

A SCHMAHL SCIENCE WORKSHOP



STAR CST

Blueprint

EIGHTH GRADE SCIENCE TEST

A SCHMAHL SCIENCE WORKSHOP

Belinda Lowe-Schmahl
Executive Director and Workshop Coordinator
171 Branham Lane, Suite 10, PMB 223
San Jose, Calif. 95136

Telephone (408) 281-7595
FAX (408) 578-5594
Bel@schmahlsience.org

A SCHMAHL SCIENCE WORKSHOP

6TH 7TH 8TH GRADE SCIENCE ★ FOCUS ★

Students in California are now assessed in eighth grade in Science. In a Language Arts and Mathematics focused curriculum, many schools find it difficult to find the resources and time needed to teach the specific science concepts and investigational skills included on the STAR CST Science Test. A Schmahl Science Workshop offers a solution!

A Schmahl Science Workshop now offers a series of workshops that are specifically focused on the six, seventh and eighth grade science standards that are the basis for the STAR Science Test.

- Four sixth grade workshops
- Four seventh grade workshops
- Four eighth grade workshops

Workshops are provided in October, November, February, and March. Test preparation review materials and formats are also provided for teacher use just prior to STAR testing.

This unique Schmahl Science program is currently limited to twelve schools.



A SCHMAHL SCIENCE WORKSHOP

Belinda Lowe-Schmahl
 Executive Director and Workshop Coordinator
 171 Branham Lane, Suite 10, PMB 223
 San Jose, Calif. 95136

Telephone (408) 281-7595
 FAX (408) 578-5594
 Bel@schmahscience.org

CALIFORNIA STANDARDS SCIENCE TEST GRADE 6, 7, & 8: STAR CRT SCIENCE TEST CONTENT STANDARDS

CALIFORNIA CONTENT STANDARDS: Grade 6-8	60 Items	100%
Motion	8 items	13%
1. The velocity of an object is the rate of change of its position. As a basis for understanding this concept:		
a. <i>Students know</i> position is defined in relation to some choice of a standard reference point and a set of reference directions.	1	
b. <i>Students know</i> that average speed is the total distance traveled divided by the total time elapsed and that the speed of an object along the path traveled can vary.	1	
c. <i>Students know</i> how to solve problems involving distance, time, and average speed.	2	
d. <i>Students know</i> the velocity of an object must be described by specifying both the direction and the speed of the object.	1	
e. <i>Students know</i> changes in velocity may be due to changes in speed, direction, or both.	1	
f. <i>Students know</i> how to interpret graphs of position versus time and graphs of speed versus time for motion in a single direction.	2	

COORELATED SSW WORKSHOPS – Motion

Sixth Grade: Not a focus area in sixth grade

Seventh Grade: Not a focus area in seventh grade

...continued on next page

COORELATED SSW WORKSHOPS – Motion

Eighth Grade:

Roller Coaster Design Challenge: (PHY 32) Why toys? Kids call it playing. Scientists call it experimenting. Playing = problem solving. How do roller coasters work? The answer is Physics. If you ever thought that physics was boring, think again because without it, we wouldn't have roller coasters. This workshop explores the physics of roller coasters. The science focuses on work, motion, forces, and energy, with an emphasis on gravity, potential energy, and kinetic energy. Activities will include experimenting with roller coasters by varying the height and angle of the rollercoaster track and by adding a jump and a bump.

Science Standards: 1a, 1b, 1c, 1d, 1e, 1f

CALIFORNIA STANDARDS SCIENCE TEST
GRADE 6, 7, & 8: STAR CRT SCIENCE TEST
 CONTENT STANDARDS

Forces	8 items	13%
2. Unbalanced forces cause changes in velocity. As a basis for understanding this concept:		
a. <i>Students know</i> a force has both direction and magnitude.	1	
b. <i>Students know</i> when an object is subject to two or more forces at once, the result is the cumulative effect of all the forces.	1	
c. <i>Students know</i> when the forces on an object are balanced, the motion of the object does not change.	1	
d. <i>Students know</i> how to identify separately the two or more forces that are acting on a single static object, including gravity, elastic forces due to tension or compression in matter, and friction.	2	
e. <i>Students know</i> that when the forces on an object are unbalanced, the object will change its velocity (that is, it will speed up, slow down, or change direction).	1	
f. <i>Students know</i> the greater the mass of an object, the more force is needed to achieve the same rate of change in motion.	1	
g. <i>Students know</i> the role of gravity in forming and maintaining the shapes of planets, stars, and the solar system.	1	

COORELATED SSW WORKSHOPS – Forces

Sixth Grade: Not a focus area in sixth grade

Seventh Grade: Not a focus area in seventh grade

Eighth Grade:

- **Simple Machines: Wheels and Axles/Newton Cars (104 ENG):** The focus of the student's the careful assembly of a balloon-powered car that provides a practical application of Newton's third law of motion. After students have completed their cars and considered the importance of axles, bearings, and symmetry they will have a lot of fun racing them around the room.

Science Standards: 1a, 1b, 1c, 1d, 1e, 1f, 2a, 2b, 2c, 2d, 2e, 2f, 2g

...continued on next page

CALIFORNIA STANDARDS SCIENCE TEST
GRADE 6, 7, & 8: STAR CRT SCIENCE TEST
CONTENT STANDARDS

Structure of Matter	9 items	15%
3. Each of the more than 100 elements of matter has distinct properties and a distinct atomic structure. All forms of matter are composed of one or more of the elements. As a basis for understanding this concept:		
a. <i>Students know</i> the structure of the atom and know it is composed of protons, neutrons, and electrons.	2	
b. <i>Students know</i> that compounds are formed by combining two or more different elements and that compounds have properties that are different from their constituent elements.	2	
c. <i>Students know</i> atoms and molecules form solids by building up repeating patterns, such as the crystal structure of NaCl or long-chain polymers.	1	
d. <i>Students know</i> the states of matter (solid, liquid, gas) depend on molecular motion.	1	
e. <i>Students know</i> that in solids the atoms are closely locked in position and can only vibrate; in liquids the atoms and molecules are more loosely connected and can collide with and move past one another; and in gases the atoms and molecules are free to move independently, colliding frequently.	2	
f. <i>Students know</i> how to use the periodic table to identify elements in simple compounds.	1	

COORELATED SSW WORKSHOPS – Structure of Matter

Sixth Grade: Not a focus area in sixth grade

Seventh Grade: Not a focus area in seventh grade

Eighth Grade:

- **Fun With Chemistry (100 CHE)** Before we can discuss food chemistry, the students must understand basic chemistry concepts. The periodic table of the elements is the grand, unified theory of chemistry. With hands-on activities we introduce our students to The Periodic Table. We also present the Table as a landscape, with fields of metals, pools of mercury and bromine, clouds of gases, and the offshore island of rare earths.

Science Standards: 3a, 3b, 3c, 3d, 3f, 51, 5b, 5c, 5d, 5e, 6a, 6b, 6c, 7a, 7b, 7c

- **Liquid Nitrogen and States of Matter (11 CHE):** Liquid Nitrogen is an extremely cold, liquefied gas. It can be used to demonstrate lots of interesting effects from superconductivity to the properties of gases & liquids, and a whole lot more! We use liquid nitrogen to investigate how cold temperatures affect materials.

Science Standards: 3c, 3d, 5c, 5d

CALIFORNIA STANDARDS SCIENCE TEST
GRADE 6, 7, & 8: STAR CRT SCIENCE TEST
 CONTENT STANDARDS

Earth in the Solar System (Earth Science)	7 items	12%
4. The structure and composition of the universe can be learned from studying stars and galaxies and their evolution. As a basis for understanding this concept:		
a. <i>Students know</i> galaxies are clusters of billions of stars and may have different shapes.	1	
b. <i>Students know</i> that the Sun is one of many stars in the Milky Way galaxy and that stars may differ in size, temperature, and color.	2	
c. <i>Students know</i> how to use astronomical units and light years as measures of distances between the Sun, stars, and Earth.	1	
d. <i>Students know</i> that stars are the source of light for all bright objects in outer space and that the Moon and planets shine by reflected sunlight, not by their own light.	1	
e. <i>Students know</i> the appearance, general composition, relative position and size, and motion of objects in the solar system, including planets, planetary satellites, comets, and asteroids.	2	

COORELATED SSW WORKSHOPS – Earth Science

Sixth Grade:

- **Sun Science (AST 48):** Students learn about the physical and chemical properties of the sun.
Science Standards: 3a, 4a, 4b
- **Comets, Planets, and Asteroids (42 AST):** Impact cratering is a process found everywhere in the solar system. Craters are among the most fascinating features of many moons and planets. In this workshop, students experiment to find out more about what causes the various features of impact craters, including the rim of mountains around the edge, and the streaks or rays that fan out from large craters.
Science Standards: 4d, 4e
- **Distance Between Planets (254 AST):** Students have various misconceptions about the solar system. Students may believe that the solar system is very full of objects, or they may believe that other objects seen in the solar system come from outside and are not a part of the solar system. This workshop explores the objects in the solar system and the distances between objects.
Science Standards: 4c, 4e
- **Planetary Volcanoes (67 AST)** Volcanism has played a major part in shaping not only planet Earth, but other places in our universe. Both Mars and Venus have volcanoes much larger than any on Earth, and they have erupted huge amounts of lava onto their surfaces in the past.
Science Standards: 4c, 4e

Seventh Grade: Not a focus area in seventh grade

Eighth Grade: Not a focus area in eighth grade

CALIFORNIA STANDARDS SCIENCE TEST
GRADE 6, 7, & 8: STAR CRT SCIENCE TEST
 CONTENT STANDARDS

Reactions	7 items	12%
5. Chemical reactions are processes in which atoms are rearranged into different combinations of molecules. As a basis for understanding this concept:		
a. <i>Students know</i> reactant atoms and molecules interact to form products with different chemical properties.	1	
b. <i>Students know</i> the idea of atoms explains the conservation of matter: In chemical reactions the number of atoms stays the same no matter how they are arranged, so their total mass stays the same.	2	
c. <i>Students know</i> chemical reactions usually liberate heat or absorb heat.	1	
d. <i>Students know</i> physical processes include freezing and boiling, in which a material changes form with no chemical reaction.	2	
e. <i>Students know</i> how to determine whether a solution is acidic, basic, or neutral.	1	

COORELATED SSW WORKSHOPS – Reactions

Sixth Grade: Not a focus in sixth grade

Seventh Grade: Not a focus in seventh grade

Eighth Grade:

- **Acids and Bases (285 CHE)** For thousands of years people have known that vinegar, lemon juice and many other foods taste sour. However, it was not until a few hundred years ago that it was discovered why these things taste sour - because they are all acids. The term acid, in fact, comes from the Latin term *acere*, which means sour. While there are many slightly different definitions of acids and bases, in this lesson we will introduce the fundamentals of acid/base chemistry. Students perform seven experiments: reacting metal with acids and producing hydrogen in safe quantities, collecting and safely testing hydrogen, reacting carbonates with acids and producing carbon dioxide, collecting and testing carbon dioxide, observing the effects of acids and bases on indicator dyes, measuring the concentration of acids by titration of an "unknown," and performing a neutralization experiment.

Science Standards: 3a, 3b, 3d, 3e, 3f, 5a, 5b, 5c, 5e

8TH GRADE SCIENCE TEST

CONTENT STANDARDS

Chemistry of Living Systems (Life Science)	3 items	5%
6. Principles of chemistry underlie the functioning of biological systems. As a basis for understanding this concept:		
a. <i>Students know</i> that carbon, because of its ability to combine in many ways with itself and other elements, has a central role in the chemistry of living organisms.	1	
b. <i>Students know</i> that living organisms are made of molecules consisting largely of carbon, hydrogen, nitrogen, oxygen, phosphorus, and sulfur.	1	
c. <i>Students know</i> that living organisms have many different kinds of molecules, including small ones, such as water and salt, and very large ones, such as carbohydrates, fats, proteins, and DNA.	1	

COORELATED SSW WORKSHOPS – Life Science

Sixth Grade: Not a focus area in sixth grade

Seventh Grade:

- **Strawberry DNA Spooling (86 BIO):** Have you ever wondered what a forensic scientist has to do to analyze DNA evidence? DNA (the building blocks of life) is present in the cells of all living organisms. In forensic science DNA is usually extracted from human cells to identify unknown parentage, crime scene suspects, missing victims and to investigate genetic diseases. Since 1985, "DNA fingerprinting" has been used in legal cases around the world to link suspects to the scene of a crime. Students extract DNA from fruit to see what it looks and feels like. This is similar to what a scientist has to do before they can then use the information contained in this DNA to solve crimes, although they don't use the same protocol.

Science Standards: 3c, 6a, 6b, 6c

- **Cell Biology: Microscopy Staining Techniques (215 BIO):** When students begin a unit in Life Science in school, they often are confronted with facts about cells; what they are, what is inside of them, how they reproduce, and the two basic types - animal and plant. What they most often do not receive is enough first-hand experience viewing living, working cells to relate what they have studied with what they have seen and know to be true. The students' environment is full of such cells, which can readily be seen and examined, with the light microscope. This workshop introduces our students to the design and use of the light microscope, and demonstrates cellular biology staining techniques.

Science Standards: 5a, 6a, 6b, 6c

...continued on next page

Seventh Grade (Continued):

- **Cheek To Cheek (336 BIO):** The importance of DNA manipulation is a major news item as is evident by the enormous media attention devoted to the subject. In order to work with and study DNA, you must first isolate it from the source. Students actually precipitate their own DNA from solution! The first step involved swabbing cheek cells and then adding various chemicals to lyse the cells. Next, the DNA is precipitated from solution by an alcohol overlay. Finally, the DNA is stained with safe methylene and transferred to the DNA Report Card™. Students have a permanent record of their DNA for safekeeping.

Science Standards: 6a, 6b, 6c, 7c

- **Off To the Races DNA (342 BIO):** What molecule will be first to the finish line? To study highly purified materials and molecules that are similar in size and electric charge, scientists use gel electrophoresis. This is a technique also used to separate DNA for genetic testing, determine susceptibility to disease, and conduct DNA fingerprinting to solve crimes. In this experiment, students make, pour and load their own gel with six food coloring samples. The smaller the molecule and the more negative its charge, the closer it gets to the finish line. By determining where it finishes its "race", scientists can make a determination about the identity of the molecule.

Science Standards: 6a, 6b, 6c, 7c

Eighth Grade: Not a focus area in eighth grade

CALIFORNIA STANDARDS SCIENCE TEST
GRADE 6, 7, & 8: STAR CRT SCIENCE TEST
CONTENT STANDARDS

Periodic Table	7 items	12%
7. The organization of the periodic table is based on the properties of the elements and reflects the structure of atoms. As a basis for understanding this concept:		
a. <i>Students know</i> how to identify regions corresponding to metals, nonmetals, and inert gases.	2	
b. <i>Students know</i> each element has a specific number of protons in the nucleus (the atomic number) and each isotope of the element has a different but specific number of neutrons in the nucleus.	2	
c. <i>Students know</i> substances can be classified by their properties, including their melting temperature, density, hardness, and thermal and electrical conductivity.	3	

COORELATED SSW WORKSHOPS – Periodic Table

Sixth Grade: Not a focus in sixth grade

Seventh Grade: Not a focus in seventh grade

Eighth Grade:

- **Heat Conductivity of Pan Metals (262 CHE):** So, how does heat make it from the burner at the bottom of your pan through to the other side and into the food? The answer is: *Conduction*. Though not necessarily decisive, knowing how well a material conducts heat is the first step in making a cookware choice. At this workshop, students perform experiments that will determine the heat conductivity of aluminum, brass, copper, iron and stainless steel. This knowledge is essential for selecting the appropriate pots, pans, and skillets used primarily on the stovetop, where heat-up speed and responsiveness to temperature changes can be critical and uniform heating is essential for preventing hot spots that burn food before it's entirely cooked.

Science Standards 7a 7b 7c

- **Canned Foods and Corrosion (286 CHE) -** Materials that have highly desirable thermal properties also tend to be highly reactive (and vice-versa). Materials that are highly reactive tend to have chemical reactions with other substances around them. A good example would be iron, which tends to react with oxygen to form iron oxide or, as we commonly know it, rust. Students use fresh fruits and vegetables to extract pigments that are sensitive to iron and tin. Color changes in the presence of metals offer insight into the chemistry of oxidation-reduction reactions and its application to the shelf life of preserved foods.
- **Science Standards 3a 3b 3d, 3f, 5a, 5b, 5c, 5e, 7a, 7c**

CALIFORNIA STANDARDS SCIENCE TEST
GRADE 6, 7, & 8: STAR CRT SCIENCE TEST
CONTENT STANDARDS

Density and Buoyancy	5 items	8%
8. All objects experience a buoyant force when immersed in a fluid. As a basis for understanding this concept:		
a. <i>Students know</i> density is mass per unit volume.	1	
b. <i>Students know</i> how to calculate the density of substances (regular and irregular solids and liquids) from measurements of mass and volume.	2	
c. <i>Students know</i> the buoyant force on an object in a fluid is an upward force equal to the weight of the fluid the object has displaced.	1	
d. <i>Students know</i> how to predict whether an object will float or sink.	1	

COORELATED SSW WORKSHOPS – Density and Buoyancy

Sixth Grade: Not a focus in sixth grade

Seventh Grade: Not a focus in seventh grade

Eighth Grade:

- **Physical Properties of Matter: Density (260 CHE):** Students determine the density of several "mystery" materials and compare the densities to the standard density of water.

Science Standards: 8b, 8c, 8d, 8e

CALIFORNIA STANDARDS SCIENCE TEST
GRADE 6, 7, & 8: STAR CRT SCIENCE TEST
CONTENT STANDARDS

Investigation and Experimentation	6 items	10%
9. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other three strands, students should develop their own questions and perform investigations. Students will:		
a. Plan and conduct a scientific investigation to test a hypothesis.		
b. Evaluate the accuracy and reproducibility of data.		
c. Distinguish between variable and controlled parameters in a test.		
d. Recognize the slope of the linear graph as the constant in the relationship $y = kx$ and apply this principle in interpreting graphs constructed from data.		
e. Construct appropriate graphs from data and develop quantitative statements about the relationships between variables.		
f. Apply simple mathematic relationships to determine a missing quantity in a mathematic expression, given the two remaining terms (including speed = distance/time, density = mass/volume, force = pressure x area, volume = area x height).		
g. Distinguish between linear and nonlinear relationships on a graph of data.		

COORELATED SSW WORKSHOPS – Investigation & Experimentation

All Schmahl Science Workshops (SSW) are hands-on and are constructed around scientific investigation and experimentation. Each workshop focuses on several aspects of this California Science Standard.

- SSW Workshops stress the development observation skills that can be transferred from to new situations, not only in science but across curricular areas
- SSW Workshops teach students to ask questions and perform investigations using the scientific process
- SSW Workshops teach students how to collect data in investigations and analyze those data to develop a logical conclusions
- SSW Workshops teach students to look at evidence and determine its reliability reproducibility.
- SSW Workshops teach students how to display information and data in a variety of formats including graphs, charts.
- SSW Workshop help student develop skills in predicting outcomes of simple investigations and compare results with predictions