

CHEMISTRY

NBPTS & ARSD/INTASC Standards & Praxis II Test Topics

NBPTS Core Proposition #1. Teachers are committed to students and their learning

- Accomplished science teachers know how students learn, actively come to know their students as individuals, and determine students' understandings of science as well as their individual learning backgrounds.
- Accomplished science teachers take steps to ensure that all students, including those from groups which have historically not been encouraged to enter the world of science, participate in the study of science.

ARSD: 24:16:07:01 Professional Education

- (1) Understanding principles of how all students develop and learn and using that knowledge to design active learning opportunities that are appropriately adapted for varied developmental levels and diverse approaches to learning.
- (4) Establishing a safe, orderly, and equitable learning environment that fosters positive social interaction, active engagement in learning, and self-motivation;
- (8) Understanding the foundations of public education, technological and societal changes in schools, and the legal and ethical responsibilities of the teaching profession.

INTASC Principles for Teachers

INTASC #3. The **candidate** of science understands how students differ in their approaches to learning and creates instructional opportunities that are adapted to diverse learners.

INTASC #2. The **candidate** of science understands how children learn and develop and can provide learning opportunities that support their intellectual, social, and personal development.

INTASC #5. The **candidate** of science uses an understanding of individual and group motivation and behavior to create a learning environment that encourages positive social interaction, active engagement in learning, and self-motivation.

PLT K-6 & 7-12 Students as Learners

- Student Development and the Learning Process
- Students as Diverse Learners
- Student Motivation and the Learning Environment

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NBPTS Core Proposition #2. Teachers know the subjects they teach and how to teach those subjects to students

- Accomplished science teachers have a broad and current knowledge of science and science education, along with in-depth knowledge of one of the sub fields of science, which they use to set important appropriate learning goals.
- Accomplished science teachers develop in students the mental operations, habits of mind, and attitudes that characterize the process of scientific inquiry.
- Accomplished science teachers create opportunities for students to examine the human contexts of science, including its history, reciprocal relationship with technology, ties to mathematics, and impacts on society so that students make connections across the disciplines of science and into other subject areas.

ARSD: 24:16:08:16 7-12 Chemistry Education

Study in the processes by which science produces new knowledge and the nature of that knowledge, study in the history and philosophy of the particular science and the interrelationships among sciences, and study in health and safety procedures and conditions in science classrooms and laboratories.

(1) **Chemistry program.** Coursework shall include a systematic, quantitative, and qualitative study of:

- (a) Fundamental principles of chemistry, biochemistry, and inorganic chemical nomenclature;
- (b) Descriptive study of elements, molecules, and formula units;
- (c) Study of organic chemistry with emphasis on reaction mechanisms, organic chemical nomenclature, and identification of organic substance through chemical and spectrophotometric means
- (d) Analytical chemistry with emphasis on fundamentals of analysis, wet chemist assay methods, separation chemistry, an relevant instrumentation; and
- (e) Physical chemistry with emphasis on kinetic theory, thermodynamics, thermochemistry, electrochemistry, and quantum chemistry;

ARSD: 24:16:07:01 Professional Education

(2) Integrating pedagogical studies with knowledge of a specific discipline to create meaningful learning experiences;

INTASC Principles for Science Teachers

INTASC #1. The *candidate* of science understands the central concepts, tools of inquiry, applications, structures of science and of the science disciplines (physics, chemistry, biology and Earth and space science) he or she teaches and can create learning experiences that make these aspects of content meaningful to students.

- Unifying Concepts and Processes
 - Science and technology
 - Life Science
 - Inquiry
 - Science in personal and social perspectives
 - History and perspectives in science
- (Chemistry content: Structure of atoms; Structure and properties of matter; Chemical reactions)

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NBPTS Core Proposition #2. Teachers know the subjects they teach and how to teach those subjects to students (*continued*)

Praxis II 0245 Chemistry: Content Knowledge

Content Categories

Content Categories	Approximate # of Questions	Approximate % of Examination
Matter and Energy; Heat, Thermodynamics and Thermochemistry	16	16%
Atomic and Nuclear Structure	10	10%
Nomenclature; The Mole, Chemical Bonding, and Geometry	14	14%
Periodicity and Reactivity; Chemical Reactions; Biochemistry and Organic Chemistry	23	23%
Solutions and Solubility; Acid/base Chemistry	12	12%
Scientific Procedure and Techniques; History and Nature of Science; Science, Technology and Society	25	25%

NBPTS Certification Topics for Science Examination Exercises

- Data Analysis
- Interrelations
- Fundamental Concepts
- Changes in Systems
- Connections in Science
- Breadth of Knowledge

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NBPTS Core Proposition #3. Teachers are responsible for managing and monitoring student learning

- Accomplished science teachers select and adapt instructional resources, including technology and laboratory and community resources, and create their own to support active student explorations of science.
- Accomplished science teachers stimulate interest in science and technology and elicit all their students' sustained participation in learning activities.
- Accomplished science teachers create safe and supportive learning environments that foster high expectations for the success of all students and in which students experience the values inherent in the practice of science.
- Accomplished science teachers use a variety of instructional strategies to expand students' understandings of the major ideas of science.
- Accomplished science teachers assess student learning through a variety of means that align with state learning goals.

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- (3) Designing a variety of instructional strategies based on knowledge of subject matter, students, materials, technology, and curriculum frameworks, including the South Dakota K-12 content standards as provided in SDCL 13-3-48 and other established academic standards;
- (4) Establishing a safe, orderly, and equitable learning environment that fosters positive social interaction, active engagement in learning, and self-motivations;
- (5) Creating, selecting, and using formal and informal assessment strategies to evaluate student progress and utilizing the results to determine whether curricula programs are addressing student needs and facilitating student achievement;

INTASC Principals for Science Teachers

INTASC #4. The *candidate* of science understands and uses a variety of instructional strategies to encourage students' development of critical thinking, problem solving, and performance skills.

INTASC #5. The *candidate* of science uses an understanding of individual and group motivation and behavior to create a learning environment that encourages positive social interaction, active engagement in learning, and self-motivation.

INTASC #6. The *candidate* of science uses knowledge of effective verbal, nonverbal and media communication techniques to foster active inquiry, collaboration, and supportive interaction in the classroom.

INTASC #7. The *candidate* of science plans instruction based upon knowledge of subject matter, students, the community, and curriculum goals.

INTASC #8. The *candidate* of science understands and uses formal and informal assessment strategies to evaluate and ensure the continuous intellectual, social and physical development of the student.

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NBPTS Core Proposition #3. **Teachers are responsible for managing and monitoring student learning**
(continued)

PLT K-6 & 7-12 Instruction and Assessment

- Instructional Strategies
- Planning Instruction
- Assessment Strategies

Communication Techniques

- Basic, effective verbal and nonverbal communication techniques
- Effect of cultural and gender differences on communications in the classroom
- Types of questions that can stimulate discussion in different ways for particular purposes

Student Learning

- Student Development and the Learning Process
- Students as Diverse Learners
- Student Motivation and the Learning Environment

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NBPTS Core Proposition #4. Teachers think systematically about their practice and learn from experience

- Accomplished science teachers constantly analyze, evaluate, and strengthen their practice in order to improve the quality of their students' learning experiences.

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- (7) Reflecting on and evaluating instructional practices and continually seeking opportunities for professional growth and development;
- (8) Understanding the foundations of public education, technological and societal changes in schools, and the legal and ethical responsibilities of the teaching profession.

INTASC Principles for Science Teachers

INTASC #9. The *candidate* of science is a reflective practitioner who continually evaluates the effects of his/her choices and actions on others (students, parents, and other professionals in the learning community) and who actively seeks out opportunities to grow professionally.

NBPTS Core Proposition #5. Teachers are members of learning communities

- Accomplished science teachers proactively work with families and communities to serve the best interests of each student.
- Accomplished science teachers contribute to the quality of the practice of their colleagues, to the instructional program of the school, and to the work of the larger professional community.

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- (6) Using effective communication and consultation techniques with students, families, patrons, school colleagues, and community agencies to foster supportive relationships for students' lifelong learning, well-being, and readiness for the workforce;
- (8) Understanding the foundations of public education, technological and societal changes in schools, and the legal and ethical responsibilities of the teaching profession.

INTASC Principles for Science Teachers

INTASC #10. The *candidate* of science fosters relationships with school colleagues, parents, and agencies in the larger community to support students' learning and well-being.

PLT K-6 & 7-12 Profession and Community

- The Reflective Practitioner
- The Larger Community