

Passport to Science Exploration: The Core of Chemistry

Major Topics

The following is a list of the major topics covered in the *Passport to Science Exploration: The Core of Chemistry*. These topics are meant to help students navigate CEF's study materials and should not be considered comprehensive. *You Be The Chemist Challenge*® questions are largely derived from information contained in the study materials, but are not limited solely to this information. Topics are arranged in the order that they appear in the study materials.

Section I: Science—A Way of Thinking

- Scientific inquiry
- Independent and dependent variables
- Control groups and controlled variables
- Scientific theories and laws

Section II: Measurement

- Accuracy and precision
- Mass
- Weight
- Volume
- Temperature
- Density
- Pressure
- Energy
- Extrinsic and intrinsic properties
- SI units
- Metric units
- Scientific notation

Section III: Classification of Matter

- Pure substances
- Mixtures
- Elements
- Allotropes
- Compounds
- Homogeneous mixtures
- Heterogeneous mixtures
- Colloids
- Physical properties
- Chemical properties
- Properties of solids
- Crystalline and amorphous solids
- Properties of liquids
- Viscosity
- Surface tension
- Properties of gases
- Effusion
- Diffusion
- Properties of plasma
- Physical changes
- Melting and freezing
- Vaporization and condensation
- Sublimation and deposition
- Chemical changes
- Types of energy
- Conservation of energy
- Mechanical energy
- Chemical energy changes
- Physical separations and chemical separations
- Filtration
- Precipitation

Section IV: Atomic Structure

- Atoms
- Protons, neutrons, and electrons
- Quarks
- Molecules
- Atomic number
- Mass number
- Chemical symbols
- Ions
- Isotopes
- Relative atomic mass

Section V: The Periodic Table

- Groups
- Periods
- Metals
- Nonmetals
- Semi-metals
- Properties of periodic table groups
- Electron configurations
- Heisenberg's uncertainty principle
- Orbitals and subshells
- Principal quantum numbers

Section VI: Laboratory Equipment

- Beakers
- Erlenmeyer, Florence, and volumetric flasks
- Test tubes
- Burets
- Graduated cylinders
- Displacement
- Triple-beam balances
- Analytical balances
- Bulb, digital, and bimetallic strip thermometers
- Manometers
- Barometers
- Pasteur and volumetric pipettes
- Bunsen burners

Section VII: Laboratory & Chemical Safety

- Chemical safety diamonds
- Safety data sheets
- Warning symbols
- Protective equipment symbols
- General safety rules