



## Sterling MCAT General Chemistry Practice Questions: High Yield MCAT Questions

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**1,200** general chemistry practice questions with detailed explanations covering all general chemistry topics tested on the Chemical & Physical Foundations section of the MCAT:

- Electronic structure and atomic nucleus
- Periodic table
- Chemical bonding
- Stoichiometry
- States of matter: gas phase, liquid phase, solids
- Solution chemistry
- Acids/base equilibria
- Rate processes in chemical reactions
- Thermochemistry, thermodynamics, bioenergetics
- Kinetics and equilibrium
- Electrochemistry

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### Editorial Review

From the Author

To achieve a high MCAT score, you need to develop skills to properly apply the knowledge you have and quickly choose the correct answer. Understanding key concepts, having the ability to extract information from the passages and distinguishing between similar answer choices is more valuable than simply memorizing terms.

This book provides **over 1,200 chemistry practice questions** that test your knowledge of all MCAT General Chemistry topics. At the back of the book, you will find answer keys (use them to verify your answers) and explanations to questions. These explanations provide step-by-step solutions for quantitative questions and detailed explanations for conceptual questions.

The explanations in this book also cover the foundations of chemistry topics needed to answer related questions on the test. **By reading these explanations carefully and understanding how they apply to solving the question, you will learn important general chemistry concepts and the relationships between them.** This will prepare you for the test and you will significantly increase your score.

Our preparation materials will help you succeed by scoring well on the MCAT. All the content of our publications is prepared by our editors who possess extensive credentials, are educated in top colleges and universities and have been admitted to medical school with stellar MCAT scores. Our editors are experts on teaching, preparing students for the MCAT and have coached thousands of premeds on admission strategies.

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From the Inside Flap

**MCAT: Chemical and Physical Foundations of Biological Systems**

**MCAT Strategies**

**Common Chemistry Equations**

**The Periodic Table of the Elements**

#### Diagnostic Tests

- DiagnosticTest #1
- DiagnosticTest #2
- DiagnosticTest #3
- DiagnosticTest #4

#### Electronic Structure; Atomic Nucleus; the Periodic Table

- Orbital structure, principal quantum number  $n$ , ground state, excited states
- Pauli exclusion principle; Heisenberg uncertainty principle
- Effective nuclear charge; photoelectric effect
- Alkali metals; alkaline earth metals; halogens; noble gases; transition metals

- Metals and non-metals; oxygen group
- Valence electrons; ionization energy; electron affinity; electronegativity
- Electron shells and the sizes of atoms and ions

### **Bonding**

- Lewis electron dot formulas (resonance structures, formal charge)
- Partial ionic character (electronegativity and charge distribution, dipole moment)
- *Sigma* and *pi* bonds (hybrid orbitals and geometry, valence shell electron pair repulsion)
- Structural formulas for molecules involving H, C, N, O, F, S, P, Si, Cl
- Delocalized electrons and resonance in ions and molecules
- Multiple bonding (bond length and bond energy, rigidity in molecular structure)

### **Gas Phase**

- Absolute temperature, (K) Kelvin scale
- Pressure; molar volume
- Kinetic molecular theory of gases
- Gas laws: ideal gas law, Boyle's law, Charles' law, Avogadro's law
- Deviation of real gas from ideal gas law: qualitative and quantitative (Van der Waals' equation)
- Partial pressure, mole fraction; Dalton's law

### **Liquid Phase**

- Hydrogen bonding
- Dipole interactions
- Van der Waals' forces (London dispersion forces)

### **Stoichiometry**

- Molecular weight; empirical and molecular formula; metric units
- Composition by percent mass; mole concept and Avogadro's number
- Density
- Oxidation number, oxidizing and reducing agents, disproportionation reactions
- Writing and balancing chemical equations (including redox equations)
- Limiting reactants; theoretical yields

### **Thermodynamics and Thermochemistry**

- Thermodynamic system - state function
- Zeroth law (temperature); First law (conservation of energy); Second law (entropy)
- Calorimetry, heat capacity, specific heat
- Endothermic/exothermic reactions (enthalpy, H, standard heats, Hess' law)
- Bond dissociation energy; free energy (*G*)
- Free energy (*G*), spontaneous reactions and  $\Delta G^\circ$ ; heat of fusion, heat of vaporization
- Phase diagram: pressure and temperature
- Free energy / *Keq*; Le Châtelier's principle; endothermic/exothermic reactions

### **Rate Processes in Chemical Reactions: Kinetics and Equilibrium**

- Reaction rate, rate law, rate constant, reaction order
- Rate-determining step
- Dependence of reaction rate upon temperature: activation energy; Arrhenius equation
- Kinetic control vs. thermodynamic control of a reaction; catalysts
- Equilibrium in reversible chemical reactions: law of mass action, Le Chatelier's principle

- Equilibrium constant and  $\Delta G^\circ$

### **Solution Chemistry**

- Molarity; solubility product constant; the equilibrium expression ( $K_{sp}$ )
- Common-ion effect: complex ion formation, complexions and solubility, solubility and pH
- Anion, cation
- Hydration, the hydronium ion

### **Acid and Base Equilibria**

- Brønsted-Lowry definition of acids and bases
- Lewis acids and bases
- Ionization of water,  $K_w$ , pH
- Conjugate acids and bases
- Strong acids and bases
- Weak acids and bases; dissociation of weak acids and bases; hydrolysis of salts of weak acids or bases
- pH of solutions of salts of weak acids or bases
- Equilibrium constants  $K_a$  and  $K_b$ :  $pK_a$ ,  $pK_b$
- Buffers: definition and concepts, influence on titration curves
- Titration: indicators, neutralization, titration curves, redox titration

### **Electrochemistry**

- Electrolytic cell, electrolysis, anode/cathode, electrolyte
- Faraday's Law; electron flow; oxidation, and reduction at the electrodes
- Galvanic or voltaic cells: half-reactions, reduction potentials, cell potential, direction of electron flow
- Concentration cell
- Batteries: electromotive force, voltage, lead-storage batteries, nickel-cadmium batteries

### **Explanations**

From the Back Cover

Scoring well on the MCAT is extremely important for admission into medical school. To achieve a high MCAT score, you need to develop skills to properly apply the knowledge you have and quickly choose the correct answer. Understanding key concepts, having the ability to extract information from the passages and distinguishing between similar answer choices is more valuable than simply memorizing terms.

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### **Users Review**

**From reader reviews:**

**Pauline Jones:**

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