

Chemistry Topics

INTRODUCTION TO CHEMISTRY

Section I—Basic (Regents-Level) Material
NYS Regents Concepts and Skills
Chemistry Is . . . ?
Matter and Energy
Measurement and the Metric System
Metric Prefixes
Scientific Notation
Volume and Density
Reporting Measured Quantities
Solving Problems

ATOMS, MOLECULES, AND IONS

Section I—Basic (Regents-Level) Material
NYS Regents Concepts and Skills
Introduction to the Atomic Model of Matter
Development of the Early Models of the Atom
The Current View of Atomic Structure
Identifying Elements: Names, Symbols, and Atomic Numbers
Neutrons, Isotopes, and Mass Numbers
Molecules
Ions

THE ELECTRONIC STRUCTURE OF ATOMS

Section I—Basic (Regents-Level) Material
NYS Regents Concepts and Skills
Introduction
The Bohr Model of the Atom
The Modern (Wave-Mechanical) Model
Valence Electrons
Lewis Structures (Electron-Dot Diagrams)
Section II—Additional Material
Atomic Orbitals and Sublevels
Electron Configurations of Atoms
Lewis Structures and Atomic Orbitals

NUCLEAR CHEMISTRY

Section I—Basic (Regents-Level) Material
NYS Regents Concepts and Skills
Nuclear Particles
Nuclear Equations
Natural Radioactivity and Radioactive Decay
Half-Life
Uses of Radioisotopes
Induced Nuclear Reactions
Section II—Additional Material
The Uranium-238 Decay Series
Isomeric Transition
Detection and Measurement of Radioactivity
Solving Radioactive Decay Problems
Particle Accelerators
Fission Reactors

THE PHASES OF MATTER

Section I Basic (Regents-Level) Material
NYS Regents Concepts and Skills
Introduction
Gases
The Gas Laws
The Kinetic-Molecular Theory (KMT) of Gas Behavior
Liquids
Solids
Change of Phase
Section II—Additional Material
Measuring Gas Pressure in the Laboratory
The Ideal (Universal) Gas Law
The Density of an Ideal Gas at STP
Gases and Chemical Reactions
Dalton's Law of Partial Pressures
Graham's Law of Effusion (Diffusion)
Gases Collected over Water
Additional Fusion and Vaporization Problems
Phase Diagrams

CHEMICAL PERIODICITY

Section I—Basic (Regents-Level) Material
NYS Regents Concepts and Skills
Introduction
The Periodic Table in History
The Modern Periodic Table
Properties Associated with Periodicity
Variation of Periodic Properties Among the Elements
The Chemistry of the Representative Groups
The Chemistry of a Period
Section II—Additional Material
Sublevels and the Periodic Table
Successive Ionization Energies
Electron Affinity
Additional Aspects of First Ionization Energy
Variation of Successive Ionization Energies
Synthetic Elements

CHEMICAL BONDING AND MOLECULAR SHAPE

Section I—Basic (Regents-Level) Material
NYS Regents Concepts and Skills
Bonding and Stability
Ionic Bonding
Covalent Bonding
Electronegativity and Bonding
Drawing the Lewis Structures of Covalent Molecules and Polyatomic Ions
Network Solids
Metallic Substances
Dipoles and Polar Molecules
Polarity and Molecular Symmetry
Intermolecular Forces
Physical and Chemical Properties of Bonded Substances:
A Summary
Section II—Additional Material
Resonance Structures
Additional Topics in Bonding

FORMULAS, EQUATIONS, AND CHEMICAL REACTIONS

Section I—Basic (Regents-Level) Material
NYS Regents Concepts and Skills
Chemical Formulas
Writing and Naming Chemical Formulas
Chemical Equations
Balancing a Chemical Equation
Classifying Chemical Reactions
Section II—Additional Material
Other Ways of Naming Ionic Compounds

SOLUTIONS AND THEIR PROPERTIES

Section I—Basic (Regents-Level) Material
NYS Regents Concepts and Skills
A Solution Is . . . ?
Saturated and Unsaturated Solutions
Solubility
Concentrations of Solutions
Effect of the Solute on the Solvent
Behavior of Electrolytes in Solution
Section II—Additional Material
Mole Fraction
Molality
Dilution of Stock Solutions
Solutions and Chemical Equations
Calculating the Freezing and Boiling Points of Solutions
Suspensions and Colloidal Dispersions

ENERGY AND CHEMICAL REACTIONS

Section I—Basic (Regents-Level) Material
NYS Regents Concepts and Skills
Energy and Its Measurement
Heat of Reaction
Potential Energy Diagrams
Spontaneous Reactions
Section II—Additional Material
Additional Calorimetry Problems
Transfer of Energy and Equilibrium Temperature
The Role of Energy in Chemical Reactions
Additional Aspects of Heats of Reaction
The Second Law of Thermodynamics

KINETICS AND EQUILIBRIUM

Section I—Basic (Regents-Level) Material
NYS Regents Concepts and Skills
Chemical Kinetics
Reversible Reactions and Dynamic Equilibrium
Phase Equilibrium
Solution Equilibrium
Chemical Equilibrium
Section II—Additional Material
The Common-Ion Effect
Heterogeneous Equilibrium
The Equilibrium Constant (K_{eq})
Problems Involving the Equilibrium Constant
Applications of Chemical Equilibrium

REDUCTION-OXIDATION (REDOX) AND ELECTROCHEMISTRY

Section I—Basic (Regents-Level) Material
NYS Regents Concepts and Skills
What Are Oxidation and Reduction?
Formal Definitions of Oxidation and Reduction
Redox Equations
Spontaneous Redox Reactions
Electrochemical Cells
Section II—Additional Material
Balancing Redox Equations by the Half-Reaction Method
Balancing Redox Equations by the Ion–Electron Method
Half-Cell Potentials and Cell Voltage
The Standard Hydrogen Half-Cell
Electrolysis of Water and Aqueous NaCl (Brine)
Electroplating
Additional Applications of Redox and Electrochemistry

ACIDS AND BASES

Section I—Basic (Regents-Level) Material
NYS Regents Concepts and Skills
Operational Definitions of Acids and Bases
Arrhenius Definitions of Acids and Bases
Acid–Base Titration
Brønsted–Lowry Definitions of Acids and Bases
The pH Scale of Acidity and Basicity
Acid–Base Indicators

Section II—Additional Material
Amphiprotic (Amphoteric) Substances
Acid–Base Equilibria
Conjugate Acid–Base Pairs
Neutralization (Revisited)
Strengths of Conjugate Acid–Base Pairs
Ionization Constants of Acids and Bases (K_a and K_b)
Ionization Constant of Water (K_w)
A More Detailed Look at pH and pOH
Hydrolysis of Salts in Aqueous Solutions
Acid–Base Properties of Oxides
Lewis Definitions of Acids and Bases

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Electrochemistry

ORGANIC CHEMISTRY

Section I—Basic (Regents-Level) Material

NYS Regents Concepts and Skills

Organic Chemistry Is . . . ?

Comparison of Organic and Inorganic Compounds

Hydrocarbons and Homologous Series

Functional Groups

Organic Reactions

Section II—Additional Material

Stereoisomerism

The Benzene Series

Primary, Secondary, and Tertiary Alcohols

Dihydroxy and Trihydroxy Alcohols

Types of Polymerization