COOL CHEMISTRY
MIDDLE SCHOOL

TEKS	
Sixth Grade:	6.5A, 6.5B, 6.5C, 6.5D
Seventh Grade:	7.6A, 7.6B, 7.6C
Eighth Grade:	8.5A, 8.5B, 8.5C, 8.5E

Vocabulary

chemical change, chemical reaction, cirrhosis of the liver, colon cancer, Crohn's disease, digestive system, electrons, esophagus, gall stones, gallbladder, hepatitis B, hepatitis C, iodine, irritable bowel syndrome, lactose intolerance, large intestine, liver, neutrons, pancreas, periodic table of elements, physical change, protons, salivary glands, small intestine, starch, stomach

Pre-Show Activity

Pre-Show Lesson: Chemical and Physical Changes in the Digestive System

Post this question on the board: "How do we know if matter has undergone a chemical change?"

Materials:

Per class: dollar bill, tongs, matches, salt, alcohol, water

Per student: index card, copy of Digestive System Parts chart (Appendix A-1)

Procedure:

1. Instructional Focus Activity: you will need a dollar bill or higher denomination, tongs, matches or a lighter, salt, a solution of 50% alcohol and 50% water (you can mix 95% alcohol with water in a 1:1 ratio, if desired). Before the students enter, complete the following steps:

- Prepare the alcohol and water solution. You can mix 50 ml of water with 50 ml of 95-100% alcohol.
- Add a pinch salt or other colorant to the alcohol/water solution, to help produce a visible flame.
- Soak a dollar bill in the alcohol/water solution so that it is thoroughly wet.
- Use tongs to pick up the bill. Allow any excess liquid to drain. Move the damp bill away from the alcohol-water solution.

When students arrive, tell them that you are going to light this one dollar bill on fire. Ask: "What changes would you expect to see and why?"

Light the bill on fire and allow it to burn until the flame goes out. Have students discuss possible explanations in small groups.

Scientific Concept Behind Burning Money

A combustion reaction occurs between alcohol and oxygen, producing heat and light (energy) and carbon dioxide and water.

$C_2H_5OH + 4\ O_2 \rightarrow 2\ CO_2 + 3\ H_2O$ + energy

When the bill is soaked an alcohol-water solution, the alcohol has a high vapor pressure and is mainly on the outside of the material (a bill is more like fabric than paper, which is nice, if you've ever accidentally washed one). When the bill is lit, the alcohol is what actually burns. The temperature at which the alcohol burns is not high enough to evaporate the water, which has a high specific heat, so the bill remains wet and isn't able to catch fire on its own. After the alcohol has burned, the flame goes out, leaving a slightly damp dollar bill.

http://chemistry.about.com/od/demonstrationsexperiments/ss/burnmoney_2.htm

2. Tell students that today they are going to be studying chemical changes in matter. Ask them what they know about chemical changes. Record their answers on a chart paper. Students should create a T-chart in their science notebook. One side is labeled "Physical Change" and the other side is labeled "Chemical Change". Ask: "What is the difference between a chemical change and a physical change?" Record differences in their chart as teacher records them on the board or chart paper. Students should understand that in physical changes, no new substance is created. In a chemical change, a new type of matter is always created.

   Chemical Changes - Look for an indication that a chemical change occurred. Chemical reactions release or absorb heat or other energy or may produce a gas,

odor, color or sound. If you don't see any of these indications, a physical change likely occurred.

3. Students will identify chemical and physical changes. Give each student an index card. On one side they will put a capital P and on the other side a capital C. The teacher will hold up a change card or state a change. If it is a chemical change, students will hold up the C card. If it is a physical change, students will hold up the P card. Discuss each change as you go.

   Changes: burning toast, baking bread, boiling water, fresh lemonade, lighting fireworks, mowing the lawn, digesting food, photosynthesis, frying eggs, cracking eggs, lighting a match, ice melting, rusting nails, slicing bread, roasting marshmallows.

   You may allow students to add some of their own ideas.

   You can find picture cards to match these changes at: http://www.middleschoolscience.com/physical-chemical-change-activity.pdf.

4. Ask students, "Is it true that if you swallow your gum it stays in your stomach for up to seven years?" "What happens in your stomach when you swallow something?" "What kinds of changes are occurring?"

5. Working in groups, students will research the changes that occur in the digestive system when we eat. There is a great slide show students can use to complete their research on the Mayo Clinic website at http://www.mayoclinic.com/health/digestive-system/DG00021. See Appendix A-1 for chart.

Post-Show Enrichment Activities

Activity One: Periodic Table of Elements

Materials: Periodic Table of Elements, 3x5 note cards, science reference books or Internet access.

Procedure:

1. Give each student a copy of the periodic table of elements. This can probably be found in their science textbook.
2. Have students work in groups to complete a T-chart about the table. In one column they need to write everything that they know about the table. In the other column, they need to write questions.
3. Debrief as a class creating a class T-chart.
4. Tell students that they have been learning about elements and the properties of matter. There are many elements, each with its own set of properties. People use elements for different purposes, based on these properties. In this activity, students will learn more about the different chemical and physical properties of matter by creating their own element trading card collection.
5. Students will make element trading cards. Each card should have the square with element information from the periodic table, the number of protons, neutrons, and electrons, who discovered it and when, physical properties and important uses (see Appendix A-2). Each student should make five cards. Be sure that each student in a small group is assigned five different elements.
6. When students have finished, combine cards together in small groups. Here are some activities students can do with them:
    - Arrange them in rows by the number of orbital shells
    - Order them by date of discovery
    - Classify them by their standard states
    - Play “guess me” by giving clues about an element
    - Connect cards to a world map with a string to identify the location of each discovery
    - Use the cards to make a class periodic table of elements

Interactive periodic table:
http://www.ptable.com/

Contains virtual games and flashcards over the periodic table:
http://education.jlab.org/elementflashcards/

Activity Two: Disappearing Color

Materials: small baby food jar, red food coloring, powdered bleach, teaspoon

Procedure:

1. Fill the jar with water.
2. Add one drop of food coloring and stir.
3. Add and stir in one teaspoon of powdered bleach.
4. Observe after 15 minutes.

Students should observe that the red color starts to fade and finally disappears. The water becomes clear except for any undissolved bleach.

When the powdered bleach is added to the water it begins to slowly give off oxygen. The combination of this oxygen with the red dye causes the color to fade until it becomes colorless.

Activity Three: Chemical Reactions in Your Mouth

Materials: bread, tincture of iodine, eyedropper, waxed paper

Procedure:

1. Cut two small pieces from a slice of white bread about one square inch each.
2. Place one piece in your mouth and chew it thirty times. It will become very mushy. Make an effort to mix as much saliva as possible with the bread.
3. Spit the mushy bread and saliva mixture onto a piece of waxed paper.
4. Place the second dry piece of bread on a separate piece of waxed paper.
5. Add four drops of iodine to both bread pieces.

The unchewed bread turns a dark blue-purple. The bread-saliva mixture does not turn dark. The starch in the bread combines with iodine to form an iodine-starch molecule. These molecules are blue-purple in color. Chewing bread mixes it with saliva. The saliva chemically changes the large

starch molecules to smaller sugar molecules. Sugar does not react with the iodine so there is no color change.

Activity Four: Digestive System Diseases

Materials: Internet access

Procedures:

1. Students will research digestive system diseases and explain the chemical and physical changes that occur (see chart in Appendix A-3).

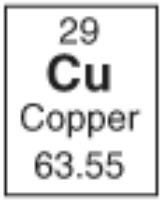
   Possible diseases to research: lactose intolerance, irritable bowel syndrome, colon cancer, cirrhosis of the liver, hepatitis B, hepatitis C, gall stones, Crohn's disease, etc.

Appendix

A-1

Digestive System Part	Physical Changes Occurring	Chemical Changes Occurring
Mouth and Salivary Glands		
Esophagus		
Stomach		
Pancreas, Liver and Gallbladder		
Small Intestine		
Large Intestine		

A-2



P= _____ N= _____ E=_____

Discovered by _____

_____ in the year _____.

Physical Properties:

Important Uses:

A-3

Name of Disease:

Disease Explanation:

Cause of disease:

Effects of Disease	Is this effect a physical or chemical change or both?	Explanation