STANDARD 4: EARTH AND SPACE SCIENCE **GRADES 3-4**

EARTH AND SPACE SCIENCE – The student will make observations from their *environment* as to certain objects, materials, and the changes, noting their *properties*, how they differ, and then be able to explain how these things exist in their present form.

Benchmark 2: The student will observe and describe objects in the sky.

Grades 3-4 Indicators	Instructional Examples
The student…	The student…
1. describes the motion of the moon and stars.	1. sketches the position of the moon in relation to a tree, rooftop, or building at two or three hourly increments on the same evening.
2. observes and compares the length of shadows.	2. observes the movement of an object's shadow during the course of a day; constructs a simple sundial.
3. ▲ discusses that the sun provides light and heat (electro-magnetic radiation) to maintain the temperature of the earth.	3. discusses why it seems cooler when the sun goes behind a cloud, and then investigates why it is cooler in the shade versus direct sunlight.

Teacher Notes:
The sun, moon, stars, clouds, birds, and other objects such as airplanes have *properties* that can be observed and compared.

Properties – word that describes an object based on direct observations using touch, sight, hearing, taste, smell, and measurements.

▲ = Recommended Grade 4 Assessed Indicator

SCIENCE AS INQUIRY – The student will develop the abilities to do scientific inquiry, be able to demonstrate how scientific inquiry is applied, and develop understandings about scientific inquiry.

Benchmark 3: The student will analyze how science advances through the interaction of new ideas, scientific investigations, skepticism, and examinations of evidence of varied explanations.

Grades 5-7 Indicators	Instructional Examples
The student…	The student…
1. after completing an investigation, generates alternative methods of investigation and/or further questions for inquiry.	1. asks "What would happen if…?" questions to generate new ideas for investigation.
2. ▲ evaluates the work of others to determine evidence which scientifically supports or contradicts the results, identifying faulty reasoning or conclusions that go beyond evidence and/or are not supported by data.	2 a. examines and analyzes a scientific breakthrough (such as a Hubble discovery) using multiple scientific sources. b. explains how a reasonable conclusion is supported. c. analyzes evidence and data which supports or contradicts various theories (e.g., theory of continental drift, spontaneous generation, etc.).

TEACHER NOTES:
Scientific investigations often result in new ideas and phenomena for study. These generate new investigations in the scientific community. Science advances through legitimate skepticism. Asking questions and querying other scientists' explanations is part of scientific inquiry. Scientists evaluate the proposed explanations by examining and comparing evidence, identifying faulty reasoning, and suggesting other alternatives.

Much time can be spent asking students to scrutinize evidence and explanations, but to develop critical thinking skills students must be allowed this time. Data that are carefully recorded and communicated can be reviewed and revisited frequently providing insights beyond the original investigative period. This teaching and learning strategy allows students to discuss, debate, question, explain, clarify, compare, and propose new thinking through social discourse. Students will apply this strategy to their own investigations and to scientific theories.

▲ = Recommended Grade 7 Assessed Indicator

STANDARD 2A: CHEMISTRY **GRADES 8-12**

CHEMISTRY – The student will develop an understanding of the structure of atoms, compounds, chemical reactions, and the interactions of energy and matter.

Benchmark 3: The student will gain a basic concept of chemical reactions.

Grades 8-12 Indicators	Additional Specificity
The student …	
1. ▲ understands a chemical reaction occurs when one or more substances (reactants) react to form a different chemical substance(s) (products).	1. Chemical reactions are written as chemical equations, which demonstrate the Law of Conservation of Mass through stoichiometric relationships.
2. understands there are different types of chemical reactions all of which demonstrate the Law of Conservation of Mass (e.g., synthesis, decomposition, combustion, single and double replacement, acid/base, and oxidation/reduction).	2. a. Two or more of the following may often identify chemical reactions: physical property change, effervescence, mass change, precipitation, light emission, and heat exchange. b. Heat exchange during a chemical reaction is often easily noticed: a reaction that absorbs heat will feel colder; a reaction that releases heat will feel warmer. c. The tendency of nature to occupy the greatest number of different states, called entropy, is ultimately the driving force behind chemical reactions. d. The rate (speed) of a chemical reaction depends on such parameters as temperature, concentration, catalysts, and reaction type.

Teacher Notes:

▲ = Recommended Sr. High Assessed Indicator

Linking the Standards to the Kansas Science Assessment
Assessed indicators are marked with a delta. The delta with a numbered indicator means that the writing committee has designated this indicator for emphasis on the new Kansas Science Assessments.

- An indicator with a delta ▲ in the Grades K-4 Standards will be assessed at Grade 4.
- An indicator with a delta ▲in the Grades 5-7 Standards will be assessed at Grade 7.
- A change with the new Kansas Science Assessment will be that two assessments will be administered in Grades 9, 10 and/or 11 based on how local curriculum is best measured. One assessment will include mostly physical science (Standard 2) indicators; the other will include mostly life science (Standard 3) indicators. Both assessments will include indicators from Standards 1, 4-7.

Implementation of the *Kansas Science Education Standards*:
Actions by Kansas school districts to implement the *Kansas Science Education Standards* (KSES) should include:

1. Use the KSES as a framework for local curriculum, including Extended Standards for special needs students. The KSES provides a framework for building local curriculum. Local curriculum, developed from these standards, determines what is taught/learned in science. Local curriculum also provides local districts with a guide for selecting instructional resources.

2. Distribute complete sets of the KSES to all K-12 science teachers and K-12 administrators. Make all grade levels aware of the assessed indicators, and include all the KSES in local district K-12 science curriculum. Local districts are advised to insure that all of the KSES are included in local curriculum and that assessed indicators are not the entire focus of the use of the standards document.

3. Match each KSES indicator with the local grade level that includes the indicator in local curriculum. Determine what local district action is needed if there are KSES standards/indicators that are not addressed in local curriculum. (Note: Once approved by the KSBE, these standards will include in the Appendix a version of the standards that show a sample grade-by grade breakdown of the grade span indicators.)

4. Develop local curricula that integrates science learning with concepts and skills of other curriculum areas, especially math.

5. Classroom teachers select developmentally appropriate instructional strategies to develop the understandings and abilities described in the KSES. The importance of inquiry does not imply that all teachers should pursue a single approach to teaching science.

6. Develop local assessments that support the KSES and extend beyond learning the measured Kansas Science Assessments.

7. Provide ongoing, research-based professional development for K-12 science teachers (all grade levels, not just assessed grade levels) to assure that all students have a highly qualified science teacher. Science teachers need professional development time and support for a creative teaching and learning environment described by the KSES as lab-based, inquiry science.

Science Education Standards

Adopted February 13, 2007

Kansas State Department of Education

Module 2: Science

1. Indicators are comprehensive and all inclusive.
   True or False

2. All indicators marked with a delta will be assessed.
   True or False

3. Instructional examples are mandatory.
   True or False

4. The standards audience is limited to teachers.
   True or False

KSDE Online Standards Staff Development Training Program Self Tests
Science Answer Key

Module 1:

1. True
2. False
3. True

Module 2:

1. False
2. True
3. False
4. False

Module 3:

1. D. 10
2. False
3. B. 4
4. False