, Bromine, and Iodine, p.29

OXID: Davy, Nernst, pp.29 - 30

### **Links and Connections**

#### **Within Chemistry**

ACID, p.31; MOLE, p.39; OXID, p.33; SOLN, p.30; STOI, p.33

#### **To the Contemporary World**

INDL, p.41; SEAW, p.28

**CHEMICAL  
EQUILIBRIUM  
(EQIL)****Laboratory Activity**

- ACID (Other Lab Activities 5): Distinction between Acid Strength and Acid Concentration, p.15
- ACID (Other Lab Activities 6): Strong vs. Weak Acids, p.15
- BICY 1: Carbon Dioxide, p.4
- BICY 2: Oxygen in the Air, p.15
- ORGN 1: Synthesis of Esters, p.5
- QUAL 1: Qualitative Analysis Laboratory I. Developing a Qualitative Analysis Scheme for the Cations  $\text{Zn}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{Cu}^{2+}$ ,  $\text{Al}^{3+}$ , and  $\text{Co}^{2+}$ , p.5

**Demonstrations**

- BICY 3: Formation of  $\text{NO}_2$  and  $\text{N}_2\text{O}_4$  Gases, p.24
- INDL 2: Brown Bottle Reaction, p.21
- PPTN 3: Producing a Blue Precipitate, p.9
- ROCK 4: Precipitation and Redissolution of Calcium Carbonate, p.17
- TRAN 3: Nickel One-Pot Reaction, p.18

**Counterintuitive Examples and Discrepant Events**

- ACID 2: Carbon Dioxide Bubbled through Limewater, p.21
- ACID 5: Bicarbonate Salts as Acids or Bases, p.21
- INDL:  $\text{NO}_2$  in Water, p.26
- MEDI 2: Methanol Poisoning, p.12
- SEAW 2: Salt Solubility vs. Temperature, p.23
- SEAW 3: Gas Solubility vs. Temperature, p.23

**Common Student Misconceptions**

- FOOD 2: Orange Juice with Calcium Added, p.30
- RATE 2: "A Catalyst Produces a Higher Yield of Product." p.35

**Tips for the Teacher**

- BICY: LeChatelier's Principle, Carbon Cycle, Oxygen Cycle, Nitrogen Cycle, p.28

**History**

- INDL: Haber, p.36
- RATE: Eigen, p.40
- THER: Gibbs, p.43

**Links and Connections****Within Chemistry**

- ACID, p.31; BICY, p.41; INDL, p.40; PPTN, p.19; QUAL, p.20; ROCK, p.25; SOLN, p.30; STOI, p.33

**Between Chemistry and Other Disciplines**

- ROCK, p.25

## **GASES (GASS) Laboratory Activity**

- BICY 1: Carbon Dioxide, p.4
- BICY 2: Oxygen in the Air, p.15
- HALO 1: Production and Chemistry of Chlorine, p.5

### **Demonstrations**

- ACID 5: pH and Environmental Gases, p.18
- ACID (Other Suggested Demos): The Nature of Common Gases, p.20
- BICY 2: The Solubility of Carbon Dioxide and Ammonia, p.22
- BICY 3: Formation of  $\text{NO}_2$  and  $\text{N}_2\text{O}_4$  Gases, p.24
- EQIL 1:  $2\text{NO}_2(\text{g}) \rightleftharpoons \text{N}_2\text{O}_4(\text{g})$  and Temperature, p.15
- EQIL 2:  $2\text{NO}_2(\text{g}) \rightleftharpoons \text{N}_2\text{O}_4(\text{g})$  and Pressure, p.16
- HALO 2: Chlorine Production by Electrolysis of a Chloride Solution, p.20
- HALO 4: Halogen Elements and Vapors, p.23
- INDL 2: Brown Bottle Reaction, p.21
- MOLE 4: Moles and Gases, p.25
- ORGN 1: Methane Bubbles, p.15
- RXNS 2: A Penny in Nitric Acid, p.15
- SOLN 1: Types of Solutions, p.17
- STOI 2: Electrolysis of Water, p.22
- STOI 3: Limiting Reactant, p.23
- THER 4: Gallon of Gas Reaction, p.26
- THER 5: Methanol-Tennis Ball Cannon, p.27
- THER 6: Heat, Temperature, and Heat Capacity in Balloons, p.29
- THER (Other Suggested Demos): Explosive Reaction, p.32

### **Counterintuitive Examples and Discrepant Events**

- ACID 2: Carbon Dioxide Bubbled through Limewater, p.21
- BICY 1: Solubility of Gases in Water, p.27
- INDL:  $\text{NO}_2$  in Water, p.26
- PHOT 1: Ozone and Oxygen, p.16
- SEAW 4: Gas Solubility vs. Temperature, p.23
- SOLN 2: Deep Sea Divers, p.24

### **Common Student Misconceptions**

- BICY 1: "The World's Supply of Oxygen Is in Danger of Being Used Up." p.38
- BICY 2: "Nitrogen Gas and Oxygen Gas Readily React with Each Other." p.38
- BICY 5: "Carbon Dioxide Is the Chief Absorber of IR Radiation and Is Mainly Responsible for the Greenhouse Effect." p.38

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**Pictures in the Mind**

RXNS: Phases, p.23

SEPN: Gas-Liquid Chromatography, p.23

**Tips for the Teacher**

BICY: Carbon Cycle, Oxygen Cycle, and Nitrogen Cycle, p.28

**Decision Making**

INST: Radon Testing, Ozone Depletion, p.18

**History**

ALKA: Gay-Lussac, p.27

BICY: Black, da Vinci, Boyle, Scheele, Priestley, Lavoisier, and Rutherford, p.38

INDL: Haber, p.36

MEDI: Who Discovered Anesthesia?, p.37

MOLE: Avogadro and Dalton, p.32

PHOT: Boyle, p.18

STOI: Gay-Lussac, Avogadro, p.31

**Links and Connections****Within Chemistry**

BICY, p.41; COND, p.43; MOLE, p.39; ORGN, p.32; PHOT, p.21; RATE, p.45;  
SEPN, p.29; STOI, p.33

**Between Chemistry and Other Disciplines**

PHOT, p.21

**To the Contemporary World**

BICY, p.41; PHOT, p.21; RXNS, p.30; SEPN, p.30; SOLN, p.30; STOI, p.35

**Laboratory Activity**

MATR 1: Preparation of Colored Glass, p.5

**Demonstrations**

ATOM 4: Modelling Orbitals, p.12

EQIL 3: Temperature Effects on Cobalt Complexes, p.16

TRAN 3: Nickel One-Pot Reaction, p.18

**Tips for the Teacher**

BICY: Carbon Cycle, p.28

**Pictures in the Mind**

BOND 2: Orbital Overlap. A Group Activity, p.32

INST: Infrared Spectroscopy, Nuclear Magnetic Resonance, X-Ray  
Diffraction, p.14

**MOLECULAR  
GEOMETRY  
(GEOM)**

### **Analogies and Metaphors**

BOND: Resonance, Covalent Bonds, and Polarity, p.24

### **Pattern Recognition**

MATR: Silicate structures, p.17

### **Problem Solving**

INST 2: Determining Crystalline and Molecular Structures, p.17

### **History**

INST: Introduction, Bragg, p.19

### **Links and Connections**

#### **Within Chemistry**

INST, p.24; ORGN, p.25; ROCK, p.32

#### **Between Chemistry and Other Disciplines**

ROCK, p.25

## **HALOGENS (HALO)**

### **Laboratory Activity**

ORGN 2: Chemical Analysis for the Presence of Halogens, p.11

PHOT 1: The Chemistry of Photography. A Survey, p.4

RATE 1: A Study of Reaction Rates, p.5

SEAW 2: Determination of the Salinity of Seawater, p.16

### **Demonstrations**

PHOT 2: Quenching of Quinine Illuminescence, p.10

PPTN 1: Solubility and Immiscibility, p.8

RATE 3: Catalysis, p.25

RXNS 9: Aladdin's Lamp, p.18

RXNS 10: Ions Need to Get Together, p.18

SOLN 1: Types of Solutions, p.17

### **History**

PHOT: History of Photography, p.18

### **Links and Connections**

#### **Within Chemistry**

ORGN, p.32

#### **To the Contemporary World**

SOLN, p.30

**Laboratory Activity**

- GASS 1: Volume and Temperature Changes in a Gas, p.4  
INST 1: Introduction to the Spectrophotometer, p.4  
STOI 1: Stoichiometry of a Reaction and Limiting Reagent, p.4  
STOI 2: Percent Yield of a Chemical Reaction, p.15  
THER 2: Heats of Reaction, p.15  
TRAN 2: The Amount of Copper in Copper(I) Oxide and Copper(II) Oxide, p.11

**Demonstrations**

- STOI 1: Balancing Chemical Equations, p.21  
STOI 2: Electrolysis of Water, p.22  
STOI 3: Limiting Reactant, p.23  
THER (Other Suggested Demos 2): Electrolysis of Water in Hoffman's Apparatus, p.32

**Counterintuitive Examples and Discrepant Events**

- SEPN: Purity and Impurities, p.24

**Common Student Misconceptions**

- STOI 1-6: Concerning Molar Masses, Subscripts, and Coefficients in Balanced Equations, p.27  
MATR 3: "The Law of Definite Proportions Applies to all Compounds." p.18  
THER: "Heat Capacity, Specific Heat Capacity, and Molar Heat Capacity Are all the Same Thing." p.37

**History**

- STOI: Avogadro, p.31

**Links and Connections****Within Chemistry**

- INDL, p.40; RXNS, p.30

**Tips for the Teacher**

- MEDI 20: Radiopharmaceuticals, p.21

**History**

- ATOM: Planck, p.23

**Links and Connections****Within Chemistry**

- GASS, p.26; RATE, p.42; STOI, p.33

**THE MOLE  
(MOLE)****NUCLEAR  
CHEMISTRY  
(NUCL)**

**ORGANIC  
CHEMISTRY  
(ORGN)**

**Laboratory Activity**

- FOOD 3: Analysis of Milk, p.15
- FORS 1: Drug Identification, p.4
- GEOM 1: Building Molecular Models. Extensions, p.5
- MEDI 1: Synthesis of Aspirin, p.4
- OXID 2: The Silver Mirror Reaction, p.10
- PHOT 1: The Chemistry of Photography. A Survey, p.4
- POLY 1: Thermoplastic and Thermoset Polymers, p.4
- POLY 2: Preparation and Properties of a Crosslinking Polymer, p.10
- SOLN 1: The Freezing Point Depression of Lauric Acid, p.5
- THER 1: The Heat of Combustion of a Candle, p.7

**Demonstrations**

- BICY 1: Carbon as a Component of Sugar, p.4
- COND 1: "Which Will Evaporate First?" p.18
- FOOD 1: "Light" Margarine, Paying More for Less, p.22
- FOOD 2: Extraction of Iron from Cereal. The Oxidation States of Iron, p.24
- FORS 3: Analysis of Fingerprints, p.14
- PHOT 1: Chemiluminescence, p.9
- PHOT 2: Quenching of Quinine Illuminescence, p.10
- PHOT 3: Photoreduction. The Blueprint Reaction, p.12
- PHOT (Other Suggested Demos 4): Triboluminescence, p.14
- POLY 1: Making Nylon Rope, p.16
- POLY 2: Plastic Packaging "Peanuts" in Acetone, p.17
- POLY 3: Super Slurper, p.17
- POLY 4: Properties of Natural Polymers, p.17
- POLY 5: Properties of Polymers, p.18
- POLY 6: Making Polyurethane Foam, p.18
- POLY 7: Polymers Have Different Directions, p.18
- POLY 8: Moon Blob, p.19
- PPTN 1: Solubility and Immiscibility, p.8
- SEPN 1: Separation of Two Immiscible Liquids, p.19
- SOLN 1: Types of Solutions, p.17
- SOLN (Other Suggested Demos): Distillation, p.23
- THER 4: Gallon of Gas Reaction, p.26
- THER 5: Methanol-Tennis Ball Cannon, p.27
- THER 7: Burning Candles, p.30

### **Counterintuitive Examples and Discrepant Events**

- FOOD 3: White Sugar vs. Honey, p.26
- FOOD 4: Food Additives, p.26
- FOOD 5: Cholesterol, p.26
- MEDI 2: Methanol Poisoning, p.12
- MEDI 3: Vitamin C, p.12

### **Common Student Misconceptions**

- FOOD 3: New Horizons Bread, p.30
- FOOD 5: Analysis of Nutrition in Hamburger and French Fries, p.30
- FOOD 6: Sodas and Yogurt, p.31
- FOOD 7: Food Additives, p.31
- MEDI 4: "There Is Only One Kind of Alcohol." p.36

### **Pictures in the Mind**

- INST: Infrared Spectroscopy and Nuclear Magnetic Resonance, p.14

### **Tips for the Teacher**

- BICY: Carbon Cycle, p.28
- MEDI 5: Analgesics, p.14
- MEDI 6: Narcotics, p.15
- MEDI 7: Pain Relievers, p.15
- MEDI 10: Local Anesthetics, p.15
- MEDI 11: Antiseptics, p.16
- MEDI 12: Vitamins, p.17
- MEDI 13: Antibiotics, p.17
- MEDI 14: Nicotine, p.18
- MEDI 15: Caffeine, p.18
- MEDI 16: Ethanol, p.19
- MEDI 17: Amphetamine, p.19
- MEDI 18: Barbiturates, p.20
- MEDI 19: Tranquilizers, p.20
- MEDI 21: Anti-Cancer Drugs, p.21
- MEDI 22: Birth Control Pills, p.22
- MEDI 23: Anabolic Steroids, p.22

### **Decision Making**

- ENZY 2: Enzyme Types, p.15
- INST: Drinking Water Standards, p.18

## History

- BOND: Dalton, p.37
- FOOD: Ethylene Glycol Tragedy, p.37
- GEOM: Kekulé, p.27
- INDL: Refineries, p.37
- MEDI: Discovery of Penicillin, p.38
- POLY: All Historical Figures Listed, p.24
- RATE: Petroleum Products, p.40

## Links and Connections

### Within Chemistry

- BICY, p.41.; ENZY, p.24; FOOD, p.34; GASS, p.26; GEOM, p.32; MEDI, p.42;  
POLY, p.27; PPTN, p.19; SEPN, p.29

### Between Chemistry and Other Disciplines

- HALO, p.44; MEDI, p.45

### To the Contemporary World

- ACID, p.34; MEDI, p.47; PHOT, p.21; SEPN, p.30; SOLN, p.30

## OXIDATION- REDUCTION (OXID)

### Laboratory Activity

- BICY 1: Carbon Dioxide, p.4
- ELEC 1: A Study of Voltaic Cells, p.5
- HALO 2: Relative Reactivity of Halogens and Halides, p.12
- INDL 1: Physical and Chemical Examination of Soil, p.5
- PERD 1: Comparing the Reactivity of Al, Ca, Mg, and S with Water and Dilute Acid, p.6
- PHOT 1: The Chemistry of Photography. A Survey, p.4
- RATE 1: A Study of Reaction Rates, p.5
- RATE 2: The Magnesium-Hydrochloric Acid System, p.14
- RATE 3: The Mystery Flask, p.56
- TRAN 1: Identification of Iron Cations, p.6

### Demonstrations

- BICY 1: Carbon as a Component of Sugar, p.21
- BICY 3: Formation of  $\text{NO}_2$  and  $\text{N}_2\text{O}_4$  Gases, p.24
- ELEC 1: Voltaic Cells, p.13
- ELEC 2: Fruit and Vegetable Batteries, p.14
- ELEC 3: Electrolysis of Water in Color, p.14
- ELEC 4: Electrolysis of Potassium Iodide, p.15
- ELEC 5: Electroplating Copper, p.16
- ELEC 6: Making a Simple Battery. The Gerber Cell, p.16
- FOOD 2: Extraction of Iron from Cereal. The Oxidation States of Iron, p.24

- HALO 2: Chlorine Production by Electrolysis of a Chlorine Solution, p.20  
 INDL 1: Reaction of Metals with Acid and Base, p.21  
 INDL 2: Brown Bottle Reaction, p.21  
 INDL 3: Electrolysis of Aqueous Copper(II) Chloride, p.22  
 INDL (Other Suggested Demos 1): The Can Ripper, p.25  
 MEDI 1: Reaction in a Breathalyzer, p.11  
 PERD 1: Relative Reactions of Alkali Metals with Water, p.17  
 PHOT 1: Chemiluminescence, p.9  
 PHOT 3: Photoreduction. The Blueprint Reaction, p.12  
 RATE 3: Catalysis, p.25  
 RXNS 2: A Penny in Nitric Acid, p.15  
 RXNS 4: Replacement Reaction, p.16  
 RXNS 5: Sodium in Water, p.16  
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**FORENSIC  
CHEMISTRY  
(FORS)****INDUSTRIAL  
INORGANIC  
CHEMISTRY  
(INDL)**

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1. Preparation of Colored Glass, p.5—ALKA, COND, GEOM, TRAN

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**MATERIALS  
CHEMISTRY  
(MATR)****CHEMISTRY IN  
MEDICINE  
(MEDI)**

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GASS

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## CHEMISTRY OF ROCKS, MINERALS AND GEMS (ROCK)

## CHEMISTRY OF SEAWATER (SEAW)

**SEPARATIONS**    **Laboratory Activity**  
**(SEPN)**

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This module was developed by Barbara Sawrey.