



TEXAS EDUCATION AGENCY

TEXAS EDUCATOR CERTIFICATION

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Preparation Manual



140 Chemistry 8–12

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Chapter 1: Introduction to the Chemistry 8–12 Test and Suggestions for Using This Test Preparation Manual	1
<ul style="list-style-type: none"> Overview Using the Test Framework Organization of the TExES Test Framework <ul style="list-style-type: none"> • Sample Competency • Sample Descriptive Statements Studying for the TExES Test 	
Chapter 2: Background Information on the TExES Testing Program	7
<ul style="list-style-type: none"> The TExES Tests for Texas Teachers <ul style="list-style-type: none"> • Development of the New TExES Tests Taking the TExES Test and Receiving Scores <ul style="list-style-type: none"> • Educator Standards 	
Chapter 3: Study Topics	11
<ul style="list-style-type: none"> Test Framework for Field 140: Chemistry 8–12 <ul style="list-style-type: none"> • The Domains • Total Test Breakdown The Standards Competencies <ul style="list-style-type: none"> • Domain I — Scientific Inquiry and Processes • Domain II — Matter and Energy • Domain III — Chemical Reactions • Domain IV — Science Learning, Instruction and Assessment 	
Chapter 4: Succeeding on Multiple-Choice Questions	25
<ul style="list-style-type: none"> Approaches to Answering Multiple-Choice Questions Question Formats <ul style="list-style-type: none"> • Single Questions • Questions with Stimulus Material • Clustered Questions 	
Chapter 5: Multiple-Choice Practice Questions	33
<ul style="list-style-type: none"> Sample Multiple-Choice Questions Answer Key 	
Chapter 6: Are You Ready? – Last-Minute Tips	45
<ul style="list-style-type: none"> Preparing to Take the Test 	
Appendix A Study Plan Sheet	49
Appendix B Preparation Resources	51

Chapter 1

**Introduction to the Chemistry 8–12 Test
and Suggestions for Using This
Test Preparation Manual**



1 OVERVIEW

The State Board for Educator Certification (SBEC) has approved Texas educator standards that delineate what the beginning educator should know and be able to do. These standards, which are based on the state-required curriculum for students — the Texas Essential Knowledge and Skills (TEKS) — form the basis for the Texas Examinations of Educator Standards® (TExES®) program. This initiative, administered by Texas Education Agency (TEA), will affect all areas of Texas education — from the more than 170 approved Texas Educator Preparation Programs (EPPs) to the more than 7,000 Texas school campuses. This standards-based system reflects SBEC’s commitment to help align Texas education from kindergarten through college. SBEC and TEA’s roles in this K–16 initiative will ensure that newly certified Texas educators have the essential knowledge and skills to teach the TEKS to the state’s public school students.

This manual is designed to help examinees prepare for the TExES test in this field. Its purpose is to familiarize examinees with the competencies to be tested, test question formats and pertinent study resources. EPP staff may also find this information useful as they help examinees prepare for careers as Texas educators.

KEY FEATURES OF THE MANUAL

- *List of competencies that will be tested*
- *Strategies for answering multiple-choice questions*
- *Sample test questions and answer key*

If you have any questions after reading this preparation manual or you would like additional information about the TExES tests or the educator standards, please visit the TEA website at www.tea.state.tx.us.

USING THE TEST FRAMEWORK

The Texas Examinations of Educator Standards (TEXES) tests measure the content knowledge required of an entry-level educator in a particular field in Texas public schools. This manual is designed to guide your preparation by helping you become familiar with the material to be covered on the test you are planning to take, identify areas where you feel you may be weak and increase your knowledge in those areas by helping you design a study plan.

When preparing for this test, you should focus on the competencies and descriptive statements, which delineate the content that is eligible for testing. A portion of the content is represented in the sample questions that are included in this manual. These test questions represent only a sampling of questions. Thus, your test preparation should focus on the competencies and descriptive statements and not simply on the sample questions.

ORGANIZATION OF THE TEXES TEST FRAMEWORK

The test framework is based on the educator standards for this field.

The content covered by this test is organized into broad areas of content called domains. Each domain covers one or more of the educator standards for this field. Within each domain, the content is further defined by a set of competencies. Each competency is composed of two major parts:

1. the **competency statement**, which broadly defines what an entry-level educator in this field in Texas public schools should know and be able to do, and
2. the **descriptive statements**, which describe in greater detail the knowledge and skills eligible for testing.

The educator standards being assessed within each domain are listed for reference at the beginning of the test framework, which begins on page 12. These are followed by a complete set of the framework's competencies and descriptive statements.

An example of a competency and its accompanying descriptive statements is provided below.

SAMPLE COMPETENCY

Chemistry 8–12

COMPETENCY 001

THE TEACHER UNDERSTANDS HOW TO SELECT AND MANAGE LEARNING ACTIVITIES TO ENSURE THE SAFETY OF ALL STUDENTS AND THE CORRECT USE AND CARE OF NATURAL RESOURCES, MATERIALS, EQUIPMENT AND TECHNOLOGIES.

1 SAMPLE DESCRIPTIVE STATEMENTS

The beginning teacher:

- A. Uses current sources of information about laboratory safety, including safety regulations and guidelines for the use of science facilities, materials and equipment.
- B. Recognizes potential safety hazards in the laboratory and in the field and knows how to prevent accidents and apply procedures, including basic first aid, for responding to accidents.
- C. Employs safe practices in planning and implementing all instructional activities and designs and implements rules and procedures to maintain a safe learning environment.
- D. Understands procedures for selecting, maintaining and safely using chemicals, tools, technologies, materials, specimens and equipment, including procedures for the recycling, reuse and conservation of laboratory resources.
- E. Knows how to use appropriate equipment and technology (e.g., Internet, spreadsheet, calculator) for gathering, organizing, displaying and communicating data in a variety of ways (e.g., charts, tables, graphs, diagrams, written reports, oral presentations).
- F. Understands how to use a variety of tools, techniques and technology to gather, organize and analyze data, perform calculations and how to apply appropriate methods of statistical measures and analysis.
- G. Knows how to apply techniques to calibrate measuring devices and understands concepts of precision, accuracy and error with regard to reading and recording numerical data from scientific instruments (e.g., significant figures).
- H. Uses the International System of Units (i.e., metric system) and performs unit conversions within and across measurement systems.

STUDYING FOR THE TExES TEST

The following steps may be helpful in preparing for the TExES test.

1. Identify the information the test will cover by reading through the test competencies (see Chapter 3). Within each domain of this TExES test, each competency will receive approximately equal coverage.
2. Read each competency with its descriptive statements in order to get a more specific idea of the knowledge you will be required to demonstrate on the test. You may wish to use this review of the competencies to set priorities for your study time.
3. Review the “Preparation Resources” section of this manual (Appendix B) for possible resources to consult. Also, compile key materials from your preparation course work that are aligned with the competencies.
4. Study this manual for approaches to taking the TExES test.
5. When using resources, concentrate on the key skills and important abilities that are discussed in the competencies and descriptive statements.
6. Use the study plan sheet (Appendix A) to help you plan your study.

NOTE: This preparation manual is the only TExES test study material endorsed by Texas Education Agency (TEA) for this field. Other preparation materials may not accurately reflect the content of the test or the policies and procedures of the TExES program.

Chapter 2

Background Information on the TExES Testing Program



THE TExES TESTS FOR TEXAS TEACHERS

As required by the Texas Education Code §21.048, successful performance on educator certification examinations is required for the issuance of a Texas educator certificate. Each TExES test is a criterion-referenced examination designed to measure the knowledge and skills delineated in the corresponding TExES test framework. Each test framework is based on standards that were developed by Texas educators and other education stakeholders.

Each TExES test is designed to measure the requisite knowledge and skills that an entry-level educator in this field in Texas public schools must possess. The tests include both individual (stand-alone) test questions and questions that are arranged in clustered sets based on real-world situations faced by educators.

DEVELOPMENT OF THE NEW TExES TESTS

Committees of Texas educators and members of the community guide the development of the new TExES tests by participating in each stage of the test development process. These working committees are composed of Texas educators from public and charter schools, university and EPP faculty, education service center staff, representatives from professional educator organizations, content experts and members of the business community. The committees are balanced in terms of position, affiliation, years of experience, ethnicity, gender and geographical location. The committee membership is rotated during the development process so that numerous Texas stakeholders may be actively involved. The steps in the process to develop the TExES tests are described below.

1. **Develop Standards.** Committees are established to recommend what the beginning educator should know and be able to do. Using the Texas Essential Knowledge and Skills (TEKS) as the focal point, draft standards are prepared to define the knowledge and skills required of the beginning educator.
2. **Review Standards.** Committees review and revise the draft standards. The revised draft standards are then placed on the TEA website for public review and comment. These comments are used to prepare a final draft of the standards that will be presented to the SBEC Board for discussion, the State Board of Education (SBOE) for review and comment and the SBEC Board for approval. Standards not based specifically on the TEKS, such as those for librarians and counselors, are proposed as rule by the SBEC Board; sent to the SBOE for its 90-day review; and, if not rejected by the SBOE, adopted by the SBEC Board.
3. **Develop Test Frameworks.** Committees review and revise draft test frameworks that are based on the standards. These frameworks outline the specific competencies to be measured on the new TExES tests. Draft frameworks are not finalized until after the standards are approved and the job analysis/content validation survey (see #4) is complete.
4. **Conduct Job Analysis/Content Validation Surveys.** A representative sample of Texas educators who practice in or prepare individuals for each of the fields for which an educator certificate has been proposed are surveyed to determine the relative job importance of each competency outlined in the test framework for that content area. Frameworks are revised as needed following an analysis of the survey responses.

5. **Develop and Review New Test Questions.** The test contractor develops draft questions that are designed to measure the competencies described in the test framework. Committees review the newly developed test questions that have been written to reflect the competencies in the new test framework. Committee members scrutinize the draft questions for appropriateness of content and difficulty; clarity; match to the competencies; and potential ethnic, gender and regional bias.
6. **Conduct Pilot Test of New Test Questions.** All of the newly developed test questions that have been deemed acceptable by the question review committees are then administered to an appropriate sample of candidates for certification.
7. **Review Pilot Test Data.** Pilot test results are reviewed to ensure that the test questions are valid, reliable and free from bias.
8. **Administer TExES Tests.** New TExES tests are constructed to reflect the competencies, and the tests are administered to candidates for certification.
9. **Set Passing Standard.** A Standard Setting Committee convenes to review performance data from the initial administration of each new TExES test and to recommend a final passing standard for that test. The SBEC Board considers this recommendation as it establishes a passing score on the test.

TAKING THE TExES TEST AND RECEIVING SCORES

Please refer to the current TExES *Registration Bulletin* or the ETS TExES website at www.texas.ets.org for information on test dates, test centers, fees, registration procedures and program policies.

Your score report will be available to you in your testing account on the ETS TExES online registration system by 5 p.m. Central time on the score reporting date indicated in the *Registration Bulletin*. The report will indicate whether you have passed the test and will include:

- A total test scaled score. Scaled scores are reported to allow for the comparison of scores on the same content-area test taken on different test administration dates. The total scaled score is not the percentage of questions answered correctly and is not determined by averaging the number of questions answered correctly in each domain.
 - For all TExES tests, the score scale is 100–300 with a scaled score of 240 as the minimum passing score. This score represents the minimum level of competency required to be an entry-level educator in this field in Texas public schools.
- Your performance in the major content domains of the test and in the specific content competencies of the test.
 - This information may be useful in identifying strengths and weaknesses in your content preparation and can be used for further study or for preparing to retake the test. However, it is important to use caution when interpreting scores reported by domain and competency as these scores are typically based on a smaller number of items than the total score and therefore may not be as reliable as the total score.
- A link to information to help you understand the score scale and interpret your results.

A score report will not be available to you if you are absent or choose to cancel your score.

For more information about scores or to access scores online, go to www.texas.ets.org.

EDUCATOR STANDARDS

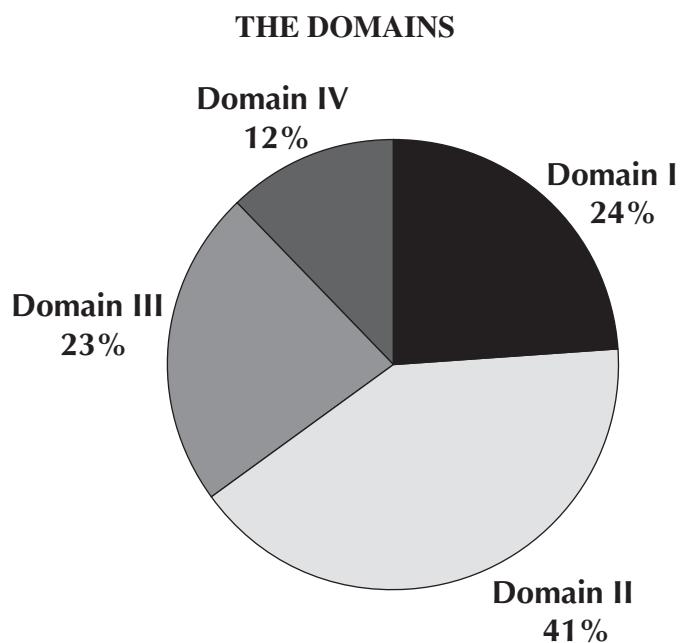
Complete, approved educator standards are posted on the TEA website at www.tea.state.tx.us.

Chapter 3

Study Topics



TEST FRAMEWORK FOR FIELD 140: CHEMISTRY 8–12



- **Domain I: Scientific Inquiry and Processes**
Standards Assessed: Physical Science I–III, VI–VII, XI
- **Domain II: Matter and Energy**
Standard Assessed: Physical Science VIII
- **Domain III: Chemical Reactions**
Standard Assessed: Physical Science VIII
- **Domain IV: Science Learning, Instruction and Assessment**
Standards Assessed: Physical Science IV–V

TOTAL TEST BREAKDOWN

- 100 Multiple-Choice Questions (80 Scored Questions*)

*The number of scored questions will not vary; however, the number of questions that are not scored may vary in the actual test. Your final scaled score will be based only on scored questions.

THE STANDARDS

DOMAIN I — SCIENTIFIC INQUIRY AND PROCESSES (approximately 24% of the test)

PHYSICAL SCIENCE STANDARD I:

The science teacher manages classroom, field and laboratory activities to ensure the safety of all students and the ethical care and treatment of organisms and specimens.

PHYSICAL SCIENCE STANDARD II:

The science teacher understands the correct use of tools, materials, equipment and technologies.

PHYSICAL SCIENCE STANDARD III:

The science teacher understands the process of scientific inquiry and its role in science instruction.

PHYSICAL SCIENCE STANDARD VI:

The science teacher understands the history and nature of science.

PHYSICAL SCIENCE STANDARD VII:

The science teacher understands how science affects the daily lives of students and how science interacts with and influences personal and societal decisions.

PHYSICAL SCIENCE STANDARD XI:

The science teacher knows unifying concepts and processes that are common to all sciences.

DOMAIN II — MATTER AND ENERGY (approximately 41% of the test)

PHYSICAL SCIENCE STANDARD VIII:

The science teacher knows and understands the science content appropriate to teach the statewide curriculum (Texas Essential Knowledge and Skills [TEKS]) in physical science.

DOMAIN III — CHEMICAL REACTIONS (approximately 23% of the test)

PHYSICAL SCIENCE STANDARD VIII:

The science teacher knows and understands the science content appropriate to teach the statewide curriculum (Texas Essential Knowledge and Skills [TEKS]) in physical science.

DOMAIN IV — SCIENCE LEARNING, INSTRUCTION AND ASSESSMENT (approximately 12% of the test)

PHYSICAL SCIENCE STANDARD IV:

The science teacher has theoretical and practical knowledge about teaching science and about how students learn science.

PHYSICAL SCIENCE STANDARD V:

The science teacher knows the varied and appropriate assessments and assessment practices to monitor science learning.

COMPETENCIES**DOMAIN I — SCIENTIFIC INQUIRY AND PROCESSES****COMPETENCY 001**

THE TEACHER UNDERSTANDS HOW TO SELECT AND MANAGE LEARNING ACTIVITIES TO ENSURE THE SAFETY OF ALL STUDENTS AND THE CORRECT USE AND CARE OF NATURAL RESOURCES, MATERIALS, EQUIPMENT AND TECHNOLOGIES.

The beginning teacher:

- A. Uses current sources of information about laboratory safety, including safety regulations and guidelines for the use of science facilities, materials and equipment.
- B. Recognizes potential safety hazards in the laboratory and in the field and knows how to prevent accidents and apply procedures, including basic first aid, for responding to accidents.
- C. Employs safe practices in planning and implementing all instructional activities and designs and implements rules and procedures to maintain a safe learning environment.
- D. Understands procedures for selecting, maintaining and safely using chemicals, tools, technologies, materials, specimens and equipment, including procedures for the recycling, reuse and conservation of laboratory resources.
- E. Knows how to use appropriate equipment and technology (e.g., Internet, spreadsheet, calculator) for gathering, organizing, displaying and communicating data in a variety of ways (e.g., charts, tables, graphs, diagrams, written reports, oral presentations).
- F. Understands how to use a variety of tools, techniques and technology to gather, organize and analyze data, perform calculations and how to apply appropriate methods of statistical measures and analysis.
- G. Knows how to apply techniques to calibrate measuring devices and understands concepts of precision, accuracy and error with regard to reading and recording numerical data from scientific instruments (e.g., significant figures).
- H. Uses the International System of Units (i.e., metric system) and performs unit conversions within and across measurement systems.

COMPETENCY 002

THE TEACHER UNDERSTANDS THE NATURE OF SCIENCE AND THE PROCESS OF SCIENTIFIC INQUIRY.

The beginning teacher:

- A. Understands the nature of science, the predictive power of science and limitations to the scope of science (i.e., the types of questions that science can and cannot answer).
- B. Knows the characteristics of various types of scientific investigations (e.g., descriptive studies, controlled experiments, comparative data analysis) and how and why scientists use different types of scientific investigations.
- C. Understands principles and procedures for designing and conducting a variety of scientific investigations, with emphasis on inquiry-based investigations and understands how to communicate and defend scientific results. Understands the difference between a theory and a hypothesis.
- D. Understands how logical reasoning, verifiable observational and experimental evidence and peer review are used in the process of generating and evaluating scientific knowledge.
- E. Understands the relationship, similarities and differences between science and technology.

COMPETENCY 003

THE TEACHER UNDERSTANDS THE ROLE OF MATHEMATICS AND THE UNIFYING CONCEPTS COMMON TO ALL SCIENCES.

The beginning teacher:

- A. Knows the characteristics and general features of systems; how properties and patterns of systems can be described in terms of space, time, energy and matter; and how system components and different systems interact.
- B. Understands how to identify potential sources of error in an investigation, evaluate the validity of scientific data and develop and analyze different explanations for a given scientific result.
- C. Knows how to apply and analyze the systems model (e.g., interacting parts, boundaries, input, output, feedback, subsystems) across the science disciplines.
- D. Understands how shared themes and concepts (e.g., systems, order and organization; evidence, models and explanation; change, constancy and measurements; evolution and equilibrium; form and function) provide a unifying framework in science.
- E. Understands how models are used to represent the natural world and how to evaluate the strengths and limitations of a variety of scientific models (e.g., physical, conceptual, mathematical).
- F. Understands the importance of mathematics to science and applies scientific conventions and mathematical methods (e.g., significant figures, scientific notation, dimensional analysis, statistical analysis, algebraic manipulation).

COMPETENCY 004

THE TEACHER UNDERSTANDS THE HISTORY OF SCIENCE, HOW SCIENCE IMPACTS THE DAILY LIVES OF STUDENTS AND HOW SCIENCE INTERACTS WITH AND INFLUENCES PERSONAL AND SOCIETAL DECISIONS.

The beginning teacher:

- A. Understands the historical development of science, key events in the history of science and the contributions that diverse cultures and individuals of both genders have made to scientific knowledge.
- B. Knows how to use examples from the history of science to demonstrate the changing nature of scientific theories and knowledge (i.e., that scientific theories and knowledge are always subject to revision in light of new evidence).
- C. Knows that science is a human endeavor influenced by societal, cultural and personal views of the world and knows that decisions about the use and direction of science are based on factors such as ethical standards, economics and personal and societal biases and needs.
- D. Understands the application of scientific ethics to the conducting, analyzing and publishing of scientific investigations.
- E. Applies scientific principles, probability and risk/benefit analysis to analyze the advantages of, disadvantages of, or alternatives to a given decision or course of action.
- F. Understands the role science can play in helping to resolve personal, societal and global issues (e.g., recycling, population growth, disease prevention, resource use, elevating product claims).

DOMAIN II — MATTER AND ENERGY

COMPETENCY 005

THE TEACHER UNDERSTANDS THE CHARACTERISTICS OF MATTER.

The beginning teacher:

- A. Differentiates between physical and chemical properties and changes of matter.
- B. Explains the structure and properties of solids, liquids and gases.
- C. Identifies and analyzes properties of substances (i.e., elements and compounds) and mixtures.
- D. Identifies elements and isotopes by atomic number and mass number and calculates average atomic mass of an element.
- E. Understands the structure, significance and history of the periodic table.

COMPETENCY 006

THE TEACHER UNDERSTANDS THE STRUCTURE AND CHARACTERISTICS OF ATOMS.

The beginning teacher:

- A. Models the atom in terms of protons, neutrons and electron clouds.
- B. Understands atomic orbitals and electron configurations and describes the relationship between electron energy levels and atomic structure.
- C. Analyzes relationships among electron energy levels, photons and atomic spectra.
- D. Applies the concept of periodicity to predict the physical (e.g., atomic and ionic radii) and chemical properties (e.g., electronegativity, ionization energy) of an element.
- E. Understands the historical development of atomic theory.

COMPETENCY 007

THE TEACHER UNDERSTANDS THE PROPERTIES OF GASES.

The beginning teacher:

- A. Understands interrelationships among temperature, moles, pressure and volume of gases contained within a closed system.
- B. Analyzes data obtained from investigations with gases in a closed system and determines whether the data are consistent with the ideal gas law.
- C. Applies the gas laws (e.g., Charles's law, Boyle's law, combined gas law, Avogadro's law) to describe and calculate gas behavior in a variety of systems.
- D. Applies Dalton's law of partial pressure in various systems, as in collecting a gas over water.
- E. Understands the relationship between Kinetic Molecular Theory and the ideal gas law.
- F. Knows how to apply the ideal gas law to analyze mass relationships between reactants and products in chemical reactions involving gases.

COMPETENCY 008

THE TEACHER UNDERSTANDS PROPERTIES AND CHARACTERISTICS OF IONIC AND COVALENT BONDS.

The beginning teacher:

- A. Relates the electron configuration of an atom to its chemical reactivity.
- B. Compares and contrasts characteristics of ionic and covalent bonds.
- C. Applies the “octet” rule to construct Lewis structures.
- D. Identifies and describes the arrangement of atoms in molecules, ionic crystals, polymers and metallic substances.
- E. Understands the influence of bonding forces on the physical and chemical properties of ionic and covalent substances.
- F. Identifies and describes intermolecular and intramolecular forces.
- G. Uses intermolecular forces to explain the physical properties of a given substance (e.g., melting point, crystal structure).
- H. Applies the concepts of electronegativity, electron affinity and oxidation state to analyze chemical bonds.
- I. Evaluates energy changes in the formation and dissociation of chemical bonds.
- J. Understands the relationship between covalent bonding, hybridization and molecular geometry.

COMPETENCY 009

THE TEACHER UNDERSTANDS AND INTERPRETS CHEMICAL NOTATION AND CHEMICAL EQUATIONS.

The beginning teacher:

- A. Identifies elements, ions and compounds using scientific nomenclature.
- B. Uses and interprets symbols, formulas and equations in describing interactions of matter and energy in chemical reactions.
- C. Understands mass relationships involving percent composition, empirical formulas and molecular formulas.
- D. Interprets and balances chemical equations using conservation of atoms, mass and charge.
- E. Understands mass and mole relationships in chemical equations.
- F. Solves stoichiometric problems including limiting reagents, reaction yield and percent yield.

COMPETENCY 010

THE TEACHER UNDERSTANDS TYPES AND PROPERTIES OF SOLUTIONS.

The beginning teacher:

- A. Analyzes factors that affect solubility (e.g., temperature, pressure, polarity of solvents and solutes) and rate of dissolution (e.g., surface area, agitation).
- B. Identifies characteristics of saturated, unsaturated and supersaturated solutions.
- C. Determines the molarity, molality and percent composition of aqueous solutions.
- D. Analyzes precipitation reactions and derives net ionic equations.
- E. Analyzes the colligative properties of solutions (e.g., vapor-pressure lowering, osmotic pressure changes, boiling-point elevation, freezing-point depression).
- F. Understands the properties of electrolytes and explains the relationship between concentration and electrical conductivity.
- G. Analyzes models to explain the structural properties of water and evaluates the significance of water as a solvent in living organisms and the environment.

COMPETENCY 011

THE TEACHER UNDERSTANDS ENERGY TRANSFORMATIONS THAT OCCUR IN PHYSICAL AND CHEMICAL PROCESSES.

The beginning teacher:

- A. Analyzes the energy transformations that occur in phase transitions.
- B. Solves problems in calorimetry (e.g., determining the specific heat of a substance, finding the standard enthalpy of formation and reaction of substances).
- C. Applies the law of conservation of energy to analyze and evaluate energy exchanges that occur in exothermic and endothermic processes.
- D. Understands thermodynamic relationships among spontaneous reactions, entropy, enthalpy, temperature and Gibbs free energy.

DOMAIN III — CHEMICAL REACTIONS**COMPETENCY 012**

THE TEACHER UNDERSTANDS CHEMICAL KINETICS AND EQUILIBRIUM.

The beginning teacher:

- A. Analyzes factors (e.g., temperature, pressure, concentration, catalysts) that influence the rate of a chemical reaction.
- B. Solves problems involving rate laws and determines the rate law of a reaction from experimental data.
- C. Understands principles of chemical equilibrium.
- D. Solves problems involving principles of chemical equilibrium.
- E. Identifies the chemical properties of a variety of common household chemicals (e.g., baking soda, bleach, ammonia) in order to predict the potential for chemical reactivity.

COMPETENCY 013

THE TEACHER UNDERSTANDS ACIDS, BASES AND THEIR REACTIONS.

The beginning teacher:

- A. Identifies the general properties of and relationships among acids, bases and salts.
- B. Identifies acids and bases using models of Arrhenius, Brønsted-Lowry and Lewis.
- C. Differentiates between strong and weak acids and bases.
- D. Applies the relationship between hydrogen ion concentration and pH for acids and bases.
- E. Understands and analyzes acid-base equilibria and buffers.
- F. Analyzes and applies the principles of acid-base titration.
- G. Analyzes neutralization reactions based on the principles of solution concentration and stoichiometry.
- H. Describes the effects of acids and bases in the real world (e.g., acid precipitation, physiological buffering).

COMPETENCY 014

THE TEACHER UNDERSTANDS OXIDATION AND REDUCTION REACTIONS.

The beginning teacher:

- A. Determines the oxidation state of ions and atoms in compounds.
- B. Identifies and balances oxidation and reduction reactions.
- C. Uses reduction potentials to determine whether a redox reaction will occur spontaneously.
- D. Explains the operating principles of electrochemical cells and the process of electroplating metals.
- E. Analyzes applications of oxidation and reduction reactions from everyday life (e.g., combustion, corrosion, electroplating, batteries).

COMPETENCY 015

THE TEACHER UNDERSTANDS NUCLEAR FISSION, NUCLEAR FUSION AND NUCLEAR REACTIONS.

The beginning teacher:

- A. Uses models to explain radioactivity and types of radioactive decay (i.e., alpha, beta, gamma).
- B. Interprets and balances equations for nuclear reactions.
- C. Compares and contrasts fission and fusion reactions.
- D. Knows how to use the half-life of radioactive elements to study real-world problems (e.g., carbon dating, radioactive tracers).
- E. Identifies various issues associated with using nuclear energy (e.g., medical, commercial, environmental).

DOMAIN IV — SCIENCE LEARNING, INSTRUCTION AND ASSESSMENT

COMPETENCY 016

THE TEACHER UNDERSTANDS RESEARCH-BASED THEORETICAL AND PRACTICAL KNOWLEDGE ABOUT TEACHING SCIENCE, HOW STUDENTS LEARN SCIENCE AND THE ROLE OF SCIENTIFIC INQUIRY IN SCIENCE INSTRUCTION.

The beginning teacher:

- A. Knows research-based theories about how students develop scientific understanding and how developmental characteristics, prior knowledge, experience and attitudes of students influence science learning.
- B. Understands the importance of respecting student diversity by planning activities that are inclusive by selecting and adapting science curricula, content, instructional materials and activities to meet the interests, knowledge, understanding, abilities (possible career paths) and experiences of all students, including English-language learners and students with special needs.
- C. Knows how to plan and implement strategies to encourage student self-motivation and engagement in their own learning (e.g., linking inquiry-based investigations to students' prior knowledge, focusing inquiry-based instruction on issues relevant to students, developing instructional materials using situations from students' daily lives, fostering collaboration among students).
- D. Knows how to use a variety of instructional strategies to ensure all students comprehend content-related texts, including how to locate, retrieve and retain information from a range of texts and technologies.
- E. Understands the science teacher's role in developing the total school program by planning and implementing science instruction that incorporates school-wide objectives and the statewide curriculum as defined in the Texas Essential Knowledge and Skills (TEKS).
- F. Knows how to design and manage the learning environment (e.g., individual, small-group, whole-class settings) to focus and support student inquiries and to provide the time, space and resources for all students to participate in field, laboratory, experimental and nonexperimental scientific investigation.
- G. Understands the rationale for using active learning and inquiry methods in science instruction and understands how to model scientific attitudes such as curiosity, openness to new ideas and skepticism.
- H. Knows principles and procedures for designing and conducting an inquiry-based scientific investigation (e.g., making observations; generating questions; researching and reviewing current knowledge in light of existing evidence; choosing tools to gather and analyze evidence; proposing answers, explanations and predictions; and communicating and defending results).

- I. Knows how to assist students with generating, refining, focusing and testing scientific questions and hypotheses.
- J. Knows strategies for assisting students in learning to identify, refine and focus scientific ideas and questions guiding an inquiry-based scientific investigation; to develop, analyze and evaluate different explanations for a given scientific result; and to identify potential sources of error in an inquiry-based scientific investigation.
- K. Understands how to implement inquiry strategies designed to promote the use of higher-level thinking skills, logical reasoning and scientific problem solving in order to move students from concrete to more abstract understanding.
- L. Knows how to guide students in making systematic observations and measurements.
- M. Knows how to sequence learning activities in a way that uncovers common misconceptions, allows students to build upon their prior knowledge and challenges them to expand their understanding of science.

COMPETENCY 017

THE TEACHER KNOWS HOW TO MONITOR AND ASSESS SCIENCE LEARNING IN LABORATORY, FIELD AND CLASSROOM SETTINGS.

The beginning teacher:

- A. Knows how to use formal and informal assessments (e.g., projects, laboratory reports and field journals, rubrics, portfolios, student profiles, checklists) of student performance and products to evaluate student participation in and understanding of inquiry-based scientific investigations.
- B. Connects assessment to instruction in the science curriculum (e.g., designing assessments to match learning objectives, using assessment results to inform instructional practice).
- C. Knows the importance of monitoring and assessing students' understanding of science concepts and skills on an ongoing basis by using a variety of appropriate assessment methods (e.g., performance assessment, self-assessment, peer assessment, formal/informal assessment).
- D. Understands the purposes and characteristics of and uses various types of assessment in science, including formative and summative assessments, and the importance of limiting the use of an assessment to its intended purpose.
- E. Understands strategies for assessing students' prior knowledge and misconceptions about science and how to use these assessments to develop effective ways to address these misconceptions.
- F. Understands characteristics of assessments, such as reliability, validity and the absence of bias in order to evaluate assessment instruments and their results.
- G. Understands the role of assessment as a learning experience for students and strategies for engaging students in meaningful self-assessment and peer assessment.

STUDY TOPICS

- H. Recognizes the importance of selecting assessment instruments and methods that provide all students with adequate opportunities to demonstrate their achievements.
- I. Recognizes the importance of clarifying teacher expectations and student achievement by sharing evaluation criteria and assessment results with students and other appropriate educational stakeholders.

Chapter 4

Succeeding on Multiple-Choice Questions



APPROACHES TO ANSWERING MULTIPLE-CHOICE QUESTIONS

The purpose of this section is to describe multiple-choice question formats that you will see on the Chemistry 8–12 test and to suggest possible ways to approach thinking about and answering the multiple-choice questions. However, these approaches are not intended to replace familiar test-taking strategies with which you are already comfortable and that work for you.

The Chemistry 8–12 test is designed to include a total of 100 multiple-choice questions, out of which 80 are scored. The number of scored questions will not vary; however, the number of questions that are not scored may vary in the actual test. Your final scaled score will be based only on scored questions. The questions that are not scored are being pilot tested in order to collect information about how these questions will perform under actual testing conditions. These questions are not identified on the test.

All multiple-choice questions on this test are designed to assess your knowledge of the content described in the test framework. In most cases, you are expected to demonstrate more than just your ability to recall factual information. You may be asked to think critically about the information, to analyze it, consider it carefully, compare it to other knowledge you have or make a judgment about it.

When you are ready to respond to a multiple-choice question, you must choose one of four answer options labeled A, B, C and D. Leave no questions unanswered. Nothing is subtracted from your score if you answer a question incorrectly. Questions for which you mark no answer or more than one answer are counted as incorrect. Your score will be determined by the number of questions for which you select the best answer.

Calculators. Scientific calculators will be provided at the test center. See the *TExES Registration Bulletin* for the brand and model of the calculator that will be available.

Physical Constants. A set of physical constants will be provided as part of the test. A copy of those physical constants is provided in Chapter 5 of this preparation manual.

Periodic Table of the Elements. A Periodic Table of the Elements will be provided as part of the test for use on science questions. A copy of this periodic table is provided in Chapter 5.

QUESTION FORMATS

You may see the following types of multiple-choice questions on the test.

- Single Questions
- Questions with Stimulus Material
- Clustered Questions

On the following pages, you will find descriptions of these commonly used question formats, along with suggested approaches for responding to each type of question.

SINGLE QUESTIONS

In the single-question format, a problem is presented as a direct question or an incomplete statement, and four answer options appear below the question. The following question is an example of this type. It tests knowledge of Chemistry 8–12 Competency 011: *The teacher understands energy transformations that occur in physical and chemical processes.*

EXAMPLE

For a given reaction, $\Delta H = 13.6$ kJ and $\Delta S = 145$ J/K. Assuming these values are independent of temperature, at what temperature will the reaction become spontaneous?

- A. 94 K
- B. 94°C
- C. 11 K
- D. 11°C

SUGGESTED APPROACH

Read the question carefully and critically. Think about what it is asking and the situation it is describing. Eliminate any obviously wrong answers, select the correct answer choice and mark your answer.

The first step in this problem is to consider the information given and the question being asked. In this case, the change in enthalpy (ΔH) and change in disorder or entropy (ΔS) are given for a chemical reaction, and you are asked for the temperature at which the reaction occurs spontaneously. The spontaneity of a reaction can be determined by calculating the Gibbs free energy of a system (ΔG). The free energy of a system is the maximum useful energy obtainable in the form of work from a given reaction at constant temperature and pressure. If $\Delta G > 0$, then the reaction is nonspontaneous. If $\Delta G < 0$, then the reaction is spontaneous. The system is at equilibrium when there is no net gain or loss of free energy within the system ($\Delta G = 0$). Equilibrium is also the threshold at which the reaction becomes spontaneous. The expression for the free energy is $\Delta G = \Delta H - T\Delta S$, where T , the temperature, is expressed using the Kelvin scale.

Thus, the question requires that you determine at what temperature the reaction will become spontaneous, $\Delta G = 0$.

Since $\Delta G = 0$, then $T\Delta S = \Delta H$, and $T = \Delta H/\Delta S$.

Inserting the given values gives $T = \frac{13.6 \text{ kJ}}{145 \text{ J/K}}$. Converting kilojoules to joules, $13.6 \text{ kJ} = 13,600 \text{ J}$, and simplifying results in $T = \frac{13,600 \text{ J}}{145 \text{ J/K}} = 93.8 \text{ K}$. **This answer is closest to response option A.**

Option B comes from confusing the Celsius and Kelvin temperature scales. Option C results from incorrectly solving the expression for $\Delta G = 0$ and obtaining $T = \Delta S/\Delta H$. Option D comes from both incorrectly solving the equation and using the incorrect temperature scale.

QUESTIONS WITH STIMULUS MATERIAL

Some questions on this test are preceded by stimulus material that relates to the question. Some types of stimulus material included on the test are reading passages, descriptions of experiments, graphics, tables or a combination of these. In such cases, you will generally be given information followed by questions that ask you to analyze the material, solve a problem or make a decision.

You can use several different approaches to respond to these types of questions. Some commonly used strategies are listed below.

- | | |
|-------------------|--|
| Strategy 1 | Skim the stimulus material to understand its purpose, its arrangement and/or its content. Then read the question and refer again to the stimulus material to obtain the specific information you need to answer the question. |
| Strategy 2 | Read the question <i>before</i> considering the stimulus material. The theory behind this strategy is that the content of the question will help you identify the purpose of the stimulus material and locate the information you need to answer the question. |
| Strategy 3 | Use a combination of both strategies. Apply the “read the stimulus first” strategy with shorter, more familiar stimuli and the “read the question first” strategy with longer, more complex or less familiar stimuli. You can experiment with the sample questions in this manual and then use the strategy with which you are most comfortable when you take the actual test. |

Whether you read the stimulus before or after you read the question, you should read it carefully and critically. You may want to note its important parts to help you answer the question.

As you consider questions set in educational contexts, try to enter into the identified teacher's frame of mind and use that teacher's point of view to answer the questions that accompany the stimulus. Be sure to consider the questions in terms of only the information provided in the stimulus — not in terms of your own class experiences or individual students you may have known.

EXAMPLE

First read the stimulus (a description of a chemistry laboratory procedure).

Use the information below to answer the three questions that follow.

To determine the amount of table salt in a salty liquid food product, 0.2 M silver nitrate solution is slowly added to 50 mL of the food product. A small amount of sodium chromate is also added to the solution as an indicator. The chromate ions react with the excess silver ions to produce an orange/red color.

Now you are ready to answer the first question. This question tests knowledge of Chemistry 8–12 Competency 010: *The teacher understands types and properties of solutions.*

1. A total of 25.0 mL of silver nitrate solution is added to the liquid food product before a color change is observed. What is the mass of the silver ions added to the food product?
 - A. 0.005 g
 - B. 0.20 g
 - C. 0.24 g
 - D. 0.54 g

SUGGESTED APPROACH

Read the question carefully and critically. Think about what it is asking and the situation it is describing. Eliminate any obviously wrong answers, select the correct answer choice and mark your answer.

To determine the mass of silver ions added to the liquid food product, information from both the stimulus and the question must be used. First, the number of moles of silver nitrate added can be calculated by multiplying the molarity of the silver nitrate solution (0.2 M) by the volume added in liters (0.025 L) before the color change occurred. The result of the calculation indicates that 0.005 mole of silver nitrate were added to the liquid food product. The number of moles of silver ions added is equal to the number of moles of silver nitrate added because the dissociation of 1 mole of silver nitrate results in 1 mole of silver ions. Multiplying the number of moles of silver ions added (0.005 mole) by the molar mass of the silver ion (107.9 grams/mole) gives the mass of silver ions added to the liquid food product as 0.54 gram. Therefore, **the correct response is option D.**

Option A is incorrect because it represents the number of moles of silver ions added but uses a unit of mass (grams). Option B is incorrect because it represents the molarity of the silver nitrate used in the reaction, but again uses a unit of mass (grams). Option C represents a correct calculation of the number of moles of silver ions added, but it then shows that this number is incorrectly multiplied by the atomic number of silver (47).

Now you are ready to answer the second question. This question also tests knowledge of Chemistry 8–12 Competency 010: *The teacher understands types and properties of solutions.*

2. Which of the following is the net ionic equation that represents the reaction occurring between the silver nitrate and the dissolved table salt in the solution?

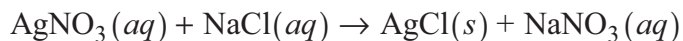
- A. $\text{AgNO}_3(aq) + \text{Na}^+(aq) \rightarrow \text{NaNO}_3(aq) + \text{Ag}(s)$
- B. $\text{AgNO}_3(aq) + \text{Na}^+(aq) \rightarrow \text{Ag}(s) + \text{Na}^+(aq) + \text{NO}_3^-(aq)$
- C. $\text{AgNO}_3(aq) + \text{Cl}^-(aq) \rightarrow \text{ClNO}_3(aq) + \text{Ag}(s)$
- D. $\text{Ag}^+(aq) + \text{Cl}^-(aq) \rightarrow \text{AgCl}(s)$

SUGGESTED APPROACH

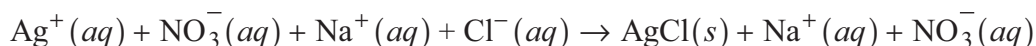
Read the question carefully and critically. Think about what it is asking and the situation it is describing. Eliminate any obviously wrong answers, select the correct answer choice and mark your answer.

This question asks which of four equations can be used to represent the reaction described in the stimulus.

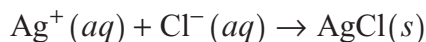
The silver nitrate and the sodium chloride in the food product react according to the balanced molecular equation shown below.



Since AgNO_3 , NaCl and NaNO_3 are all soluble ionic compounds, the equation can be written in ionic form, which shows ions in solution.



Spectator ions are ions that are not directly involved in the chemical reaction and can be omitted when writing an equation for the net chemical reaction. In this case, the sodium and nitrate ions are spectator ions. Omitting spectator ions yields the following equation.



Therefore, **the correct response is option D.**

Options A and B both incorrectly drop the chloride ion as a spectator ion. Chloride ions combine with silver ions to form the solid precipitate silver chloride. The equations in both options A and B erroneously identify elemental silver as the solid product of the reaction. Option C incorrectly brings two negatively charged ions together in the compound ClNO_3 . Option C, like options A and B, also shows the production of solid silver.

Now you are ready to answer the third question. The question below tests knowledge of Chemistry 8–12 Competency 001: *The teacher understands how to select and manage learning activities to ensure the safety of all students and the correct use and care of natural resources, materials, equipment and technologies.*

3. Which of the following analytic techniques is used in this analysis?
- A. Titration
 - B. Chromatography
 - C. Calorimetry
 - D. Electrolysis

SUGGESTED APPROACH

Read the question carefully and critically. Think about what it is asking and the situation it is describing. Eliminate any obviously wrong answers, select the correct answer choice and mark your answer.

This question asks for identification of the analytic technique that is described in the stimulus. Option A gives the technique called “titration.” Titration involves the gradual addition of a solution of known concentration to a known quantity of another solution just to the point of complete reaction, which is often determined by a sudden color change in the presence of an indicator solution. This technique matches the one described in the stimulus, in which silver nitrate solution of known concentration is slowly added to 50 mL of a salty liquid food product until the reaction between the silver ions and available chloride ions is complete, as indicated by the appearance of an orange/red color. Therefore, **the correct response is option A.**

Option B is incorrect because chromatography is used to separate components of a mixture. Option C is incorrect because calorimetry is used to measure heat exchanges in chemical reactions. Option D is incorrect because electrolysis uses electrical energy to drive nonspontaneous chemical reactions.

CLUSTERED QUESTIONS

You may have one or more questions related to a single stimulus. When you have at least two questions related to a single stimulus, the group of questions is called a cluster.

Chapter 5

Multiple-Choice Practice Questions



SAMPLE MULTIPLE-CHOICE QUESTIONS

This section presents some sample test questions for you to review as part of your preparation for the test. To demonstrate how each competency may be assessed, each sample question is accompanied by the competency that it measures. While studying, you may wish to read the competency before and after you consider each sample question. Please note that the competency statements will not appear on the actual test.

An answer key follows the sample questions. The answer key lists the question number and correct answer for each sample test question. Please note that the answer key also lists the competency assessed by each question and that the sample questions are not necessarily presented in competency order.

The sample questions are included to illustrate the formats and types of questions you will see on the test; however, your performance on the sample questions should not be viewed as a predictor of your performance on the actual test.

PERIODIC TABLE OF THE ELEMENTS

1	H 1.0079	2	He 4.0026										
3	4	5	6	7	8	9	10						
Li 6.941	Be 9.012	B 10.811	C 12.011	N 14.007	O 16.00	F 19.00	Ne 20.179						
11	12	13	14	15	16	17	18						
Na 22.99	Mg 24.30	Al 26.98	Si 28.09	P 30.974	S 32.06	Cl 35.453	Ar 39.948						
19	20	21	22	23	24	25	26	27	28	29	30		
K 39.10	Ca 40.08	Sc 44.96	Ti 47.90	V 50.94	Cr 52.00	Mn 54.938	Fe 55.85	Co 58.93	Ni 58.69	Cu 63.55	Zn 65.39		
37	38	39	40	41	42	43	44	45	46	47	48		
Rb 85.47	Sr 87.62	Y 88.91	Zr 91.22	Nb 92.91	Mo 95.94	Tc (98)	Ru 101.1	Rh 102.91	Pd 106.42	Ag 107.87	Cd 112.41		
55	56	57	72	73	74	75	76	77	78	79	80		
Cs 132.91	Ba 137.33	*La 138.91	Hf 178.49	Ta 180.95	W 183.85	Re 186.21	Os 190.2	Ir 192.2	Pt 195.08	Au 196.97	Hg 200.59		
87	88	89	104	105	106	107	108	109	110	111	112		
Fr (223)	Ra 226.02	†Ac 227.03	Rf (261)	Db (262)	Sg (266)	Bh (264)	Hs (277)	Mt (268)	Ds (271)	Rg (272)	§ (277)		
§Not yet named													
*Lanthanide Series													
58	59	60	61	62	63	64	65	66	67	68	69	70	71
Ce 140.12	Pr 140.91	Nd 144.24	Pm (145)	Sm 150.4	Eu 151.97	Gd 157.25	Tb 158.93	Dy 162.50	Ho 164.93	Er 167.26	Tm 168.93	Yb 173.04	Lu 174.97
90	91	92	93	94	95	96	97	98	99	100	101	102	103
Th 232.04	Pa 231.04	U 238.03	Np 237.05	Pu (244)	Am (243)	Cm (247)	Bk (247)	Cf (251)	Es (252)	Fm (257)	Md (258)	No (259)	Lr (262)
†Actinide Series													

Physical Constants for Chemistry 8–12

The universal gas constant is 8.314 J/K-mol or 0.08206 L-atm/K-mol.

Planck's constant is 6.6256×10^{-34} J-s.

Avogadro's number is 6.022×10^{23} .

END OF PHYSICAL CONSTANTS

COMPETENCY 002

1. A descriptive study differs from a controlled experiment primarily in that a descriptive study involves
 - A. measurement and interpretation of data but not quantitative analysis of data.
 - B. quantitative and qualitative data collection related to phenomena but not interpretation of data.
 - C. inferential conclusions related to observed phenomena but not deductive reasoning.
 - D. observation and analysis of phenomena but not manipulation of a variable.

COMPETENCY 003

2. The value of a mathematical equation such as $PV = nRT$ to the endeavor of science is that it
 - A. may be readily understood by all scientists, irrespective of language and training.
 - B. quantifies the relationship among variables precisely and without ambiguity.
 - C. specifies the types of inquiry that will be most fruitful with regard to a variable of interest.
 - D. may be applied to understand patterns in a variety of scientific contexts.

COMPETENCY 004

3. The practice of stoichiometry is most directly related to which of the following historical events in chemistry?
 - A. Rutherford's development of the nuclear model of the atom
 - B. Curie's discovery of radioactive transmutation
 - C. Einstein's discovery of general relativity
 - D. Lavoisier's development of the law of conservation of matter

COMPETENCY 006

4. Which of the following orbital notations shows the correct electron arrangement of a neutral carbon atom in its ground state?
 - A. $\frac{\uparrow\uparrow}{1s} \quad \frac{\uparrow}{2s} \quad \frac{\uparrow}{2p} \quad \frac{\uparrow}{2p} \quad \frac{\uparrow}{2p}$
 - B. $\frac{\uparrow\downarrow}{1s} \quad \frac{\uparrow}{2s} \quad \frac{\uparrow}{2p} \quad \frac{\uparrow}{2p} \quad \frac{\uparrow}{2p}$
 - C. $\frac{\uparrow\downarrow}{1s} \quad \frac{\uparrow\downarrow}{2s} \quad \frac{\uparrow}{2p} \quad \frac{\uparrow}{2p} \quad \underline{\hspace{1cm}}$
 - D. $\frac{\uparrow\downarrow}{1s} \quad \frac{\uparrow\downarrow}{2s} \quad \frac{\uparrow\downarrow}{2p} \quad \underline{\hspace{1cm}} \quad \underline{\hspace{1cm}}$

COMPETENCY 007

5. A gas-filled balloon with a volume of 3.00 L at 300.0 K and 1.00 atm rises into the stratosphere where the pressure is 3.00×10^{-3} atm and the temperature is 250.0 K. What is the volume of the balloon?
- A. 250 L
 B. 750 L
 C. 833 L
 D. 1200 L

COMPETENCY 008

7. Which of the following is the molecular geometry of the NH_3 molecule?
- A. Tetrahedral
 B. Trigonal pyramidal
 C. Trigonal planar
 D. Octahedral

COMPETENCY 009

8. Which of the following is the correct IUPAC name for the ion $\text{Ca}_3(\text{PO}_4)_2$?
- A. Tricalcium phosphate
 B. Calcium diphosphate
 C. Tricalcium bis(phosphate)
 D. Tricalcium diphosphate

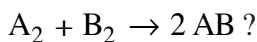
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COMPETENCY 008

6. Use the information below to answer the question that follows.

Bond	Bond Energy (kJ/mol)
A—A	336
B—B	363
A—B	358

The table gives the average amount of energy required to break a particular bond. Which of the following equations correctly calculates the energy change, in kJ/mol, for a reaction with the formula



- A. $336 + 363 + 358 = 1057$
 B. $336 + 363 - 358 = 341$
 C. $336 + 363 - 2(358) = -17$
 D. $2(336) - 2(363) - 2(358) = -770$

COMPETENCY 012

9. Use the information below to answer the question that follows.

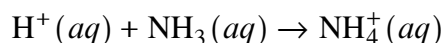
Reaction	Equilibrium Concentrations	
$2 \text{NO}(g) + \text{O}_2(g) \rightleftharpoons 2 \text{NO}_2$	NO	0.0813 M
	O ₂	0.1905 M
	NO ₂	28.47 M

The table gives the equilibrium concentrations for the reaction. What is the equilibrium constant for the reaction?

- A. $\frac{(0.0813)^2(0.1905)}{(28.47)^2}$
- B. $\frac{(0.0813)^2(0.1905)^2}{(28.47)}$
- C. $\frac{(28.47)^2}{(0.0813)^2(0.1905)}$
- D. $\frac{(28.47)}{(0.0813)^2(0.1905)^2}$

COMPETENCY 013

10. Use the equation below to answer the question that follows.



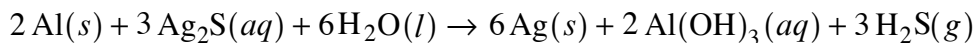
In this reaction, the $\text{NH}_3(aq)$ can be considered a Brønsted base because it

- A. has an oxidation number equal to 0.
- B. contains a metal and a nonmetal.
- C. reacts with hydroxide ions.
- D. acts as a proton acceptor.

MULTIPLE-CHOICE PRACTICE QUESTIONS

Use the information below to answer the two questions that follow.

To remove tarnish from a silver bracelet, a jeweler loosely wraps the bracelet in aluminum foil and submerges the system in a beaker of water. The jeweler next adds baking soda to the water and gently heats the water. The tarnish is removed by the reaction represented below.



COMPETENCY 014

11. Which of the following is the change in the oxidation state of Ag in the reaction?
- A. $0 \rightarrow +1$
 - B. $0 \rightarrow +6$
 - C. $+1 \rightarrow 0$
 - D. $+1 \rightarrow +6$

COMPETENCY 014

12. In this reaction, which of the following species acts as the reducing agent?
- A. Al
 - B. H_2O
 - C. S^{2-}
 - D. OH^-

COMPETENCY 015

13. The isotope $^{14}_6\text{C}$ undergoes beta decay. What is the product of this decay process?
- A. $^{13}_5\text{B}$
 - B. $^{14}_5\text{B}$
 - C. $^{14}_7\text{N}$
 - D. $^{15}_7\text{N}$

COMPETENCY 016

14. A teacher has prepared several electrochemical cells using different pairs of electrodes and asks students to predict which cell they believe will give the highest reading on a voltmeter and explain their reasoning. Which of the following is a primary rationale for asking students to make predictions and listening to their responses and explanations before actually measuring the current?
- A. To provide practice in forming opinions free from external influence
 - B. To test students on their knowledge of the principles of electrochemistry
 - C. To correct students' misconceptions prior to performing the demonstration
 - D. To encourage students to consider what they already know or think they know about a topic

Use the information below to answer the two questions that follow.

In an introductory unit on solubility, an eighth-grade science teacher gives the students the following materials and asks them to determine whether the materials are soluble in water. The students work in teams of two.

- table salt
- baking powder
- zinc powder
- sugar

COMPETENCY 017

15. The teacher would like to use this investigation as a starting point for an extended inquiry-based unit on solubility. Which of the following assignments would be most appropriate for meeting the teacher's goal?
- A. Carefully describe what you observed and pose at least one scientific question related to solubility that could be investigated by empirical methods
 - B. Write a brief essay in which you explain what happens at the molecular level as a substance is dissolved in water
 - C. Repeat the experiment using the same materials and procedures as were used in the original experiment
 - D. Use the Internet to research the properties of saturated and supersaturated solutions and be prepared to present your research to the class

COMPETENCY 017

16. As the inquiry unit progresses, the students perform an experiment in which they are asked to predict whether adding a solute to water will affect the boiling point of water. The students then design and carry out an experiment to test their predictions. The students are asked to communicate the results of their experiment in a written lab report. Which of the following should be the primary criterion used by the teacher in assessing the section of each team's report where the students state the conclusion of their experiment?
- A. Is the conclusion consistent with accepted scientific knowledge?
 - B. Is the conclusion supported by the data collected during the experiment?
 - C. Is the conclusion in agreement with the students' predictions?
 - D. Is the conclusion in agreement with those of the other teams in the class?

ANSWER KEY

Question Number	Correct Answer	Competency
1	D	002
2	B	003
3	D	004
4	C	006
5	C	007
6	C	008
7	B	008
8	C	009
9	C	012
10	D	013
11	C	014
12	A	014
13	C	015
14	D	016
15	A	017
16	B	017

Chapter 6

Are You Ready? – Last-Minute Tips



PREPARING TO TAKE THE TEST

CHECKLIST

Complete this checklist to determine if you are ready to take your test.

- ✓ Do you know the testing requirements for your teaching field?
- ✓ Have you followed the test registration procedures?
- ✓ Have you reviewed the test center identification document requirements in the *Registration Bulletin* or on the ETS TExES website at www.texas.ets.org?
- ✓ Do you know the test frameworks that will be covered in each of the tests you plan to take?
- ✓ Have you used the study plan sheet at the end of this manual to identify what content you already know well and what content you will need to focus on in your studying?
- ✓ Have you reviewed any textbooks, class notes and course readings that relate to the frameworks covered?
- ✓ Do you know how long the test will take and the number of questions it contains? Have you considered how you will pace your work?
- ✓ Are you familiar with the test directions and the types of questions for your test?
- ✓ Are you familiar with the recommended test-taking strategies and tips?
- ✓ Have you practiced by working through the sample test questions at a pace similar to that of an actual test?
- ✓ If constructed-response questions are part of your test, do you understand the scoring criteria for these questions?
- ✓ If you are repeating a test, have you analyzed your previous score report to determine areas where additional study and test preparation could be useful?

THE DAY OF THE TEST

You should have ended your review a day or two before the actual test date. Many clichés you may have heard about the day of the test are true. You should:

- Be well rested.
- Take the appropriate identification document(s) with you to the test center (identification requirements are listed in the *Registration Bulletin* and on the ETS TExES website at www.texas.ets.org).
- Take 3 or 4 well-sharpened soft-lead (No. 2 or HD) pencils with good erasers.
- Eat before you take the test.
- Be prepared to stand in line to check in or to wait while other test takers are being checked in.
- Stay calm. You can't control the testing situation, but you can control yourself. Test administrators are well trained and make every effort to provide uniform testing conditions, but don't let it bother you if a test doesn't start exactly on time. You will have the necessary amount of time once it does start. Using the *Reducing Test Anxiety* booklet in the days before you test may be helpful in mentally and emotionally preparing yourself to test. It is available free at www.texas.ets.org.

You can think of preparing for this test as training for an athletic event. Once you have trained, prepared and rested, give it everything you've got. Good luck.

Appendix A

Study Plan Sheet



Appendix B

Preparation Resources



PREPARATION RESOURCES

The resources listed below may help you prepare for the TExES test in this field. These preparation resources have been identified by content experts in the field to provide up-to-date information that relates to the field in general. You may wish to use current issues or editions to obtain information on specific topics for study and review.

JOURNALS

ChemMatters, American Chemical Society.

The Science Teacher, National Science Teachers Association.

Texas Science Teacher, Science Teachers Association of Texas.

OTHER RESOURCES

Brown, T. E., Lemay, H. E., Bursten, B. E., Murphy, C. J., and Woodward, P. M. (2009). *Chemistry: The Central Science*, Eleventh Edition. Prentice Hall.

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Crotts, D. (1995). *Critical Thinking Skills: Science*. Frank Schaffer Publications, Inc.

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Joyce, B. R., Weil, M., and Calhoun, E. (2003). *Models of Teaching*, Seventh Edition. Allyn & Bacon.

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Ostlund, K. L. (1992). *Science Process Skills: Assessing Hands-On Student Performance*. Addison-Wesley.

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- Whitten, K. W., Davis, R. E., Peck, L. M., and Stanley, G. G. (2006). *General Chemistry*, Eighth Edition. Brooks/Cole.
- Zumdahl, S. S., and Zumdahl, S. A. (2007). *Chemistry*, Seventh Edition. Houghton Mifflin.

ONLINE RESOURCES

- American Chemical Society — www.acs.org
- National Science Teachers Association — www.nsta.org
- The Associated Chemistry Teachers of Texas — www.statweb.org/ACT2/

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