ALABAMA SCIENCE

Student Assessment
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What are our Goals Today?

• Briefly discuss the Alabama Course of Study: Science, Bulletin 2005, No. 20
• Discuss the Alabama Science Assessment: Grades 5 and 7 development timeline
• Discuss eligible content for Grade 5
• Discuss eligible content for Grade 7
• Answer questions
A Curriculum Document:

• Containing the *Minimum Required Content* of a Subject Area for All Alabama Public Schools

• Specifying What Students Should *Know and Be Able to Do* in a Particular Subject Area by the End of Each Course and Grade Level (K-12)
Influence of No Child Left Behind on Alabama's Science Academic Content Standards

• Standards apply to all students.
• Standards are not repeated.
• Standards are clear and measurable at the state level.
• Mastery is expected at each grade level.
• Content standards are fewer in number.
• Bullets are related content that must be taught.
Interpreting the Content Standards

Content standards:
- Define *what* students should *know* and *be able to do* at the conclusion of a course or grade
- Identify *minimum* required content

Bullets:
- Contain *additional* related and *required* content

Examples:
- *Clarify* certain components of content standards and/or bullets
- *Are illustrative* but *not exhaustive*
Science for Every Student in Every Grade Every Day?

Yes!!
WHY?
“As educators, we know we cannot wait until students are in the eleventh and twelfth grade to foster a love of science and mathematics; the love has to be nurtured and promoted throughout the K-12 experience.”

Jo Anne Vasquez, NSB Member
According to the *No Child Left Behind Act* of 2001, by the 2007 – 2008 school year, states must administer annual science assessments at least once in Grades 3 – 5, Grades 6 – 9, and Grades 10 – 12. In order to comply with this federal law, these assessments must be aligned with state academic content and achievement standards and involve multiple measures of higher-order thinking and understanding.
The Alabama Science Assessment: Grades 5 and 7

The Alabama Science Assessment: Grades 5 and 7 will measure students’ mastery of the Alabama Course of Study: Science, Bulletin 2005, No. 20. The Alabama Science Assessment: Grades 5 and 7 will be a criterion-referenced test. The assessment will have approximately 60 - 74 multiple-choice items.
Development Timeline

• December 11, 2003 - Resolution to Appoint the Science State Course of Study Committee

• January 13, 2005 - The State Board of Education Received Resolution for Adoption of Science State Course of Study

• February 10, 2005 - Resolution for Adoption of Science State Course of Study
Development Timeline

• November 10, 2005 – Approved Recommendations of the State Textbook Committee for Adoption and Rejection of Textbooks for Science

• January 2006 - Award State Contract to Develop the Grade 5 and Grade 7 Science Assessment

• March 2006 – Test/Item Specifications Meeting for Grades 5 and 7
Development Timeline

• March 2006 – System Test Coordinators Provide Superintendent Recommendations for Teachers to Serve on Bias and Content Committees

• March – July 2006 – Item Development

• July 18 – 20, 2006 - Content and Bias Committee Reviews

• September 18 – 20, 2006 - Content and Bias Committee Reviews
When there were questions about test items, they were literally tested for accuracy.
Development Timeline

• April 16 – 24, 2007 - Item Pilot Administration

• May 2007 – July 2007 - Analyze Statistics from the Item Pilot and Develop Final Test Forms

• July 2007 – Fall 2007 – Develop Item Specifications for Distribution to LEAs

• April 9 – 22, 2008 - Live Administration for Grades 5 and 7
What is assessed at Grade 5?

• Physical Science

• Life Science

• Earth and Space Science
What is assessed at Grade 5?

PHYSICAL SCIENCE
Standard 1
Identify evidence of chemical changes through color, gas formation, solid formation, and temperature change.
Grade 5 Physical Science

Chemical Changes - Color
Bacteria light up the water
Grade 5 Physical Science
Chemical Changes – Gas Formation
Grade 5 Physical Science

Chemical Changes - Solid Formation
Sodium + Chlorine: Pass the Salt, Please

New Solid - Rust
Grade 5 Physical Science

Chemical Changes – Temperature Change
CHEMICAL AND PHYSICAL CHANGES

• Students should know the differences between chemical and physical changes.

• Students should be able to list examples of a chemical change.

• Students should be able to list examples of a physical change.
A raw egg becomes a cooked egg.
EXAMPLES OF CHEMICAL CHANGES

A cake mix becomes a cake.
EXAMPLES OF CHEMICAL CHANGES

A newspaper becomes ash.
EXAMPLES OF CHEMICAL CHANGES

Steel becomes rust over time.
EXAMPLE OF A PHYSICAL CHANGE

Ice melting is a good example of a physical change.
CHEMICAL OR PHYSICAL CHANGE, HOW CAN I TELL?

A physical change is reversible, a chemical change is not. For example, the freezing of water would be a physical change because it can be reversed. The burning of wood is a chemical change - you can't "unburn" it.
CHEMICAL OR PHYSICAL CHANGE, HOW CAN I TELL?

A physical change is a change in which no new substance is formed; a chemical change results in the formation of one or more new substances. Again, consider the previous examples: Freezing water into ice just results in water molecules which are 'stuck' together - it's still H₂O. Whereas, burning wood results in ash, carbon dioxide, etc, all new substances which weren't there when you started.
EXAMPLE OF A PHYSICAL CHANGE

[Image of a physical change, e.g., butter melting in a pan]
Standard 2: Define mass, volume, and density.

Mass – How much “stuff” is in an object
Volume – How much space an object occupies
Density – The amount of mass that fits in a given volume

The density of an object is found by dividing its mass by its volume:

\[ D = \frac{M}{V} \]
NAEP ITEM

1. Look at the two pictures below. They show what happened when two solid blocks were each put in a jar containing a liquid. Based just on what you can see in the pictures, what can you say about the blocks and the jars?

A) The liquid in the jars must be water.
B) The block in jar 1 weighs more than the block in jar 2.
C) The block in jar 1 is floating lower in its liquid than is the block in jar 2.
D) The block in jar 1 must be made of metal and the block in jar 2 must be made of wood.
As shown in the picture below, Christina has two identical cups that are filled to the same level with water. She also has two solid steel balls.

Steel Ball 1  
Cup 1

Steel Ball 2  
Cup 2

5. Christina puts ball 1 in cup 1 and ball 2 in cup 2. In which cup will the water level rise the most?

_________________________________________________________________________________

Tell why you think so.

_________________________________________________________________________________
2. You are going to the park on a hot day and need to take some water with you. You have three different bottles, as shown in the picture below. You want to choose the bottle that will hold the most water. Explain how you can find out which bottle holds the most water.
A student added a small ball to a graduated cylinder containing 10 milliliters of water.

What is the volume of the ball?

A  5 mL
B  10 mL
C  15 mL
D  20 mL
Density determines whether something will sink or float!
Why Is This Happening?
Standard 3: Use everyday indicators to identify common acids and bases.
MUST DO HANDS-ON ACTIVITIES
RED CABBAGE JUICE - AN EVERYDAY INDICATOR
Are You An Acid Or A Base?
pH Scale

- **Acidic**:
  - $10^{-3}$: Vinegar
  - $10^{-2}$: Beer
  - $10^{-1}$: Carbonated water
  - $10^0$: Lemon juice
- **Neutral**:
  - $10^{-7}$: Milk
  - $10^{-6}$: Blood
  - $10^{-5}$: 0.1 M baking soda
- **Basic**:
  - $10^{-4}$: Milk of magnesia
  - $10^{-3}$: Household ammonia
  - $10^{-2}$: Sea water (pH 7.0–8.3)
  - $10^{-1}$: 0.1 M NaOH
  - $10^0$: Stomach acid (pH 1.0–3.0)
  - $10^1$: 0.1 M HCl
Standard 4: Describe forms of energy, including chemical, heat, light, and mechanical.
CHEMICAL ENERGY

Pizza, Apples, Fried Chicken, Hamburger
Potential and Kinetic Energy
Potential and Kinetic Energy
Windmills
How Hydroelectric Power Is Created

1. Dam creates a reservoir, which stores water.
2. Dam elevates the water, creating a drop.
3. Water in the forebay falls through the penstock to turn the turbine.
4. Generator is turned by the turbine to produce electricity.
5. Electricity is carried to homes and businesses by transmission lines.
Heat Energy Moves in Three Ways

Soup is heated in the pan by convection. The hot soup rises. Cool soup falls to take the hot soup’s place.

Pan handle is an insulator and doesn’t conduct heat very well.

Heat energy from the stove is transferred to the pan by conduction.
LIGHT ENERGY
Photosynthesis

Energy

Carbon Dioxide

Oxygen is released

Chlorophyll

Glucose is formed

Water
MECHANICAL ENERGY
Standard 5: Contrast ways in which light rays are bent by concave and convex lenses.

Reflection from Convex and Concave Surfaces

Figure 4

Outside Spoon Bowl

Inside Spoon Bowl
Graphics

and more Graphics
What happens when light enters a lens?

How do these lenses bend light?
Standard 6: Compare effects of gravitational force on Earth, on the moon, and within space.
Apollo 13 Launch Video
Lost on the Moon Activity

• Your spaceship has just crashed on the moon. You were scheduled to rendezvous with a mother ship 200 miles away on the lighted surface of the moon, but the rough landing has ruined your ship and destroyed all the equipment on board except for the 15 items listed below.

• Your crew's survival depends on reaching the mother ship, so you must choose the most critical items available for the 200-mile trip.

• Your task is to rank the 15 items in terms of their importance for survival. Place a number 1 by the most important item, number 2 by the second most important, and so on, through number 15, the least important.
LOST ON THE MOON WORKSHEET

______  Box of matches
______  Food concentrate
______  50 feet of nylon rope
______  Parachute silk
______  Solar-powered portable heating unit
______  Two .45-caliber pistols
______  One case of dehydrated milk
______  Two 100-pound tanks of oxygen
______  Stellar map (of the moon's constellations)
______  Self-inflating life raft
______  Magnetic compass
______  5 gallons of water
______  Signal flares
______  First-aid kit containing injection needles
______  Solar-powered FM receiver-transmitter
# LOST ON THE MOON TEST: THE ANSWERS

Following are the answers to the group problem-solving test, *Lost on the Moon*. The difference between your rank and NASA's (plus or minus) is to be listed in the "Difference for You" column. The difference between your group's rank and NASA's is to be listed in the last column. Keep in mind that this is supposed to be a learning experience. Have fun with the activity.

<table>
<thead>
<tr>
<th>ITEM</th>
<th>Reasoning</th>
<th>NASA's Rank</th>
<th>Your Rank</th>
<th>Difference for You</th>
<th>Group Rank</th>
<th>Difference for Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Box of matches</td>
<td>No oxygen to sustain flame, virtually worthless</td>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Food concentrate</td>
<td>Efficient means of supplying energy requirements</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fifty feet of nylon rope</td>
<td>Useful in scaling cliffs, tying injured together</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parachute silk</td>
<td>Protection from sun's rays</td>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Solar-powered portable heating unit</td>
<td>Not needed unless on dark side</td>
<td>13</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Two .45 caliber pistols</td>
<td>Possible means of self-propulsion</td>
<td>11</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>One case of Pet milk</td>
<td>Bulkier duplication of food concentrate</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Two 100-pound tanks of oxygen</td>
<td>Most pressing survival need</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stellar map of the moon's constellations</td>
<td>Primary means of navigation</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-inflating life raft</td>
<td>CO2 bottle in military raft may be used for propulsion</td>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Magnetic compass</td>
<td>Magnetic field on moon is not polarized; worthless for navigation</td>
<td>14</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 gallons of water</td>
<td>Replacement for tremendous liquid loss on lighted side</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Signal flares</td>
<td>Distress signal when mother ship is sighted</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>First-aid kit injection needles</td>
<td>Needles for vitamins, medicines, etc., will fit special aperture in NASA space suits</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Solar-powered FM receiver-transmitter</td>
<td>For communication with mother ship; but FM requires line-of-sight transmission and short ranges</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total points difference:

Error points are the absolute difference between your rankings and NASA's (disregard plus or minus signs).

- 0-25 excellent
- 26-32 good
- 33-45 fair
- 56-70 oops
- 71-112 oh, well
Life Science
Standard 7
Identify common parts of plant and animal cells, including the nucleus, cytoplasm, and cell membrane.
ANIMAL CELL
ANIMAL CELL

1. Cell membrane
2. Cytoplasm
3. Nucleus
The Incredible, Edible Cell

Ingredients:
A gelatin dessert
2 blue or green pieces of fruit roll-ups for Golgi Bodies
2 red or yellow pieces of fruit roll-ups for the endoplasmic reticulum
1 teaspoon of sprinkles for the ribosomes
4 hot tamales for the mitochondria
4 chocolate covered raisins for the vacuoles
1 gum ball for the nucleus
## Plant and Animal Cell Parts

<table>
<thead>
<tr>
<th></th>
<th>Plant Cells</th>
<th>Animal Cells</th>
<th>Plant and Animal Cells</th>
</tr>
</thead>
<tbody>
<tr>
<td>cell membrane</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
</tr>
<tr>
<td>cell wall</td>
<td>☑</td>
<td>no</td>
<td></td>
</tr>
<tr>
<td>chloroplast</td>
<td>☑</td>
<td>no</td>
<td></td>
</tr>
<tr>
<td>cytoplasm</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
</tr>
<tr>
<td>E.R.</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
</tr>
<tr>
<td>Golgi bodies</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
</tr>
<tr>
<td>lysosome</td>
<td>☑</td>
<td>uncommon</td>
<td></td>
</tr>
<tr>
<td>mitochondria</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
</tr>
<tr>
<td>nucleus</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
</tr>
<tr>
<td>ribosome</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
</tr>
<tr>
<td>vacuole</td>
<td>large ones</td>
<td>small ones</td>
<td></td>
</tr>
</tbody>
</table>
Standard 8
Identify major body systems and their functions, including the circulatory system, respiratory system, excretory system, and reproductive system.
CIRCULATORY SYSTEM
CIRCULATORY SYSTEM

- Pumps blood through the body taking oxygen and nutrients to body cells.
- Picks up needed materials from the lungs and digestive system and carries it to the body.
- Carries waste products to where they can be eliminated.
- Helps fight disease and injury by carrying the substances that will heal you.
RESPIRATORY SYSTEM
The function of the respiratory system is to provide the blood with oxygen and remove wastes.
EXCRETORY SYSTEM

Removes Waste From The Body
The excretory system's job is to take wastes out of the body. The skin, intestines, kidneys, liver, lungs, and sweat glands are the main organs in the excretory system.
Reproduction is a characteristic of all living systems; because no individual organism lives forever, reproduction is essential to the continuation of every species.

*National Science Education Standards*
Standard 9

Describe the relationship of populations within a habitat to various communities and ecosystems.
A population comprises all the individuals of a given species in a specific area or region at a certain time.
A community refers to all the populations in a specific area or region at a certain time.
An ecosystem is composed of the biological community and the abiotic environment.
Student should know the relationships within a food web. These should include decomposers, producers, and consumers.
Decomposers are organisms that get their food by breaking down the nutrients in dead organisms or animal wastes.

Consumers are organisms that must eat (consume) other organisms to get food. Some consumers are decomposers.

Producers are organisms that produce their own food. Like most producers, plants use energy from the Sun to make food from water and carbon dioxide.
Earth and Space Science
Standard 10

Identify spheres of Earth, including the geosphere, atmosphere, and hydrosphere.
Atmosphere
Geosphere
Hydrosphere
What events take place in the spheres of Earth?
Earth's atmosphere is a layer of gases surrounding the planet Earth and retained by the Earth's gravity.
The geosphere is the solid Earth that includes continental and oceanic crust as well as the various layers of the Earth's interior.
The hydrosphere includes all water on Earth.
Standard 11
Compare distances from the sun to planets in our solar system.
Where’s Pluto?
My Other Vehicle Is On Its Way To Pluto

PLUTO IS A PLANET IN MY SOLAR SYSTEM

Honk if Pluto is still a planet.
“As educators, we know we cannot wait until students are in the eleventh and twelfth grade to foster a love of science and mathematics; the love has to be nurtured and promoted throughout the K-12 experience.”

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Questions?