

**EDUC 511**  
Jan 18, 2011



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### ED 511 January 18

- Items for the good of the order
  - Course Disk
  - Web site
  - Standards & Anchors
  - Activity
  - Science Safety



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### Before it's too late

- Blue Ribbon Commission Fall 2000
- investigate and report on the quality of mathematics and science teaching
- consider ways of improving recruitment, preparation, retention, and professional growth for mathematics and science teachers in K-12 classrooms nationwide.



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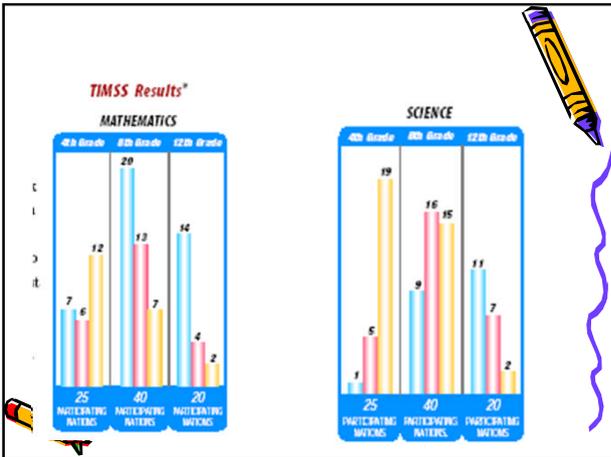
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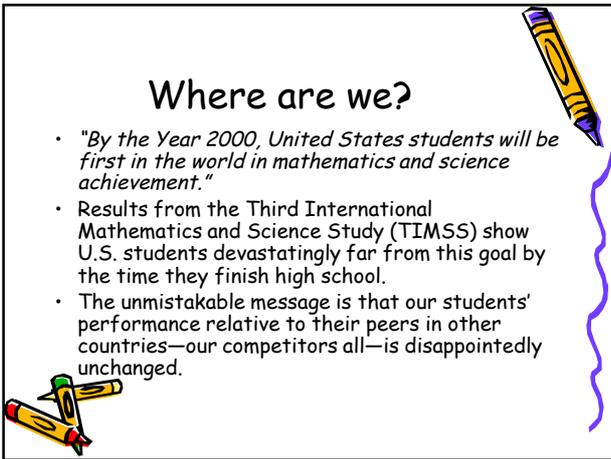
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### Where are we?

- "By the Year 2000, United States students will be first in the world in mathematics and science achievement."
- Results from the Third International Mathematics and Science Study (TIMSS) show U.S. students devastatingly far from this goal by the time they finish high school.
- The unmistakable message is that our students' performance relative to their peers in other countries—our competitors all—is disappointingly unchanged.



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### 4 Reasons

- Global Economy
- Everyday decision-making
- Link to security issues
- Source of lifelong learning



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Progress?

A box containing the text "Progress?". In the bottom-left corner, there are three crayons (red, green, yellow). In the top-right corner, a yellow crayon is shown drawing a purple wavy line that extends down the right side of the box.

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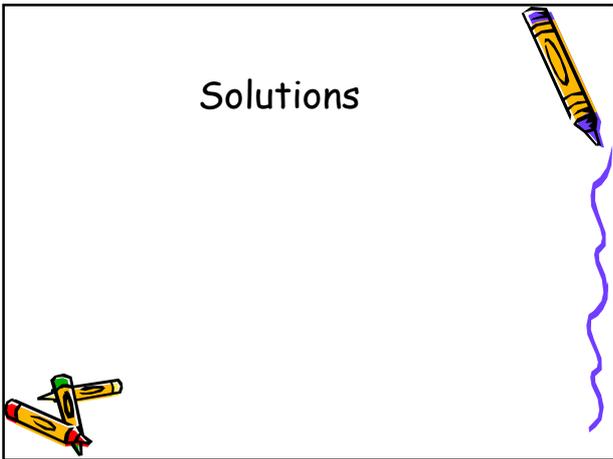
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Solutions

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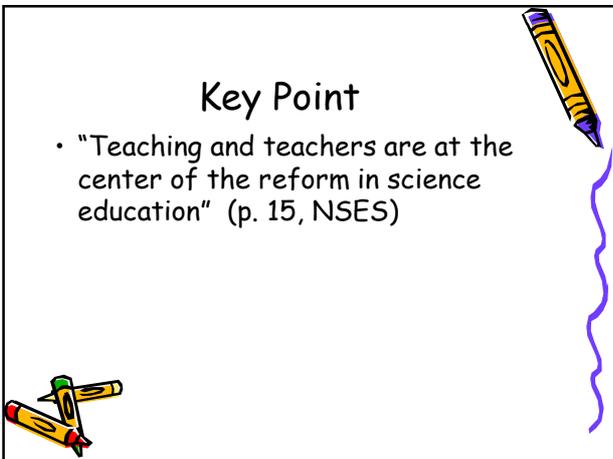
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Key Point

- "Teaching and teachers are at the center of the reform in science education" (p. 15, NSES)

A box containing the text "Key Point" and a bullet point. In the bottom-left corner, there are three crayons (red, green, yellow). In the top-right corner, a yellow crayon is shown drawing a purple wavy line that extends down the right side of the box.

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### General Trends Among the Standards Documents

- "What children should know by . . ."
- Grade Level variation

NSES	Benchmarks	PA State
4	2	4
8	5	7
12	8	10
	12	12




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### Organization of the NSES

- Standards for science teaching ([Chapter 3](#)).
- Standards for professional development for teachers of science ([Chapter 4](#)).
- Standards for assessment in science education ([Chapter 5](#)).
- Standards for science content ([Chapter 6](#)).
- Standards for science education programs ([Chapter 7](#)).
- Standards for science education systems ([Chapter 8](#)).




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### Why Standards?

- Goal: A scientifically literate populace
- What does it mean to be "Scientifically literate"?




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## Principles

- Science is for all students.
- Learning science is an active process.
- School science reflects the intellectual and cultural traditions that characterize the practice of contemporary science.
- Improving science education is part of systemic education reform.



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## Central Theme Among the Standards Documents

- 'Science as Inquiry'
- Leads to:
  - What is inquiry?
  - How do I implement it?



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## INQUIRY.

- the diverse ways in which scientists study the natural world and propose explanations based on the evidence derived from their work.
- also refers to the activities of students in which they develop knowledge and understanding of scientific ideas, as well as an understanding of how scientists study the natural world.



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### PA Academic Standards for Science & Technology

- Approved January 2001
- Key is *Academic*
- Grade Grouping
  - 4
  - 7
  - 10
  - 12



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### PA Academic Science & Technology Standards

- History
  - Early 1990's AAAS Project 2061 & NSTA's SS&C
  - 1996 NSES
  - Early 1994 PA started
  - Draft Spring 1996
  - Final Accepted Version Jan 5, 2002



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### Key Phrase

- *Pennsylvania's public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to . . .*



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## Organization

- Eight Categories
- Four Grade Levels
- 4-5 Standards Statements
- 4-5 Standards Descriptors
  - Explain the nature & scope of the std
  - Serve as a measurement point or benchmark



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## Introduction

The standards document describes what students should know and be able to do in the following eight areas:

- 3.1. Unifying Themes of Science
- 3.2. Inquiry and Design
- 3.3. Biological Sciences
- 3.4. Physical Science, Chemistry and Physics
- 3.5. Earth Sciences
- 3.6. Technology Education
- 3.7. Technological Devices
- 3.8. Science, Technology and Human Endeavors



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## Referencing a Standard

**##.#.Letter.#**

Category

Grade  
Level

Standard  
Statement

Standard  
Descriptor



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### Referencing a Standard

3 . 1 . 10 . A . 5

Category      Grade Level      Standard Statement      Standard Descriptor

Analyze and describe the effectiveness of systems to solve problems

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### Environment and Ecology Standards Categories

1. Watersheds and Wetlands (4.1)
2. Renewable and Nonrenewable Resources (4.2)
3. Environmental Health (4.3)
4. Agriculture and Society (4.4)
5. Integrated Pest Management (4.5)
6. Ecosystems and their Interactions (4.6)
7. Threatened, Endangered, and Extinct Species (4.7)
8. Humans and the Environment (4.8)
9. Environmental Laws and Regulations (4.9)

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### Assessment Anchors

- Foundation of large scale assessment
- Focus on core content
- Describes applicable concepts, processes, skills and knowledge
- Provides clarity and identifies cognitive expectations
- Subset of STEE standards

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## Anchor Introduction

- Science and Technology & Environment and Ecology (STEE) Academic Standards adopted January 2002
- Anchors issued and periodically updated to “tighten the focus of what is assessed”
- Anchors reduce 17 Standards to Reporting Categories



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## Anchor Info

- Anchors may be adjusted by Pennsylvania Department of Education. Changes to Academic Standards requires legislative approval.
- Science Item and Scoring Samplers are “tools for developing instruction”
- Mandatory field testing begins April 2007
- Operational testing begins March 2008



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## Anchors are . . .

- “Subset of STEE Standards” that is “Foundation of large-scale assessment”
- Grade level ranges of 3-5, 6-9, and 10-12
- Eligible content and test designs are prepared for grades 4, 8, and 11.
- Focus on core content
- Describes “applicable concepts, processes, skills, and knowledge” necessary for assessment success



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## Anchors

- Reduce 17 combined STEE Standards Categories to 4 "Reporting Categories" labeled A-D.
  - A. Nature of Science
  - B. Biological Science
  - C. Physical Science (Chemistry and Physics)
  - D. Earth and Space Sciences
- All Standards are still required to be taught, but Anchors only address Standards which will be tested.



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## Anchor Numbering

- Individual Anchors use five number and letter identification system
  - First is always letter S for science
  - Second is grade level number 4, 8, or 11
  - Third is Reporting Category letters A-D
  - Fourth is number representing a Sub-Reporting Category from Anchors
  - Fifth is a number representing the Anchor number



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## Anchor Number Sample

Example:

Anchor S4.D.1.2

S - Science

4 - Grade 4

D - Earth and Space Sciences

1 - Earth Features and Processes that Change Earth and its Resources

2 - Identify the Types and Uses of the Earth's Resources



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## Eligible Content

- The “Eligible Content” appears to the right of each anchor. The Pennsylvania Department of Education (PDE) defines Eligible Content as “the assessment limit” and suggests that their purpose is to help educators “identify how the anchor will be assessed.”



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## Reading the Document

- The PDE defines “e.g.” as denoting plain examples and “i.e.” as denoting examples of the limit to which students must be prepared.
- The PDE defines “or” as meaning that some of the elements of that Anchor will be assessed each year and “and” as meaning that all of the elements of the Anchor will be assessed each year.



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## An example Anchors page

**ASSESSMENT ANCHOR**  
**S4.A.1 Reasoning and Analysis**

**S4.A.1.1** Identify and explain the application of scientific, environmental, or technological knowledge to possible solutions to problems.

*Reference: 3.2.4.A, 3.2.4.C, 3.8.4.C*

**ELIGIBLE CONTENT**

**S4.A.1.1.1** Distinguish between a scientific fact and an opinion, providing clear explanations that connect observations and results (e.g., a scientific fact can be supported by making observations).

**S4.A.1.1.2** Identify and describe examples of common technological changes past to present in the community (e.g., energy production, transportation, communications, agriculture, packaging materials) that have either positive or negative impacts on society or the environment.



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## PSSA Science

- In December 2005, the PDE published "Science Item and Scoring Samplers" for the grades 4, 8, and 11 Operational STEE PSSA scheduled for March 2008.
- The sample items have been reviewed and found to be statistically reliable and valid.
- It is suggested that classroom teachers use these tools as part of their instructional program.



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## Exam Format

- The Operational STEE PSSA will consist of multiple-choice and Short Open-Ended (SOE) questions.
- Multiple choice questions will have 4 possible answers. The correct answer will be worth 1 point.
- Short Open-Ended questions are designed to take approximately 10 minutes to complete. SOE questions will be scored from 0-2 points



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## GENERAL DESCRIPTION OF 2-POINT SCIENCE SCORING GUIDELINES:

2 - The response demonstrates a thorough understanding of the scientific content, concepts, and procedures required by the task(s).

1- The response demonstrates a partial understanding of the scientific content, concepts, and procedures required by the task(s).



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### Scoring (cont.)

0 - The response provides insufficient evidence to demonstrate any understanding of the scientific content, concepts, and procedures as required by the task(s) for that grade level.




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### Webb's Depth of Knowledge

- Level 1 Recall and Reproduction
- Level 2 Skills and Concepts
- Level 3 Strategic Thinking
- Level 4 Extended Thinking




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### Time line

- Finalize AA and sample items June 05
- Begin item development July 05
- Cognitive lab scenarios Oct 05
- Item Review June 06
  - (content & fairness)
- Operational Testing March 08
- Standard Setting June 08




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**SNEAK PEEK**

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**SCIENCE**

**MULTIPLE-CHOICE ITEMS**

**A.1.3.2**

Use the drawing below to answer question 1.



1. A student makes a drawing of the night sky. Which statement correctly explains the size of the objects in the picture?

- A. The Moon is drawn smaller than the tree because it is smaller than the tree.
- B. The Moon is drawn larger than the stars because it is farther away than the stars.
- C. The stars are drawn smaller than the Moon because they are farther away than the Moon. \*
- D. The stars are drawn smaller than the mountains because they are smaller than the mountains.

**Key:** *Because the stars are so far away, they appear smaller than the Moon, which is closer.*

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**D.3.1.1**

2. Which statement best describes the motion of Earth?

- A. It spins as it orbits the Sun. \*
- B. It spins as it orbits the Moon.
- C. It makes one complete turn as it orbits the Sun.
- D. It makes one complete turn as it orbits the Moon.

**Key:** *Earth rotates (spins) as it revolves around the Sun.*

**B:** *Earth does not orbit the Moon.*

**C:** *Earth rotates about 365 times as it orbits the Sun once.*

**D:** *Earth does not orbit the Moon.*

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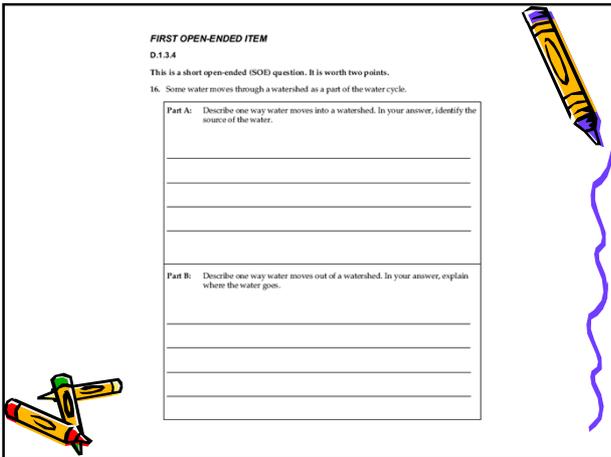
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**FIRST OPEN-ENDED ITEM**  
**D.1.3.4**  
 This is a short open-ended (SOE) question. It is worth two points.  
 16. Some water moves through a watershed as a part of the water cycle.

**Part A:** Describe one way water moves into a watershed. In your answer, identify the source of the water.

**Part B:** Describe one way water moves out of a watershed. In your answer, explain where the water goes.




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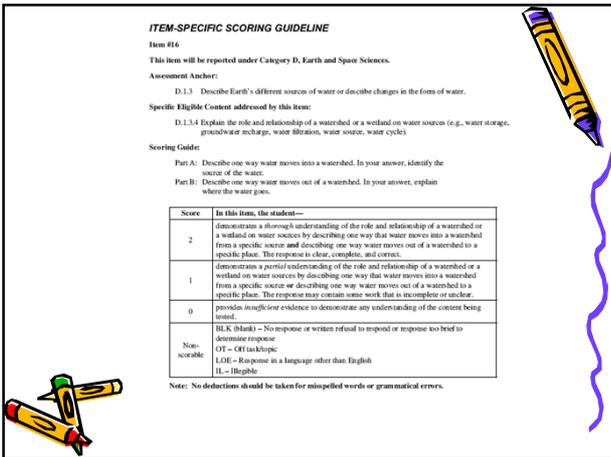
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**ITEM-SPECIFIC SCORING GUIDELINE**  
 Item #16  
 This item will be reported under Category D, Earth and Space Sciences.  
 Assessment Anchor:  
 D.1.3 Describe Earth's different sources of water or describe changes in the form of water.  
 Specific Eligible Content addressed by this item:  
 D.1.3.4 Explain the role and relationship of a watershed at a watershed on water sources (e.g., water storage, groundwater recharge, water filtration, water source, water cycle).

**Scoring Guide:**  
 Part A: Describe one way water moves into a watershed. In your answer, identify the source of the water.  
 Part B: Describe one way water moves out of a watershed. In your answer, explain where the water goes.

Score	In this item, the student—
2	demonstrates a thorough understanding of the role and relationship of a watershed or a watershed on water sources by describing one way that water moves into a watershed from a specific source and describing one way water moves out of a watershed to a specific place. The response is clear, complete, and correct.
1	demonstrates a partial understanding of the role and relationship of a watershed or a watershed on water sources by describing one way that water moves into a watershed from a specific source or describing one way water moves out of a watershed to a specific place. The response may contain some work that is incomplete or unclear.
0	provides insufficient evidence to demonstrate any understanding of the content being tested.
Non-scorable	BLK (Blank) – No response or written refusal to respond or response too brief to determine response OT – Off task/topic LOE – Response in a language other than English IL – Illegible

Note: No deductions should be taken for misspelled words or grammatical errors.




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**PREPARING OUR STUDENTS FOR SUCCESS:**  
 Pennsylvania's New High School Graduation Requirements

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## Big Picture: How Does It All Connect?

*Two-thirds of all new jobs created in the United States require at least some postsecondary education*

It's critical that we prepare all students to graduate high school with the potential to continue their studies and grow their skills.

### New Graduation Requirements and Assessments:

- Designed to help all students, beginning with the class of 2015, demonstrate proficiency in state academic standards
- Complement the standards that guide Pennsylvania's high schools' education systems: Pennsylvania Standards and the Common Core State Standards
- Grounded in Pennsylvania's comprehensive approach to supporting student achievement using the Standards Aligned System (SAS) portal



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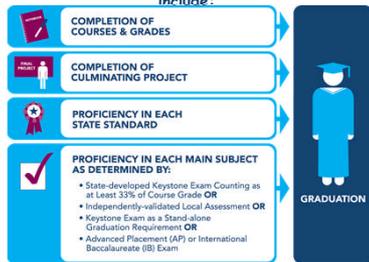
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## Graduation Requirements

School district graduation policies must *at least include:*



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## Graduation Policy Phases

**PHASE ONE:** Students graduating in 2015 and 2016 must demonstrate proficiency in:

- English Composition
- Literature
- Algebra I
- Biology

**PHASE TWO:** Students graduating in 2017 and beyond must demonstrate proficiency in:

- Both English Composition and Literature
- Two of three Mathematics (Algebra I, Algebra II, or Geometry)
- One of two Sciences (Biology or Chemistry)
- One of three Social Studies (American History, Civics and Government or World History)



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## Keystone Exams

A district may choose to administer a state-developed Keystone Exam in core subjects that would serve as the final exam and count for at least 33% of the course grade.

**Beginning with the graduating class of 2015, Keystone Exams are:**

- Administered at the end of the course
- Counted for at least 1/3 of the overall course grade
- Available for students to retake either in their entirety or just a portion (module) 3 times during the year: winter, spring, and summer





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## Alignment to Standards

- Keystone Exams align with Pennsylvania's Standards Aligned System (SAS) and the Common Core State Standards
- The Keystone Exams are simply a new assessment tool for Pennsylvania school districts
- Test questions for the Keystone Exams in English and Math will be guided by Eligible Content on the Standards Aligned System website ([www.pdesas.org](http://www.pdesas.org))





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## What's Happening When: Fall 2010

**Field Testing:**

- Field testing of Algebra I, Biology, and Literature Keystone Exams
- The exams will be made available to mostly high school students and some middle school students in participating school districts

Course	Field Test
Algebra I, Biology, Literature	Fall 2010





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## What's Happening When: Spring 2011

**Field Testing:**

- Field testing of Algebra II, Geometry, and English Composition Keystone Exams

Course	Field Test
Algebra II, Geometry, English Composition	Spring 2011

**Operational Administration:**

- Operational administration of Algebra I, Biology, and Literature begins

Course	Operational
Algebra I, Biology, Literature	Spring 2011





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## What's Happening When: Five-Year Implementation Plan

Course	Field Test	Available For All Schools
Algebra I, Biology, Literature	Fall 2010	Spring 2011
Algebra II, Geometry, English Composition	Spring 2011	Winter 2011-2012
U.S. History	Fall 2012	Spring 2013
Chemistry, Civics and Government, World History	Spring 2015	TBD





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## 100-Point Scale

Each Keystone Exam is graded on a 100-point scale. The chart below shows the points associated with each performance level.

Performance Level	Points
Below Basic	0
Basic	50-69
Proficient	70-89
Advanced	90-100





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## Test Format

**Keystone Exam Questions:**

- Includes multiple-choice questions and constructed-response, or open-ended questions.
- Algebra I and Biology: 60%-75% of the total score from multiple-choice questions and 25%-40% of the total score from constructed-response questions
- English Composition: 20% of the total score will come from multiple-choice, and 80% from constructed-response questions

**Keystone Exam Scoring:**

- Each correct multiple-choice question is worth one point
- Partial credit could be given on constructed-response questions, depending on the rubric

**Keystone Exam Format:**

- Online and paper/pencil formats available for all Keystone Exams
- Each district will individually determine if online, paper/pencil or both formats will be used
- Each exam will take approximately 2 to 2.5 hours to complete




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## Retesting

Students can take the Keystone Exam up to 3 times per school year.

- Students who don't score 'proficient' can retake the entire test or just the module they didn't pass
- Retesting scoring will be based on the highest module scores, so it is in the best interest of the student to retake the entire Keystone Exam
- If a student has not achieved proficiency after 2 attempts, he/she can complete a project-based alternative to demonstrate his/her knowledge in the subject matter




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## Project-Based Assessment

A student who does not achieve proficiency on a Keystone Exam after 2 attempts will be eligible to complete a project-based assessment.

**Projects will be:**

- Aligned with Keystone Exam modules
- Developed by the department and administered by school staff
- Scored by regional panels of educators




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## Accommodations

**ONLINE KEYSTONE EXAMS**

- Audio versions of the Math and Science Keystone Exams will be available online
- A magnifier will be available for students to use on all versions of the online Keystone Exams

Keystone accommodations guidelines will be available in spring 2011

**PAPER/PENCIL KEYSTONE EXAMS**

- Appropriate accommodations will be permitted based on recommendation from the student's teacher(s) or Individual Education Program (IEP)
- Questions can only be read out loud in Keystone Math and Science Exams and only if it doesn't interrupt other students' testing
- Only Math and Science Keystone Exams will be translated into Spanish



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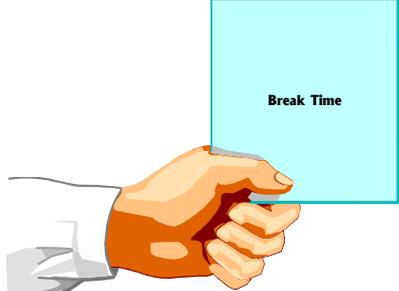
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Break Time



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## Flinn Lab Safety Video

- Things to keep in mind...
  - Are you liable?
  - What are the conditions for establishing negligence?
  - What is the Right-to-Know Law?
  - How can you anticipate problems?
  - Is it only chemistry or is there a concern about safety in biology?



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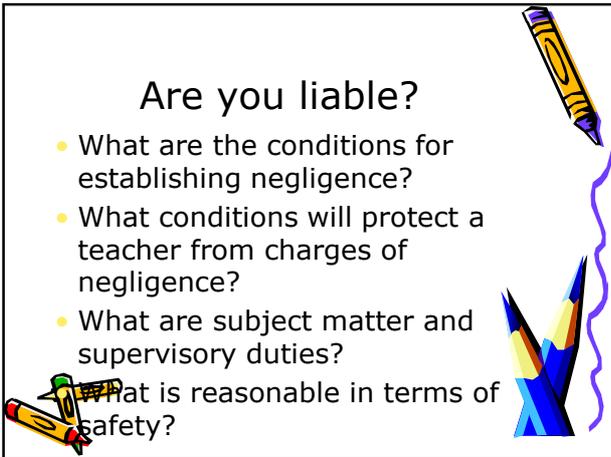
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### Are you liable?

- What are the conditions for establishing negligence?
- What conditions will protect a teacher from charges of negligence?
- What are subject matter and supervisory duties?
- What is reasonable in terms of safety?



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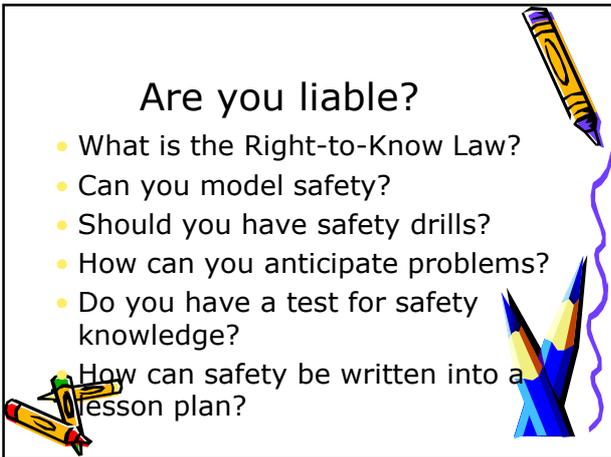
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### Are you liable?

- What is the Right-to-Know Law?
- Can you model safety?
- Should you have safety drills?
- How can you anticipate problems?
- Do you have a test for safety knowledge?
- How can safety be written into a lesson plan?



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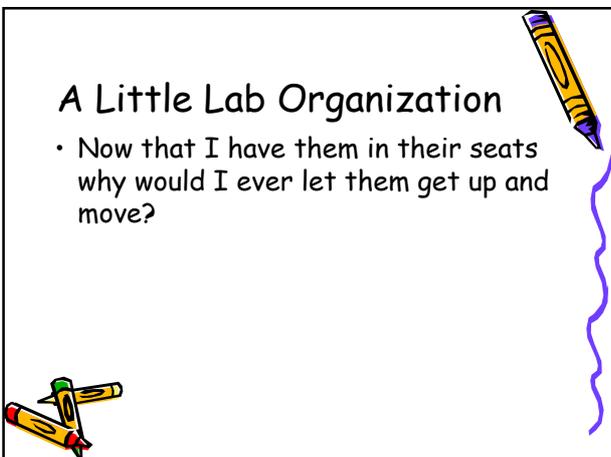
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### A Little Lab Organization

- Now that I have them in their seats why would I ever let them get up and move?



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## Safety Poster Assignment

- Requirements:
  - Valid Safety Rules
  - Poster Size
  - 1 rule or many
  - Must be a useable classroom item
  - Neat, Organized *Grammatically correct*



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## Next Time

- Planning a Lesson
- Lesson Objectives
- 'New' Lesson Plan Format



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